

CORPORATE FINANCE

THIRD
ASIA-PACIFIC
EDITION



JOHN GRAHAM • CHRISTOPHER ADAM • BRINDHA GUNASINGHAM

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3rd Asia-Pacific Edition
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National Library of Australia Cataloguing-in-Publication Data
Creator: Graham, John R., author.
Title: Corporate finance / John R. Graham, Christopher Adam, Brindha Gunasingham.
Edition: 3rd Asia-Pacific edition
ISBN: 9780170446075 (paperback)
Includes index.
Other Creators/Contributors:
Adam, Christopher, author. Gunasingham, Brindha, author.

Cengage Learning Australia
Level 7, 80 Dorcas Street
South Melbourne, Victoria Australia 3205

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Printed in Singapore by C.O.S. Printers Pte Ltd.
1 2 3 4 5 6 7 24 23 22 21 20



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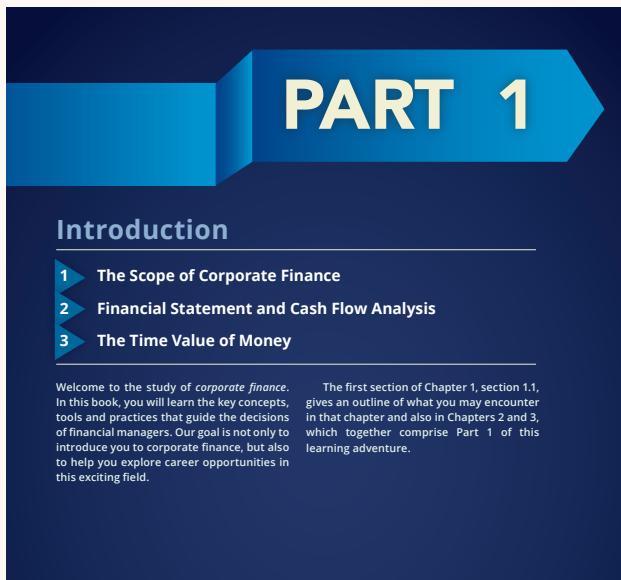
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Guide to the text

As you read this text you will find a number of features in every chapter to enhance your study of corporate finance and help you understand how the theory is applied in the real world.

PART OPENING FEATURES

Part openers introduce each of the chapters within the part and give an overview of how they relate to each other.



Understand how key concepts are connected across all chapters in the part by viewing the **Concept map**.



After you have worked through the part, revisit the ethics in corporate finance in the **NEW Sound bites: ethics in corporate finance** to apply your knowledge with several Assignments.

SOUND BITES: ETHICS IN CORPORATE FINANCE – PART 1

WRITTEN BY BORIS BIELER

Boris Bieler has over twenty years of risk management experience mainly gained in senior audit leadership roles at foreign corporate and investment banks in Australia. Boris studied at the University of Bayreuth in Germany and at the University of Warwick in England. He is a CFA charter holder, a Fellow of CPA Australia (FCPA) and a signatory of the Banking and Finance Oath (BFO) in Australia. He has been a speaker and chairperson at conferences held by the Institute of Internal Auditors Australia and CPA Australia and has supported the CFA Institute globally with their programs and curriculum. Boris has also been a guest lecturer and panelist at Macquarie University and University of Technology Sydney on topics around auditing, risk management, corporate governance and ethics in banking. He is currently a member of the advisory board at the department of accounting and corporate governance at Macquarie University. He has contributed to publications on ethics and the banking royal commission in Australia released on the CFA Institute's online portals and the BFO newsletter. Boris has been working on youth education and mentoring initiatives and is passionate about sharing his knowledge to students and assisting them with their first steps into the corporate world.

WEEK 1 INTO JANE WONG'S M&A ANALYST ROLE



CHAPTER OPENING FEATURES

Gain an insight into how corporate finance theories relate to the real world through the **What companies do** at the beginning of each chapter.

3

THE TIME VALUE OF MONEY

WHAT COMPANIES DO

TRANSPORTS OF DELIGHT?

In March 2008, Meyrick and Associates, a consulting group, together with EconSearch and Steer Davies Gleave, presented a report on a range of transport options for the East-West Link to the Victorian State Government. The East-West Link was a planned major infrastructure project that would affect transport and traffic patterns for millions of people who live and work in the city of Melbourne over many decades. The report summarised economic analyses undertaken to evaluate the benefits and costs of the base case and the various other options for developing this new source of transport infrastructure, and described a series of present values that had been determined. For example, one piece of analysis was of the present value of public transport revenue accrued by each option. It was determined by:

5 calculating the difference between the base case and each other option.

The project received considerable public attention, especially when, following a 2014 election and change of government, it was revealed that the initial business case for the project predicted a loss of 45 cents for every dollar invested. Further analyses were conducted to incorporate wider economic benefits stemming from the project, including reduced travel and commercial times, but the return from the project increased only to 84 cents for each dollar invested.

The use of present value analysis is central to any project in which a decision must be made as whether to commit scarce financial resources to an investment that will produce a long stream of cash payments in the future. This chapter will show you the key

Identify the key concepts you will engage with through the **Learning objectives** at the start of each chapter.

LEARNING OBJECTIVES

After studying this chapter, you will be able to:

- LO3.1 understand how a dollar today is not the same value as a dollar tomorrow
- LO3.2 explain that a delay in receiving cash over time means its value must increase to compensate the cash receiver who cannot engage in other investment projects while waiting – hence values of cash today are compounded into the future
- LO3.3 understand that the converse of compounding – paying more for future cash than having its value today – is discounting; that is, reducing the value of future cash if it is to be received today
- LO3.4 describe how different patterns of future cash flows (lump sums, payments each period for finite intervals (annuities), and payments each period forever (perpetuities)) can allow us to simplify the present value formulae
- LO3.5 understand how to calculate a cumulative value of cash flows at a future date
- LO3.6 understand how to calculate a cumulative value of cash flows at the present date
- LO3.7 describe how combinations of cash flow patterns can be calculated with some simplifications of the relevant formulae.

Find the main heading covering each learning outcome quickly with **LO icons**.

LO3.1

FEATURES WITHIN CHAPTERS

Analyse practical applications of concepts through the **Finance in the real world** examples.

FINANCE IN THE REAL WORLD

CFO SURVEY EVIDENCE (II)

Surveys of corporate financial managers around the world reveal both major similarities and significant differences in the use of various capital budgeting techniques. The graph below documents how frequently managers in Australia, the United States, the United Kingdom, Germany, France and Brazil use internal rate of return, net present value, payback period, real option analysis and accounting rate of return. IRR and NPV are used by over 70% of managers of Australian and US companies and by a majority, or near-majority, of Brazilian and British managers; but the propensity to use either of these theoretically preferred methods of capital budgeting decision making is below 50% in all other countries. The payback method is one of the most frequently employed decision-making tools in other countries.

Capital budgeting techniques (by country)

Technique	Australia	Brazil	France	Germany	UK	USA
IRR	High	Medium-High	Medium-Low	Medium-Low	Medium-Low	High
NPV	Medium-High	Medium-High	Medium-Low	Medium-Low	Medium-Low	Medium-High
Payback	Very High	Very High	Very High	Very High	Very High	Very High
Real Option	Medium-Low	Medium-Low	Medium-Low	Medium-Low	Medium-Low	Medium-Low
ARR	Medium-Low	Medium-Low	Medium-Low	Medium-Low	Medium-Low	Medium-Low

Check your understanding of the content by answering the **Concept review questions** as you progress through the chapter.

CONCEPT REVIEW QUESTIONS

- 10 You are given a mixed cash flow stream and an interest rate, and you are asked to calculate both the present and future values of the stream. Explain how the two numbers you calculate are related.
- 11 How is the present value of an annuity due related to the present value of an identical ordinary annuity?
- 12 Does a perpetuity pay an infinite amount of cash? Why is the present value of a perpetuity not infinite?
- 13 How would you calculate the present value of a perpetuity that had payments that were declining by a fixed percentage each year?

THINKING CAP QUESTION

- 3 Some companies (such as IBM) have issued bonds that are perpetuities. What sort of information do you think the companies have to tell investors in the market about the perpetuities to convince them to buy them?

FEATURES WITHIN CHAPTERS

Examine how theoretical concepts have been used in practice through the **Example** boxes.

EXAMPLE

More Google Calculations

In 2004, the year of its IPO, Google generated total revenue of about \$3.2 billion. Fourteen years later, the company reported 2018 revenues of about \$137 billion. What was the annual growth rate in Google's revenues during this period? Again, we apply **Equation 3.1**, substituting the values that we know as follows:

$$\begin{aligned} FV &= PV(1 + r)^n \\ \$137 &= \$3.2(1 + r)^{14} \\ (\$137 \div \$3.2)^{1/14} &= (1 + r) \\ 1.71 &= 1 + r \\ r &= 0.71 = 71\% \end{aligned}$$

Sources: Google, https://abcxyz/investor/static/pdf/2018Q4_alphabert_earnings_release.pdf. Accessed 25 June 2019.

Notice here that we are still solving for r , just as we did in the previous example. In this case, the interpretation of r is a little different. It is not the rate of return (or the rate of interest) on some investment, but rather the *compound annual growth rate* between Google's 2004 and 2018 revenues. It is a simple measure of how fast the company was growing during this period. Repeating the algebraic manipulations (spreadsheet keystrokes) from the prior example, we can determine that Google's revenues increased at an annual rate of 71% from 2004 to 2018.

END-OF-CHAPTER FEATURES

At the end of each chapter you will find several tools to help you to review, practise and extend your knowledge of the key learning objectives.

Review your understanding of the key chapter topics with the **Summary**.

Test your knowledge and consolidate your learning through the **Important equations**, **Self-test problems**, **Questions** and **Problems**.

STUDY TOOLS

SUMMARY

- L09.1** The capital budgeting process involves generating, reviewing, analysing, selecting and implementing long-term investment proposals that are consistent with the company's strategic goals.
- Other things being equal, managers would prefer an easily applied capital budgeting technique that considers cash flow, recognises the time value of money, fully accounts for expected risk and return and, when applied, leads to higher share prices.
- Though simplicity is a virtue, the simplest approaches to capital budgeting do not always lead companies to make the best investment decisions.
- Sophisticated techniques include *net present value* (NPV), *internal rate of return* (IRR) and *profitability index* (PI). These methods often give the same accept-reject decisions, but do not necessarily rank projects the same. They all focus on cash flows, rather than accounting earnings, and make appropriate adjustments for time.
- The NPV gives a direct estimate of the change in shareholder wealth resulting from a given investment and provides a straightforward way to control differences in risk among alternatives. However, it does not provide a means for incorporating the value of managerial flexibility during the life of a project.
- The NPV is calculated as the sum of the discounted cash flows, as shown in important **Equation 9.1**.
- The EVA is a variant of NPV analysis, which essentially calculates an investment's NPV on a year-by-year basis. It uses the economic profit, rather than just focusing on accounting profit, and thus allows for the cost of capital. The EVA is equal to the cash flow less the product of the cost of capital and invested capital.
- The IRR is the rate of return which sets the NPV (or sum of the discounted cash flows) to zero, as shown in important **Equation 9.2**.
- The IRR approach makes an appropriate adjustment for the time value of money and allows managers to make explicit, quantitative adjustments for differences in risk across different projects. However, using the IRR approach can occasionally lead to poor investment decisions when projects have cash flow streams alternating between negative and positive values. The IRR technique may provide sub-optimal project rankings when different investments have very different scales or when the timing of cash flows varies dramatically from one project to another.
- Although the NPV and IRR techniques give the same accept or reject decisions, these techniques do not necessarily agree in ranking mutually exclusive projects. IRR techniques weight earlier cash flows higher (since they are discounted less), and this can result in differences between rankings using each technique. Because of its lack of mathematical, scale and timing problems, the most straightforward and, theoretically, the best decision technique is net present value (NPV).
- The profitability index is a close cousin of the NPV approach, but it suffers from the same scale problem as the IRR approach. The PI is calculated as shown in important **Equation 9.3**. It is the sum of the discounted cash flows from Period 1 onwards, indexed by the modulus of the cash flow at time zero.
- Capital budgeting techniques include the payback period, discounted payback period and accounting rate of return, which are less sophisticated techniques, because they do not explicitly deal with the time value of money and are not tied to the company's wealth-maximisation goal.
- A single complete example can illustrate how the different measures of value can be calculated, and how investment decisions that add value to an enterprise can be identified.

IMPORTANT EQUATIONS

TABLE OF IMPORTANT EQUATIONS

$$\begin{aligned} 9.1 \quad NPV &= CF_0 + \frac{CF_1}{(1+r)} + \frac{CF_2}{(1+r)^2} + \frac{CF_3}{(1+r)^3} + \dots + \frac{CF_n}{(1+r)^n} \\ 9.2 \quad IRR &= r, \text{ where } NPV = \$0 = CF_0 + \frac{CF_1}{(1+r)} + \frac{CF_2}{(1+r)^2} + \frac{CF_3}{(1+r)^3} + \dots + \frac{CF_n}{(1+r)^n}, r = IRR \\ 9.3 \quad PI &= \frac{\frac{CF_1}{(1+r)^1} + \frac{CF_2}{(1+r)^2} + \frac{CF_3}{(1+r)^3} + \dots + \frac{CF_n}{(1+r)^n}}{|CF_0|} \end{aligned}$$

SELF-TEST PROBLEMS

Answers to these 'Self-test problems' and the 'Concept review' questions throughout the chapter appear on the Student Companion Website.

S9-1 JK Products Pty Ltd is considering investing in either of two competing projects that will allow the company to eliminate a production bottleneck and meet the growing demand for its products. The company's engineering department narrowed the alternatives down to two: Status Quo (SQ) and High Tech (HT). Working with the accounting and finance personnel, the company's CFO developed the following estimates of the cash flows for SQ and HT over the relevant six-year time horizon. The company has an 11% required return, and views these projects as equally risky.

QUESTIONS

- Q9-1** For a company that uses the NPV rule to make investment decisions, what consequences result if the company misestimates shareholders' required returns and consistently applies a discount rate that is 'too high'?
- Q9-2** 'Cash flow projections more than a few years out are not worth the paper they're written on. Therefore, using payback analysis, which ignores long-term cash flows, is more reasonable than making wild guesses, as one has to do in the NPV approach.' Respond to this comment.
- Q9-3** 'Smart analysts can massage the numbers in NPV analysis to make any project's NPV look positive. It is better to use a simpler approach, such as payback or accounting rate of return, that gives analysts fewer degrees of freedom to manipulate the numbers.' Respond to this comment.

PROBLEMS

NET PRESENT VALUE

- P9-1** Calculate the net present value (NPV) for the following 20-year projects. Comment on the acceptability of each. Assume that the company has an opportunity cost of 14%.
- a Initial cash outlay is \$15,000; cash inflows are \$13,000 per year.
 - b Initial cash outlay is \$32,000; cash inflows are \$4,000 per year.
 - c Initial cash outlay is \$50,000; cash inflows are \$8,500 per year.

P9-2 Michael's Bakery is evaluating a new electronic oven. The oven requires an initial cash outlay

END-OF-CHAPTER FEATURES

Analyse **Case studies** and **Real-world case studies** that present issues in context, encouraging you to integrate the concepts discussed in the chapter and apply them to the workplace.

CASE STUDY

CAPITAL BUDGETING PROCESS AND TECHNIQUES

Contact Manufacturing, Ltd. is considering two alternative investment proposals. The first proposal calls for a major renovation of the company's manufacturing facility. The second involves replacing just a few obsolete pieces of equipment in the facility. The company will choose one project or the other this year, but it will not do both. The cash flows associated with each project appear below and the company discounts project cash flows at 15%.

YEAR	RENOVATE	REPLACE
0	\$9,000,000	\$24,000,000
1	1,000,000	1,000,000
2	3,000,000	800,000
3	3,000,000	200,000
4	3,000,000	200,000
5	3,000,000	200,000

ASSIGNMENT

- Calculate the *payback period* of each project and, based on this criterion, indicate which project you would recommend for acceptance.
- Calculate the *internal rate of return* (IRR) of each project, and based on this criterion, indicate which project you would recommend for acceptance.
- Calculate the *profitability index* (PI) of each project, and based on this criterion, indicate which project you would recommend for acceptance.
- Overall, you should find conflicting recommendations based on the various criteria. Why is this occurring?
- Chart the *NPV profiles* of these projects. Label the intersection points on the x- and y-axes and the crossover point.
- Based on the *NPV profile analysis*, and assuming the *WACC* is 15%, which project would you recommend for acceptance? Why?
- Based on the *NPV profile analysis*, and assuming the *WACC* is 25%, which project would you recommend for acceptance? Why?
- Discuss the important elements to consider when deciding between these two projects.

2 Calculate the *net present value* (NPV) of each project, and based on this criterion, indicate which project you would recommend for acceptance.

3 Calculate the *internal rate of return* (IRR) of each project, and based on this criterion, indicate which project you would recommend for acceptance.

4 Calculate the *profitability index* (PI) of each project, and based on this criterion, indicate which project you would recommend for acceptance.

5 Overall, you should find conflicting recommendations based on the various criteria. Why is this occurring?

6 Chart the *NPV profiles* of these projects. Label the intersection points on the x- and y-axes and the crossover point.

7 Based on the *NPV profile analysis*, and assuming the *WACC* is 15%, which project would you recommend for acceptance? Why?

8 Based on the *NPV profile analysis*, and assuming the *WACC* is 25%, which project would you recommend for acceptance? Why?

9 Discuss the important elements to consider when deciding between these two projects.

REAL-WORLD CASE STUDY

ALL IN THE FAMILY

The Egibi family operated a series of businesses of quite diverse natures over five generations, and left a reasonable record of its activities for us to analyse. The start of the business is not particularly clear, although it seems that it came from a marriage link when a man of some means married a less wealthy woman and took up business with his brother-in-law. The Egibi brother-in-law claims to have taught his sororal nephew the trade, who then had founded it. He died, but without granting him an inheritance share beside his three natural sons. In the following generations, the eldest sons married upward, to women 'of good families' who had good connections and provided rich dowries. By contrast, their daughters were married off to business partners with dowries that typically cost only a fraction of what their eldest sons received.

The Egibis invested their profits in farmland, which they rented out on a sharecropping basis. The leasing arrangements focused on the long term, and encouraged tenants on their lands to invest in cultivating more capital-

officials responsible for maintaining the canals and collecting fees from their users in which the family paid the officials to pay the government, in return for the right to extract the fees in kind. In effect, the Egibis set up a strong shipping, storage and food-processing network, with tax-farming as a sideline operation. This work built enough financial support from the external market that, in two generations, the family was one of the most financially wealthiest in the country adjacent to the capital. The primary organisational structure used by the Egibis was the partnership arrangement, with local entrepreneurs who specialised in related production, such as beer-brewing or buying local crops, and selling them in the capital. The businesses maintain working capital at steady levels and distribute profits to the individual partners, to allow them to invest on their own in other businesses.

To extend their own investments, the Egibis moved into real estate. They developed a special relationship with the household of the local crown prince, and acquired a house

CASE STUDY

- The Scope of Corporate Finance Ch 1, p. 28
Financial Statement and Cash Flow Analysis Ch 2, p. 65
Present Value Ch 3, p. 111
Bond Purchase Decision Ch 4, p. 152
Valuing Shares Ch 5, p. 182
The Trade-Off Between Risk and Return Ch 6, p. 219
Risk, Return and the Capital Asset Pricing Model (CAPM) Ch 7, p. 255
Options Ch 8, p. 294
Capital Budgeting Process and Techniques Ch 9, p. 347
Cash Flow and Capital Budgeting Ch 10, pp. 389–390
Cost of Capital and Project Risk Ch 11, p. 421

- Raising Long-Term Financing Ch 12, p. 464
Adding Value with Capital Structure Ch 13, p. 498
Long-Term Debt and Leasing Ch 14, p. 533
Dividend Policy Ch 15, p. 563
International Financial Management Ch 16, p. 585
Mergers, Corporate Control and Corporate Governance Ch 17, P. 631
Financial Planning Ch 18, p. 670
Risk Management Ch 19, P. 700
Entrepreneurial Finance and Venture Capital Ch 20, p. 728
Cash Conversion, Inventory and Receivables Management Ch 21, p. 761
Liquidity Management Ch 22, p. 787
Insolvency and Financial Distress Ch 23, pp. 810–811

REAL-WORLD CASE STUDY

- All In the Family Ch 3, pp. 112–113
Sharing the Business Ch 8, pp. 295–296
Cannibals in The Market! Ch 11, p. 422

- 'Plane' And Simple? Ch 16, pp. 586–588
Restructuring Finances to End Litigation Ch 17, p. 632

Guide to the online resources

FOR THE INSTRUCTOR

Cengage is pleased to provide you with a selection of resources that will help you prepare your lectures and assessments.

These teaching tools are accessible via cengage.com.au/instructors for Australia or cengage.co.nz/instructors for New Zealand.

MINDTAP

Premium online teaching and learning tools are available on the *MindTap* platform - the personalised eLearning solution.

MindTap is a flexible and easy-to-use platform that helps build student confidence and gives you a clear picture of their progress. We partner with you to ease the transition to digital – we're with you every step of the way.

The *Cengage Mobile App* puts your course directly into students' hands with course materials available on their smartphone or tablet. Students can read on the go, complete practice quizzes or participate in interactive real-time activities.

MindTap for Corporate Finance is full of innovative resources to support critical thinking, and help your students move from memorisation to mastery! Includes:

- Polling questions
- Smart videos
- Concept review questions
- Revision quizzes
- Problem sets (*in Aplia*)

Now the simplicity and reliability of *Aplia* is available in the premier eLearning platform, *MindTap*.

Engage your students at every stage of the course with study exercises and assignments that connect concepts to the real world and provide an unmatched level of feedback.

Assessments offer automatic grading of every question with immediate explanations that link back to the online text so that students can review concepts.

MindTap is a premium purchasable eLearning tool. Contact your Cengage learning consultant to find out how *MindTap* can transform your course.



INSTRUCTOR'S MANUAL

The Instructor's manual includes:

- Learning objectives
- Chapter outlines
- Key questions
- Case question solutions
- Suggested class discussions and projects
- Videos
- Websites and readings

COGNERO®-BASED TEST BANK

A bank of questions has been developed in conjunction with the text for creating quizzes, tests and exams for your students. Create multiple test versions in an instant and deliver tests from your LMS, your classroom, or wherever you want using Cognero. Cognero test generator is a flexible online system that allows you to import, edit, and manipulate content from the text's test bank or elsewhere, including your own favourite test questions.

SMART VIDEOS

Industry expert talking-head videos.

POWERPOINT™ PRESENTATIONS

Use the chapter-by-chapter **PowerPoint slides** to enhance your lecture presentations and handouts by reinforcing the key principles of your subject.

ARTWORK FROM THE TEXT

Add the digital files of **graphs, tables, pictures and flow charts** into your learning management system, use them in student handouts, or copy them into your lecture presentations.

FOR THE STUDENT

MINDTAP

MindTap is the next-level online learning tool that helps you get better grades!

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- Get better grades
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When your instructor creates a course using *MindTap*, they will let you know your course link so you can access the content. Please purchase *MindTap* only when directed by your instructor. Course length is set by your instructor.

MindTap for Corporate Finance includes *Apria* – the online homework and assessment solution that helps you to better prepare for class and exams.



PREFACE

Finance matters! All business students – and, increasingly, members of the general public – need to understand finance. Whether you are working to evaluate a potential investment, an alternative marketing campaign or a new product decision, you can benefit from an understanding of introductory finance. In your personal life, too, whether you want to estimate the amount to save to buy a new car or home, or you want to decide whether to buy shares, bonds or both for your retirement account, you may make better decisions if you have a grasp of concepts of finance.

As instructors (and former students), however, we realise that finance can be an intimidating subject, especially for students who are challenged by quantitative material. The initial goal in writing this book was to change that perception by reducing the intimidation factor and clearly communicating the excitement and relevance that finance holds for each of us. We hope to continue that excitement and relevance with this new edition.

In previous years, the US editions received two types of feedback, suggesting that they achieved their objective of creating an effective, user-friendly text. Many users told the authors, first, about their positive experiences with the book, and, second, that the book continued to experience strong and growing success in the market. This success carried over to the first and second Asia-Pacific editions, published in 2014 and 2017 respectively, and we are grateful to all those who bought the book and who gave us their comments on it.

In this third Asia-Pacific edition, we aim to build on the book's earlier success to establish it as a market-leading corporate finance text. We strongly believe that this third edition offers the up-to-date pedagogy and features necessary to achieve these goals.

NEW DISTINGUISHING FEATURES OF THE BOOK

This book shows you how the concepts you have learned in your fundamental business courses – such as economics, statistics and accounting – directly connect to finance. Understanding these linkages should allow you to quickly realise that you already know more about finance than you think you do! To help you recognise the practicality of the concepts covered in this book, chapters include many illustrations of how you may utilise key chapter ideas in your own lives. In this third Asia-Pacific edition, we have updated examples and cases. We have continued to use the ‘flow chart’ from the second Asia-Pacific edition for the overall learning pattern of the book, so that you can see at a glance where the current topic you are reading fits into the universe of finance knowledge. We have adjusted questions and problems at the ends of chapters; and we have continued to bring into our discussions materials reflecting existing and emerging finance practice across the Asia-Pacific region.

In addition to the major cases at the end of each Part of the book, we have introduced new cases which focus on ethical issues in finance, as a growing field in the finance literature and practice.

Every student needs some extra explanation or support at different points in this course. Consequently, an outstanding technology package accompanies this book (see the Resources Guide for further details) to allow you to learn and absorb material at your own pace.

Included in this technology package are many video clips of finance professionals and scholars, each of whom contributes to the picture of just how often financial issues affect today's world.

CORE PRINCIPLES AND FEATURES

To accomplish our goal of making this the most effective, student-friendly introductory finance textbook in the market today, we followed several core principles when writing and revising the text and designing its support package.

- *Pique your interest, as students of finance, and demonstrate the relevance of important concepts and techniques.* We feel that it's important to begin each chapter with a recent practical illustration that stimulates your interest in the chapter. The chapters of this book each begin with a story pulled from recent headlines that illustrates a key chapter concept in an applied setting.

In order to make it clear that the concepts and techniques presented in this text are not merely academic abstractions, but rather are used by industry practitioners, we have included in most chapters a feature called 'Finance in the Real World'. It adds reality to your learning experience by providing insight into how senior financial executives apply many of the concepts and techniques that are presented throughout the book.

We also strive to provide you with a smooth bridge between concepts and practice by including demonstrations that are labelled 'Example'. These illustrations, many of which use real data from well-known companies, take concepts and make them easy to understand within interesting and relevant contexts.

The third edition of the Asia-Pacific version of the text also includes a new set of cases which encourage the reader to think about ethical issues involved with financial decisions. These have been created by Boris Bieler, a new contributor to the book. Called 'Sound Bites: Ethics in Corporate Finance', the cases are located at the end of each of the five Parts of the book (Part V being online – see the Resources Guide for further details). Each financial ethics case links back to the initial set-up at the end of Part I, and provides a new decision situation for Jane Wong, the central actor in the cases. Following each case, we give a set of Assignments for student activity, and, in the accompanying technology package (see the Resources Guide for further details) a collection of Polling Questions which may be used to spark discussion in a tutorial or seminar.

- *Maximise the pedagogical and motivational value of technology.* Technology accompanying textbooks may often impede learning and classroom delivery rather than facilitate student interest and understanding. At times, the mental investment required to learn enough about text technology can cancel out one's ability to absorb the most important finance concepts. In other cases, students may focus too much on what a particular technology can do, rather than what it should do. With this in mind, we have developed an accompanying technology package which engages, motivates and at times entertains readers, while helping them master financial concepts in their own time and at their own pace. Most of all, as authors of the Asia-Pacific text, we wanted to take primary responsibility for integrating the technology seamlessly with the text's most important concepts and techniques.

To meet this principle, please refer to the Resources Guide on p. xxi to see a sample of the rich content that you can access.

- *Provide a truly global perspective, viewed through an Asia-Pacific lens.* The economic world is shrinking – particularly with respect to financial transactions. Formerly centrally planned economies are moving towards becoming market economies. Many developing nations are making rapid economic progress using markets-based methods. Financial markets play an increasingly important role in the ongoing globalisation of business and finance. Against this backdrop of change, some aspects of business still vary significantly in different markets; for example, the Australian or New Zealand company stock exchange listing rules and aspects of the new issues markets are very different from those in the US markets. As future practitioners in this region, we feel it is important for you to understand these distinctions. Rather than grouping international issues into a chapter or two, we have integrated a global perspective, while providing an Asia-Pacific focus, throughout the book.
- *Consider students' prerequisites and connect with the courses you have taken to finance.* Experienced financial managers consistently tell us that they need people who can see the big picture and who can recognise connections across functional disciplines. To help you develop a larger sense of what finance is about, why it is relevant to your business studies, and to ease your transition into your own chosen fields, we highlight concepts that most students will have learned in their introductory economics, statistics and accounting courses. We then connect these concepts to finance.
- *Inspire students to think beyond the book and explore some of these concepts in more depth.* To help you do this, throughout the text we have included 'stretch' questions in the margin near the related discussion. These questions, which are labelled 'Thinking cap questions', are intended to encourage you to think beyond the direct explanation of the text about applied issues in finance. These insights may also be relevant for job interviews that you may be undertaking; you can use these to prepare for interviews or can ask these questions about the organisation during an interview.

For additional learning enhancements, see the Guide to the Text and Guide to the Online Resources on p. xxi and p. xxv respectively.

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Boris Bieler who has authored the "Sound Bites: Ethics in Corporate Finance" cases at the end of each Part has over 20 years of risk management experience, mainly gained in senior audit leadership roles at foreign corporate and investment banks in Australia.

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ACKNOWLEDGEMENTS

Cengage Learning and the authors would like to thank the following reviewers (and several anonymous reviewers) for their incisive and helpful feedback:

- Gurmeet S Bhabra, University of Otago
- Debajyoti Chakrabarty, Charles Darwin University
- Elson Goh, Curtin University
- May Hu, Deakin University
- Charles Koh, Macquarie University
- Shawgat S. Kutubi, Charles Darwin University
- Asjeet Lamba, University of Melbourne
- Mirela Malin, Griffith University
- Sagarika Mishra, Deakin University
- Hoa Nguyen, Deakin University
- Dr. Gabrielle Parle, University of the Sunshine Coast

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Corporate finance is the art of measuring and managing value over time and with uncertainty

Cash is the physical measure of value, which is embedded in the flow of **Time** and affected by **Uncertainty**. Exchange of value occurs through **Market interaction**.

PART 1

Introduction

- 1 The Scope of Corporate Finance**
 - 2 Financial Statement and Cash Flow Analysis**
 - 3 The Time Value of Money**
-

Welcome to the study of *corporate finance*. In this book, you will learn the key concepts, tools and practices that guide the decisions of financial managers. Our goal is not only to introduce you to corporate finance, but also to help you explore career opportunities in this exciting field.

The first section of Chapter 1, section 1.1, gives an outline of what you may encounter in that chapter and also in Chapters 2 and 3, which together comprise Part 1 of this learning adventure.

1

THE SCOPE OF CORPORATE FINANCE

WHAT COMPANIES DO

APPLE INC.: APPLE EPS REACHES ALL-TIME HIGH AT \$4.18

January 2019 – Apple today announced financial results for its fiscal 2019 first quarter, ended 29 December 2018. The company posted quarterly revenue of US\$84.3 billion, a decline of 5% from the year-ago quarter, and quarterly earnings per diluted share of US\$4.18, up 7.5%. International sales accounted for 62% of the quarter's revenue.

Revenue from iPhone® declined 15% from the prior year, while total revenue from all other products and services grew 19%. Services revenue reached an all-time high of US\$10.9 billion, up 19% over the prior year. Revenue from Mac® and Wearables, Home and Accessories also reached all-time highs, growing 9% and 33%, respectively, and revenue from iPad® grew 17%.

'While it was disappointing to miss our revenue guidance, we manage Apple for the long term, and this quarter's results demonstrate that the underlying strength of our business runs deep and wide', said Tim Cook, Apple's CEO. 'Our active installed base of devices reached an all-time high of 1.4 billion in the first quarter, growing in each

of our geographic segments. That's a great testament to the satisfaction and loyalty of our customers, and it's driving our Services business to new records thanks to our large and fast-growing ecosystem.'

'We generated very strong operating cash flow of US\$26.7 billion during the December quarter and set an all-time EPS [earnings per share] record of US\$4.18', said Luca Maestri, Apple's CFO. 'We returned over US\$13 billion to our investors during the quarter through dividends and share repurchases. Our net cash balance was US\$130 billion at the end of the quarter, and we continue to target a net cash neutral position over time.'

Source: 'Apple Reports First Quarter Results.' Press release. 29 January 2019. <https://www.apple.com/newsroom/2019/01/apple-reports-first-quarter-results/>. Accessed 9 June 2019.

This sort of analysis of corporate performance contains a great deal of information, although the particular meaning of these details may be lost in the wave of terminology. This press release contained accounting data, financial data, product data and customer satisfaction data. How do we





decode these sets of information? This text focuses on corporate financial performance, but necessarily draws on the other sets of information given out by corporations. We shall examine in this book how important it is to consider cash flows (particularly distinctly from net income or profit measures as supplied in accounting data), why we may

wish to know what the given corporation is doing with its shares (buying them back or selling more of them) and such other aspects as whether the corporation is working in a domestic market or has international exposure, as Apple clearly does (62% of its sales revenue in this quarter came from international sales).

LEARNING OBJECTIVES

After studying this chapter, you will be able to:

- LO1.1 describe how companies obtain funding from financial intermediaries and markets, and discuss the five basic functions that financial managers perform
- LO1.2 define agency costs and explain how shareholders monitor and encourage corporate managers to maximise shareholder wealth
- LO1.3 appreciate how finance interacts with other functional areas of any business,
- LO1.4 assess the costs and benefits of the principal forms of business organisation and explain why limited liability companies, with publicly traded shares, dominate economic life in most countries
- see the diverse career opportunities available to finance majors.

1.1 CORPORATE FINANCE ELEMENTS AND FUNCTIONS

As you begin your learning journey in corporate finance using this book, it is useful to have an overview of the content you will cover. This chapter offers guidelines in two dimensions: a summary of key corporate finance ideas, and a consideration of applications of corporate finance ideas as they have emerged in actual markets around the world. In this first section of the chapter, we outline the content of the central ideas or elements of corporate finance. In the following sections, we consider how those ideas have been used to define what a corporate financial manager does and how that role interacts with other functional business areas; and then we review what business (corporate) entities have emerged to implement the ideas. This review leads us back to close Chapter 1 with a summary of career opportunities that may exist for people in corporate finance.

1.1a ELEMENTS AND STRUCTURE OF CORPORATE FINANCE LEARNING

The order of chapters in this book is built on our view of the central concepts that underpin corporate finance. Foundations are laid in Part 1, with the key ideas in Chapter 1. In corporate finance, we depend a great deal on measurement – if we can measure concepts, we may be better able to manage them – so in Chapter 2 we outline the key (accounting) measures that are relevant for finance. The principal focus in corporate finance is on cash flows in an organisation, but their measurement is developed from traditional accounting concepts such

as net income. We then take the concept of cash flow and introduce you in Chapter 3 to the primary insight of finance, the time value of money, which allows us to compare cash flows at different times, to see if value is being added to an organisation by its decisions, or if value is being reduced. These three chapters complete Part 1.

Because applications of the time value of money come in many different forms based on the huge variety of financial instruments that have been created over human history, we explore some of the most important applications in Part 2 of the book. Here we review the valuation of bonds (Chapter 4) and of shares (Chapter 5), before adding a further element central to finance, the concept of risk (Chapter 6). With the concept of risk in hand, we explore two major applications of financial value and risk, by studying the capital asset pricing model (Chapter 7) and options (Chapter 8).

In Part 3, we turn to a primary decision process arising for corporate entities: how to decide which investments – typically large, long-term commitments of funds with cash returns that extend over many years into the future – should be undertaken. The key insight from Parts 1 and 2 is that investments that add net present value (NPV) to the firm are most preferred. If an individual or corporation has to choose just one among several positive NPV investments, then the one with the largest NPV is most preferred. This whole area of analysis is covered under the heading of Part 3, Capital Budgeting. In Part 3 we examine many examples of the challenges which arise when measuring the present value of uncertain cash inflows and outflows associated with various types of investment. Naturally, risk is a constant companion in this exploration of how to measure value from future commitments, and we explain how risk can be calculated and incorporated in the present value formulations.

Then we come to Part 4 Financial Strategy. Successful business organisations arise from the commitment of their managers to undertake activities which add value to the organisations through investments; but those investments often cannot be undertaken without new funding (cash inflows) being contributed to the organisation. The funds may come from existing activities which generate net positive cash flows; or they may arise in concert with the start of new activities; or the funds may need to be newly contributed by sources external to the organisation. When we consider these different funds suppliers, we are talking about financial strategy. The *external* funds suppliers, in particular, are very important to almost all organisations, and so Part 4 examines the various ways a modern corporation can raise funds externally from groups or persons who are not currently part of the corporation, but who are willing to commit the funds and trust the corporation's management to create a positive return for them. Some of these external funds may be borrowed, and some may be given. The borrowed funds are typically repaid over time, with appropriate returns to the funds' suppliers. The funds which are given are exchanged for ownership in the corporation – shares of various types – to which an expected return is attached, but not guaranteed. The return to the shareholders may be directly in cash or other shares, a form of dividend; or it may be in terms of a rising value of the shares so the shareholders can obtain a capital gain from selling the shares in the future.

By conquering the content of Parts 1, 2, 3 and 4, we are now in a good position to understand the essential operations of modern corporate finance. The subject, however, is much larger than its essential features. Thanks to many generations of thinkers and financial activists over the past 150 or more years, we have seen the emergence of some new pathways for understanding advanced features of corporate finance. One of these pathways is tackled in Part 5, under the heading of Financial Lifecycle. When we examined organisations' financial activities in both capital budgeting and financial strategy in Parts 1–4, we tended to focus on established businesses that were already operating in their markets. But all organisations start somewhere and at some time, and should have the ability to create a financial plan as they consider the financing of these beginning businesses and their hopeful later growth. This area of study has now developed into a specific topic, entrepreneurial finance and venture capital, that we argue should be reviewed in a thorough corporate finance book; so we provide that review in Part 5. We also examine financial issues arising later in the

corporate lifecycle, with growing businesses that have moved past their foundation; and we go on to consider what financial activities are involved with organisations that are in financial distress or, further, are sliding into insolvency and are liable for liquidation, ending their lives.

As corporate finance has evolved over recent years, there has emerged a growing concern that its practitioners may need to take a wider, societal view of the impacts of their activities in capital markets. A way to explain such a view in this text has been to include case studies of ethics in each of the five parts of the text. These ethics case studies have been created by a colleague of the main authors, Mr Boris Bieler. What is the key message of these studies? They represent an intensified focus on integrating ethics into management decisions and employee behaviour across the financial services industry, including the corporate finance sector. By their inclusion in the text, they aim to discourage repetition of past events of unethical activities, and to make current and future practitioners conscious of the ethical implications of their work. The finance sector has increasingly revisited expected norms and values for guiding employees' behaviour which is monitored, rewarded and disciplined. Through the cases, we hope to help meet the increasing community expectations of the finance industry, which is further evidenced in regulators' enforcement actions and more prescriptive standards.

The cases presented at the end of each part follow a logical pattern for learning. At the end of Part 1, we have a case that introduces a framework for dealing with ethical issues in finance; at the end of Part 2, once you have gained more knowledge about the key ideas of corporate finance, the case reviews some history on ethical issues; and Part 3's case expands on a series of activities in corporate management that encounter ethical questions, using your knowledge of capital budgeting from the chapters in Part 3. Part 4's case addresses expectations about ethical behaviour that have emerged from a number of reviews of behaviour in corporate finance in several countries; and the case for Part 5 gives a good summary of what may be expected to emerge in the interaction between ethics and finance in coming years.

1.1b THE FIVE BASIC CORPORATE FINANCE FUNCTIONS

Although **corporate finance** is defined generally as the activities involved in managing cash (money) that flows through a business, a more precise description notes that the practice of corporate finance involves five basic functions: financing, financial management, capital budgeting, risk management and corporate governance. Nearly every topic covered in this text focuses on one or more of these five functions.

corporate finance
The activities involved in managing cash (money) that flows through a business

Financing

The **financing function** involves raising capital to support a company's operations and investment programs. A key aspect of this activity, known as the *capital structure decision*, involves determining and maintaining the mix of debt and equity securities that maximises the company's overall market value. Businesses raise money either externally, from creditors or shareholders, or internally, by retaining and reinvesting profits. Companies in Australia and other developed economies raise about two-thirds of their required financing internally, but the financing function focuses primarily on *external financing*. Large companies enjoy varied opportunities to raise money externally, either by selling *equity* (ordinary or preferred shares) or by issuing *debt*, which involves borrowing money from creditors. When companies are young and small, they usually must raise equity capital privately, from friends and family, or from professional investors such as *venture capitalists*. **Venture capitalists** specialise in making high-risk, high-return investments in rapidly growing entrepreneurial businesses. After companies reach a certain size, they may 'go public' by conducting an **initial public offering (IPO)** of shares – selling shares to outside investors and listing them for trade on a stock exchange. After going public, companies can raise funds by selling additional shares.

financing function
Raising capital to support a company's operations and investment programs

venture capitalists
Professional investors who specialise in making high-risk, high-return investments in rapidly growing entrepreneurial businesses

initial public offering (IPO)
Companies offering shares for sale to the public for the first time by selling shares to outside investors and listing them for trade on a stock exchange

Financial Management

financial management function

The activities involved in managing the company's operating cash flows as efficiently and effectively as possible

The **financial management function** involves managing the company's operating cash flows as efficiently as possible. A key responsibility of the financial management function is to ensure that the company has enough funds on hand to support day-to-day operations. This involves obtaining seasonal financing, building adequate inventories to meet customer demand, paying suppliers, collecting from customers and investing surplus cash, all while maintaining adequate cash balances. Effectively managing the day-to-day financial activities of the company requires not only technical and analytical skills, but also people skills, since almost every aspect of this activity involves building and maintaining relationships with customers, suppliers, lenders and others.

capital budgeting function

The activities involved in selecting the best projects in which to invest the company's funds based on their expected risk and return. Also called the investment function

Capital Budgeting

The **capital budgeting function**, often called the *investment function*, involves selecting the best projects in which to invest the company's funds based on expected risk and return. It is a critical function for two reasons. First, the scale of capital investment projects is often quite large. Second, companies can prosper in a competitive economy only by seeking out the most promising new products, processes and services to deliver to customers. Companies such as Telstra, BHP Billiton, Woolworths and Hills Industries regularly make large capital investments, the outcomes of which drive the value of their companies and the wealth of their owners. For these and other companies, the annual capital investment budget can total several billion dollars.

The capital budgeting process breaks down into three steps:

- 1 Identifying potential investments.
- 2 Analysing the set of investment opportunities and selecting those that create the most shareholder value.
- 3 Implementing and monitoring the selected investments.

The long-term success of most companies depends on mastering all three steps.

Not surprisingly, capital budgeting is also the area where managers have the greatest opportunity to create value for shareholders by acquiring assets that yield benefits greater than their costs.

Risk Management

risk management function

The activities involved in identifying, measuring and managing the company's exposure to all types of risk to maintain an optimal risk-return trade-off, and therefore to maximise share value

risk shifting

When an organisation pays another entity or person to restore a loss of value due to unforeseen circumstances

risk spreading, or diversification

When an organisation undertakes a number of risk ventures at the same time and the likelihood of all the ventures simultaneously failing and reducing organisational value is very low

hedge

To diversify risks by using financial instruments to offset market risks such as interest rate and currency fluctuations

The **risk management function** involves identifying, measuring and managing the company's exposure to all types of risk to maintain an optimal risk-return trade-off, and therefore maximise share value. Common risks include losses that can result from adverse interest rate movements, changes in commodity prices and fluctuations in currency values. The techniques for managing these risks are among the most sophisticated of all corporate finance practices. The risk management task begins with quantifying the sources and size of a company's risk exposure and deciding whether to simply accept these risks, or to actively manage them.

Risks can be managed in two ways: **risk shifting** and **risk spreading, or diversification**. Risk shifting involves you or your organisation paying another entity to take on the risk and to compensate you in case negative outcomes occur. This is insurance. Some risks are easily insurable, such as the risk of loss due to fire, employee theft or product liability, because there is much history of their occurrence, meaning probabilities of loss are calculable.

Risk spreading involves combining activities that give rise to risks in such a way that the overall risk of the combination is less than the risk of each item in the combination. This is also called diversification.

For example, rather than use a sole supplier for a key production input, a company might choose to contract with several suppliers, even if doing so means purchasing the input above the lowest attainable price. However, most companies' risk management practices focus on market-driven risks. Risk managers, who typically work as part of a company's treasury staff, use complex financial instruments to **hedge**, or offset, market risks such as interest rate and currency fluctuations.

Corporate Governance

The **corporate governance function** involves developing company-wide structures and incentives that influence managers to behave ethically and make decisions that benefit shareholders. The existence of a well-functioning corporate governance system is extremely important. Good management does not occur in a vacuum. Instead, it results from a corporate governance system that hires and promotes qualified, honest people and structures employees' financial incentives to motivate them to maximise company value.

An optimal corporate governance system is difficult to develop in practice, not least because the incentives of shareholders, managers and other stakeholders often conflict. A company's shareholders want managers to work hard and protect shareholders' interests, but it is rarely profitable for any *individual* shareholder to expend time and resources monitoring managers to see if they are acting appropriately. An individual shareholder would personally bear all the costs of monitoring management, but the benefit of such monitoring would accrue to all shareholders. This is a classic example of the **collective action problem** that arises in most relationships between shareholders and managers. Likewise, managers may feel the need to increase the wealth of owners, but they also want to protect their own jobs. Managers, rationally, do not want to work harder than necessary if others will reap most of the benefits. Finally, managers and shareholders may effectively run a company to benefit themselves at the expense of creditors or other stakeholders who do not have a direct say in corporate governance.

As you might expect, several mechanisms have been designed to mitigate these problems. A strong board of directors is an essential element in any well-functioning governance system because it is the board's duty to hire, fire, pay and promote senior managers. The board develops *fixed* (salary) and *incentive* (bonus- and share-based) compensation packages to align managers' and shareholders' incentives. Auditors play a governance role by certifying the validity of companies' financial statements.

For example, in Australia, the independent national governmental body charged with oversight of corporate activities is the **Australian Securities and Investments Commission (ASIC)**. ASIC's role is to enforce and regulate company and financial services laws to protect Australian consumers, investors and creditors; to be the corporate, markets and financial services regulator. It was created in 1998 from an earlier national regulator, and had further functions added to its portfolio in 2002 for credit protection, oversight of the **Australian Securities Exchange (ASX)** in 2009 and of the newest stock exchange, Chi-X, in 2011. The ASX was created by the merger of the Australian Stock Exchange and the Sydney Futures Exchange in July 2006, and is today one of the world's top 10 listed exchange groups measured by market capitalisation.

Just as companies struggle to develop an effective corporate governance system, so too do countries. Governments establish legal frameworks that either encourage or discourage the development of competitive businesses and efficient financial markets. For example, a legal system should permit efficiency-enhancing mergers and acquisitions, but should block business combinations that significantly restrict competition. It should provide protection for creditors and minority shareholders by limiting the opportunities for managers or majority shareholders to expropriate wealth.

We will discuss each of the five major finance functions at length in this text, and we hope you come to share our enthusiasm about the career opportunities that corporate finance provides. Never before has finance been as fast-paced, as technological, as international, as ethically challenging or as rigorous as it is today, and the market seems to be responding. A notable recent pattern in Australian university education has been that more students are currently enrolled in undergraduate and postgraduate business and management education courses than in any other broad field such as science, engineering or arts.

corporate governance function

The activities involved in developing company-wide structures and incentives that influence managers to behave ethically and make decisions that benefit shareholders

collective action problem

When individual shareholders bear all the costs of monitoring management, but the benefit of such monitoring accrues to all shareholders

Australian Securities and Investments Commission (ASIC)

The Australian government entity charged with enforcing and regulating company and financial services laws to protect Australian consumers, investors and creditors, and being the corporate, markets and financial services regulator for Australia

Australian Securities Exchange (ASX)

The primary stock exchange operating in Australia for trading shares in publicly listed companies

FINANCE IN THE REAL WORLD



ACCENTURE IN THE REAL WORLD: ACCENTURE'S VIEW OF FINANCE'S CHALLENGES

In a survey by Accenture, analysis found that the following issues were central to the finance function in the organisation and the role of the CFO in managing it.

MANAGING VOLATILITY

Finance functions have made significant progress in their ability to navigate some of the powerful external forces that affect performance, including the challenge of permanent volatility.

THE RISE OF DIGITAL ON THE CFO AGENDA

Digital technology – which may include cloud computing or software as a service (SaaS), big data and/or analytics, mobility and social media – is having a profound impact on the finance function's performance.

NAVIGATING COMPLEXITY

Complexity, in its various guises, is the biggest challenge finance organisations face today. But it is also an opportunity. High-performance businesses must find ways of navigating complexity – by standardising and optimising processes to streamline and simplify the organisation.

HIGH-PERFORMANCE BUSINESSES HAVE MORE INFLUENTIAL CFOs

Finance leaders at high-performance businesses are particularly likely to have seen their influence grow in key strategic activities.

Source: Accenture. Used with permission. https://www.accenture.com/t20150523T021053_w/_us-en/_acnmedia/Accenture/Conversion-Assets/DotCom/Documents/Global/PDF/Digital_2/Accenture-2014-High-Performance-Finance-Study-CFO-Architect-Business-Value.PDF. Accessed 18 October 2015.

1.1c DEBT AND EQUITY: THE TWO FLAVOURS OF CAPITAL

debt capital

Long-term borrowed money

Companies have access to two broad types of capital: debt and equity. **Debt capital** includes all of a company's long-term borrowing from creditors. The borrower is obliged to pay *interest*, at a specified annual rate, on the full amount borrowed (called the loan's *principal*), as well as to repay the principal at the debt's maturity. These payments must be made according to a predetermined schedule, and creditors have a legally enforceable claim against the company. If the company defaults on any of its debt payments, creditors can take legal action to force repayment. In some cases, this means that creditors can push the borrowing company into bankruptcy, forcing them out of business and into selling (liquidating) their assets to raise the cash needed to satisfy creditor claims.

equity capital

An ownership interest purchased by an investor, usually in the form of ordinary or preferred shares, that is expected to remain permanently invested

Investors contribute **equity capital** in exchange for ownership interests in the company. Equity remains permanently invested in the company. The two basic sources of equity capital are ordinary shares and preferred shares. *Ordinary shareholders* (Australian and UK terminology), or *common stockholders* (US terminology), bear most of the company's risk because they receive returns on their investments only after creditors and preferred shareholders are paid in full. Similar to creditors, *preferred shareholders* are promised a specified annual payment on their invested capital. Unlike debt, preferred shareholders' claims are not legally enforceable, so these investors cannot force a company to become insolvent if a scheduled preferred share dividend is not paid. If a company becomes insolvent and must be liquidated, preferred shareholders' claims are paid off before any money is distributed to ordinary shareholders, but after creditors' claims have been paid.

1.1d THE ROLE OF FINANCIAL INTERMEDIARIES IN CORPORATE FINANCE

In Australia and most developed countries, companies can obtain debt capital by selling securities, either directly to investors or through financial intermediaries. A **financial intermediary** is an institution that raises capital by issuing liabilities against itself, and then uses the capital raised either to make loans to companies and individuals or to buy various types of investments. Financial intermediaries include banks, insurance companies, savings and loan institutions, credit unions, mutual funds and pension funds. But the best-known financial intermediaries are commercial banks, which issue liabilities such as demand deposits (cheque accounts) to companies and individuals and then lend these funds to companies, governments and households.

financial intermediary
An institution that raises capital by issuing liabilities against itself, and then uses the capital raised either to make loans to companies and individuals or to buy various types of investments

In addition to making corporate loans, financial intermediaries provide a variety of financial services to businesses. By accepting money in demand deposits received from companies and individuals, banks eliminate their depositors' need to hold large amounts of cash for use in purchasing goods and services. Banks also act as the backbone of a nation's payments system by facilitating the transfer of money between payers and payees, providing transaction information and streamlining large-volume transactions such as payroll disbursements.

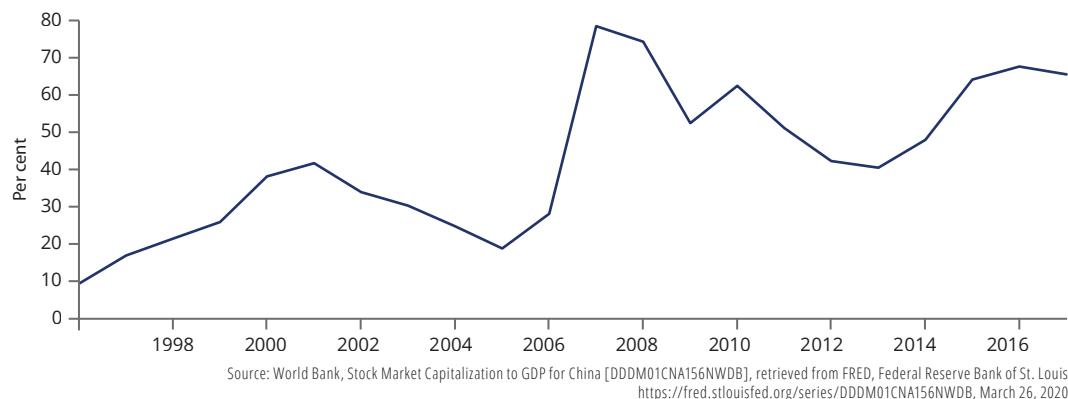
The Growing Importance of Financial Markets

The role of traditional intermediaries such as banks as providers of debt capital to companies has been declining for decades. During 2007–2011, this source of debt capital contracted severely in many countries as the effects of global financial turbulence spread around the world. Many banks stopped lending to customers, especially during the latter part of 2008, and this caused a severe liquidity crisis for many companies. Recovery, from 2009 onward, has seen some increases in lending, but only trending towards the levels before 2007. Stock market valuations also varied greatly over time, but strongly growing economies such as China were able to sustain long-term trends of growth relative to overall gross domestic product even with some declines, as shown in **Figure 1.1**.

For several decades, non-financial companies have increasingly turned to capital markets for external financing. This shift towards greater reliance on market-based external funding has resulted in the growth of mutual funds and superannuation funds – both financial intermediaries that are major purchasers of the securities of non-financial companies.

FIGURE 1.1 SHARE MARKET CAPITALISATION FOR CHINA 1994–2017

Even as China was exposed to the global financial crisis during 2007–2011, and its share market value declined from a peak of nearly 80% of its gross domestic product in 2007 to 40% in 2013, the overall value of the ratio was on an upward trend from the mid-1990s through to at least 2017.



primary-market transactions

Cash sales of securities to investors by a company to raise capital

When companies sell securities to investors in exchange for cash, they raise capital in **primary-market transactions**. In such transactions, companies actually receive the proceeds from issuing securities, so these are true capital-raising events. Once companies issue securities, investors can sell them to other investors. Trades between investors, called **secondary-market transactions**, generate no new cash flow for the company, so they are not true capital-raising events. Most share market trades are secondary-market trades, whereas a large fraction of all bond market trades are capital-raising primary-market transactions.

LO1.1

CONCEPT REVIEW QUESTIONS

secondary-market transactions

Trades between investors that generate no new cash flow for the company

- 1 List and briefly describe the five basic corporate finance functions. What is the general relationship among them?
- 2 Which of the five basic corporate finance functions might be considered non-traditional? Why do you think these functions have become so important in recent years?
- 3 What is a financial intermediary? Why have these institutions been steadily losing market share to capital markets as the principal source of external financing for companies?

LO1.2

1.2 GOALS FOR THE CORPORATE FINANCIAL MANAGER

In widely held companies, the owners typically do not manage the company. This raises the interesting question: whose interests should managers serve – those of shareholders, creditors, customers or employees? The traditional answer given in finance textbooks is that managers should operate the company in a way that maximises shareholder wealth. As a practical matter, that recommendation is difficult to implement, partly because managers may be tempted to pursue their own interests rather than shareholders' interests.

In the sections that follow, we first evaluate profit maximisation, and then describe shareholder wealth maximisation. Next, we discuss the *agency costs* arising from potential conflicts between shareholders, managers and other stakeholders (such as bondholders). Finally, we consider the role of ethics in corporate finance, including a brief look at how some recent legislation affects financial management.

1.2a WHAT SHOULD A FINANCIAL MANAGER TRY TO MAXIMISE?

Should a financial manager try to maximise corporate profits, shareholder wealth or something else? Here, we hope to convince you that managers should seek, within some ethical and legal bounds, to maximise shareholder wealth but with an awareness of social goals that may arise, such as supporting 'green finance'. A narrow focus simply on cash flows generated only by corporate activities may in fact reduce corporate value.

Maximise Profit?

Some people believe that the manager's objective is to maximise profits, and it is common to see compensation plans designed so that managers receive larger bonuses for increasing reported earnings. To achieve profit maximisation, the financial manager takes those actions that make a positive contribution to the company's profits. Thus, for each alternative, the financial manager should select the one with the highest expected profit. From a practical standpoint, this objective translates into maximising *earnings per share (EPS)*, the

amount earned on behalf of each outstanding ordinary share. Although it seems a plausible objective, profit maximisation suffers from several flaws:

- EPS figures are inherently backward-looking, reflecting what has happened rather than what will happen.
- Some short-run decisions (such as forgoing maintenance) to boost EPS can actually destroy value in the long run. Even if managers strive to maximise profits over time, they should not ignore the timing of those profits. A large profit that arrives many years in the future may be less valuable than a smaller profit earned today. As we will learn in Chapter 3, money has a time value; simply put, a dollar today is worth more than a dollar in the future.
- A manager cannot maximise profits without knowing how to measure them, and conventional barometers of profit come from accrual-based accounting principles rather than from a focus on cash flows. In finance, we place more emphasis on cash – the true currency of business – than on profits or earnings.

Focusing solely on earnings ignores risk. When comparing two investment opportunities, managers should not always choose the one they expect to generate the highest profits. They must consider the risks of the investments as well. As we will learn in Part 2, a trade-off exists between *risk and return*, the two key determinants of share prices. Higher cash flow generally leads to higher share prices, whereas higher risk results in lower share prices. Therefore, an investment project with high profits and high risk could be less valuable than one with lower profits and lower risk.

Maximise Shareholder Wealth?

Modern finance asserts that *the proper goal of companies is to maximise the wealth of shareholders*, where wealth is measured by the company's share price. This share price reflects the timing, magnitude and risk of the *cash flows* that investors expect a company to generate over time. When considering alternative strategies, financial managers should undertake only those actions that they expect will increase the company's share price.

Why does finance preach the wisdom of maximising share value as the primary corporate objective? Why not focus instead on satisfying the desires of corporate **stakeholders** such as customers, employees, suppliers and creditors? A company's shareholders are sometimes called its **residual claimants**, meaning that they can exert claims only on the company's cash flows that remain after all other claimants, such as customers, employees, suppliers, creditors and governments, are satisfied in full. It may help to visualise a queue with all the company's stakeholders standing in line to receive their share of the company's cash flows. Shareholders stand at the end of this line. If the company cannot pay its employees, suppliers, creditors and the tax authorities, then shareholders receive nothing. Shareholders earn a return on their investment only after all other stakeholders' claims have been met. In other words, maximising shareholder returns usually implies that the company must also satisfy customers, employees, suppliers, creditors and other stakeholders first.

Furthermore, by accepting their position as residual claimants, shareholders agree to bear more risk than do other stakeholders. If companies did not operate with the goal of maximising shareholder wealth in mind, then shareholders would have little incentive to accept the risks necessary for a business to thrive. To understand this point, consider how a company would operate if it were run solely in the interests of its creditors. Given that creditors receive only a fixed return, would such a company be inclined to make risky investments, no matter how profitable? Only shareholders have the proper incentives to make risky, value-increasing investments.

stakeholders
Those with a justified interest in, or claim on, a company, such as customers, employees, suppliers, creditors and shareholders

residual claimants
Corporate investors – typically, ordinary shareholders – who have the right to receive cash flows after all other claimants have been satisfied in full

Focus on Stakeholders?

Although the primary goal of managers should be to maximise shareholder wealth, many companies have broadened their focus to include the interests of other stakeholders, such as customers, employees, suppliers, creditors, tax authorities and the communities where companies operate. A company with a stakeholder

focus consciously avoids actions that would harm stakeholders by transferring their wealth to shareholders. The goal is not so much to maximise others' interests as it is to preserve those interests. Considering other constituents' interests is part of the company's social responsibility, and keeping other affected groups happy provides long-term benefits to shareholders. Such relationships minimise employee turnover, conflicts and litigation. In most cases, taking care of stakeholders translates into maximising shareholder wealth. But conflict between these two objectives sometimes arises. When it does, the company should ultimately be run to benefit shareholders while preserving stakeholder interests. For example, it is important to put customers first; but, obviously, making customers happy enough to do repeat business is also part of maximising shareholder value.

Interestingly, even though Australian and New Zealand companies are generally expected to act in a socially responsible way, they are rarely *required* by law to do so. The situation is different in many western European countries, where companies are expected to contribute to social welfare almost as much as they are expected to create private wealth.

One recent example of recommendations to increase requirements for corporations and other business entities to contribute to the social welfare goals of a country is given in studies from the United Nations focusing on ecosystems and environmental disasters, and why we should increase awareness of the links between them when investing in countries. The UN Office for Disaster Risk Reduction (UNDRR) is quoted as saying that among important reasons for embracing 'nature-based' approaches in order to reduce disaster-related risks is the concept of a 'no-regret investment': that sustainable ecosystem management should provide multiple social, economic and environmental benefits as well as disaster risk reduction. This sort of management can enhance resilience to disasters while contributing to national gross domestic product, poverty reduction, food security, biodiversity and carbon sequestration.¹ This suggests that limiting the 'stakeholder' group for corporate investments only to employees, or employees and shareholders, may omit significant other interests that might be affected by the corporate decision making.

1.2b HOW CAN AGENCY COSTS BE CONTROLLED IN CORPORATE FINANCE?

We have argued that financial managers should pursue the goal of maximising shareholder wealth. Thus, managers act as *agents* of the owners who have hired them and given them decision-making authority. In practice, managers also care about their personal wealth, job security, lifestyle, prestige and perquisites (such as golf club memberships, personal chauffeurs and posh offices). Such concerns cause managers to pursue objectives other than maximising shareholder wealth. Shareholders recognise the potential for managers' self-interested behaviour, and they use a variety of tools to limit this behaviour. Similarly, conflicts can arise between shareholders and bondholders, especially regarding the risks that the company takes when it makes new investments. The term '**agency costs**' refers to costs that arise as a result of these conflicts between various corporate stakeholders.

agency costs
Costs that arise from conflicts of interest between shareholders and managers

agency problems
The conflict of interest between the goals of a company's owners and its managers

Types of Agency Costs

The conflict of interest between owners and managers gives rise to **agency problems**. Shareholders can attempt to overcome these agency problems by various means, including:

- relying on market forces to exert managerial discipline
- incurring the monitoring and bonding costs necessary to ensure that executive compensation packages fairly align the interests of managers and shareholders.

¹ http://unepinquiry.org/wp-content/uploads/2017/06/Fintech_Green_Finance_and_Developing_Countries-input-paper.pdf. Accessed May 2019.

Several market forces constrain the behaviour of a company's managers. In recent years, large investors have become more active in management. This is particularly true for *institutional investors* such as mutual funds, life insurance companies and pension funds, which often hold large blocks of shares. Activist institutional investors use their influence to put pressure on underperforming management teams, occasionally applying enough pressure to replace the CEO.

An even more powerful form of market discipline is the **hostile takeover**, which involves the acquisition of one company (the *target*) by another (the *acquirer*) through an open-market bid for a majority of the target's shares. By definition, a takeover attempt is *hostile* if the target company's senior managers resist (or simply do not support) the acquisition. Bidders in hostile deals may believe that they can improve the value of the target company, and thereby make a profit on their investment, by replacing incumbent management. Managers naturally find this threatening, and erect a variety of barriers to thwart potential acquirers. Nevertheless, the constant threat of a takeover provides additional motivation for managers to act in the interests of the company's owners.

In addition to these market forces, other devices exist that encourage managers to behave in the shareholders' interests or that limit the consequences when managers misbehave. *These may include monitoring expenditures paid for audits and control procedures that alert shareholders when managers pursue their own interests too aggressively.* Managers and directors of companies can also accept that a portion of their total remuneration is to be received in the form of delayed compensation, such as receiving access to some of their pay in the company several years after a profitable year.

hostile takeover

The acquisition of one company (the target) by another (the acquirer) through an open-market bid for a majority of the target's shares if the target company's senior managers do not support (or, more likely, actively resist) the acquisition

Use of Compensation Plans to Control Agency Costs

Another way to align managerial and shareholder interests is through **executive compensation plans**. The objective is to design such plans to give managers the incentive to act in the best interests of the owners. Incentive compensation plans tie managerial wealth to the company's share price by paying managers with shares in the company, or **share options**. Share options give the manager the right to purchase shares at a fixed price, usually the market price of the shares at the time the manager receives the options. The key idea is that managers will have an incentive to take actions that maximise the share price because this will increase their wealth along with that of the other shareholders.

executive compensation plans

Incentives offered to a manager to encourage them to act in the best interests of the owners

share options

Outright grants of shares to top managers, or, more commonly, grants the rights to purchase shares at a fixed price

Although tying management compensation to performance seems like an effective way to motivate managers, compensation plans have come under intense scrutiny in recent years. Individual and institutional investors have publicly questioned whether the multimillion-dollar compensation packages granted to executives really are linked to performance. It is not hard to find examples of CEOs who receive millions in compensation even though their companies are underperforming. In addition, average levels of CEO compensation in other developed countries tend to be much lower – a fact that critics of CEO pay in the United States, in particular, do not miss. Over the past two years in Australia and New Zealand, there have been several publicly listed companies in which the senior executive teams were advised by their boards of directors that bonuses would not be paid due to underperformance of the company over the previous year.

1.2c ETHICS ARE IMPORTANT IN CORPORATE FINANCE

In recent years, the media and others have questioned the legitimacy of actions taken by certain businesses. Examples range from the US\$1.2 million that former Merrill Lynch CEO John Thain spent redecorating his office, shortly after Bank of America acquired Merrill in 2008, to the billions stolen by Bernard Madoff through his massive Ponzi scheme. The global financial crisis of 2007–2011 focused attention on a wide range of ethical issues. Did mortgage lenders lower their credit standards in order to make a quick profit on loan originations while passing on the risk of subprime mortgages to other investors? Did a lack of due diligence

by rating agencies cause them to fail to warn investors of the risks of exotic mortgage-backed securities and credit default swaps? Should financial institutions like American International Group (AIG) pay bonuses to managers even after receiving billions in governmental bailout dollars?

Ethical concerns received attention in the media after the Enron collapse in late 2001. For example, in response to a series of (mostly US) corporate scandals, the ASX adopted rules for companies listed on its exchange that asked companies to provide extensive documentation about the internal controls they had to protect investors from fraud. If a company decided not to comply with some of the rules – such as ensuring that the external organisation auditing the company books was not also a consultant to the company – then the company had to explain why it was not following the rules, and the ASX had to be satisfied with the explanation. It is interesting to note that one response to the global financial crisis and its subsequent securities markets' effects has been the enactment of new laws in many countries placing limits on the risks that financial institutions can take.

The Royal Commission into Misconduct in the Banking, Superannuation and Financial Services Industry revealed an ongoing interest by Australian governments and people in how ethically (or unethically) banks had behaved in recent years with respect to lending and repayment practices. The Royal Commission found that the key reason why corporate misconduct occurred in the banking, superannuation and financial services industry was ‘greed – the pursuit of short-term profit at the expense of basic standards of honesty ... From the executive suite to the front line, staff were measured and rewarded by reference to profit and sales ... When misconduct was revealed, it either went unpunished or the consequences did not meet the seriousness of what had been done’.²



Managing Ethics in Investment

Since 1972, Harvard University has operated with two committees that together guide the university's approach to shareholder responsibility in relation to the university's investments in publicly traded corporations: the Advisory Committee on Shareholder Responsibility (ACSR) and the Corporation Committee on Shareholder Responsibility (CCSR). The ACSR reviews shareholder resolutions associated with corporate social responsibility at publicly traded companies in which Harvard owns shares, and makes recommendations to the CCSR, which is responsible for final decisions on the university's voting on those resolutions.

Recently, the Harvard Management Company (HMC) has relied increasingly on pooled investments typically managed by outside investment firms rather than directly owning shares in individual firms. This has led to a review

of ACSR's role, so that the committee will focus on developing guidelines to help inform Harvard's external investment managers as they vote on future shareholder resolutions.

This move towards developing broadly available proxy guidelines has been part of Harvard's efforts to intensify the university's engagement with its external investment managers, with companies and with other investors in relation to the issue of corporate social responsibility. Harvard's decision in 2014 to become the first US university to subscribe to the United Nations-supported Principles for Responsible Investment, and its announcement this week [sic] to affiliate with the global investor initiative Climate Action 100+, is part of the university's deepening commitment to ethical and environmental issues in its investments.

Source: Herpich, N. 'Taking Corporate Social Responsibility Seriously'. *The Harvard Gazette*. 18 September 2019. [https://news.harvard.edu/gazette/story/2019/09/changes-in-investment-strategy-refocus-duties-of-corporate-social-responsibility-panels/?utm_source=SilverpopMailing&utm_medium=email&utm_campaign=Daily%20Gazette%2020190919%20\(1\)](https://news.harvard.edu/gazette/story/2019/09/changes-in-investment-strategy-refocus-duties-of-corporate-social-responsibility-panels/?utm_source=SilverpopMailing&utm_medium=email&utm_campaign=Daily%20Gazette%2020190919%20(1)). Accessed 20 September 2019.

² Hayne, K. 'Interim Report: Executive Summary'. 28 September 2018. Royal Commission into Misconduct in the Banking, Superannuation and Financial Services Industry. Commonwealth of Australia. <https://financialservices.royalcommission.gov.au/Documents/interim-report/interim-report-exec-summary.pdf>. Accessed 4 February 2020.

More and more companies are now directly addressing the issue of ethics by establishing corporate ethics policies and guidelines and by requiring employee compliance with them. Frequently, employees are required to sign a formal pledge to uphold the company's ethics policies. Such policies typically apply to employee actions in dealing with all corporate stakeholders, including the public at large. *Ethical behaviour is therefore viewed as both necessary and perfectly consistent with achieving the company's goal of maximising shareholder wealth.*

LO1.2

CONCEPT REVIEW QUESTIONS

- 4 What are agency costs? Why do these tend to increase in severity as a company grows larger?
- 5 What are the relative advantages and disadvantages of using sophisticated management compensation packages to align the interests of managers and shareholders?
- 6 Why are ethics important in corporate finance? What is the likely consequence of unethical behaviour by financial managers?

THINKING CAP QUESTIONS

- 1 What problems might be encountered if a company ties its employee bonuses to earnings per share?
- 2 When you read or hear about a company in the media, does the company explain the primary goal of its actions? For a publicly listed company, does its annual report outline its primary goal?

LO1.3

1.3 THE ROLE OF CORPORATE FINANCE IN BUSINESS

Apple's recent history, as outlined in the section 'What companies do' at the start of this chapter, illustrates some of the positive results of good management in a highly competitive, technology-driven industry. It also reflects on the vital role that financial managers play in creating wealth. Business involves people with many different skills and backgrounds working together towards common goals. Financial experts play a major role in achieving these goals and in creating value for the **firm's** shareholders.

This book focuses on the practising financial manager, who is a key player in the management team of a modern company. Throughout this text we highlight one simple question that managers should ask when contemplating all business decisions: does this action create value for the shareholders? *By taking actions that generate benefits in excess of costs, firms generate wealth for their investors.* Managers seeking to generate wealth for their investors should take only those actions in which the benefits exceed the costs.

The skills and knowledge needed to achieve corporate business objectives are the same as those needed to be a successful entrepreneur, to manage family businesses or to run a non-profit organisation. Successful financial managers must be able to creatively manage both people and money. Although the financial world was shaken by the recession that began in 2007 and continues to have impacts around the world, companies still need to accept, invest and manage capital. If anything, today it is more important than ever to have a good understanding of corporate finance.

As an introduction to what a financial manager's job entails, the next section discusses how various functional disciplines interact with financial managers, and describes the kinds of jobs that people with financial training generally take.

firm

A term generally used by economists to refer to a non-governmental entity that employs tangible or intangible resources as inputs to create outputs, representing a form of production function. In economics, a firm is often assumed to have a goal of maximising profits. In Australia, a firm is usually called a company

1.3a HOW FINANCE INTERACTS WITH OTHER FUNCTIONAL BUSINESS AREAS

Financial professionals interact with experts in a wide range of disciplines to operate successful businesses. For example, from the quotation of Accenture's survey in 'Finance in the Real World' box earlier in the chapter, we saw that those working in the finance area of an organisation would need to:

- understand the organisation's overall volatility, which may affect any area of its operations
- recognise the impacts of computer technology – the development of digital systems – on how an organisation may function
- help develop methods to address complexity of operations so that the organisation can treat the complex interactions as routine and standard
- be able to create new strategies with reasonable speed in high-performance businesses, even in areas which may focus more on marketing or new technologies.

1.3b LEGAL FORMS OF BUSINESS ORGANISATION

Companies exist so that people can organise to pursue profit-making ventures. This section examines how companies organise themselves legally, and discusses the costs and benefits of each major form. We begin with the most popular forms of business organisation in developed economies, and then look at some forms that are used in some other nations.

Business Organisational Forms

The three key legal forms of business organisation in countries that have inherited a British system of company laws – such as the US, Canada, Australia, New Zealand, India, Singapore and Hong Kong – have been the sole proprietorship, the partnership and the company. These have recently been joined by a fourth type, the limited partnership. The sole proprietorship is the most common form of organisation. The largest businesses tend to be organised as companies, and they account for a large fraction of total business sales and profits. The principles and tools that financial analysts use to do their jobs apply to all of these organisational forms.

Sole Proprietorships

sole proprietorship
A business with a single owner

A **sole proprietorship** is a business with a single owner. In fact, in sole proprietorships, there is no legal distinction between the business and the owner. The business is the owner's personal property; it exists only as long as the owner lives and chooses to operate it, and all business assets belong to the owner. Furthermore, the owner bears personal liability for all the company's debts and pays income taxes on its earnings. In recent years, sole traders and partnerships made up about 45% of actively traded businesses in Australia, but generated less than 10% of total sales.³

Simplicity and ease of operation constitute the principal benefits of the proprietorship. However, this organisational form suffers from weaknesses that in most cases limit the company's long-term growth potential. These include the following:

- *Limited life* – By definition, a proprietorship ceases to exist when the founder retires or dies. Although the founder-entrepreneur can pass the assets of the business on to a third party, most of what makes the business valuable is tied to the proprietor personally. Furthermore, changes in ownership of successful companies can trigger large tax liabilities.

³ Berk, J., DeMarzo, P., Harford, J., Ford, G., Mollica, V. and Finch, N. *Fundamentals of Corporate Finance*, 2nd edition. Pearson Australia, 2012: 421.

- *Limited access to capital* – A proprietorship can obtain operating capital from only two sources: reinvested profits and personal borrowing by the entrepreneur. In practice, both of these sources are easily exhausted.
- *Unlimited personal liability* – A sole proprietor is personally liable for all the debts of the business, including judgements awarded to a plaintiff in any successful lawsuit. This is a high risk, which often is not insurable; and the risk is not spread widely because the sole proprietor has a small investment by definition.

Partnerships

A (general) **partnership** is essentially a proprietorship with two or more owners who have joined their skills and personal wealth. As in a sole proprietorship, there is no legal distinction between the business and its owners, each of whom can execute contracts binding on all the other(s), and each of whom is personally liable for all the partnership's debts. This sharing of legal responsibility is known as **joint and several liability**.

Although nothing requires the owners to formalise the terms of their partnership in a written **partnership agreement**, most partnerships create such a document. In the absence of a partnership agreement, the business dissolves whenever one of the partners retires or dies. Furthermore, unless there is a partnership agreement specifying otherwise, each partner shares equally in business income and each has equal management authority. As with a proprietorship, partnership income is taxed only once: at the personal level.

In addition to the tax benefits and ease of formation that partnerships share with proprietorships, the partnership allows a large number of people to pool their expertise and capital to form a much larger enterprise. Partnerships enjoy more flexibility than proprietorships in that the business need not automatically terminate following the retirement or death of one partner. Industries in which partnerships are usually the dominant form of organisation include accounting, consulting, engineering, law and medicine.

The drawbacks of the partnership form resemble those of the sole proprietorship:

- *Limited life* – The life of the company can be limited, particularly if only a few partners are involved. Problems may also result from the instability inherent in long-term, multi-person business associations.
- *Limited access to capital* – For operating capital, the company is still limited to retained profits and personal borrowings.
- *Unlimited personal liability* – This disadvantage is accentuated because the partners are subject to joint and several liability. As companies grow larger, the competitive disadvantages of the proprietorship and partnership organisational forms tend to become extremely burdensome. Almost all successful companies eventually adopt the corporate organisational form.

Limited Partnerships

In many ways, a **limited partnership (LP)** combines the best features of the (general) partnership and the corporate organisational forms, which we cover next. This is a recent organisational form in many countries. For example, in the US it dates from legislation put in place in the mid-1970s, and in Australia from 2000. In any limited partnership, there must be one or more **general partners**, each of whom has unlimited personal liability. Because only the **general partners** operate the business and are legally exposed, they usually receive a greater-than-proportional (in terms of their capital contribution) share of partnership income. Most of the participants in the partnership are **limited partners**. They have the limited liability of corporate shareholders, but their share of the profits from the business is taxed as partnership income. The limited partners, however, must be totally passive. They contribute capital to the partnership, but cannot have their names associated with the business; nor can they take an active role in the operation of the business, even as employees. In return for this passivity, the limited partners face no personal liability for business debts. This means that although limited partners can lose their equity investment in the business, tax authorities (or other plaintiffs) cannot sue the limited partners personally for payment of their claims. It should be

partnership
A proprietorship with two or more owners who have joined their skills and personal wealth

joint and several liability
A legal concept that makes each partner in a partnership legally liable for all the debts of the partnership

limited partnership (LP)
A partnership in which most of the participants (the limited partners) have the limited liability of corporate shareholders, but their share of the profits from the business is taxed as partnership income

general partners (limited partnership)
One or more participants in a limited partnership who operate the business and have unlimited personal liability

limited partners (limited partnership)
One or more totally passive participants in a limited partnership, who do not take any active role in the operation of the business and do not face personal liability for the debts of the business

emphasised that limited partners share in partnership income, which is taxed as ordinary personal income for the partners.

Limited partnerships are ideal vehicles for funding long-term investments that generate large non-cash operating losses in the early years of the business because these losses *flow through* directly to the limited partners. This means the limited partners can (under specified conditions) use the tax losses to offset taxable income from other sources. Disadvantages of LPs include a shallow secondary market for securities and difficulties with monitoring and disciplining the general partner(s).

proprietary limited company

A company form with between two and five shareholders with limited liability that creates an organisational form separate from individuals

company

A legal entity, owned by the shareholders who hold its ordinary shares, with many of the economic rights and responsibilities enjoyed by individuals

corporation

A legal entity set up to conduct business and usually regulated by a governmental authority. A corporation can be limited by share or by guarantee, or be a no-liability company, a proprietary limited company or a private company. Also referred to as a 'company'

shareholder

An owner of ordinary or preferred shares in a company

public company

A company, the shares of which can be freely traded among investors without the permission of other investors, and whose shares are listed for trading in a public securities market

board of directors

Elected by shareholders to be responsible for hiring and firing senior managers and for setting overall corporate policies

constitution

The legal document created at the company's inception to govern its operations

equity claimants

Owners of a company's equity securities

Proprietary Limited Companies

A private company is a more complex business structure formed by one or more people who wish to have a business that is a separate legal entity to themselves. This makes a key distinction with the concepts of partnerships and sole proprietor forms of organisation. A **proprietary limited company** creates the roles of employee, director and shareholder of the company.

Establishment and ongoing administrative costs associated with such companies can be high, which is why the structure is generally considered to be better suited for medium to large businesses.

Companies

Under corporations laws in Australia, New Zealand, Hong Kong and many other nations with British-style laws, a **company** is defined as a fictitious person created by charter, prescription or legislation. It is also called a **corporation**. Because it is a 'person' separate from humans, a company is owned by the **shareholders**, who hold its ordinary shares, with many of the economic rights and responsibilities enjoyed by individuals. A company can sue and be sued, it can own property and execute contracts in its own name, and it can be tried and convicted for crimes committed by its employees.

The corporate organisational form has several key competitive advantages over other forms, including the following:

- *Unlimited life* – Once created, a company has perpetual life unless it is explicitly terminated.
- *Limited liability* – The company's shareholders cannot be held personally liable for the company's debts.
- *Separable contracting* – Companies can contract individually with managers, suppliers, customers and ordinary employees, and each individual contract can be renegotiated, modified or terminated without affecting other stakeholders.
- *Improved access to capital* – The company itself, rather than its owners, can borrow money from creditors, and it can also issue various classes of ordinary and preferred shares to equity investors. Furthermore, the ownership claims themselves (ordinary and preferred shares) can be freely traded among investors (secondary-market transactions) without obtaining the permission of current investors or management if the company is a **public company** – that is, one whose shares are listed for trading in a public securities market.

Corporate ordinary shares carry voting rights, and shareholders vote at an annual meeting to elect the company's directors. The *directors* include key corporate personnel as well as outsiders, typically successful private businesspeople or executives of other major companies. The **board of directors** is responsible for hiring and firing senior managers and for setting overall corporate policies. The rules dictating voting procedures and other parameters of corporate governance appear in the company's **constitution**, the legal document created at the company's inception to govern its operations. The constitution can be changed only by a vote of the shareholders.

Companies may issue two forms of shares, *ordinary* and *preferred*, each with slightly different rights and privileges. Shareholders of ordinary and preferred stock or shares, as owners of the company's equity securities, are often called **equity claimants**. Shareholders of preferred shares typically have higher-priority access to the company's earnings and bear less risk than shareholders of ordinary shares. In exchange for

this privileged risk position, the preferred shareholders may not have the right to vote. Therefore, we refer to ordinary shareholders as the company's ultimate owners. Ordinary shareholders vote periodically to elect the members of the board of directors and, occasionally, to amend the company's constitution.

It is important to note the division between owners and managers in a large company. The **managing director or chief executive officer (CEO)** is responsible for managing day-to-day operations and carrying out policies established by the board. The board expects regular reports from the CEO regarding the company's current status and future direction. However, the CEO and the board serve at the will of the shareholders. The separation between owners and managers leads to agency costs, the costs that arise from conflicts of interest between shareholders (owners) and managers. These costs – and the agency problems that cause them – were discussed in greater depth in section 1.2b.

Although companies dominate economic life around the world, this form has some competitive disadvantages. Many governments tax corporate income at both company and personal levels. In Australia, however, this is generally not an issue: because of the implementation of the dividend imputation tax regime, the personal investor in a company is taxed at his or her own rate of taxation, with compensation being provided for any corporate tax that has already been paid on dividends received. This tax arrangement is discussed in more detail in our later chapter on dividends and payout policy.

managing director or chief executive officer (CEO)

The top company manager with overall responsibility and authority for managing daily company affairs and carrying out policies established by the board

1.3c SPECIAL FORMS OF BUSINESS ORGANISATION

Here, we briefly review the most important organisational forms used by companies in the US and some other countries other than former British Commonwealth nations. In countries with different legal structures, such as Germany or France, which have codified laws, the organisational forms may differ.

Almost all capitalist economies allow some form of limited liability business organisation, with ownership shares that are freely traded on national share markets. These companies tend to dominate economic life in the countries where these organisations exist.

Limited Liability Companies

The **limited liability company (LLC)** combines the tax advantages of a partnership with the limited liability protection of a company. These forms were developed in the US, where they are easy to set up. The US Internal Revenue Service, or IRS (the American federal tax office), allows an LLC's owners to elect taxation as either a partnership or as a company, and many states allow one-person LLCs and a choice between a finite or infinite company life. Even though LLCs can be taxed as partnerships, their owners face no personal liability for other partners' malpractice, making this type of company especially attractive for professional service companies. Given the limited liability feature and the flexibility of LLCs, it is likely that they will continue to gain significant organisational market share in years to come.

limited liability company (LLC)

A form of business organisation that combines the tax advantages of a partnership with the limited liability protection of a company

Limited Liability Companies in Other Industrialised Countries

Although LLCs exist around the world, they have different names in different countries. In Britain, they are called public limited companies (plc); in Germany, *Aktiengesellschaft* (AG); in France, *société générale* (SG); and in Spain, Mexico and elsewhere in Latin America, *sociedad anónima* (SA). Details vary, but all of these structures are similar to publicly traded companies. Key differences between international and, say, Australian or New Zealand companies revolve around tax treatment of business income and the amount of information that publicly traded companies must disclose. Tax rules are typically, though not always, harsher in Australia than elsewhere, and disclosure requirements are almost always greater for British Commonwealth and US companies than for companies in other countries.

Many countries also distinguish between LLCs that can be traded publicly and those that are privately held. In Germany, *Gesellschaft mit beschränkter Haftung* (GmbH) are privately owned, unlisted,

limited-liability share companies. In France, these are called *société à responsabilité limitée* (SARL). Private (unlisted) companies, particularly family-owned companies, play important roles in all market economies. For example, Germany's phenomenal post-Second World War growth was propelled by mid-sized, export-oriented companies that pursued niche marketing strategies at home and abroad. These *Mittelstand* (middle market) companies have been prominent in German industrial growth, although other European countries, such as the UK, are apparently catching up with their successes.⁴ A similar set of relatively small, entrepreneurial family-owned companies has helped propel some Asian nations to growth rates consistently higher than those achieved in other industrialised countries.

LO1.3

CONCEPT REVIEW QUESTIONS

- 7 What are the costs and benefits of each of the three major organisational forms – the sole proprietorship, the partnership and the company – in Australia? Why do you think the various hybrid forms of business organisation have proven so successful?
- 8 Comment on the following statement: 'Sooner or later, all successful private companies that are organised as proprietorships or partnerships must become companies.'

THINKING CAP QUESTION

- 2 What are the pros and cons of organising a business as a company rather than as a partnership?

LO1.4

1.4 CAREER OPPORTUNITIES IN FINANCE

This section briefly surveys career opportunities in finance. Though different jobs require different specialised skills, financial professionals employ the same basic tools of corporate finance whether they work for internet start-ups, in large manufacturing companies, in the investment funds sector or in the offices of a commercial bank or life insurance company. Three other skills that virtually all finance jobs require are:

- good written and verbal communication skills
- an ability to work in teams
- proficiency with computers and the internet.

For an increasing number of finance jobs, managers also need an in-depth knowledge of international business to achieve career success.

We classify finance career opportunities as follows:⁵

- corporate finance
- commercial banking
- investment banking
- money management
- consulting.

4 'Medium-sized UK Firms Add More to Economy than German Peers – Report'. *The Guardian*, 3 March 2015. <http://www.theguardian.com/business/2015/mar/02/medium-sized-uk-firms-add-more-economy-than-german-peers-report>. Accessed 12 December 2015.

5 The website <http://jobs.efinancialcareers.com.au/Australia.htm> is informative for jobs in finance in Australia.

More specific work areas in finance include:

- account and relationship management
- compliance and risk
- credit
- financial planning
- funds management
- mortgages
- settlements
- stockbroking and trading
- treasury.

1.4a CORPORATE FINANCE

Corporate finance is concerned with the duties of financial managers in business. These professionals handle the financial affairs of many types of businesses – financial and non-financial, private and public, large and small, profit-seeking and not-for-profit. They perform such varied tasks as budgeting, financial forecasting, cash management, credit administration, investment analysis and funds procurement. In recent years, changing economic and regulatory environments have increased the importance and complexity of the financial manager's duties. The globalisation of business has also increased demand for people who can assess and manage the risks associated with volatile exchange rates and rapidly changing political environments.

Figure 1.2 summarises the primary activities of various corporate finance positions.

FIGURE 1.2 CAREER OPPORTUNITIES IN CORPORATE FINANCE

POSITION	PRIMARY ACTIVITIES
Financial analyst	Prepares and analyses the company's financial plans and budgets
Capital budgeting manager	Evaluates and recommends proposed asset investments
Cash manager	Maintains and controls the company's cash flow and short-term investments
Project finance manager	Arranges financing for approved asset investments
FinTech manager	Controls and develops the interface between financial operations and electronic/internet connections of the organisation
Credit analyst or manager	Analyses and manages all aspects of the company's credit-granting activities
Treasurer	Oversees all financial management activities
Controller	Manages all aspects of the company's accounting activities
Chief financial officer (CFO)	Develops financial policies and strategies and oversees the activities of the treasurer and controller

1.4b COMMERCIAL BANKING

Unlike in the US, the commercial banking industry in most countries is dominated by a few large players. In Australia, there are four very large banks: ANZ, Commonwealth Bank, NAB and Westpac. They comprise approximately 75% of the bank assets in the country. In Singapore, the three largest banks (DBS, OCBC and United Overseas Bank) dominate the local market.⁶ Nonetheless, Australia, for example, does have more than

chief financial officer (CFO)

Top management position charged with developing financial policies and strategies covering all aspects of a company's financial management and accounting activities

6 https://en.wikipedia.org/wiki/List_of_largest_banks_in_Southeast_Asia. Accessed 19 June 2019.

90 banks in total, many serving special client needs.⁷ Singapore has more than 100 foreign banks represented.⁸ Banks continue to hire large numbers of new business and finance graduates each year, and banking remains a fertile training ground for managers who later migrate to other fields. The key aptitudes required in most entry-level banking jobs are the same as in other areas. In addition to communication, people, computer and international skills, apprentice bankers must master cash flow valuation, as well as financial and credit analysis.

Most commercial banks offer at least two basic career tracks: consumer or commercial banking. *Consumer banking* serves the financial needs of a bank's individual customers in its branch network, increasingly via electronic media such as the internet. *Commercial banking*, on the other hand, involves extending credit and other banking services to corporate clients, ranging from small, family-owned businesses to global corporate behemoths. In addition, a great many technologically intensive support positions in banking require excellent finance skills and intimate knowledge of telecommunications and computer technology. **Figure 1.3** describes career opportunities in commercial banking.

FIGURE 1.3 CAREER OPPORTUNITIES IN COMMERCIAL BANKING

POSITION	PRIMARY ACTIVITIES
Credit analyst	Analyses the creditworthiness of corporate and individual loan applicants
Corporate loan officer	Develops new loan business for the bank, makes loan recommendations and services existing loans
Branch manager	Manages the personnel and operation of a bank branch and markets bank services to attract new depositors and borrowers
Trust officer	Provides investment, tax and estate advice and products to wealthy bank customers
Mortgage banker	Originates and services mortgage loans to homebuyers and businesses
Leasing manager	Manages banks' equipment-leasing operations and develops related products and services
Operations officer	Responsible for a number of possible activities, such as electronic banking, internal data processing, security of electronic transactions and coordination of computer links to ATMs, other banks and the Reserve Bank

1.4c INVESTMENT BANKING

Along with consulting, investment banking is the career of choice for many highly qualified finance students because of its high income potential and the interesting nature of the work. *Investment banking* involves three main types of activities:

- helping corporate customers obtain funding by selling securities, such as shares and bonds, to investors
- providing advice to corporate clients on strategic transactions, such as mergers and acquisitions
- trading debt and equity securities for customers or for the company's own account.

Except during the global financial crisis, investment banking has been extraordinarily profitable since the early 1990s. The large investment banks in Australia include the Australian-owned Macquarie Group and CommSec and foreign-owned entities such as JPMorgan, Deutsche Bank, Credit Suisse, Goldman Sachs, Barclays, BNP Paribas and HSBC. As you can see from their names, these foreign-owned investment banks are from the US and Europe, financial institutions with a global presence.

Investment banking remains a highly volatile industry. For example, from October 2007 to November 2008, Goldman Sachs' US share price lost three-quarters of its value, an experience shared by most of the

7 <https://www.apra.gov.au/publications/monthly-banking-statistics>. Accessed 19 June 2019.

8 https://en.wikipedia.org/wiki/List_of_banks_in_Singapore. Accessed 19 June 2019.

large American investment banks. On the other hand, the Australian-owned banks lost small amounts of share value, but overall came out of the global financial turbulence of 2007–2011 with reasonable financial strength. Investment banking is also notorious for being extremely competitive and for demanding long working hours from its professionals (especially the junior ones).

Investment banking can offer lucrative rewards for those who master the game. The remuneration does depend on the area of investment banking: corporate finance, mergers and acquisitions, and structured finance tend to be more generously rewarded compared with margin lending or property finance. Employees who advance in the investment banking business find that their incomes often rise rapidly. Success in this industry demands good analytical and communication skills, while social and networking skills also pay handsome dividends. Much of the growth in investment banking over the foreseeable future is likely to come from two sources: the ongoing development of new financial products and services, and the continued internationalisation of corporate finance.

1.4d MONEY MANAGEMENT

The 1980s and 1990s were very good for share market investors and finance professionals employed in the money management industry. The funds management industry has been challenging over recent years because of a highly volatile market that has produced very low returns on average. This industry includes investment advisory companies, mutual fund companies, superannuation fund managers, trust departments of commercial banks and the investment arms of insurance companies. In fact, the money management industry encompasses any person or institution that acts as a **fiduciary**, a person who invests and manages money on another's behalf.

In recent decades, three powerful trends in many countries have begun to create a rapidly growing demand for money management services. First, the bulk of the Baby Boomers (those born between 1946 and 1964) have entered their peak earning years and are beginning to invest large sums to prepare for retirement. Because many Baby Boomers lack the financial expertise to handle their own finances, the demand for professional money managers has surged.

Second, the introduction by some governments, such as those of Australia and New Zealand, of legislation requiring all employees in the country to be a member of a superannuation or retirement pension fund gave a tremendous impetus to the collection of funds to be managed for investment.

The third major force fuelling the growth of the money management industry has been the *institutionalisation of investment*. Whereas in the past, individuals held most financial assets (especially ordinary shares), today, institutional investors dominate the markets. For example, approximately two-thirds of Australian securities exchange shares are held by institutions, not individuals. Of course, these money managers are not the owners of the securities they invest in, but they do hold securities and make investment decisions for their clients. This trend towards professional management of institutionally held financial assets continues to create employment opportunities in the money management industry.

Figure 1.4 describes career opportunities in money management.

fiduciary
A person or institution
who invests and manages
money on another's behalf

FIGURE 1.4 CAREER OPPORTUNITIES IN MONEY MANAGEMENT

POSITION	PRIMARY ACTIVITIES
Securities analyst	Prepares company-specific and industry-wide analyses and recommendations for various classes of publicly traded securities (especially ordinary shares and bonds)
Portfolio management, sales	Markets mutual fund shares to individual and/or institutional investors
Portfolio manager	Selects financial assets for inclusion in portfolios designed to meet specific investment objectives (growth, income, international, emerging market bonds)





POSITION	PRIMARY ACTIVITIES
Superannuation fund manager	Manages assets held by a superannuation fund by diversifying them, allocating them to investment managers and controlling administrative costs
Financial planner	Provides budgeting, tax, borrowing, insurance, investment, retirement planning and estate planning advice to individuals
Investment adviser	Provides investment advice, performance evaluation and quantitative analysis services to both the money management industry and wealthy (or 'high net worth') individual investors

1.4e CONSULTING

Management consulting jobs are highly prized by business school graduates. Consultants are hired by companies to analyse companies' business problems, processes and strategies, and to make and, possibly, to implement associated recommendations. Consulting positions offer a unique opportunity early in your career to work with a broad range of businesses on a wide range of issues, and compensation in this industry often rivals pay in the investment banking field. The nature of the work means that consultants can expect to spend much of their time travelling.

In summary, you can establish a rewarding and satisfying finance career using the corporate finance concepts, tools and practices covered in this text.

LO1.4

CONCEPT REVIEW QUESTIONS 1.4

- 9 Think of another company or product besides Apple's iPhone 6, and note that company's connections between other functional areas and finance.
- 10 List and briefly describe five main career paths open to finance graduates.

THINKING CAP QUESTION

- 3 Do you see yourself working in the finance industry in five years, or in another industry? Does your current career plan include work in the finance industry?

STUDY TOOLS

SUMMARY

LO1.1

- Corporate finance activities can be grouped into five basic functions: the financing function, the financial management function, the capital budgeting function, the risk management function and the corporate governance function.
- Companies can obtain capital either by borrowing (debt capital) or by selling shares (equity capital), which represents permanent ownership in the company. Companies can obtain debt capital either by selling securities to investors or from a financial intermediary, such as a commercial bank. The initial

sale of securities is called a primary-market transaction, whereas all subsequent trades between investors are considered secondary-market transactions.

LO1.2

- When making financial decisions, managers should seek to create value for the company's owners, its shareholders. The most important way to do this is to take actions that generate benefits in excess of costs, which should generate wealth for the company's owners.
- The goal of the company's managers should be to maximise shareholder wealth, not to maximise profits. Maximising profits focuses on the past rather than the future, ignores the timing of profits, relies on accounting values rather than future cash flows and ignores risk. Maximising shareholder wealth is socially optimal because shareholders are residual claimants who profit only after all other claims are paid in full.
- Agency costs that result from the separation of ownership and management must be addressed satisfactorily for companies to prosper. These costs can be overcome (or at least reduced) by relying on the workings of the market for corporate control, incurring monitoring and bonding costs, and using executive compensation contracts designed to align the interests of shareholders and managers.
- Ethical behaviour is viewed as necessary for achievement of the company's goal of maximising owner wealth. The ASX established rules and procedures in 2002 aimed at eliminating the potential for unethical acts and conflicts of interest in public companies.

LO1.3

- The three key legal forms of business organisation are sole proprietorships, partnerships and companies. Sole proprietorships are most common, but companies dominate economically. Limited partnerships are hybrid forms, combining the limited liability of companies with the favourable tax treatment of partnerships. Similar forms of business organisation exist in other industrialised economies.

LO1.4

- Finance graduates must interact with professionals trained in all other business disciplines. The five most important career paths for finance professionals are in corporate finance, commercial banking, investment banking, money management and consulting.

QUESTIONS

Q1-1 Why must a financial manager have an integrated understanding of the five basic finance functions? Why has the risk-management function become more important in recent years? Why is the corporate governance function considered a finance function?

Q1-2 Can there be a difference between maximising profit and maximising shareholder wealth? If so, what could cause this difference? Which of the two should be the goal of the company and its management?

Q1-3 What is meant by an agency cost or agency problem? Do these interfere with maximising shareholder wealth? Why or why not? What mechanisms minimise these costs and problems? Are executive compensation contracts effective in mitigating them?

Q1-4 Are ethics critical to the financial manager's goal of maximising shareholder wealth? How are the two related? Is establishing corporate ethics policies and requiring employee compliance enough to ensure ethical behaviour by employees?

PROBLEMS

THE CORPORATE FINANCIAL MANAGER'S GOALS

P1-1 Consider the following simple corporate example involving one shareholder and one manager. There are two mutually exclusive projects in which the manager may invest, and two possible manager compensation plans that the shareholder may choose to employ. The manager may be

either paid a flat \$300,000 or receive 10% of corporate profits. The shareholder receives all profits net of manager compensation. The probabilities and associated gross profits associated with each project are given below:

PROJECT #1		PROJECT #2	
PROBABILITY	GROSS PROFIT	PROBABILITY	GROSS PROFIT
33.33%	\$0	50.0%	\$600,000
33.33%	\$3,000,000	50.0%	\$900,000
33.33%	\$9,000,000		

- a Which project maximises shareholder wealth? Which compensation plan does the manager prefer if this project is chosen?
- b Which project will the manager choose under a flat compensation arrangement?
- c Which compensation plan aligns the interests of the shareholders and the manager so that the manager will act in the best interest of the shareholders?
- d What do the answers tell you about structuring management compensation plans?

LEGAL FORMS OF BUSINESS ORGANISATION

- P1-2**
- a Calculate the tax disadvantage of organising a business today as a company, as compared to a partnership, under the following conditions. Assume that all earnings will be paid out as cash dividends. Operating income (operating profit before taxes) will be \$500,000 per year under either organisational form. Assume the tax rate on corporate profits is 35% ($T_c = 0.35$), the average personal tax rate for the partners is also 35% ($T_p = 0.35$) and the capital gains tax rate on dividend income is 15% ($T_{div} = 0.15$).
 - b Now recalculate the tax disadvantage using the same income, but with the tax rates of 35% ($T_c = 0.35$) on corporate profits and 38.6% ($T_p = 0.386$) on personal investment income.

CASE STUDY

THE SCOPE OF CORPORATE FINANCE

The potential career paths for an individual with expertise in finance are varied and exciting. Career possibilities include the areas of corporate finance, commercial banking, investment banking, money management and consulting.

Think of ways that the skills described as being vital to success in this chapter can be applied in each career listed. How are the ongoing trends of globalisation and increased technological sophistication likely to have an impact on these jobs over the next few years?

ASSIGNMENT

Using a website such as <https://www.efinancialcareers.com/>, find descriptions for these career possibilities and other finance-related careers.

2

FINANCIAL STATEMENT AND CASH FLOW ANALYSIS

WHAT COMPANIES DO

FIVE NUMBERS YOU NEED TO KNOW

The Commonwealth Bank states on its webpage (provided below) 'five numbers you need to know' to help your business run better. The five numbers are:

- reconciled cash balance (cash in hand, with adjustments for recent payments and receipts to be collected)
- days sales outstanding
- break-even point
- margins (gross profit to sales ratio)
- special industry number (for example, for restaurants, covers per night or wastage; or for retail, sales per metre of floor space).

While a focus on these numbers will not guarantee a successful business operation, the Commonwealth Bank does observe that '[k]nowing the benchmark indicators for your industry can help you compare yourself with your peers, measure your business's success and identify any problems'. These numbers are derived from several parts of a business operation, but they have a common element of being based on accounting data linked to the financial statements of a company.

Source: Commonwealth Bank of Australia, <https://www.commbank.com.au/guidance/business/growing-a-business-five-numbers-your-small-business-needs-to-know-201711.html>. Accessed 21 June 2019.

LEARNING OBJECTIVES

After studying this chapter, you will be able to:

- LO2.1 understand the key financial statements that companies are required to provide to their shareholders
- LO2.2 evaluate the company's cash flows using its financial statements, including the statement of cash flows
- LO2.3 calculate and interpret liquidity, activity and debt ratios
- LO2.4 review the popular profitability ratios and the role of the DuPont system in analysing the company's returns
- LO2.5 compute and interpret the price/earnings and market/book ratios
- LO2.6 discuss the basics of corporate taxation of both ordinary income and capital gains.

accrual-based approach
Revenues are recorded at the point of sale and costs when they are incurred, not necessarily when a company receives or pays out cash

cash flow approach
Used by financial professionals to focus attention on current and prospective inflows and outflows of cash

Accounting is called the language of business. Corporate finance relies heavily on accounting concepts and language, but the primary focus of finance professionals and accountants differs significantly. Usually, accountants apply generally a version of International Financial Reporting Standards (IFRS) frameworks to construct financial statements using an **accrual-based approach**. This means that accountants record revenues at the point of sale and costs when they are incurred, not necessarily when a company receives or pays out cash.

In contrast, finance professionals use a **cash flow approach**, which focuses on current and prospective inflows and outflows of cash. The financial manager must convert relevant accounting and tax information into cash inflows and cash outflows so that companies and investors can use this information for analysis and decision making.

This chapter describes how finance professionals use accounting information and terminology to analyse the company's cash flows and financial performance. We begin with a brief review of the four major financial statements, then use these to demonstrate some of the key concepts involved in cash flow analysis. We give special emphasis to the company's cash flows, free cash flows, the classification of inflows and outflows of cash, and the development and interpretation of statements of cash flows. Then, we discuss some popular financial ratios used to analyse the company's financial performance.

LO2.1 ➤ 2.1 FINANCIAL STATEMENTS

Accounting standards may vary across countries, and if you are dealing within one nation it is important that you understand and follow the relevant accounting rules and regulations for reporting information about the business you may be running. For example, the International Financial Reporting Standards (IFRS) system covers about 120 countries around the world, but the US uses Generally Accepted Accounting Principles (GAAP), which are similar to IFRS but do have some specific differences. There are, however, some general insights about the use of financial information that are common to many countries, and in this chapter we seek to identify and outline them to give a good basis for understanding how businesses may be operating. In particular, the accounting information should be the underpinning of measurements for whether a specific business is adding value to the worth of its investors and owners.

To take one specific example of setting accounting rules, the Australian Accounting Standards Board (AASB) was set up by the Australian government, under the *Australian Securities and Investments Commission Act 2001*, as an independent body with the mission to:¹

- develop, issue and maintain principles-based Australian accounting and external reporting standards and guidance that meet user needs and enhance external reporting consistency and quality
- contribute to the development of a single set of accounting and external reporting standards for worldwide use.

As part of its charter, the AASB is required to help with the development of global financial reporting standards. This means that Australian standards are created with an awareness of global patterns of financial reporting, and contribute to the writing of global guidelines. Over the years, this has led to a growing convergence of accounting standards in Australia and many other countries under the broad umbrella of IFRS. Australia adopted its version of IFRS from January 2005, although not without some controversy. The discussion in this chapter will not delve into the details of the Australian IFRS (AIFRS), but will focus on the more generic financial statements and contents that apply across many countries in addition to Australia and New Zealand.

¹ <https://www.aasb.gov.au/About-the-AASB.aspx>. Accessed 28 June 2019.

Reporting financial information, both externally to investors and internally to managers, is clearly an activity that is very important to senior financial executives. The adjacent ‘Finance in the Real World’ feature shows that financial executives spend more time on this activity than on anything else.

In this chapter we shall focus on four key financial statements: (1) the balance sheet; (2) the income statement; (3) the statement of retained earnings; and (4) the statement of cash flows.² We review the information these statements present using the financial statements from the 2020 shareholders’ report of the Global Production Corporation (GPC). Though GPC is fictional, the values constructed for it mirror those of a globally active production company.

2.1a BALANCE SHEET

A company’s balance sheet presents a snapshot view of the company’s financial position at a specific time. By definition, a company’s assets must equal the combined value of its liabilities and shareholders’ equity. In essence, the balance sheet shows how the organisation obtained its funds, and how it invested them in real assets (other than people). Thus, creditors (lenders) or equity investors (owners) finance all of a company’s assets. A balance sheet shows assets on the left-hand side and the claims of creditors and shareholders on the right-hand side. Assets and liabilities appear in descending order of *liquidity*, the length of time it takes to convert accounts into cash during the normal course of business. The most liquid asset, *cash*, appears first, and the least liquid, *intangible assets*, comes last. Similarly, the item *accounts payable* represents the obligations the company must pay with cash within the next year. The last entry on the right-hand side of the balance sheet, *shareholders’ equity*, never matures – it is ongoing as long as the company endures.

Figure 2.1 presents Global Production Corporation’s balance sheet as at 30 June 2020, the end of its fiscal or accounting year. As is standard practice in annual reports, the table also shows the accounts of the prior fiscal or financial year (1 July 2018–30 June 2019) for comparison. *Cash and cash equivalents* are assets such as cheque account balances at commercial banks that can be used directly as a means of payment. *Marketable securities* represent very liquid, short-term investments, which financial analysts view as a form of ‘near cash’. *Accounts receivable* represent the amount customers owe the company from sales made on credit. *Inventories* include raw materials, work in process (partially finished goods) and finished goods held by the company.

The entry for *gross property, plant and equipment* is the original cost of all real property, structures and long-lived equipment owned by the company. *Net property, plant and equipment* represents the difference between their original value and *accumulated depreciation* – the cumulative expense recorded for the depreciation of fixed assets since their purchase. This represents a measure of how the assets are ‘used up’ in the operations of the company. On their financial statements, companies do not deduct the full cost of fixed assets when these assets are purchased. Instead, they deduct a portion of the cost, called depreciation, over several years. The only fixed asset that is not regularly depreciated is land, because it seldom declines in value. Finally, *intangible assets* include items such as patents, trademarks, copyrights or, in the case of petroleum companies, mineral rights entitling the company to extract oil and gas on specific properties. Although intangible assets are usually nothing more than legal rights, they are often extremely valuable – as demonstrated by our discussion of the market value of global brands in the ‘Finance in the Real World’ feature in this chapter.

Now turn your attention to the right-hand side of the balance sheet. Current liabilities include *accounts payable*, amounts owed for credit purchases by the company; *notes payable*, outstanding short-term loans, typically from commercial banks; and *accrued expenses*, costs incurred by the company that have not yet been paid. Examples of accruals include taxes owed to the government and wages due to employees.

² Although these statement titles are consistently used throughout the text, it is important to recognise that, in practice, companies frequently use different statement titles.

FIGURE 2.1 BALANCE SHEET FOR GLOBAL PRODUCTION CORPORATION

Global Production Corporation balance sheets for the years ended 30 June 2019 and 2020 (\$ in millions)

ASSETS	2020	2019	LIABILITIES AND SHAREHOLDERS' EQUITY	2020	2019
Current assets			Current liabilities		
Cash and cash equivalents	\$ 440	\$ 213	Accounts payable	\$ 697	\$1,304
Marketable securities	35	28	Notes payable	477	587
Accounts receivable	1,619	1,203	Accrued expenses	440	379
Inventories	615	530	Total current liabilities	\$2,614	\$2,270
Other (mostly prepaid expenses)	170	176	Long-term liabilities		
Total current assets	\$2,879	\$2,150	Deferred taxes	\$ 907	\$ 793
Fixed assets			Long-term debt	1,760	1,474
Gross property, plant and equipment	\$9,920	\$9,024	Total long-term liabilities	\$2,667	\$2,267
			Total liabilities	\$5,281	\$4,537
Less: Accumulated depreciation	3,968	3,335	Shareholders' equity		
			Preferred shares	\$ 30	\$ 30
Net property, plant and equipment	\$ 5,952	\$ 5,689	Ordinary shares (\$1 par value)	179	185
Intangible assets and others	758	471	Paid-in capital in excess of par	442	386
Net fixed assets	\$ 6,710	\$ 6,160	Retained earnings	4,271	3,670
Total assets	\$9,589	\$8,310	Less: Treasury shares	614	498
			Total shareholders' equity	\$ 4,308	\$ 3,773
			Total liabilities and shareholders' equity	\$9,589	\$8,310

deferred taxes

An account that reflects the difference between the taxes that companies actually pay and the tax liabilities they report on their public financial statements

long-term debt

Debt that matures more than one year in the future

preferred shares

A form of ownership that has preference over ordinary shares when the company distributes income and assets

ordinary shares

The most basic form of corporate ownership

par value (ordinary shares); book value

An arbitrary value assigned to ordinary shares on a company's balance sheet

paid-in capital in excess of par

The number of ordinary shares outstanding multiplied by the original selling price of the shares, net of the par value

retained earnings

The cumulative total of the earnings that a company has reinvested since its inception

In many countries, laws permit companies to construct two sets of financial statements, one for reporting to the public and one for tax purposes. For example, when a company purchases a long-lived asset, it can choose to depreciate this asset rapidly for the purpose of obtaining large, immediate tax write-offs. When the company constructs financial statements for release to the public, however, it may choose a different depreciation method – perhaps one that results in higher reported earnings in the early years of the asset's life. The **deferred taxes** entry is a long-term liability that reflects the difference between the taxes that companies actually pay and the tax liabilities they report on their public financial statements. **Long-term debt** represents debt that matures more than one year in the future.

The shareholders' equity section provides information about the claims against the company held by investors who own preferred and ordinary shares. The preferred shares entry shows the proceeds from the sale of **preferred shares** (\$30 million for GPC), which is a form of ownership that has preference over ordinary shares when the company distributes income and assets. Next, two entries show the amount paid in by the original purchasers of **ordinary shares**, the most basic form of corporate ownership. The ordinary shares entry equals the number of outstanding ordinary shares multiplied by the **par value or book value** per share, which is an arbitrary nominal value with little or no economic significance. **Paid-in capital in excess of par** equals the number of shares outstanding multiplied by the original selling price of the shares, net of the par value. The combined value of ordinary shares and paid-in capital in excess of par equals the proceeds the company received when it originally sold shares to investors. **Retained earnings** are the cumulative total of the earnings that the company has reinvested since its inception. Be sure you know that retained earnings are not a reservoir of unspent cash. When the retained earnings vault is empty, it is because the company has already reinvested the earnings in new assets.

Finally, the **treasury shares** entry records the value of ordinary shares that the company currently holds in reserve. Usually, treasury shares appear on the balance sheet because the company has reacquired previously issued shares through a share repurchase program.

GPC's balance sheet (**Figure 2.1**) shows that the company's total assets increased by \$1,279 million, from \$8,310 million in 2019 to \$9,589 million in 2020. As expected, the total liabilities and shareholders' equity exactly match these totals in 2019 and 2020.

2.1b INCOME STATEMENT

Figure 2.2 presents Global Production Corporation's income statement (also called the profit-and-loss statement, or P & L) for the year ended 30 June 2020. As with the balance sheet, GPC's income statement includes data from 2019 for comparison. When reporting to shareholders, companies typically also include a so-called **common-size income statement** that expresses all income statement entries as a percentage of sales. In the vocabulary of accounting, income (also called *profit*, *earnings* or *margin*) equals revenue minus expenses. A company's income statement, however, has several measures of 'income' appearing at different points. The first income measure is *gross profit*, the amount by which *sales revenue* exceeds the *cost of goods sold* (the direct cost of producing or purchasing the goods sold).

Next, a company deducts from gross profits various operating expenses, including selling expense, general and administrative expense and depreciation expense.³ The resulting *operating profit* (\$1,531 million for GPC) represents the profits earned from the sale of products, although this amount does not include financial and tax costs. *Other income*, earned on transactions not directly related to producing and/or selling the company's products, is added to operating income to yield *earnings before interest and taxes (EBIT)* of \$1,671 million. When a company has no 'other income', its operating profit and EBIT are equal. Next, the company subtracts *interest expense* – representing the cost of debt financing – from EBIT to find *pre-tax income*. For example, GPC subtracts \$123 million of interest expense from EBIT to find *pre-tax income* of \$1,548 million.

FIGURE 2.2 INCOME STATEMENT FOR GLOBAL PRODUCTION CORPORATION

Global Production Corporation income statements for the years ended 30 June 2019 and 2020 (\$ in millions)

	2020	2019
Sales revenue	\$12,843	\$9,110
Less: Cost of goods sold ^a	<u>8,519</u>	<u>5,633</u>
Gross profit	\$ 4,324	\$3,477
Less: Operating and other expenses	1,544	1,521
Less: Selling, general and administrative expenses	616	584
Less: Depreciation expense	<u>633</u>	<u>608</u>
Operating profit	\$ 1,531	\$ 764
Plus: Other income	<u>140</u>	<u>82</u>
Earnings before interest and taxes (EBIT)	\$ 1,671	\$ 846
Less: Interest expense	<u>123</u>	<u>112</u>
Pre-tax income	\$ 1,548	\$ 734
Less: Taxes		
Current	367	158
Deferred	<u>232</u>	<u>105</u>
Total taxes	<u>599</u>	<u>263</u>
Net income (net profits after taxes)	\$ 949	\$ 471
Less: Preferred share dividends	<u>3</u>	<u>3</u>
Earnings available for ordinary shareholders	\$ 946	\$ 468
Less: Dividends	<u>345</u>	<u>326</u>
To retained earnings	<u>601</u>	<u>142</u>
Per share data ^b		
Earnings per share (EPS)	\$ 5.29	\$ 2.52
Dividends per share (DPS)	\$ 1.93	\$ 1.76
Price per share	\$ 76.25	\$71.50

a Annual purchases have historically represented about 80% of cost of goods sold. Using this relationship, its credit purchases in 2020 were \$6,815 and in 2019, they were \$4,506.

b Based on 178,719,400 and 185,433,100 shares outstanding as of 30 June 2020 and 2019, respectively.

treasury shares
Ordinary shares that were issued and later reacquired by the company through share repurchase programs and are therefore being held in reserve by the company

common-size income statement
An income statement in which all entries are expressed as a percentage of sales

³ Companies frequently include depreciation expense in manufacturing costs – the cost of goods sold – when calculating gross profits. In this text, we show depreciation as an expense in order to isolate its effect on cash flows.

The final step is to subtract taxes from pre-tax income to arrive at *net income*, or *net profits after taxes* (\$949 million for GPC). Net income is the proverbial bottom line: the single most important accounting number for both corporate managers and external financial analysts. Note that GPC incurred a total tax liability of \$599 million during 2020, but only the \$367 million *current* portion must be paid immediately. The remaining \$232 million in deferred taxes must be paid eventually, but these are non-cash expenses for year 2019.

earnings available for ordinary shareholders
Net income net of preferred share dividends

earnings per share (EPS)
Earnings available for ordinary shareholders divided by the number of ordinary shares outstanding

dividend per share (DPS)

The portion of the earnings per share paid to shareholders

From its net income, GPC paid \$3 million in dividends on its \$30 million of preferred shares outstanding during both 2019 and 2020. Net income net of preferred share dividends is **earnings available for ordinary shareholders**. Dividing earnings available for ordinary shareholders by the number of ordinary shares outstanding results in **earnings per share (EPS)**. Earnings per share represents the amount earned during the period on each outstanding ordinary share. Because there are 178,719,400 of GPC shares outstanding on 30 June 2020, its EPS for 2020 is \$5.29, which represents a significant increase from the previous year EPS of \$2.52. The cash **dividend per share (DPS)** paid to GPC's ordinary shareholders during 2020 is \$1.93, up slightly from the 2019 DPS of \$1.76.

2.1c STATEMENT OF RETAINED EARNINGS

The statement of retained earnings is a shortened form of the statement of shareholders' equity that reconciles the net income earned during a given year, and any cash dividends paid, with the change in retained earnings between the start and end of that year. **Figure 2.3** presents this statement for GPC for the year ended 30 June 2020. It shows that the company began the year with \$3,670 million in retained earnings, and had net income after taxes of \$949 million. From its net income, GPC paid a total of \$348 million in preferred and ordinary share dividends. At year-end, retained earnings were \$4,271 million. Thus, in 2020, the net increase for GPC was \$601 million (\$949 million net income minus \$348 million in dividends).

FIGURE 2.3 STATEMENT OF RETAINED EARNINGS FOR GLOBAL PRODUCTION CORPORATION

Global Production Corporation statement of retained earnings for the year ended 30 June 2020 (\$ in millions)

Retained earnings balance (1 January 2020)		\$3,670
Plus: Net income (for 2020)		949
Less: Cash dividends (paid during 2020)		
Preferred shares	\$ 3	
Ordinary shares	345	
Total dividends paid		348
Retained earnings balance (30 June 2020)		<u>\$4,271</u>

FINANCE IN THE REAL WORLD

ASSESSING THE MARKET VALUE OF GLOBAL BRANDS

How much is a global brand name worth? Interbrand Corporation, a New York-based consulting company, has been trying to answer this question for several years. The table below details what this company considers the

five most valuable brands of 2018, and also lists the change in value of those brands from 2017. The total brand values are large, and all the brands included are those of US-based companies.



Although American companies are not required to disclose estimated brand values in their financial statements, large, publicly traded British and Australian companies must do so. Brand values do, however, have a major impact on US accounting rules in one important area: accounting for the 'goodwill' created when a company is acquired by another company for more than the acquired company's book value. This premium over book value represents the higher market (versus book) value of intangible assets such as patents, copyrights and trademarks,

as well as brand names and business relationships that are not accounted for at all.

The US Financial Accounting Standards Board (FASB) requires acquirers to periodically assess the fair value of assets they purchase through acquisitions. If the fair value of those assets declines significantly over time, the company must recognise 'goodwill impairment', meaning that the value of its intangible assets has also declined. Charges arising from goodwill impairment can have a dramatic effect on reported earnings.

RANK 2018	BRAND	2018 BRAND VALUE (\$ MILLION)	PER CENT CHANGE	COUNTRY OF OWNERSHIP
1	Apple	214,480	16%	US
2	Google	155,506	10%	US
3	Amazon	100,764	56%	US
4	Microsoft	92,715	16%	US
5	Coca-Cola	66,341	-5%	US

Source: Interbrand. For full list of top 100 brands, see <https://www.interbrand.com/best-brands/best-global-brands/2018/ranking/>. Accessed 21 June 2019.

2.1d STATEMENT OF CASH FLOWS

The statement of cash flows summarises the inflows and outflows of cash during a given period, typically a year. This statement isolates the company's operating, investment and financing cash flows and reconciles them with changes in its cash and marketable securities during the year. **Figure 2.6**, on page 41, presents GPC's statement of cash flows for the year ended 30 June 2020. This statement is discussed in greater depth in section 2.2, where we present some important cash flow concepts and measures, then show how to use those data to develop and interpret the statement of cash flows.

2.1e NOTES TO FINANCIAL STATEMENTS

A public company's financial statements include explanatory notes keyed to the relevant accounts in the statements. These notes provide detailed information on the accounting policies, calculations and transactions that underlie entries in the financial statements. For example, the Notes to Woolworths Ltd's financial statements cover 49 of the 55 pages of its financial report to shareholders in its 2018 annual report. Notes typically provide additional information about a company's revenue recognition practices, income taxes, fixed assets, leases and employee compensation plans. Professional security analysts find this information particularly useful, and they routinely scour the notes when evaluating a company's performance and value.

LO2.1

CONCEPT REVIEW QUESTIONS

- 1 What role does the AASB play with regard to establishing accounting standards for Australia?
- 2 Are balance sheets and income statements prepared with the same purpose in mind? How are these two statements different, and how are they related?
- 3 Which statements are of greatest interest to creditors? Which would be of greatest interest to shareholders?

LO2.2

2.2 CASH FLOW ANALYSIS

Although financial managers are interested in the information in the company's accrual-based financial statements, their primary focus is on cash flows. Without adequate cash to pay obligations on time, to fund operations and growth and to compensate owners, the company will fail. There is an expression in corporate finance that 'cash is king': this means that the focus for finance is really on the ability of a company to pay its bills as they come due – whether they are payroll, payments to external suppliers, declared dividends to shareholders, or interest charges and principal repayments on debt.

The financial manager and other interested parties can gain insight into the company's cash flows over a given time period by using some popular measures of cash flow, and by analysing the company's statement of cash flows.

2.2a THE COMPANY'S CASH FLOWS

operating flows

Cash inflows and outflows directly related to the production and sale of a company's products or services

investment flows

Cash flows associated with the purchase or sale of fixed assets

financing flows

Cash flows that result from debt and equity financing transactions

free cash flow (FCF)

The net amount of cash flow remaining after the company has met all operating needs, including working capital commitments and capital expenditures. It represents the cash amount that a company could distribute to debt and equity investors after meeting all its other obligations

Figure 2.4 illustrates the company's cash flows. Note that in the process of evaluating a company's cash flows, analysts view cash and marketable securities as perfect substitutes. Both represent a reservoir of liquidity that increases with *cash inflows* and decreases with *cash outflows*.

The company's reservoir of liquidity, containing both cash and marketable securities, is affected by changes in: (1) operating flows; (2) investment flows; and (3) financing flows.

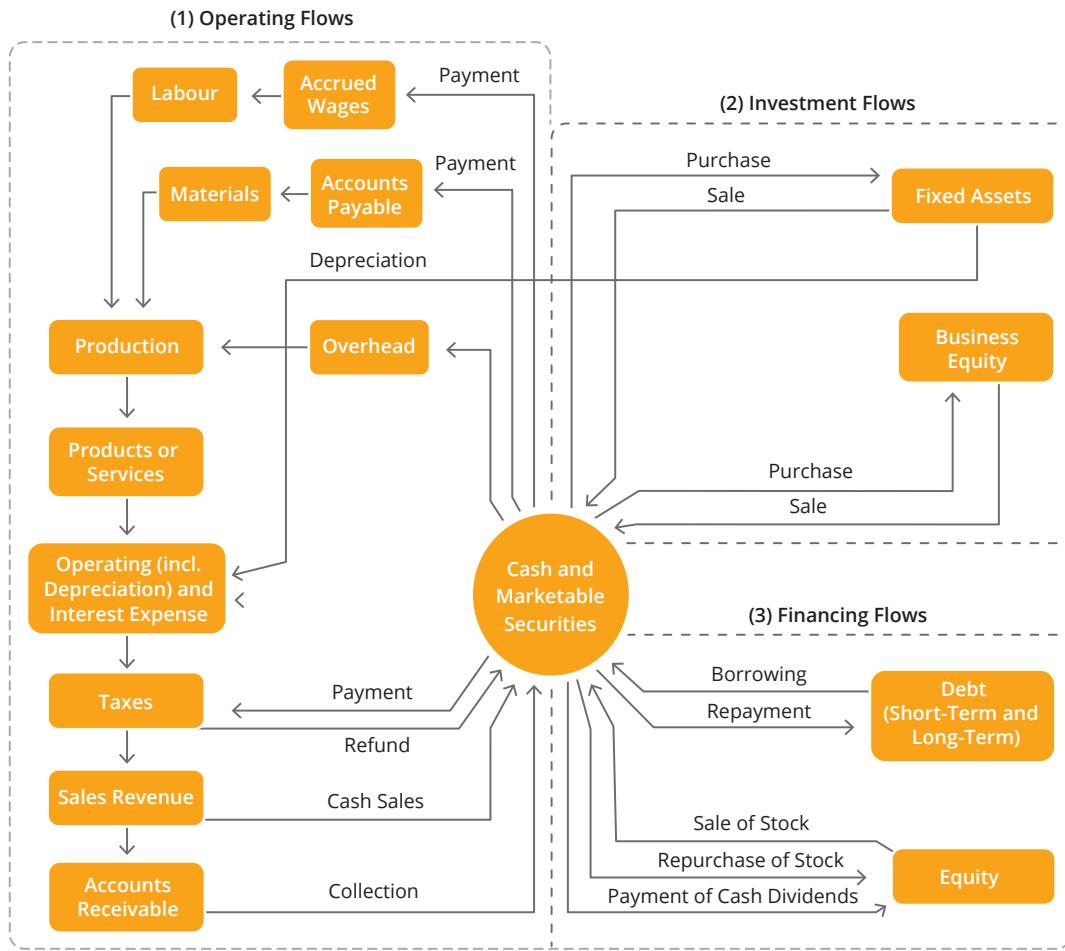
A company's total cash flows can conveniently be divided into: (1) operating flows; (2) investment flows; and (3) financing flows. The **operating flows** are cash inflows and outflows directly related to the production and sale of products or services. **Investment flows** are cash flows associated with the purchase or sale of fixed assets. Clearly, purchases result in cash outflows, whereas sales generate cash inflows. The **financing flows** result from debt and equity financing transactions. Taking on new debt (short-term or long-term) results in a cash inflow; repaying existing debt requires a cash outflow. Similarly, the sale of shares generates a cash inflow, whereas the repurchase of shares or payment of cash dividends results in a cash outflow. In combination, the operating, investment and financing cash flows during a given period affect the company's cash and marketable securities balances.

Monitoring cash flow is important both for financial managers and for outside analysts trying to estimate a company's worth. Managers and analysts track a variety of cash flow measures. Among these, one of the most important is *free cash flow*.

Free Cash Flow

The measure of **free cash flow (FCF)** is the amount of cash flow available to investors – the providers of debt and equity capital. It represents the net amount of cash flow remaining after the company has met all

FIGURE 2.4 THE PATTERN OF CASH FLOWS THROUGH A COMPANY



operating needs, including working capital commitments and capital expenditures. Free cash flow for a given period can be calculated in two steps.

First, we find the company's **net operating profits after taxes (NOPAT)**, the company's earnings before interest and after taxes:⁴

(Eq. 2.1)

$$\text{NOPAT} = \text{EBIT} \times (1 - T)$$

where:

EBIT = earnings before interest and taxes

T = corporate tax rate

Adding depreciation back into NOPAT yields **operating cash flow (OCF)**, which is the amount of cash flow generated by the company's operations.

(Eq. 2.2)

$$\text{OCF} = \text{NOPAT} + \text{Depreciation}$$

net operating profits after taxes (NOPAT)

The amount of earnings before interest and after taxes, which equals $\text{EBIT} \times (1 - T)$, where EBIT is earnings before interest and taxes and T equals the corporate tax rate

operating cash flow (OCF)

The amount of cash flow generated by a company from its operations. Mathematically, it is the earnings before interest and taxes (EBIT) minus taxes plus depreciation

⁴ A related indicator of a company's financial performance is earnings before interest, taxes, depreciation and amortisation (EBITDA). Analysts use EBITDA to compare profitability of companies, because it measures revenue minus all expenses other than interest, taxes, depreciation and amortisation. It thereby eliminates the effects of financing and accounting decisions. Although EBITDA is a useful measure of profitability, it does not measure cash flows.

non-cash charges

Expenses, such as depreciation, amortisation and depletion allowances, that appear on the income statement but do not involve an actual outlay of cash

Note that because depreciation is a non-cash charge, we add it back when determining OCF. **Non-cash charges** – such as depreciation, amortisation and depletion allowances – are expenses that appear on the income statement but do not involve an actual outlay of cash. Almost all companies list depreciation on their income statements, so we focus on depreciation in our presentation. But when amortisation or depletion allowances occur in a company's financial statements, they are treated in a similar manner.

Substituting **Equation 2.1** for NOPAT into **Equation 2.2**, we obtain a single equation for operating cash flow:

(Eq. 2.3)

$$OCF = [EBIT \times (1 - T)] + \text{Depreciation}$$

Substituting the values from GPC's 2020 income statement (from **Figure 2.2**), and assuming a 38.70% tax rate ($T = 38.70\%$), as implied by GPC's 2020 income statement, we get GPC's operating cash flow:

$$OCF = \$1,671 \times (1.00 - 0.3870) + \$633 = \$1,024 + \$633 = \$1,657$$

Hence, GPC's OCF was \$1,657 million.

Notice that we have deducted the tax from EBIT, but we have not deducted interest payments in order to obtain the OCF. In many countries, businesses are allowed to deduct interest payments *before* they pay taxes, which reduces the cost of taxation and net interest payments. In corporate finance we more commonly calculate the OCF as done here, then adjust the interest rate on debt by calculating it net of taxation and using this adjusted interest rate as part of the discount rate used in estimating present values of the cash flows of the business. We would not reduce the EBIT by the interest payments and also adjust the discount rate for taxation because this would double-count or overestimate the tax savings. These adjustments are explained in Chapter 11.

Next, we convert this operating cash flow to free cash flow (FCF). To do so, we deduct the company's net investments (denoted by delta, the 'change' symbol: Δ) in fixed and current assets from operating cash flow, as shown in the following equation:

(Eq. 2.4)

$$FCF = OCF - \Delta FA - \Delta WC$$

where:

ΔFA = change in gross fixed assets

ΔWC = change in working capital
 $= \Delta CA - \Delta A/P - \Delta accruals$

where:

ΔCA = change in current assets

$\Delta A/P$ = change in accounts payable

$\Delta accruals$ = change in accrued expenses

Spontaneous current liability changes occur automatically with changes in sales. They must therefore be deducted from current assets in order to find the net change in working capital investment. From the preceding calculation, we know that GPC's OCF in 2020 was \$1,657 million. Using GPC's 2019 and 2020 balance sheets (**Figure 2.1**), we can calculate the changes in gross fixed assets, current assets, accounts payable and accruals between 2019 and 2020:

$$\Delta FA = \$9,920 - \$9,024 = \$896$$

$$\Delta CA = \$2,879 - \$2,150 = \$729$$

$$\Delta A/P = \$1,697 - \$2,150 = \$393$$

$$\Delta accruals = \$440 - \$379 = \$61$$

$$\Delta WC = \$729 - \$393 - \$61 = \$275$$

Substituting these values into **Equation 2.4** yields the following expression:

$$\begin{aligned} \text{FCF} &= \$1,657 - \$896 - \$275 \\ &= \$486 \end{aligned}$$

The first line of this FCF calculation shows that, after subtracting \$896 million in fixed asset investment and \$275 million in current asset investment net of accounts payable and accruals from its OCF of \$1,657 million, GPC had free cash flow in 2020 of \$486 million available to pay its investors. We will use free cash flow in Chapter 5 to estimate the value of a company. At this point, suffice it to say that FCF is an important measure of cash flow used by corporate finance professionals.

Inflows and Outflows of Cash

Figure 2.5 classifies the basic inflows and outflows of cash for companies (assuming all other things are held constant). For example, a \$1,000 increase in accounts payable would be an *inflow of cash*. A \$2,500 increase in inventory would be an *outflow of cash*.

FIGURE 2.5 THE INFLOWS AND OUTFLOWS OF CORPORATE CASH	
INFLOWS	OUTFLOWS
Decrease in any asset	Increase in any asset
Increase in any liability	Decrease in any liability
Net income (profit after tax)	Net loss
Depreciation and other non-cash charges	Dividends paid
Sale of ordinary or preferred shares	Repurchase or retirement of shares

Two additional points about the classifications in **Figure 2.5** are worth noting:

- 1 A decrease in an asset (such as inventory) is an inflow of cash, because cash that has been tied up in the asset is released and can be used for some other purpose, such as repaying a loan. In contrast, an increase in inventory (or any other asset) is an outflow of cash, because additional inventory ties up more of the company's cash. Similar logic explains why an increase in any liability is an inflow of cash and why a decrease in any liability is an outflow of cash.
- 2 Our earlier discussion noted why depreciation and other non-cash charges are considered cash inflows. Logic suggests that if net income is a cash inflow, then a net loss (negative net profits after taxes) is a cash outflow. The company must balance its losses with an inflow of cash from, say, selling off some of its fixed assets (reducing an asset) or increasing external borrowing (increasing a liability). Can a company have a net loss (negative NOPAT) and still have positive operating cash flow? Yes: as **Equation 2.2** indicates, this can occur when depreciation and other non-cash charges during the period are greater than the net loss. The statement of cash flows treats net income (or net losses) and depreciation and other non-cash charges as separate entries.



Changes in Accounts

At 30 June 2018, Cochlear reported the following balances, in millions of dollars, in certain current asset and liability accounts.





ACCOUNT	2018 \$M	2017 \$M
Cash and cash equivalents	61.5	89.5
Trade and other receivables	316.7	292.1
Inventories	167.4	160.0
Trade and other payables	140.5	130.9
Loans and borrowings	144.0	134.2

If we look at total current asset accounts for Cochlear, we find they slightly decreased during

Source: Cochlear Limited Annual Report 2018, https://www.cochlear.com/43d56bcc-d510-4a20-ab70-6208fa5af77e/en_annualreport2018_cochlear2018annualreport_5.69mb.pdf?MOD=AJPERES&CONVERT_TO=url&CACHEID=ROOTWORKSPACE-43d56bcc-d510-4a20-ab70-6208fa5af77e-mkRS5RK. Accessed 21 June 2019.

the fiscal year 2017–2018, causing outflows of cash for the company. We can note that the decrease of cash occurred during the year that trade and other receivables (payments due to Cochlear) increased: so the firm became less cash heavy and more dependent on funds yet to be received. On the liabilities side, accounts payable increased, while short-term debt decreased considerably. The overall impact was a fall in currently liabilities, representing smaller cash balances for Cochlear.

2.2b DEVELOPING AND INTERPRETING THE STATEMENT OF CASH FLOWS

Accountants construct the statement of cash flows by using the income statement for a given year along with the beginning- and end-of-year balance sheets. The procedure involves classifying balance sheet changes as inflows or outflows of cash; obtaining income statement data; classifying the relevant values into operating, investment and financing cash flows; and presenting them in the proper format.

Global Production Corporation's statement of cash flows for the year ended 30 June 2020 appears in **Figure 2.6**. Note that the statement assigns positive values to all cash inflows and negative values to all cash outflows. Notice that the calculation of 'Cash provided by operating activities' includes more detail than the OCF calculation in **Equation 2.1**, and therefore these two measures differ. Notice also that, in the investment activities section, the statement of cash flows records the increase in *gross* fixed assets – rather than *net* fixed assets – as a cash outflow. Depreciation accounts for the difference between changes in gross and net fixed assets, but depreciation expense appears in the operating activities section of the statement. The focus on changes in gross fixed assets avoids double-counting depreciation in the statement. For a similar reason, the statement does not show a specific entry for the change in retained earnings as an inflow (or outflow) of cash. Instead, the factors that determine the change in retained earnings (that is, profits or losses and dividends) appear as separate entries in the statement.

By adding up the items in each category – operating, investment and financing activities – we obtain the net increase (or decrease) in cash and marketable securities for the year. As a check, this value should reconcile with the actual yearly change in cash and marketable securities, obtained from the beginning- and end-of-year balance sheets.

By applying this procedure to GPC's 2020 income statement and 2019 and 2020 balance sheets, we obtain the company's 2020 statement of cash flows (see **Figure 2.6**). It shows that GPC experienced a \$234 million increase in cash and marketable securities in fiscal year 2020. Looking at GPC's balance sheets for the two years in **Figure 2.1** (on page 32), we see that the company's cash increased by \$227 million and that its marketable securities increased by \$7 million. The \$234 million net increase in cash and marketable securities from the statement of cash flows reconciles with the total change of \$234 million in these accounts during 2020. Therefore, GPC's statement of cash flows reconciles with the balance sheet changes.

The statement of cash flows allows the financial manager and other interested parties to analyse the company's cash flow over time. Unusual changes in either the major categories of cash flow or in specific items offer clues to problems a company may be experiencing. For example, an unusually large increase in accounts receivable or inventory, resulting in major cash outflow, may signal credit or inventory problems. Financial managers and analysts can also prepare a statement of cash flows developed from projected,

FIGURE 2.6 STATEMENT OF CASH FLOWS FOR GLOBAL PRODUCTION CORPORATION

This statement is constructed using the company's income statements and two most recent balance sheets. It groups cash flow into: (1) cash flow from operations; (2) cash flow from investments; and (3) cash flow from financing. The net change at the bottom of the statement should match the net change in the cash and marketable securities balance shown between the company's most recent two balance sheets.

GLOBAL PRODUCTION CORPORATION STATEMENT OF CASH FLOWS FOR THE YEAR ENDED 30 JUNE 2020 (\$ IN MILLIONS)		
Cash flow from operating activities		
Net income (net profit after tax)	\$949	
Depreciation	633	
Increase in accounts receivable	(416)	
Increase in inventories	(85)	
Decrease in other current assets	6	
Increase in accounts payable	393	
Increase in accrued expenses	61	
Cash provided by operating activities		\$1,541
Cash flow from investment activities		
Increase in gross fixed assets	(896)	
Increase in intangible and other assets	(287)	
Cash provided (consumed) by investment activities		(\$1,183)
Cash flow from financing activities		
Decrease in notes payable	(\$110)	
Increase in deferred taxes	114	
Increase in long-term debt	286	
Changes in shareholders' equity	(66)	
Dividends paid	(348)	
Cash provided (consumed) by financing activities		(\$ 124)
Net increase in cash and marketable securities		<u>\$ 234</u>

or pro forma, financial statements. They use this approach to determine if the company will need additional external financing or will generate excess cash that could be reinvested or distributed to shareholders. After you learn the concepts, principles and practices of corporate finance presented in this text, you will be able to glean a good amount of useful information from the statement of cash flows.

LO2.2

CONCEPT REVIEW QUESTIONS

- 4 How do depreciation and other non-cash charges act as sources of cash inflow to the company? Why does a depreciation allowance exist in the tax laws? For a profitable company, is it better to depreciate an asset quickly or slowly for tax purposes? Explain.
- 5 What is operating cash flow (OCF)? How does it relate to net operating profits after taxes (NOPAT)? What is free cash flow (FCF), and how is it related to OCF?



- 6 Why is the financial manager likely to have great interest in the company's statement of cash flows? What type of information can interested parties obtain from this statement?

THINKING CAP QUESTION

- 1 Why does cash management matter for the financing of a company?

LO2.3

2.3 ASSESSING FINANCIAL PERFORMANCE USING RATIO ANALYSIS

Assessing a company's financial statements is of interest to shareholders, creditors and the company's own management. A company often wants to compare its financial condition to that of similar companies, but doing so can be very tricky. For example, suppose you are introduced to a man named Jeff who tells you that he runs a company that earned a profit of \$12 million last year. Would you be impressed by that? What if you knew that Jeff's last name was Bezos? Most people would agree that a profit of \$12 million would be a great disappointment for Amazon, the company built by Jeff Bezos, because Amazon's annual profit is typically in the billions.

The point here is that the amounts of sales, profits and other items that appear on a company's financial statements are difficult to interpret unless we have some way to put the numbers in perspective. To analyse financial statements, we need relative measures that, in effect, normalise size differences. Effective analysis of financial statements is thus based on the use of *ratios* or *relative values*. **Ratio analysis** involves calculating and interpreting financial ratios to assess a company's performance and status.

ratio analysis

Calculating and interpreting financial ratios to assess a company's performance and status

2.3a USING FINANCIAL RATIOS

Different constituents will focus on different types of financial ratios. Creditors are primarily interested in ratios that measure the company's short-term liquidity and its ability to make interest and principal payments. A secondary concern of creditors is profitability; they want assurance that the business is healthy and will continue to be successful. Present and prospective shareholders focus on ratios that measure the company's current and future levels of risk and return because these two dimensions directly affect share price. The company managers use ratios to generate an overall picture of the company's financial health and to monitor its performance from period to period. Good managers carefully examine unexpected changes in order to isolate developing problems.

An additional complication of ratio analysis is that a normal ratio in one industry may be highly unusual in another. For example, the net profit margin ratio measures the net income generated by each dollar of sales. (We will show later how to compute the ratio.) Net profit margins vary dramatically across industries. An outstanding net profit margin in the retail grocery industry would look paltry in the software business. Therefore, when making subjective judgements about the health of a given company, analysts usually compare the company's ratios to two benchmarks. First, they compare the financial ratios in the current year with previous years' ratios. In doing so, they hope to identify trends that will aid in evaluating the company's prospects. Second, they compare the ratios of one company with those of other benchmark companies in the same industry (or to an industry average obtained from a trade association or third-party provider).

We will use the 2020 and 2019 balance sheets and income statements for Global Production Corporation, presented earlier in **Figures 2.1** and **2.2**, to demonstrate ratio calculations. (To simplify the presentation,

we have deleted the *millions* after GPC's values.) The ratios presented in this chapter can be applied to nearly any company. Of course, many companies in different industries use ratios that focus on aspects peculiar to their industry.⁵ We shall cover the most common financial ratios, which are grouped into five categories: *liquidity, activity, debt, profitability* and *market ratios*.

2.3b LIQUIDITY RATIOS

Liquidity ratios measure a company's ability to satisfy its short-term obligations *as they come due*. Because a common precursor to financial distress or bankruptcy is low or declining liquidity, liquidity ratios are good leading indicators of cash flow problems. The two basic measures of liquidity are the *current ratio* and the *quick (acid-test) ratio*.

The **current ratio**, one of the most commonly cited financial ratios, measures the company's ability to meet its short-term obligations. It is defined as current assets *divided* by current liabilities. The current ratio presents in ratio form what **net working capital** measures by *subtracting* current liabilities from current assets. The current ratio for GPC on 30 June 2020 is computed as follows:

$$\text{Current ratio} = \frac{\text{Current assets}}{\text{Current liabilities}} = \frac{\$2,879}{\$2,614} = 1.10$$

How high should the current ratio be? The answer depends on the type of business and on the costs and benefits of having too much versus not enough liquidity. For example, a current ratio of 1.0 may be acceptable for an energy supply company, but unacceptably low for a manufacturer requiring more liquidity. The more predictable a company's cash flows, the lower the acceptable current ratio. Because the business of oil exploration and development has notoriously unpredictable annual cash flows, GPC's current ratio of 1.10 indicates that the company takes a fairly aggressive approach to managing its liquidity.

The **quick (acid-test) ratio** is similar to the current ratio, except that it *excludes* inventory, which is usually the least-liquid current asset. The generally low liquidity of inventory results from two factors. First, many types of inventory cannot be easily sold because they are partially completed items, special-purpose items and the like. Second, inventory is typically sold on credit, so it becomes an account receivable before being converted into cash. The quick ratio is calculated as follows:

$$\text{Quick ratio} = \frac{\text{Current assets} - \text{Inventory}}{\text{Current liabilities}} = \frac{\$2,879 - \$615}{\$2,614} = 0.866$$

The quick ratio for GPC in 2020 is 0.866.

The quick ratio provides a better measure of overall liquidity *only* when a company's inventory cannot be easily converted into cash. If inventory is liquid, then the current ratio is a preferred measure. Because GPC's inventory is mostly finished products that can be readily converted into cash, the company's managers will probably focus on the current ratio.

2.3c ACTIVITY RATIOS

Activity ratios measure the speed with which the company converts various accounts into sales or cash. Analysts use activity ratios as guides to assess how efficiently the company manages its assets and its accounts payable.

liquidity ratios

Measure a company's ability to satisfy its short-term obligations *as they come due*

current ratio

A measure of a company's ability to meet its short-term obligations, defined as current assets *divided* by current liabilities

net working capital

A measure of a company's liquidity calculated by *subtracting* current liabilities from current assets

quick (acid-test) ratio

A measure of a company's liquidity that is similar to the current ratio except that it *excludes* inventory, which is usually the least-liquid current asset

activity ratios

A measure of the speed with which a company converts various accounts into sales or cash

⁵ For example, Air New Zealand, an airline, would pay close attention to the ratio of revenues to passenger miles flown. Retailers such as Woolworths and Walmart diligently track the growth in same-store sales from one year to the next.

inventory turnover
A measure of how quickly a company sells its goods

Inventory turnover provides a measure of how quickly a company sells its goods. Here is the calculation for GPC's 2020 *inventory turnover ratio*:

$$\text{Inventory turnover} = \frac{\text{Cost of goods sold}}{\text{Inventory}} = \frac{\$8,519}{\$615} = 13.85$$

In the numerator we used cost of goods sold, rather than sales, because companies value inventory at cost on their balance sheets. Note also that, in the denominator, we use the *ending* inventory balance of \$615. If inventories are growing over time or exhibit seasonal patterns, analysts sometimes use the *average* level of inventory throughout the year, rather than the ending balance, to calculate this ratio.

The resulting turnover of 13.85 indicates that the company basically sells out its inventory 13.85 times each year, or slightly more than once per month. This value is most meaningful when compared with that of other companies in the same industry or with the company's past inventory turnover. An inventory turnover of 20.0 is not unusual for a grocery store, whereas a common inventory turnover for an aircraft manufacturer is 4.0. GPC's inventory turnover is in line with those for other oil and gas companies, and it is slightly above the company's own historic norms.

We can easily convert inventory turnover into an **average age of inventory** by dividing the turnover figure into 365 (the number of days in a year). For GPC, the average age of inventory is 26.4 days ($365 \div 13.85$), meaning that GPC's inventory balance turns over about every 26 days.



Differing Inventory Ratios

Inventory ratios, like most other financial ratios, vary a great deal from one industry to another. For example, in June 2018, Woolworths Ltd, a supermarket retail operation, reported inventory of \$4.233 billion and cost of goods sold of \$40.256 billion. This implies an inventory turnover ratio for Woolworths of about 9.51, and an average age of inventory of about 38.4 days. With the limited shelf life of retail groceries, its primary product, Woolworths cannot afford to hold inventory too long.

In contrast, for the year ended 30 June 2018, Cochlear Ltd, the Australian manufacturer of ear implant devices, reported cost of goods sold of \$361.2 million and inventory of \$167.4 million. Cochlear's inventory turnover ratio is thus 2.16, and its average age of inventory is about 169 days.

Clearly, the differences in these inventory ratios reflect differences in the economic circumstances of the industries. Apparently, groceries lose their value much faster than do ear implants.

Source: Cochlear Limited Annual Report 2018, <http://translator.61financial.com.au/server/documents/eng-pdf/553795.pdf>, https://www.woolworthsgroup.com.au/icms_docs/195396_annual-report-2018.pdf. Accessed 27 June 2019.

average collection period
The average amount of time that elapses from a sale on credit until the payment becomes usable funds for a company. Calculated by dividing accounts receivable by average daily sales.
Also called the *average age of accounts receivable*

The **average collection period**, or *average age of accounts receivable*, is useful in evaluating credit and collection policies. It measures the average amount of time that elapses from a sale on credit until the payment becomes usable funds for a company. To compute the measure, we divide the company's average daily sales into the accounts receivable balance. As shown in the following equations, in 2020 it took GPC, on average, 46.0 days to receive payment from a credit sale:

$$\text{Average daily sales} = \frac{\text{Annual sales}}{365} = \frac{\$12,843}{365} = \$35.19$$

$$\text{Average collection period} = \frac{\text{Accounts receivable}}{\text{Average daily sales}} = \frac{\$1,619}{\$35.19} = 46.0 \text{ days}$$

The average collection period is meaningful only in relation to the company's credit terms. If GPC extends 30-day credit terms to customers, then an average collection period of 46.0 days may indicate a poorly managed credit or collection department (or both). On the other hand, a longer collection period could be the result of an intentional relaxation of credit-term enforcement in response to competitive pressures. If the company had offered customers 45-day credit terms, then the 46.0-day average collection period would be quite acceptable. Clearly, one would need additional information to evaluate the effectiveness of the company's credit and collection policies.

Companies use the **average payment period** to evaluate their payment performance. This metric measures the average length of time it takes a company to pay its suppliers. The average payment period equals the average daily purchases divided into the accounts payable balance. Before calculating average daily purchases, an analyst may need to estimate the company's annual purchases because these are not reported on a company's published financial statements. Instead, annual purchases are included in its cost of goods sold. GPC's annual purchases in 2020 were estimated at 80% of the cost of goods sold, as shown in footnote (a) to its income statement (**Figure 2.2** on page 33).

Using the annual purchase estimate of \$6,815, GPC's average payment period in 2020 indicates that the company usually takes 90.9 days to pay its bills:

$$\text{Average daily purchases} = \frac{\text{Annual purchases}}{365} = \frac{\$6,815}{365} = \$18.67$$

$$\text{Average payment period} = \frac{\text{Accounts payable}}{\text{Average daily purchases}} = \frac{\$1,697}{\$18.67} = 90.9 \text{ days}$$

Like the average collection period, the average payment period is meaningful only in light of the actual credit terms the company's suppliers offer. If GPC's suppliers extend, on average, 60-day credit terms, then the company's average payment period of 90.9 days suggests that the company is slow in paying its bills. Paying suppliers 30 days later than the agreed-upon terms could damage the company's ability to obtain additional credit, and could raise the cost of any credit that it does obtain.

However, if suppliers grant GPC average credit terms of 90 days, then its 90.9-day average payment period is very good. Clearly, an analyst would need further information to draw definitive conclusions about the company's overall payment policies from the average payment period measurement.

The **fixed asset turnover** ratio measures the efficiency with which a company uses its *fixed assets*. The ratio tells analysts how many dollars of sales the company generates per dollar of investment in fixed assets. The ratio equals sales divided by net fixed assets:

$$\text{Fixed asset turnover} = \frac{\text{Sales}}{\text{Net fixed assets}} = \frac{\$12,843}{\$6,710} = 1.91$$

GPC's fixed asset turnover in 2020 is 1.91. Stated another way, GPC generates almost \$2 in sales for every dollar of fixed assets. As with other ratios, the level of fixed asset turnover considered normal varies widely from one industry to another.

The **total asset turnover** ratio indicates the efficiency with which a company uses *all its assets* to generate sales. Like the fixed asset turnover ratio, total asset turnover indicates how many dollars of sales a company generates per dollar of asset investment. All other factors being equal, analysts favour a high turnover ratio: it indicates that a company generates more sales (and, ideally, more cash flow for investors) from a given investment in assets.

average payment period

The average length of time it takes a company to pay its suppliers. It is calculated by dividing the company's accounts payable balance by its average daily purchases

fixed asset turnover

A measure of the efficiency with which a company uses its *fixed assets*, calculated by dividing sales by the number of dollars of net fixed asset investment

total asset turnover

A measure of the efficiency with which a company uses all its assets to generate sales; it is calculated by dividing the dollars of sales a company generates by the dollars of total asset investment

GPC's total asset turnover in 2020 equals 1.34, calculated as follows:

$$\text{Total asset turnover} = \frac{\text{Sales}}{\text{Total assets}} = \frac{\$12,843}{\$9,589} = 1.34$$

When using the fixed asset and total asset turnover ratios, an analyst must be aware that these are calculated using the *historical costs* of fixed assets. Because some companies have significantly newer or older assets than do others, comparing fixed asset turnovers of those companies could be misleading. Companies with newer assets tend to have lower turnovers than those with older assets, which have lower book (accounting) values. A naïve comparison of fixed asset turnover ratios for different companies may lead an analyst to conclude that one company operates more efficiently than another when, in fact, the company that appears to be more efficient simply has older (more fully depreciated) assets on its books.

2.3d DEBT RATIOS

Companies finance their assets from two broad sources, equity and debt. Equity comes from shareholders, whereas debt comes in many forms from many different lenders. Companies borrow from suppliers, banks and investors who buy publicly traded bonds. *Debt ratios* measure the extent to which a company uses money from creditors rather than from shareholders to finance its operations. Because creditors' claims must be satisfied before companies can distribute earnings to shareholders, current and prospective investors pay close attention to the debt on the balance sheet. The more indebted the company, the higher the probability that it will be unable to satisfy the claims of all its creditors.

financial leverage
Using fixed-cost sources of financing, such as debt and preferred shares, to magnify both the risk and the expected return on a company's securities

Fixed-cost sources of financing, such as debt and preferred shares, create **financial leverage** that magnifies both the risk and the expected return on the company's securities.⁶ In general, the more debt a company uses in relation to its total assets, the greater its financial leverage. That is, the more a company borrows, the riskier its outstanding shares and bonds and the higher the return that investors require on those securities. Later in the text, we discuss in detail the effect of debt on the company's risk, return and value. This explains our focus on the use of debt ratios when assessing a company's indebtedness and its ability to meet the fixed payments associated with debt – a way of quantifying financial leverage.

coverage ratio
A debt ratio that uses data from the *income statement* to assess the company's ability to generate sufficient cash flow to make scheduled interest and principal payments

Broadly speaking, there are two types of debt ratios. One type focuses on how much debt (relative to other sources of financing) appears on a company's balance sheet. The other type, known as **coverage ratio**, uses data from the *income statement* to assess the company's ability to generate sufficient cash flow to make scheduled interest and principal payments. Investors and credit-rating agencies use both types of ratios to assess a company's creditworthiness.

debt ratio
A measure of the proportion of total assets financed by a company's creditors

The **debt ratio** measures the proportion of total assets financed by the company's creditors. The higher this ratio, the greater is the company's reliance on borrowed money to finance its activities. The ratio equals total liabilities divided by total assets. GPC's debt ratio in 2020 was 0.551, or 55.1%:

$$\text{Debt ratio} = \frac{\text{Total liabilities}}{\text{Total assets}} = \frac{\$5,281}{\$9,589} = 0.551 = 55.1\%$$

This figure indicates that the company has financed more than half of its assets with debt.

6 By fixed cost, we mean that the cost of this financing source does not vary over time in response to changes in the company's revenue and cash flow. For example, if a company borrows money at a variable rate, then the interest cost of that loan is not fixed through time, although the company's obligation to make interest payments is 'fixed' regardless of the level of the company's revenue and cash flow.

A close cousin of the debt ratio is the **assets-to-equity (A/E) ratio**, sometimes called the **equity multiplier**:

$$\text{Assets-to-equity ratio} = \frac{\text{Total assets}}{\text{Ordinary shares}} = \frac{\$9,589}{\$4,278} = 2.24$$

Note that the denominator of this ratio uses only ordinary shares equity of \$4,278 (\$4,308 of total equity – \$30 of preferred equity). The resulting value indicates that GPC's assets in 2020 were 2.24 times greater than its equity. This value seems reasonable given that the debt ratio indicates slightly more than half (55.1%) of GPC's assets in 2020 were financed with debt. The high equity multiplier indicates high debt and low equity, whereas a low equity multiplier indicates low debt and high equity.

An alternative measure that focuses solely on the company's long-term debt is the **debt-to-equity ratio**. It is calculated as long-term debt divided by shareholders' equity. The 2020 value of this ratio for GPC is calculated as follows:

$$\text{Debt-to-equity ratio} = \frac{\text{Long-term debt}}{\text{Shareholders' equity}} = \frac{\$1,760}{\$4,308} = 0.409 = 40.9\%$$

GPC's long-term debts were therefore only 40.9% as large as its shareholders' equity. A word of caution: both the debt ratio and the debt-to-equity ratio use book values of debt, equity and assets. Analysts should be aware that the *market values* of these variables may differ substantially from their book values.

The **times interest earned ratio** measures the company's ability to make contractual interest payments. It equals earnings before interest and taxes divided by interest expense. A higher ratio indicates a greater capacity to meet scheduled payments. The times interest earned ratio for GPC in 2020 was equal to 13.59, indicating that the company could experience a substantial decline in earnings and still meet its interest obligations:

$$\text{Times interest earned} = \frac{\text{Earnings before interest and taxes}}{\text{Interest expense}} = \frac{\$1,671}{\$123} = 13.59$$

assets-to-equity (A/E) ratio, or equity multiplier

A measure of the proportion of total assets financed by a company's equity.

debt-to-equity ratio

A measure of the company's financial leverage, calculated by dividing long-term debt by shareholders' equity

times interest earned ratio

A measure of the company's ability to make contractual interest payments, calculated by dividing earnings before interest and taxes by interest expense

LO2.3

CONCEPT REVIEW QUESTIONS

- 7 How could analysts use the availability of cash inflow and cash outflow data to improve the accuracy of the liquidity and debt coverage ratios presented previously?
- 8 What specific ratio measures – using cash flow rather than financial statement data – would you calculate to assess the company's liquidity and debt coverage?

LO2.4

2.4 PROFITABILITY RATIOS

Several measures of profitability relate a company's earnings to its sales, assets or equity. *Profitability ratios* are among the most closely watched and widely quoted financial ratios. Many companies link employee bonuses to profitability ratios, and share prices react sharply to unexpected changes in these measures.

gross profit margin
A measure of profitability that represents the percentage of each sales dollar remaining after a company has paid for its goods

operating profit margin
A measure of profitability that represents the percentage of each sales dollar remaining after deducting all costs and expenses *other than* interest and taxes

net profit margin
A measure of profitability that represents the percentage of each sales dollar remaining after all costs and expenses, *including* interest, taxes and preferred share dividends, have been deducted

The **gross profit margin** measures the percentage of each sales dollar remaining after the company has paid for its goods. The higher the gross profit margin, in general, the better. GPC's gross profit margin in 2020 was 33.7%:

$$\text{Gross profit margin} = \frac{\text{Gross profit}}{\text{Sales}} = \frac{\$4,324}{\$12,843} = 0.337 = 33.7\%$$

The **operating profit margin** measures the percentage of each sales dollar remaining after deducting all costs and expenses *other than* interest and taxes. As with the gross profit margin, the higher the operating profit margin, in general, the better. This ratio tells analysts what a company's bottom line looks like before deductions for payments to creditors and tax authorities. GPC's operating profit margin in 2020 was 11.9%:

$$\text{Operating profit margin} = \frac{\text{Operating profit}}{\text{Sales}} = \frac{\$1,531}{\$12,843} = 0.119 = 11.9\%$$

The **net profit margin** measures the percentage of each sales dollar remaining after deducting all costs and expenses *including* interest, taxes and preferred share dividends. GPC's net profit margin of 7.4% in 2020 is calculated as follows:

$$\begin{aligned}\text{Net profit margin} &= \frac{\text{Earnings available for ordinary shareholders}}{\text{Sales}} \\ &= \frac{\$946}{\$12,843} = 0.074 = 7.4\%\end{aligned}$$

Probably the most closely watched financial ratio of them all is *earnings per share (EPS)*, which the investing public considers to be an indicator of corporate success. The earnings per share measure represents the number of dollars earned on behalf of each outstanding ordinary share. Many companies tie management bonuses to specific EPS targets. Earnings per share are calculated as follows:

$$\begin{aligned}\text{Earnings per share} &= \frac{\text{Earnings available for ordinary shareholders}}{\text{Number of ordinary shares outstanding}} \\ &= \frac{\$946}{178.7} = \$5.29\end{aligned}$$

The value of GPC's earnings per share in 2020 was \$5.29.⁷ This figure represents the dollar amount *earned* on behalf of each ordinary share outstanding. Note that EPS is not the same as dividends. The amount of earnings actually *distributed* to each shareholder is the dividend per share; as noted in GPC's income statement (**Figure 2.2**), this value rose to \$1.93 in 2020 from \$1.76 in 2019.

The **return on total assets (ROA)**, often called the *return on investment (ROI)*, measures management's overall effectiveness in using the company's assets to generate returns to ordinary shareholders. The return on total assets for GPC in 2020 was equal to 9.9%:

$$\begin{aligned}\text{Return on total assets} &= \frac{\text{Earnings available for ordinary shareholders}}{\text{Total assets}} \\ &= \frac{\$946}{\$9,589} = 0.099 = 9.9\%\end{aligned}$$

⁷ We state per-share values strictly in dollars and cents, as do company reports.

A closely related measure of profitability is the **return on ordinary equity (ROE)**, which captures the return earned on the ordinary shareholders' (owners') investment in the company. For a company that uses only ordinary shares to finance its operations, the ROE and ROA figures will be identical. With debt or preferred shares on the balance sheet, these ratios will usually differ. When the company earns a profit, even after making interest payments to creditors and paying dividends to preferred shareholders, the company's ROE will exceed its ROA. Conversely, if the company's earnings fall short of the amount it must pay to lenders and preferred shareholders, the ROE will be less than ROA. For GPC, the return on ordinary equity for 2020 was 22.1%, substantially above GPC's return on total assets:

$$\text{Return on common equity} = \frac{\text{Earnings available for ordinary shareholders}}{\text{Ordinary shares}}$$

$$= \frac{\$946}{\$4,278} = 0.221 = 22.1\%$$

return on ordinary equity (ROE)

A measure that captures the return earned on the ordinary shareholders' (owners') investment in a company

2.4a DUPONT SYSTEM OF ANALYSIS

Financial analysts sometimes conduct a deeper analysis of the ROA and ROE ratios using the **DuPont system**. This approach uses both income statement and balance sheet information to break the ROA and ROE ratios into component pieces, or 'drivers' of their values. It highlights the influence of both the net profit margin and the total asset turnover on a company's profitability. In the DuPont system, the return on total assets equals the product of the net profit margin and total asset turnover:

$$\text{ROA} = \text{Net profit margin} \times \text{Total assets turnover}$$

By definition, the net profit margin equals earnings available for ordinary shareholders divided by sales, and total asset turnover equals sales divided by total assets. When we multiply these two ratios together, the sales figure cancels, resulting in the familiar ROA measure:

$$\text{ROA} = \frac{\text{Earnings available for ordinary shareholders}}{\text{Sales}} \times \frac{\text{Sales}}{\text{Total assets}}$$

$$= \frac{\$946}{\$12,843} \times \frac{\$12,843}{\$9,589} = 0.074 \times 1.34 = 0.099 = 9.9\%$$

$$\text{ROA} = \frac{\text{Earnings available for ordinary shareholders}}{\text{Total assets}} = \frac{\$946}{\$9,589} = 0.099 = 9.9\%$$

DuPont system

An analysis that uses both income statement and balance sheet information to break the ROA and ROE ratios into component pieces

FINANCE IN THE REAL WORLD



ANALYSING YOUR PERSONAL FINANCIAL STATEMENTS

Imagine that in early 2021, you prepare an abbreviated personal balance sheet and income statement for the year just ended, 30 June 2020. You also prepare a list of 'Notes' and then analyse the statements using some popular personal finance ratios, which are shown below. A review of the statements and ratios should disclose great similarity between personal and corporate financial statements and ratios.



BALANCE SHEET AT 30 JUNE 2020			
ASSETS		LIABILITIES AND EQUITY	
Total liquid assets	\$ 2,225	Total current liabilities	\$ 905
Total investments	\$ 5,750	Total long-term liabilities	\$ 104,850
Total real and pers. prop.	\$ 139,200	(2) Total liabilities	\$ 105,755
(1) Total assets	<u>\$147,175</u>	Net worth [(1)–(2)]	<u>\$ 41,420</u>
		Total liab. and net worth	<u>\$147,175</u>

INCOME STATEMENT, YEAR ENDED 30 JUNE 2020			
(1) Total income			\$73,040
(2) Total expenses			\$61,704
Cash surplus (deficit) [(1)–(2)]			\$11,336

Notes:

■ Total current debts = \$22,589

■ Total income taxes = \$15,430

■ Total monthly loan payments = \$1,807

■ Monthly gross (before-tax) income = \$6,807

RATIOS			
RATIO	FORMULA	CALCULATION	INTERPRETATION
Solvency ratio	$\frac{\text{Total net worth}}{\text{Total assets}}$	$\frac{\$41,420}{\$147,175} = 0.281 = 28.1\%$	You could tolerate about a 28% decline in asset values before becoming insolvent.
Liquidity ratio	$\frac{\text{Total liquid assets}}{\text{Total current debts}}$	$\frac{\$2,225}{\$22,589} = 0.099 = 9.9\%$	You can cover only about 10% of 1-year debts with current liquid assets.
Savings ratio	$\frac{\text{Cash surplus}}{\text{Income after taxes}}$	$\frac{\$11,336}{\$73,040 - \$15,430} = 0.197 = 19.7\%$	You saved 19.7% of your after-tax cash income during the year.
Debt service ratio	$\frac{\text{Total monthly loan payments}}{\text{Monthly gross before-tax (income)}}$	$\frac{\$1,807}{\$6,087} = 0.297 = 29.7\%$	Your monthly loan payments account for about 30% of monthly gross income.

Naturally, the ROA value for GPC in 2020 obtained using the DuPont system is the same value we calculated before. Yet now, seeing its two component parts, we can think of the ROA as a product of how much profit the company earns on each dollar of sales and the efficiency with which the company uses its assets to generate sales. Holding the net profit margin constant, an increase in total asset turnover increases the company's ROA. Similarly, holding total asset turnover constant, an increase in the net profit margin increases ROA.

We can push the DuPont system one step further by multiplying the ROA by the *assets-to-equity (A/E) ratio*, or the *equity multiplier*. The product of these two ratios equals the return on ordinary equity:

$$\text{ROE} = \text{ROA} \times \text{A/E}$$

For a company that uses no debt and has no preferred shares, the assets-to-equity ratio equals 1.0, and so the ROA equals the ROE. For all other companies, the assets-to-equity ratio exceeds 1.

We can apply this version of the DuPont system to GPC and thereby recalculate its return on ordinary equity for 2020:

$$\begin{aligned} \text{ROE} &= \frac{\text{Earnings available for ordinary shareholders}}{\text{Total assets}} \times \frac{\text{Total assets}}{\text{Ordinary shares}} \\ &= \frac{\$946}{\$9,589} \times \frac{\$9,589}{\$4,278} = 0.099 \times 2.24 = 0.221 = 22.1\% \end{aligned}$$

$$\text{ROE} = \frac{\text{Earnings available for ordinary shareholders}}{\text{Ordinary shares}} = \frac{\$946}{\$4,278} = 0.221 = 22.1\%$$

Observe that GPC's assets-to-equity ratio is 2.24. This means that GPC's return on ordinary equity was more than twice as large as its return on total assets. Note also that if GPC's return on total assets were a *negative* number, then the company's return on ordinary equity would be even more negative than its ROA.

The advantage of the DuPont system is that it allows the company to break its return on ordinary equity into three components tied to the financial statements: (1) a profit-on-sales component (net profit margin) that ties directly to the income statement; (2) an efficiency-of-asset-use component (total asset turnover) that ties directly to the balance sheet; and (3) a financial leverage use component (assets-to-equity ratio) that also ties directly to the balance sheet. Analysts can then study the effect of each of these factors on the overall return to ordinary shareholders, as demonstrated in the following example.⁸



Using Ratios to Make Policy

The 2020 ratio values for the ROE, ROA, assets-to-equity ratio, total asset turnover and net profit margin calculated earlier for GPC are shown below, along with industry averages for globally active oil companies.

RATIO GPC INDUSTRY	RATIO GPC INDUSTRY	RATIO GPC INDUSTRY
Return on ordinary equity (ROE)	22.1%	19.7%
Return on total assets (ROA)	9.9%	12.1%
Assets-to-equity (A/E) ratio	2.24	1.63
Totals asset turnover	1.34	1.42
Net profit margin	7.4%	8.5%

We begin the analysis of GPC's performance during 2020 with its return on ordinary equity of 22.1%, which is noticeably above the industry average of 19.7%. To learn why GPC's ROE

outperformed the industry, we look at two components of ROE: ROA and the assets-to-equity (A/E) ratio. We see that GPC's ROA of 9.9% was well below the industry average of 12.1%. But thanks to its greater use of leverage – an A/E ratio of 2.24 for GPC versus 1.63 for the industry – GPC was able to generate a higher ROE than the average company.

Looking further at the two components of ROA (the net profit margin and the total asset turnover), we see that GPC's total asset turnover of 1.34 is very close to the industry average of 1.42. However, *its net profit margin of 7.4% is*

⁸ Keep in mind that the ratios in the DuPont system are interdependent, and that the equation is just a mathematical identity. It is easy to draw questionable conclusions about lines of causality using the DuPont system. For example, consider this farcical version of the formula:

$$\text{ROA} = \frac{\text{Earnings available for ordinary shareholders}}{\text{Sales}} \times \frac{\text{Sales}}{\text{Assets}} \times \frac{\text{Assets}}{\text{CEO age}} \times \frac{\text{CEO age}}{\text{Ordinary shares}}$$

In this equation, we might interpret the third term on the right as the efficiency with which a CEO of a given age manages the company's assets. If a younger CEO manages the same quantity of assets, then this ratio would increase and, holding all other factors constant, we could say that the company's ROA would increase. This is clearly silly, but mathematically this expression ultimately gives you the company's ROA.



below the industry average of 8.5%, which caused GPC's ROA to be below the industry average, too. This suggests that GPC was less able than its competitors to manage costs and generate a profit on sales.

In summary, GPC compensated for its below-average ROA by using significantly more leverage than its competitors. Clearly,

GPC took greater risk in order to compensate for low profits on sales. The company should focus on its income statement to improve its profitability and also should consider reducing its leverage to moderate its risk. It appears that GPC has problems in both its income statement (net profit margin) and its balance sheet (assets-to-equity ratio).

LO2.4

CONCEPT REVIEW QUESTIONS

- 9 Assume that a company's total assets and sales remain constant. Would an increase in each of the following ratios be associated with a cash inflow or a cash outflow?
 - a Current ratio
 - b Inventory turnover
 - c Average collection period
 - d Average payment period
 - e Debt ratio
 - f Net profit margin

- 10 Use the DuPont system to explain why a slower-than-average inventory turnover could cause a company with an above-average net profit margin to have a below-average return on ordinary equity.

LO2.5

2.5 MARKET RATIOS

Market ratios relate the company's market value, as measured by its current share price, to certain accounting values. These ratios provide insight into how investors think the company is performing, and they also reflect the ordinary shareholders' assessment of the company's past and expected future performance. Here, we consider two popular market ratios, one that focuses on earnings and another that considers book value.

price/earnings (P/E) ratio

A measure of a company's long-term growth prospects that represents the amount investors are willing to pay for each dollar of a company's earnings

The **price/earnings (P/E) ratio** measures the amount investors are willing to pay for each dollar of the company's earnings. Investors often use the P/E ratio, the most widely quoted market ratio, as a barometer of a company's long-term growth prospects and of investor confidence in the company's future performance. A high P/E ratio indicates investors' belief that a company will achieve rapid earnings growth in the future; hence, companies with high P/E ratios are referred to as *growth stocks or shares*. Simply stated, investors who believe that future earnings are going to be higher than current earnings are willing to pay a lot for today's earnings, and vice-versa.

Using the per-share price of \$76.25 for Global Production Corporation on 30 June 2020, and its 2020 EPS of \$5.29, the P/E ratio at year-end 2020 is:

$$\begin{aligned}\text{Price/earnings (P/E) ratio} &= \frac{\text{Market price per ordinary share}}{\text{Earnings per share}} \\ &= \frac{\$76.25}{\$5.29} = 14.41\end{aligned}$$

This figure indicates that investors were paying \$14.41 for each dollar of GPC's earnings. GPC's price/earnings ratio one year before (on 30 June 2019) had been almost twice as high, at 28.37 (\$71.50 per share price ÷ \$2.52 earnings per share).

The **market/book (M/B) ratio** provides another assessment of how investors view the company's performance. It relates the market value of the company's shares to their book value. The shares of companies that investors expect to perform well in the future – improving profits, growing market share, launching successful products and so forth – typically sell at higher M/B ratios than the shares of companies with less attractive prospects. Companies that investors expect to earn high returns relative to their risk typically sell at higher M/B multiples than those expected to earn low returns relative to risk.

market/book (M/B) ratio
A measure used to assess a company's future performance by relating its market value per share to its book value per share

To calculate the M/B ratio for GPC in 2020, we first need to find its *book value per share*:

$$\begin{aligned}\text{Book value per share} &= \frac{\text{Ordinary shares}}{\text{Number of ordinary shares outstanding}} \\ &= \frac{\$4,278}{178.7} = \$23.94\end{aligned}$$

We then compute the M/B ratio by dividing the book value into the current price of the company's ordinary shares:

$$\begin{aligned}\text{Market/book (M/B) ratio} &= \frac{\text{Market value per share}}{\text{Book value per share}} \\ &= \frac{\$76.25}{\$23.94} = 3.19\end{aligned}$$

Investors are currently paying \$3.19 for each \$1.00 of book value of GPC's shares. Clearly, investors expect GPC to continue to grow in the future: they are willing to pay more than book value for the company's shares.

LO2.5

CONCEPT REVIEW QUESTIONS

11 Which of the categories and individual ratios described in this chapter would be of greatest interest to each of the following parties?

- a Existing and prospective creditors (lenders)
- b Existing and prospective shareholders
- c The company's management

12 How can you reconcile investor expectations for a company with an above-average M/B ratio and a below-average P/E ratio? Could the age of the company have any effect on this ratio comparison?

THINKING CAP QUESTIONS

2 What are some advantages for financial analysts of using ratios, rather than absolute numbers in dollars, when comparing different companies?

3 What financial ratios might you review in order to gain insight into how investors think a company is performing? Does your choice of ratio depend on the industry in which a company operates?

LO2.6

2.6 CORPORATE TAXES

Taxation is one of the key measurement challenges facing financial decision-makers. In GPC's income statement ([Figure 2.2](#)), we can see that the company's taxes for fiscal year 2020 totalled \$599 million on pre-tax income of \$1,548 million – a significant cash outflow. The financial manager needs to understand the basics of corporate taxation in order to estimate the after-tax benefits and costs required by proposed actions. Such understanding also allows consultation with tax experts, such as a corporate tax counsellor or a tax consultant.

Here, we briefly review the most basic corporate tax concepts: the taxation of ordinary income, and capital gains. Keep in mind that: (1) tax law is frequently revised; (2) companies are subject to tax rates that differ from the personal tax rates applicable to non-corporate businesses such as sole proprietorships and partnerships; and (3) tax rules differ from country to country.

2.6a ORDINARY CORPORATE INCOME

ordinary corporate income

Income resulting from the sale of the company's goods and services

Ordinary corporate income is income resulting from the sale of the company's goods and services. This income, or part of it, is usually taxed by governments in the countries which the company operates. In Australia, all companies are subject to a federal (national government) tax rate of 30% on their taxable income, except for 'small business' companies, which pay a reduced tax rate of 27.5% up to and including 2019–2020 income year. By contrast, the corporate tax rate in Singapore is 17%, while in India it is quoted as 35%. Different countries allow for different effective tax rates depending on deduction allowed against income before taxation, and other preferential or penalty rates that may be charged.

In general, a corporate income tax rate applies to income earned during the period from one fixed date in a year (such as 1 July or 1 January) to one day short of that date the following year (30 June or 31 December).

As we noted, not all countries operate with identical corporate income tax rates. A website such as that offered by KPMG ([see <https://home.kpmg/xx/en/home/services/tax/tax-tools-and-resources/tax-rates-online/corporate-tax-rates-table.html>](https://home.kpmg/xx/en/home/services/tax/tax-tools-and-resources/tax-rates-online/corporate-tax-rates-table.html)) gives an indication of the variety that exists across nations. Some countries, such as the US, also have different corporate income tax rates for different levels of income, with higher rates on higher corporate incomes. This is called a progressive tax regime. The Australian model is a flat tax regime for companies.

Average Tax Rate

average tax rate

A company's tax liability divided by its pre-tax income

capital gain

The difference between the sale price and the initial purchase price of a capital asset, such as equipment or shares held as an investment

capital loss

The loss resulting from the sale of a capital asset, such as equipment or shares held as an investment, at a price below its book, or accounting, value

A useful measure is the company's **average tax rate**, which is calculated by dividing its tax liability by its pre-tax income. For example, if the tax that a company expected to pay in the coming year was \$952,000, and its pre-tax income was \$2,800,000, then the average tax rate would be exactly 34% ($\$952,000 \div \$2,800,000$). This company would expect to pay an average of 34 cents on each dollar of pre-tax income earned.

2.6b CORPORATE CAPITAL GAINS

Companies experience **capital gains** when they sell capital assets, such as equipment or shares held as an investment, for more than their original purchase price. The amount of the capital gain is equal to the difference between the sale price and initial purchase price. If the sale price is less than the asset's book, or accounting, value, the difference is called a **capital loss**. Under current tax law, corporate capital gains are merely added to operating income and taxed at the ordinary corporate tax rates. The tax treatment of capital losses on depreciable business assets involves a deduction from pre-tax ordinary income, whereas any other capital losses must be used to offset capital gains. The following example demonstrates the tax treatment of a capital gain.



EXAMPLE

Tax Impacts

Assume that a company decided to sell an entire production line for \$850,000. If the company had originally purchased the line two years earlier for \$700,000, how much in capital gain taxes would the company owe on this transaction if it

were in the 30% corporate income tax bracket on ordinary corporate income? The company would have realised a \$150,000 (\$850,000 – \$700,000) capital gain on this transaction, which would result in \$45,000 ($\$150,000 \times 0.30$) of taxes.

LO2.6

CONCEPT REVIEW QUESTIONS

13 How are Australian-resident companies taxed on ordinary income?

14 What are corporate capital gains and capital losses? How are they treated for tax purposes?

STUDY TOOLS

SUMMARY

LO2.1

- The four key financial statements are: (1) the balance sheet; (2) the income statement; (3) the statement of retained earnings; and (4) the statement of cash flows. Companies typically include with these statements detailed notes describing the technical aspects of the financial statements.

LO2.2

- A company's total cash flows can be conveniently divided into: (1) operating flows; (2) investment flows; and (3) financing flows. Operating cash flow (OCF) measures the amount of cash flow generated by the company's operations; it is calculated by adding any non-cash charges (the main one being depreciation) to the company's net operating profits after taxes (NOPAT). The value of NOPAT is calculated as earnings before interest and taxes (EBIT) multiplied by 1 minus the tax rate.
- More important than OCF to financial analysts is free cash flow (FCF), the amount of cash flow available to investors. Free cash flow equals operating cash flow less the company's net investments in fixed and current assets.
- The statement of cash flows summarises the company's cash flows over a specified period of time, typically one year. It presents operating, investment and financing cash flows. When interpreting the statement, an analyst typically looks for unusual changes in either the major categories of cash flow or in specific items to find clues to problems that the company may be experiencing.

LO2.3

- Financial ratios are a convenient tool for analysing the company's financial statements to assess its performance over a given period. Analysts use various financial ratios to assess a company's liquidity, activity, debt, profitability and market value.

- LO2.4 The DuPont system is often used to assess various aspects of a company's profitability and market value. The DuPont system uses both income statement and balance sheet data to assess a company's profitability, particularly the returns earned on both the total asset investment and the owners' ordinary shares in the company.
- LO2.5 Ratios based on market data can also provide valuable insights on organisations, so we have outlined some basic measures that are useful here.
- LO2.6 Financial decision-makers must be conversant with basic corporate tax concepts because taxes affect both benefits and costs. Taxes are a major outflow of cash to the profitable company; they are levied on both ordinary income and capital gains.

IMPORTANT EQUATIONS

TABLE OF IMPORTANT EQUATIONS

- | |
|--|
| 2.1 NOPAT = EBIT \times (1 - T) |
| 2.2 OCF = NOPAT + Depreciation |
| 2.3 OCF = [EBIT \times (1 - T)] + Depreciation |
| 2.4 FCF = OCF - ΔFA - ΔWC |

SELF-TEST PROBLEMS

Answers to these 'Self-test problems' and the 'Concept review' questions throughout the chapter appear on the Student Companion Website (<http://login.cengagebrain.com>) or via your instructor.

ST2-1 Use the financial statements below to answer the questions about M&M Manufacturing's financial position at the end of the calendar year 2020.

M&M MANUFACTURING PTY LTD BALANCE SHEET AT 30 JUNE 2020 (\$ IN THOUSANDS)			
ASSETS		LIABILITIES AND EQUITY	
Current assets		Current liabilities	
Cash	\$ 140,000	Accounts payable	\$ 480,000
Marketable securities	260,000	Notes payable	500,000
Accounts receivable	650,000	Accruals	80,000
Inventories	800,000	Total current liabilities	\$ 1,060,000
Total current assets	\$1,850,000	Long-term debt	
Fixed assets		Bonds outstanding	\$ 1,300,000
Gross fixed assets	\$ 3,780,000	Bank debt (long-term)	260,000
Less: Accumulated depreciation	1,220,000	Total long-term debt	\$ 1,560,000
Net fixed assets	\$ 2,560,000	Total liabilities	\$ 2,620,000
Total assets	\$4,410,000	Shareholders' equity	
		Preferred shares	\$ 180,000
		Ordinary shares (at par)	200,000
		Paid-in capital in excess of par	810,000
		Retained earnings	600,000
		Total shareholders' equity	\$ 1,790,000
		Total liabilities and equity	\$4,410,000

M&M MANUFACTURING, PTY LTD INCOME STATEMENT FOR YEAR ENDED 30 JUNE 2020 (\$ IN THOUSANDS)		
Sales revenue		\$6,900,000
Less: Cost of goods sold		<u>4,200,000</u>
Gross profits		\$2,700,000
Less: Operating expenses		
Sales expense	\$ 750,000	
General and administrative expense	1,150,000	
Leasing expense	210,000	
Depreciation expense	<u>235,000</u>	
Total operating expenses		<u>2,345,000</u>
Earnings before interest and taxes		\$ 355,000
Less: Interest expense		<u>85,000</u>
Net profit before taxes		\$ 270,000
Less: Taxes		<u>81,000</u>
Net profits after taxes		\$ 189,000
Less: Preferred share dividends		<u>10,800</u>
Earnings available for ordinary shareholders		\$ 178,200
Less: Dividends		<u>75,000</u>
Total retained earnings		\$ 103,200
Per share data		
Earnings per share (EPS)	\$ 1.43	
Dividends per share (DPS)	\$ 0.60	
Price per share	\$ 15.85	

- a How much cash and near cash does M&M have at fiscal year-end 2020?
- b What was the original cost of all of the company's real property that is currently owned?
- c How much in total liabilities did the company have at fiscal year-end 2020?
- d How much did M&M owe for credit purchases at fiscal year-end 2020?
- e How much did the company sell during 2020?
- f How much equity did the ordinary shareholders have in the company at fiscal year-end 2020?
- g What is the cumulative total of earnings reinvested in the company from its inception to the end-of-fiscal-year 2020?
- h How much operating profit did the company earn during fiscal year 2020?
- i What is the total amount of dividends paid out by the company during the fiscal year 2020?
- j How many ordinary shares did M&M have outstanding at fiscal year-end 2020?

ST2-2 The partially complete 2020 balance sheet and income statement for Challenge Industries are given below, followed by selected ratio values for the company based on its completed 2020 financial statements. Use the ratios along with the partial statements to complete the financial statements. Hint: Use the ratios in the order listed to calculate the missing statement values that need to be installed in the partial statements.

CHALLENGE INDUSTRIES PTY LTD BALANCE SHEET AT 30 JUNE 2020			
ASSETS		LIABILITIES AND EQUITY	
Current assets		Current liabilities	
Cash	\$ 52,000	Accounts payable	\$150,000
Marketable securities	60,000	Notes payable	?
Accounts receivable	200,000	Accruals	<u>80,000</u>
Inventories	<u>?</u>	Total current liabilities	<u>?</u>
Total current assets	<u>?</u>	Long-term debt	\$425,000
Fixed assets (gross)	<u>?</u>	Total liabilities	?
Less: Accumulated depreciation	240,000	Shareholders' equity	
Net fixed assets	<u>?</u>	Preferred shares	?
Total assets	<u>?</u>	Ordinary shares (at par)	150,000
		Paid-in capital in excess of par	?
		Retained earnings	<u>390,000</u>
		Total shareholders' equity	<u>?</u>
		Total liabilities and shareholders' equity	<u>?</u>

CHALLENGE INDUSTRIES PTY LTD INCOME STATEMENT FOR THE YEAR ENDED 30 JUNE 2020		
Sales revenue		\$4,800,000
Less: Cost of goods sold		<u>?</u>
Gross profits		<u>?</u>
Less: Operating expenses		
Sales expense	\$690,000	
General and administrative expense	750,000	
Depreciation expense	<u>120,000</u>	
Total operating expenses		<u>1,560,000</u>
Earnings before interest and taxes		?
Less: Interest expense		<u>35,000</u>
Earnings before taxes		<u>?</u>
Less: Taxes		<u>?</u>
Net income (net profits after taxes)		<u>?</u>
Less: Preferred dividends		<u>15,000</u>
Earnings available for ordinary shareholders		?
Less: Dividends		<u>60,000</u>
Total retained earnings		<u>?</u>

CHALLENGE INDUSTRIES PTY LTD RATIOS FOR THE YEAR ENDED 30 JUNE 2020	
RATIO	VALUE
Total asset turnover	2.00
Gross profit margin	40%
Inventory turnover	10
Current ratio	1.60
Net profit margin	3.75%
Return on ordinary equity	12.5%

QUESTIONS

- Q2-1** What information (explicit and implicit) can be derived from financial statement analysis? Does the standardisation required by IFRS add greater validity to comparisons of financial data between companies and industries? Are there possible shortcomings to relying solely on financial statement analysis to value companies?
- Q2-2** Distinguish between the types of financial information contained in the various financial statements. Which statements provide information on a company's performance over a reporting period, and which present data on a company's current position? What sorts of valuable information may be found in the notes to financial statements? Describe a situation in which the information in the notes would be essential to making an informed decision about the value of a company.
- Q2-3** What is operating cash flow (*OCF*)? How is it calculated? What is free cash flow (*FCF*)? How is it calculated from *OCF*? Why do financial managers focus attention on the value of *FCF*?
- Q2-4** Describe the common definitions of *inflows* of cash and *outflows* of cash used by analysts to classify certain balance sheet changes and income statement values. What three categories of cash flow are used in the statement of cash flows? To what value should the net value in the statement of cash flows reconcile?
- Q2-5** How do analysts use ratios to analyse a company's *financial leverage*? Which ratios convey more important information to a credit analyst: those revolving around the levels of indebtedness, or those measuring the ability to meet the contractual payments associated with debt? What is the relationship between a company's levels of indebtedness and risk? What must happen for an increase in financial leverage to be successful?
- Q2-6** How is the DuPont system useful in analysing a company's ROA and ROE? What information can be inferred from the decomposition of ROE into contributing ratios? What is the mathematical relationship between each of the individual components (net profit margin, total asset turnover and assets-to-equity ratio) and ROE? Can ROE be raised without affecting ROA? How?
- Q2-7** Provide a general description of the tax rates applicable to Australian companies. How do *capital gains* differ from ordinary corporate income?

PROBLEMS

CASH FLOW ANALYSIS

P2-1 Given the balance sheets and selected data from the income statement of SMG Industries that follow, answer parts (a)–(c).

- a Calculate the company's *operating cash flow (OCF)* for the year ended 30 June 2020, using [Equation 2.2](#).
- b Calculate the company's *free cash flow (FCF)* for the year ended 30 June 2020, using [Equation 2.4](#).
- c Interpret, compare and contrast your cash flow estimates in parts (a) and (b).

SMG INDUSTRIES BALANCE SHEETS (\$ IN MILLIONS)					
ASSETS	30 JUNE 2020	30 JUNE 2019	LIABILITIES AND SHAREHOLDERS' EQUITY	30 JUNE 2020	30 JUNE 2019
Cash	\$ 3,500	\$ 3,000	Accounts payable	\$ 3,600	\$ 3,500
Marketable securities	3,800	3,200	Notes payable	4,800	4,200
Accounts receivable	4,000	3,800	Accruals	1,200	1,300
Inventories	<u>4,900</u>	<u>4,800</u>	Total current liabilities	\$ 9,600	\$ 9,000
Total current assets	<u>\$ 16,200</u>	<u>\$ 14,800</u>	Long-term debt	<u>\$ 6,000</u>	<u>\$ 6,000</u>
Gross fixed assets	\$ 31,500	\$ 30,100	Ordinary shares	\$ 11,000	\$ 11,000
Less:			Retained earnings	6,400	5,800
Accumulated depreciation	<u>14,700</u>	<u>13,100</u>	Total shareholders' equity	\$ 17,400	\$ 16,800
Net fixed assets	<u>\$ 16,800</u>	<u>\$ 17,000</u>	Total liabilities and shareholders' equity	<u>\$33,000</u>	<u>\$31,800</u>
Total assets	<u>\$33,000</u>	<u>\$31,800</u>			

INCOME STATEMENT DATA (FISCAL YEAR 2020, \$ IN MILLIONS)	
Depreciation expense	\$1,600
Earnings before interest and taxes (EBIT)	4,500
Taxes	1,300
Net profits after taxes	2,400

ANALYSING FINANCIAL PERFORMANCE USING RATIO ANALYSIS

P2-2 Manufacturers Bank is evaluating Aluminium Industries Pty Ltd, which has requested a \$3 million loan in order to assess the company's financial leverage and risk. On the basis of the debt ratios for Aluminium, along with the industry averages and Aluminium's recent financial statements (which follow), evaluate and recommend appropriate action on the loan request.

ALUMINIUM INDUSTRIES PTY LTD INCOME STATEMENT FOR THE YEAR ENDED 30 JUNE 2020		
Sales revenue		\$30,000,000
Less: Cost of goods sold		<u>21,000,000</u>
Gross profit		\$ 9,000,000
Less: Operating expenses		
Selling expense	\$3,000,000	
General and administrative expenses	1,800,000	
Lease expense	200,000	
Depreciation expense	<u>1,000,000</u>	
Total operating expense		<u>6,000,000</u>
Operating profit		\$ 3,000,000
Less: Interest expense		<u>1,000,000</u>
Net profit before taxes		\$ 2,000,000
Less: Taxes (rate = 40%)		<u>800,000</u>
Net profits after taxes		<u>\$ 1,200,000</u>

ALUMINIUM INDUSTRIES PTY LTD BALANCE SHEET AS AT 30 JUNE 2020			
ASSETS		LIABILITIES AND SHAREHOLDERS' EQUITY	
Current assets		Current liabilities	
Cash	\$ 1,000,000	Accounts payable	\$ 8,000,000
Marketable securities	3,000,000	Notes payable	8,000,000
Accounts receivable	12,000,000	Accruals	500,000
Inventories	<u>7,500,000</u>	Total current liabilities	\$16,500,000
Total current assets	<u>\$23,500,000</u>	Long-term debt (including financial leases)	<u>\$20,000,000</u>
Fixed assets (at cost)		Total liabilities	\$36,500,000
Land and buildings	\$11,000,000	Shareholders' equity	
Machinery and equipment	20,500,000	Preferred shares (25,000 shares, \$4 dividend)	\$ 2,500,000
Furniture and fixtures	<u>8,000,000</u>	Ordinary shares (1 million shares, \$5 par)	5,000,000
Gross fixed assets	\$39,500,000	Paid-in capital in excess of par	4,000,000
Less: Accumulated depreciation	<u>13,000,000</u>	Retained earnings	<u>2,000,000</u>
Net fixed assets	<u>\$26,500,000</u>	Total shareholders' equity	<u>\$13,500,000</u>
Total assets	<u>\$50,000,000</u>	Total liabilities and shareholders' equity	<u>\$50,000,000</u>

INDUSTRY AVERAGES	
Debt ratio	0.51
Debt/equity ratio	1.07
Times interest earned ratio	7.30

- P2-3** Use the following financial data for Greta's Gadgets Pty Ltd to determine the effect of using additional debt financing to purchase additional assets. Assume that an additional \$1 million of assets is purchased with 100% debt financing with a 10% annual interest rate.

GRETA'S GADGETS PTY LTD INCOME STATEMENT FOR THE YEAR ENDED 30 JUNE 2020	
Sales	\$4,000,000
Less: Costs and expenses @ 90%	3,600,000
Earnings before interest & taxes	\$ 400,000
Less: Interest ($0.10 \times \$1,000,000$)	100,000
Earnings before taxes	\$ 300,000
Less: Taxes = 40%	120,000
Net income	\$ 180,000

GRETA'S GADGETS PTY LTD BALANCE SHEET AS AT 30 JUNE 2020			
ASSETS		LIABILITIES AND SHAREHOLDERS' EQUITY	
Current assets	\$ 0	Current liabilities	\$ 0
Fixed assets	2,000,000	Long-term debt @ 10%	1,000,000
Total assets	\$2,000,000	Total liabilities	\$ 1,000,000
		Ordinary shares	\$ 1,000,000
		Total liabilities and shareholders' equity	\$2,000,000

- a Calculate the current (2020) net profit margin, total asset turnover, assets-to-equity ratio, return on total assets and return on ordinary equity for Greta's Gadgets.
- b Now, assuming no other changes, determine the effect of purchasing the \$1 million in assets using 100% debt financing with a 10% annual interest rate. Further assume that the newly purchased assets generate an additional \$2 million in sales and that the costs and expenses remain at 90% of sales. For purposes of this problem, further assume a tax rate of 40%. What is the effect on the ratios calculated in part (a)? Is the purchase of these assets justified on the basis of the return on ordinary equity?
- c Assume that the newly purchased assets in part (b) generate only an extra \$500,000 in sales. Is the purchase justified in this case?
- d Which component ratio(s) of the DuPont system is/are not affected by the change in sales? What does this imply about the use of financial leverage?

- P2-4** Tracey White, owner of the Buzz Tea Shop chain, has decided to expand her operations. Her 2020 financial statements follow. Tracey can buy two additional teahouses for \$3 million, and she has the choice of completely financing these new teahouses with either a 10% (annual interest) loan or the issuance of new ordinary shares. She also expects these new shops to generate an additional \$1 million in sales. Assuming a 40% tax rate and no other changes, should Tracey buy the two teahouses? Why or why not? Which financing option results in the better ROE?

BUZZ TEA SHOPS PTY LTD FINANCIAL STATEMENTS 2020			
BALANCE SHEET		INCOME STATEMENT	
Current assets	\$ 250,000	Sales	\$500,000
Fixed assets	750,000	Less: Costs and expenses@ 40%	200,000
Total assets	\$1,000,000	Earnings before interest and taxes (EBIT)	\$300,000
Current liabilities	\$ 300,000	Less: Interest expense	0
Long-term debt	0	Net profit before taxes	\$300,000
Total liabilities	\$ 300,000	Less: Taxes = 40%	120,000
Ordinary equity	\$ 700,000	Net income	\$180,000
Total liabilities and shareholders' equity	\$1,000,000		

P2-5 The financial statements of Access Corporation for the year ended 30 June 2020 follow.

ACCESS CORPORATION INCOME STATEMENT FOR THE YEAR ENDED 30 JUNE 2020		
Sales revenue		\$160,000
Less: Cost of goods sold*		106,000
Gross profit		\$ 54,000
Less: Operating expenses		
Sales expense	\$16,000	
General and administrative expense	10,000	
Lease expense	1,000	
Depreciation expense	10,000	
Total operating expense		37,000
Operating profit		\$ 17,000
Less: Interest expense		6,100
Net profit before taxes		\$ 10,900
Less: Taxes = 40%		4,360
Net profits after taxes		\$ 6,540

* Access Corporation's annual purchases are estimated to equal 75% of cost of goods sold.

ACCESS CORPORATION BALANCE SHEET AS AT 30 JUNE 2020			
ASSETS		LIABILITIES AND SHAREHOLDERS' EQUITY	
Cash	\$ 500	Accounts payable	\$ 22,000
Marketable securities	1,000	Notes payable	47,000
Accounts receivable	25,000	Total current liabilities	\$ 69,000
Inventories	45,500	Long-term debt	\$ 22,950
Total current assets	\$ 72,000	Total liabilities	\$ 91,950





ACCESS CORPORATION BALANCE SHEET AS AT 30 JUNE 2020			
ASSETS		LIABILITIES AND SHAREHOLDERS' EQUITY	
Land	\$ 26,000	Ordinary shares ^a	\$ 31,500
Buildings and equipment	90,000	Retained earnings	26,550
Less:		Total shareholders' equity	\$ 58,050
Accumulated depreciation	<u>38,000</u>	Total liabilities and shareholders' equity	\$150,000
Net fixed assets	<u>\$ 78,000</u>		
Total assets	<u>\$150,000</u>		

a The company's 3,000 outstanding ordinary shares closed on 30 June 2020 at a price of \$25 per share.

- Use the preceding financial statements to complete the following table. Assume that the industry averages given in the table are applicable for both 2019 and 2020.
- Analyse Access Corporation's financial condition as it relates to: (1) liquidity; (2) activity; (3) debt; (4) profitability; and (5) market value. Summarise the company's overall financial condition.

ACCESS CORPORATION'S FINANCIAL RATIOS			
	INDUSTRY AVERAGE	ACTUAL RATIO 2019	ACTUAL RATIO 2020
Current ratio	1.80	1.84	—
Quick (acid-test) ratio	0.70	0.78	—
Inventory turnover	2.50	2.59	—
Average collection period ^a	37 days	36 days	—
Average payment period ^a	72 days	78 days	—
Debt-to-equity ratio	50%	51%	—
Times interest earned ratio	3.8	4.0	—
Gross profit margin	38%	40%	—
Net profit margin	3.5%	3.6%	—
Return on total assets (ROA)	4.0%	4.0%	—
Return on ordinary equity (ROE)	9.5%	8.0%	—
Market/book (M/B) ratio	1.1	1.2	—

a Based on a 365-day year and on end-of-fiscal-year figures.

- P2-6** Choose a company that you would like to analyse and obtain its financial statements from the internet. Now, select another company from the same industry and obtain its financial data. Perform a complete ratio analysis on each company. How well does your selected company compare with its industry peer? Which components of your company's ROE are superior, and which are inferior?

CASE STUDY



FINANCIAL STATEMENT AND CASH FLOW ANALYSIS

You have been hired as a financial analyst by the Bank of Nausori, located in Fiji. One of your first job assignments is to analyse the present financial condition of Tabua Stores Pty Ltd. You are provided with the following 2020 balance sheet and income statement information for Tabua Stores. In addition, you are told that Tabua Stores has 10,000,000 ordinary shares outstanding, currently trading at \$9 per share, and has made annual purchases of \$210,000,000.

Your assignment calls for you to calculate certain financial ratios and to compare these calculated ratios with the industry average ratios that are provided. You are also told to base your analysis on five categories of ratios: (a) liquidity ratios; (b) activity ratios; (c) debt ratios; (d) profitability ratios; and (e) market ratios.

BALANCE SHEET (\$ IN THOUSANDS)			
Cash	\$ 5,000	Accounts payable	\$ 15,000
Accounts receivable	20,000	Notes payable	<u>20,000</u>
Inventory	40,000	Total current liabilities	\$ 35,000
Total current assets	\$ 65,000	Long-term debt	\$100,000
Net fixed assets	<u>135,000</u>	Shareholder equity	<u>\$ 65,000</u>
Total assets	<u>\$200,000</u>	Total liabilities and equity	<u>\$200,000</u>

INCOME STATEMENT (\$ IN THOUSANDS)	
Net sales (all credit)	\$300,000
Less: Cost of goods sold	250,000
Earnings before interest and taxes	\$ 50,000
Less: Interest	<u>40,000</u>
Earnings before taxes	\$ 10,000
Less: Taxes (40%)	<u>4,000</u>
Net income	<u>\$ 6,000</u>

INDUSTRY AVERAGES FOR KEY RATIOS	
Net profit margin	6.4%
Average collection period (365 days)	30 days
Debt ratio	50%
P/E ratio	23
Inventory turnover ratio	12.0
ROE	18%
Average payment period (365 days)	20 days

INDUSTRY AVERAGES FOR KEY RATIOS	
Times interest earned ratio	8.5
Total asset turnover	1.4
Current ratio	1.5
Assets-to-equity ratio	2.0
ROA	9%
Quick ratio	1.25
Fixed asset turnover ratio	1.8

ASSIGNMENT

Use the following guidelines to complete this job assignment. First, identify which ratios you need to use to evaluate Tabua Stores in terms of its: (a) liquidity position; (b) business activity; (c) debt position; (d) profitability; and (e) market comparability. Next, calculate these ratios. Finally, compare these ratios to the industry average ratios provided in the problem, and then answer the following questions.

- 1 Based on the provided industry-average information, discuss Tabua Stores' liquidity position. Discuss specific areas in which Tabua compares positively and negatively with the overall industry.
- 2 Based on the provided industry-average information, what do Tabua Stores' activity ratios tell you? Discuss specific areas in which Tabua compares positively and negatively with the overall industry.
- 3 Based on the provided industry-average information, discuss Tabua Stores' debt position. Discuss specific areas in which Tabua compares positively and negatively with the overall industry.
- 4 Based on the provided industry-average information, discuss Tabua Stores' profitability position. As part of this investigation of company profitability, include a DuPont analysis. Discuss specific areas in which Tabua compares positively and negatively with the overall industry.
- 5 Based on the provided industry-average information, how is Tabua Stores viewed in the marketplace? Discuss specific areas in which Tabua compares positively and negatively with the overall industry.
- 6 Overall, what are Tabua's strong and weak points? Knowing that your boss will approve new loans only to companies in a better-than-average financial position, what is your final recommendation: approval or denial of loan?

3

THE TIME VALUE OF MONEY

WHAT COMPANIES DO

TRANSPORTS OF DELIGHT?

In March 2008, Meyrick and Associates, a consulting group, together with EconSearch and Steer Davies Gleave, presented a report on a range of transport options for the East-West Link to the Victorian State Government. The East-West Link was a planned major infrastructure project that would affect transport and traffic patterns for millions of people who live and work in the city of Melbourne over many decades. The report summarised extensive analyses undertaken to evaluate the benefits and costs of the base case and the various other options for developing this new piece of transport infrastructure, and described a series of present values that had been determined. For example, one piece of analysis was of the present value of public transport revenue accrued by each option. It was determined by:

- 1 estimating revenue per day for the base case and for each option
- 2 estimating revenue per year for each option
- 3 discounting the future cash flows
- 4 estimating the yearly increase of revenue for each option
- 5 calculating the difference between the base case and each other option.

The project received considerable public attention, especially when, following a 2014 election and change of government, it was revealed that the initial business case for the project predicted a loss of 45 cents for every dollar invested. Further analyses were conducted to incorporate wider economic benefits stemming from the project, including reduced travel and commercial times; but the return from the project increased only to 84 cents for each dollar invested.

The use of present value analysis is central to any project in which a decision must be made on whether or not to commit scarce financial resources to an investment that will produce a long stream of cash payments in the future. This chapter will show you the key concepts that underpin our use of present value analysis.

Sources: Meyrick and Associates, *East West Needs Assessment Economic Benefits and Costs Analysis – Technical Report*, March 2008, https://www.ptua.org.au/files/2008/PTUA_EWLNA_submission_20080715.pdf, accessed 24 June 2019.

LEARNING OBJECTIVES

After studying this chapter, you will be able to:

- LO3.1 understand how a dollar today is not the same value as a dollar tomorrow
- LO3.2 explain that a delay in receiving cash over time means its value must increase to compensate the cash receiver who cannot engage in other investment projects while waiting – hence values of cash today are compounded into the future
- LO3.3 understand that the converse of compounding – paying more for future cash than having its value today – is discounting, that is, reducing the value of future cash if it is to be received today
- LO3.4 describe how different patterns of future cash flows (lump sums, payments each period for finite intervals (annuities), and payments each period forever (perpetuities)) can allow us to simplify the present value formulae
- LO3.5 understand how to calculate a cumulative value of cash flows at a future date
- LO3.6 understand how to calculate a cumulative value of cash flows at the present date
- LO3.7 describe how combinations of cash flow patterns can be calculated with some simplifications of the relevant formulae.

3.1 INTRODUCTION TO THE TIME VALUE OF MONEY

In business, most decisions that financial managers face involve trading off costs and benefits that are spread out over time. Companies have to decide whether the initial cost of building a new factory or launching a new advertising campaign is justified by the long-term benefits that result from the investment. In the East-West Link example outlined in this chapter's 'What Companies Do' box, the investment by Australia's Victorian State Government was to be for a multimillion-dollar commitment over a period of several years, with the impacts lasting decades. Because of the long time horizon involved, there was a great deal of uncertainty about the likelihood of the project being a success. In general, financial managers for major projects need a quantitative framework for evaluating cash inflows and outflows that occur at different times over many years. It turns out that this framework is just as useful to typical consumers in their everyday lives as it is to executives in huge, multinational corporations.

The most important idea in Chapter 3 is that money has time value. This simply means that it is better to have \$1 today than to receive \$1 in the future. The logic of this claim is straightforward – if you have \$1 in hand today, you can invest it and earn interest, which means that you will have more than \$1 in the future. Thus, the **time value of money** is a financial concept recognising that the value of a cash receipt (or payment) depends not only on how much money you receive, but also on when you receive it.

A simple example illustrates the essence of the time value of money. Suppose you have \$100 today, and you can put that sum into an investment that pays 5% interest per year. If you invest \$100 now, by the end of one year you will earn \$5 in interest ($0.05 \times \$100 = \5). Your \$100 initial investment will have grown to \$105 in one year (\$5 in interest plus the original \$100 investment). In a sense, then, receiving \$100 now is equivalent to receiving \$105 in one year. Whether you receive \$100 now and invest it at 5%, or whether you have to wait a year to receive \$105, you wind up with the same amount of cash. In this case, we would say that *\$105 is the future value of \$100 invested for one year at 5%*. More generally, the **future value** is the value of a cash receipt or payment as at some future date.

We can reframe the above example to illustrate another dimension of the time value of money. Suppose you have no money today, but you expect to receive \$105 in one year. Suppose also that a bank is willing to

time value of money
Financial concept that explicitly recognises that \$1 received today is worth more than \$1 received in the future

future value
The value of an investment made today measured at a specific future date, accounting for interest earned over the life of the investment

present value

The value today of a cash flow to be received at a specific date in the future, accounting for the opportunity to earn interest at a specified rate

lend you money, charging an interest rate of 5%. How much would they lend you today if you promise to pay them the \$105 that you will receive next year? From the calculations above, you can probably guess that the answer is \$100. The bank will give you \$100 today in exchange for a payment next year of \$105. Here, *\$100 is the present value of \$105 to be received in one year when the interest rate is 5%*. More generally, the **present value** is just the value of a future cash receipt or payment in terms of today's dollars.

On an almost daily basis, managers use time value of money methods to compare the costs and benefits of important business decisions. People buying houses with borrowings from banks can use the same techniques to evaluate the terms of different mortgage products. Consumers do likewise when they compare offers to purchase durable goods (like cars or furniture) that offer either an immediate cash discount or a low-interest financing plan. The rest of this chapter shows you how to apply time value of money analytics to a wide variety of problems that you may encounter either in your career or in your personal financial transactions.

LO3.1

 CONCEPT REVIEW QUESTIONS

- 1 Why is it better to receive \$1 today than at some point in the future?
- 2 During the global financial crisis, interest rates in Australia fell to low levels; but in the United States, interest rates on relatively safe investments, such as bank deposits, were just barely above zero. If the interest rate actually is zero, what is the relationship between the present value and the future value of money?

LO3.2

3.2 FUTURE VALUE OF A LUMP SUM RECEIVED TODAY

Saving today allows investors to earn interest on their savings and enjoy higher future consumption. We have already seen that a person who invests \$100 today at 5% interest expects to receive \$105 in one year, representing \$5 interest plus the original \$100 investment. Now, let's examine how much money investors can earn when they set aside money for more than a single year.

3.2a THE CONCEPT OF FUTURE VALUE

simple interest

Interest paid only on the initial *principal* of an investment, not on the interest that accrues in earlier periods

principal

The amount of money borrowed on which interest is paid

compound interest

Interest earned both on the initial *principal* and on the interest earned in previous periods

We can calculate the future value of an investment made today by applying either *simple interest* or *compound interest* over a specified period of time. **Simple interest** is interest paid only on the initial principal of an investment. **Principal** is the amount of money on which the interest is paid. To demonstrate, if the investment in our previous example pays 5% simple interest, then the future value in any year equals \$100 plus the product of the annual interest payment and the number of years. In this case, its future value would be \$110 after two years [$\$100 + (2 \times \$5)$], \$115 in three years [$\$100 + (3 \times \$5)$], \$120 at the end of the fourth year [$\$100 + (4 \times \$5)$] and so on.

Compound interest is interest earned both on the initial principal and on the interest earned in previous periods. To demonstrate compound interest, assume that you have the opportunity to deposit \$100 into an account paying 5% annual interest. After one year, your account will have a balance of \$105. This sum represents the initial principal of \$100 plus 5% (\$5) in interest. This future value is calculated as follows:

$$\text{Future value after one year} = \$100 \times (1 + 0.05) = \$105$$

If you leave this money in the account for another year, the investment will pay interest at the rate of 5% on the *new principal* of \$105. In other words, you will receive 5% interest both on the initial principal of \$100 and on the first year's interest of \$5. At the end of this second year, there will be \$110.25 in your account, representing the principal at the beginning of year 2 (\$105) plus 5% of the \$105, or \$5.25, in interest.¹

The future value at the end of the second year is computed as follows:

$$\text{Future value after two years} = \$105 \times (1 + 0.05) = \$110.25$$

Substituting the first equation into the second one yields the following:

$$\begin{aligned}\text{Future value after two years} &= \$100 \times (1 + 0.05) \times (1 + 0.05) \\ &= \$100 \times (1 + 0.05)^2 \\ &= \$110.25\end{aligned}$$

Therefore, \$100 deposited at 5% *compound* annual interest will be worth \$110.25 at the end of two years.

It is important to recognise the difference in future values resulting from compound versus simple interest. Although the difference between the account balances for simple versus compound interest in this example (\$110 versus \$110.25) seems rather trivial, the difference grows exponentially over time. With simple interest, this account would have a balance of \$250 after 30 years [$\$100 + (30 \times \$5)$]; with compound interest, the account balance after 30 years would be \$432.19.

3.2b THE EQUATION FOR FUTURE VALUE

Because financial analysts routinely use compound interest, we generally use compound rather than simple interest throughout this book. **Equation 3.1** gives the general algebraic formula for calculating the future value, at the end of n periods, of a lump sum invested today at an interest rate of $r\%$ per period:

(Eq. 3.1) $FV = PV \times (1 + r)^n$

where: FV = future value of an investment,

PV = present value of an investment (the lump sum),

r = interest rate per period (typically 1 year),

n = number of periods (typically years) that the lump sum is invested.

The following example illustrates how you might use the concept of future value to evaluate an investment in a bank savings account.

EXAMPLE

Making Money

You have an opportunity to invest \$100 cash in a bank savings account that pays 6% annual interest. You would like to know how much money you will have at the end of five years.

Substituting $PV = \$100$, $r = 0.06$ and $n = 5$ into **Equation 3.1** gives the future value at the end of year 5:

$$\begin{aligned}FV &= \$100 \times (1 + 0.06)^5 = \$110 \times (1.3382) \\ &= \$133.82\end{aligned}$$

Your account will have a balance of \$133.82 at the end of the fifth year, so your investment grew by \$33.82.

¹ Said differently, compound interest includes the beneficial effect of 'earning interest on your interest'. In this example, during the second year you earn \$5 interest on your initial \$100 principal, plus you earn another \$0.25 interest on the interest you earned (and saved) the first period. In total, in the second period you earn \$5.25 in interest (\$5 + \$0.25).

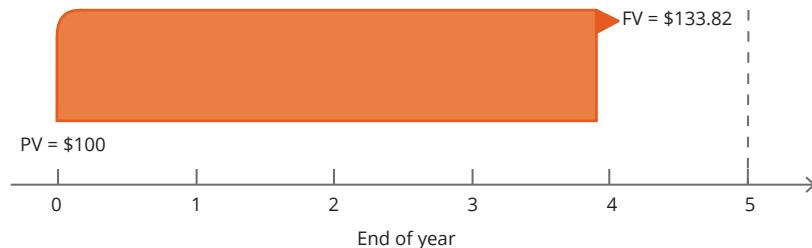
time line

A graphical representation of cash flows over a given period of time

An easy way to visualise how time value of money problems work is by drawing a time line like the one shown in **Figure 3.1**. A **time line** is a simple diagram that illustrates the value of a single cash flow or a series of cash flows as of a particular date. **Figure 3.1** demonstrates that if you invest \$100 today (time 0) at 6% interest, in five years (time 5), the future value of the initial \$100 will grow to \$133.82.

FIGURE 3.1 FUTURE VALUE OF \$100 INVESTED FOR FIVE YEARS AT 6% ANNUAL INTEREST

This figure illustrates how \$100 invested today grows to \$133.82 over five years if the annual interest rate is 6%. The time line at the top shows the initial deposit as well as the accumulated value after five years. The lower right portion of the figure shows how to calculate the future value using Excel.



Spreadsheet		
Column	A	B
Row		
1	Present value	-\$100
2	Number of periods	5
3	Interest rate	6%
4	Future value	\$133.82
5	Formula B4: =FV(B3,B2,0,B1)	

In practice, when analysts solve problems like these, they don't solve for the future value algebraically. Instead, they use a financial calculator or a spreadsheet program such as Excel to do the calculations.

If you are using Excel to solve this problem, you will make use of the *FV (future value) function*. The format of that function is = fv(rate,nper,pmt,pv,type). In this function, the symbols 'pmt' and 'type' refer to inputs that you need when solving problems involving multiple cash flows over time. Because the problem you are solving involves a single, up-front investment, you can enter the value zero for both 'pmt' and 'type'. The only other inputs required are the interest rate, the number of periods and the present value (that is, the initial investment). Therefore, in Excel, you could type = fv(0.06,5,0,-100,0), and when you enter this formula, Excel will produce the answer you seek, \$133.82.

Notice that you enter the initial \$100 investment as a negative number. You can interpret this as taking money *out* of your wallet or pay cheque to put it into the bank savings account. Five years later, you *receive* the future value, \$133.82, which appears as a positive number.

EXAMPLE

Compounding the Earnings

Suppose the interest rate on a bank savings account is only 2%, one-third of the rate in our earlier example. How much money will be in the account in five years, and how much growth does that represent on the initial investment?

By using a spreadsheet to solve **Equation 3.1** using the inputs given here, we can quickly determine that the future value of a \$100 investment for five years is \$110.41.

$$\text{(Eq. 3.1)} \quad FV = \$100 \times (1 + 0.02)^5 = \$110.41$$

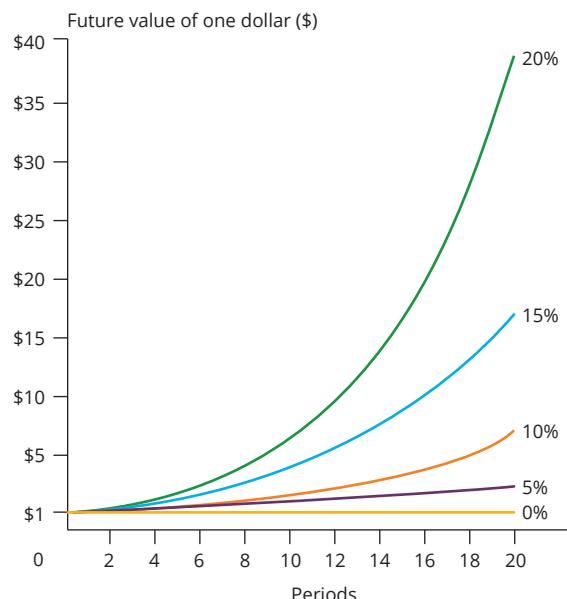
In this case, the investment grew by \$10.41. Notice that, while the interest rate used in this calculation was one-third of the rate we used before (2% rather than 6%), the growth in the account's value was less than one-third of what it was before (\$10.41 versus \$33.82). This is the effect of compound interest. When the interest rate on an investment increases, the value of the investment rises at an increasing rate; and a reduction of the interest rate will still see the value of the investment grow, but at a decreasing rate.

3.2c A GRAPHIC VIEW OF FUTURE VALUE

Remember that we measure future value at the *end* of the given period. **Figure 3.2** shows how quickly a \$1 investment grows over time at various annual interest rates. The figure shows that: (1) the higher the interest rate, the higher the future value; and (2) the longer the period of time, the higher the future value. Note that for an interest rate of 0 (zero)%, the future value always equals the present value (\$1), but for any interest rate greater than zero, the future value is greater than \$1.

FIGURE 3.2 THE POWER OF COMPOUND INTEREST: FUTURE VALUE OF \$1 INVESTED TODAY AT DIFFERENT ANNUAL INTEREST RATES

This figure shows that the future value of \$1 invested today increases over time as long as the interest rate is greater than 0 (zero)%. Notice that each line gets steeper the longer the money remains invested, because the future value grows at an increasing rate. This is the power of compound interest. For the same reason, the future value grows faster at higher interest rates. (Observe how the lines get steeper as the interest rates increase.)



LO3.2

CONCEPT REVIEW QUESTIONS

- 3 If compounding occurs once per year, will a deposit made in an account paying compound interest yield a higher future value after one period than an equal-size deposit in an account paying simple interest? What about future values for investments held longer than one period?

- 4 How would the future value of a deposit be affected by: (a) a decrease in the interest rate; or (b) an increase in the holding period? Why?

LO3.3

3.3 PRESENT VALUE OF A LUMP SUM RECEIVED IN THE FUTURE

So far we have examined how to project the amount of cash that builds over time as an initial investment earns interest. Now we reverse that focus, asking what an investor would pay today in exchange for receiving a lump-sum payment at some point in the future. In other words, we want to know the *present value* of the future cash flow.

3.3a THE CONCEPT OF PRESENT VALUE

discounting

The process of calculating present values

In finance, we use the term **discounting** to describe the process of calculating present values. The technique of discounting helps us to answer this question: if I can earn $r\%$ on my money, then what is the most I would be willing to pay *now* for the opportunity to receive FV dollars n periods from today? This process is actually the inverse of compounding interest:

- Compounding tells us the future value of present dollars invested at a given interest rate.
- Discounting helps us determine the present value of a future amount, assuming an opportunity to earn a given return (r) on the money.²

To see how this works, suppose an investment will pay you \$300 one year from now. How much would you be willing to spend today to acquire this investment if you can earn 6% on an alternative investment of equal risk? To answer this question, you must determine how many dollars you would have to invest at 6% today in order to have \$300 one year from now. Let PV equal this unknown amount, and use the same notation as in our discussion of future value:

$$PV \times (1 + 0.06) = \$300$$

Solving this equation for PV gives us

$$PV = \frac{\$300}{(1 + 0.06)} = \$283.02$$

The present value of \$300 one year from today is \$283.02 in today's dollars. That is, \$283.02 invested today at a 6% interest rate would grow to \$300 at the end of one year. Therefore, today, you would be willing to pay no more than \$283.02 for an investment that pays you \$300 in one year.

² This interest rate, r , is variously referred to as the discount rate, the required return, the cost of capital, the hurdle rate or the opportunity cost of capital.

3.3b THE EQUATION FOR PRESENT VALUE

We can find the *present value of a lump sum* mathematically by solving **Equation 3.1** for PV . In other words, the present value (PV) of some future amount (FV) to be received n periods from now, assuming an opportunity cost of r , is given by **Equation 3.2**:

(Eq. 3.2)

$$PV = \frac{FV}{(1+r)^n} = FV \times \frac{1}{(1+r)^n}$$

Investors use **Equation 3.2** to determine the value today of an investment that pays off in the future. There are many applications of this formula. One application helps companies determine how much money they need to charge a customer today to cover a liability looming in the future.



PV of Leasing

HK Best Products leases machinery to other companies that make tennis racquets. The lease agreements that HK Best Products sets up with its clients run for five years, which corresponds to the useful life of the equipment. Part of its standard lease agreement dictates that at the end of the lease, HK Best Products must remove the old equipment, and fulfilling that requirement costs HK Best Products about \$1,200 per machine. Managers at HK Best Products want to

know the present value of this cost so that they can add it to the list of up-front fees that they charge when they sign a new lease with a client. Assuming that the relevant discount rate is 7%, what is the present value of a \$1,200 payment that occurs five years in the future?

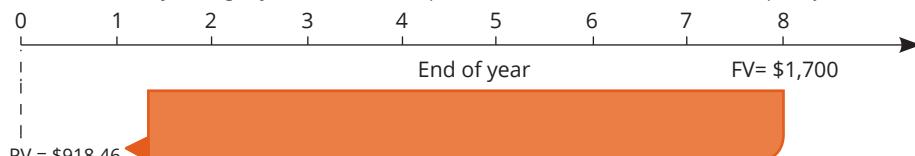
Substituting $FV = \$1,200$, $n = 5$ and $r = 0.07$ into **Equation 3.2** yields the following:

$$PV = \frac{\$1,200}{(1+0.07)^5} = \frac{\$1,200}{(1.07)^5} = \$855.58$$

Figure 3.3 provides a time line illustrating the cash flows in this example as well as the spreadsheet solution method. The format of Excel's PV (present value) function is =pv(rate,nper,pmt,fv,type).

FIGURE 3.3 PRESENT VALUE OF \$1,700 TO BE RECEIVED IN EIGHT YEARS AT AN 8% DISCOUNT RATE

To calculate the present value of \$1,700 received in year 8, we must discount it to reflect the lost opportunity to earn 8% interest on the money for eight years. In this example, the discounted value of \$1,700 equals just \$918.46.



Spreadsheet

Column Row	A	B
1	Future value	-\$1,700
2	Number of periods	8
3	Interest rate	8%
4	Present value	\$918.46
5	Formula B4:	=PV(B3,B2,0,B1,0)

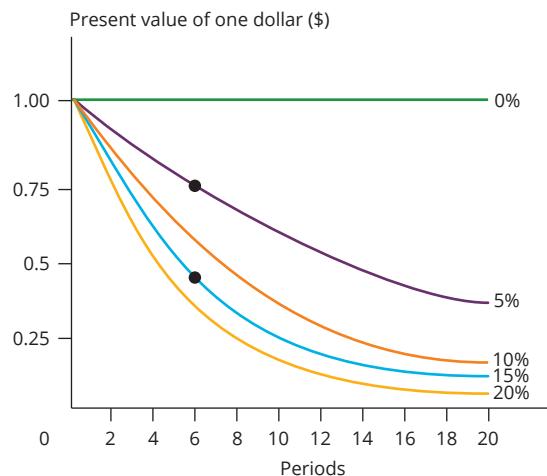
The arguments of this function are nearly identical to those of the FV (future value) function. As before, the arguments ‘pmt’ and ‘type’ apply only to problems with cash flow streams, not lump sums, so for those two arguments you enter the value 0. To solve the preceding example using Excel, you could simply enter =PV(0.07,5,0,-1200,0), and Excel would provide the answer, \$855.58. Notice that if you *enter the \$1,200 as a negative number* the solution for PV comes back as a positive number. In other words, the \$1,200 represents an outflow when the company pays to remove the equipment in eight years, and the \$855.58 represents an inflow when the company charges this fee to its customer at the beginning of the lease.³

3.3c A GRAPHIC VIEW OF PRESENT VALUE

Figure 3.4 illustrates the relationship between the present value of a future lump sum, the discount rate and the ‘waiting time’ before the future lump sum is paid. For investors who expect to receive cash in the future, **Figure 3.4** contains two important messages. First, the present value of a future cash payment declines the longer investors must wait to receive it. Second, the present value declines as the discount rate rises. Note that for a discount rate of 0 (zero)%, the present value always equals the future value (\$1). However, for any discount rate greater than zero, the present value falls below the future value.

FIGURE 3.4 THE POWER OF DISCOUNTING: PRESENT VALUE OF \$1 DISCOUNTED AT DIFFERENT INTEREST RATES

This figure shows the present value of receiving \$1 at various points in the future, discounted at different discount rates. For example, if the discount rate is 5%, the present value of \$1 received in six years is about \$0.75. Note that the present value of \$1.00 falls as the interest rate rises. For example, the present value of \$1 received in year six is only \$0.75 if the discount rate is 5%, but only \$0.43 if the discount rate is 15%. Similarly, the longer one must wait to receive a \$1.00 payment, the lower the present value of that payment.



³ Just remember that when using a calculator or spreadsheet, the PV and FV will have opposite signs. Which sign you use really doesn't matter. In this example, for instance, if you enter the FV (\$1,200) as a positive number, then the answer you get back for PV will be negative (-\$855.58).

LO3.3

CONCEPT REVIEW QUESTIONS

- 5 How are the present value and the future value of a lump sum related in words? How are they related mathematically?
- 6 How would the present value be affected by: (a) an increase in the discount rate; or (b) a decrease in the time period until the cash flow is received? Why?

LO3.4

3.4 ADDITIONAL APPLICATIONS INVOLVING LUMP SUMS

Equations 3.1 and **3.2** are just two ways of writing a mathematical relationship linking the present and future value of cash flows to each other and to the interest rate and investment horizon. In many situations, the objective is not to find the present or future value of a cash payment, but instead to answer a question about the interest rate or the investment horizon. The series of examples that follows illustrates other kinds of problems that can be solved by using some form of **Equation 3.1**.

EXAMPLE

Excel and PV Calculations

You saved \$1,000, and you plan to put it into an investment earning 8% interest. How many years will it take you to triple your money? To solve this problem, start with **Equation 3.1**:

$$FV = PV \times (1 + r)^n$$

In this case, we know $PV = \$1,000$ and $r = 0.08$. We also know that $FV = \$3,000$ because the goal is to triple the initial \$1,000 investment. The unknown quantity is n , the number of years needed for \$1,000 to grow to \$3,000 if the interest rate is 8%. Therefore, we have:

$$\$3,000 = \$1,000 (1 + 0.08)^n$$

Dividing both sides by \$1,000 leaves a simplified equation

$$3.0 = (1.08)^n$$

To solve this last expression algebraically, we take the natural logarithm of each side and then simplify terms as follows

$$\ln(3.0) = \ln(1.08)^n$$

$$\ln(3.0) = \ln(1.08) \times n$$

$$\ln(3.0) \div \ln(1.08) = n$$

$$1.0986 \div 0.0770 = n$$

$$14.3 \text{ years} = n$$

Figure 3.5 illustrates the spreadsheet solution for this problem.

FIGURE 3.5 USING A SPREADSHEET TO FIND INVESTMENT TIME PERIOD

Spreadsheet		
Column	A	B
Row		
1	Present value	\$1,000
2	Interest rate	8%
3	Future value	-\$3,000
4	Number of years	14.3
5	<i>Formula B4: =NPER(B2,0,B1,B3,0)</i>	

In the preceding example, we solved for the number of periods required for a lump sum to grow to a particular future value at a particular interest rate. Here, again, Excel offers a quick way to find the answer. You can use the ‘number of periods’ function in Excel, which has the syntax =nper(rate,pmt,pv,fv,type). In the previous problem, \$1,000 is the present value, \$3,000 is the future value and 8% is the rate (the arguments ‘pmt’ and ‘type’ still do not apply, so enter 0). For Excel to solve this problem, the values you enter for present value and future value must have opposite signs (it doesn’t matter which is positive and which is negative). Therefore, in Excel you could enter =nper(0.08,0,1000,-3000,0), and Excel would provide the answer, 14.3 years.

Another common type of business problem requires analysts to determine the rate of return on a particular investment or to calculate the rate of growth over time in a company’s sales or profits.



Google at These Earnings

Google LLC, a limited liability company now within Alphabet Inc., became a public company when it conducted an initial public offering (IPO) of ordinary shares in August 2004. Originally priced at \$85 per share, Google equity soared after the IPO. By June 2019, Google shares stood at \$1125. What annual rate of return did the investors who bought Google shares at the IPO and held them until June 2019 earn? Once again, start with **Equation 3.1:**

$$FV = PV \times (1 + r)^n$$

In this case we know $FV = \$1,125$, $PV = \$85$ and $n = 15$ years. Plug those values into **Equation 3.1** and solve for r .

$$\begin{aligned} \$1,125 &= \$85(1 + r)^{15} \\ \$1,125 \div \$85 &= (1 + r)^{15} \\ (\$1,125 \div \$85)^{(1 \div 15)} &= (1 + r) \\ 1.1879 &= 1 + r \\ r &= 0.1879 = 18.79\% \end{aligned}$$

Google investors earned about 19% per year in the company’s first 15 years. **Figure 3.6** illustrates how to solve this problem using a spreadsheet. The Excel function that solves this type of problem is the ‘rate’ function, and its syntax is =rate(nper,pmt, pv,fv,type,guess). All but one of the arguments of this function should be familiar by now. The new argument is ‘guess’, which is not a value that is part of the problem, but rather a numerical value that you provide just to ‘get Excel started’ as it tries to find the solution. By default, Excel assumes a value of ‘guess’ of 0.10 or 10%. You can leave that argument blank, or enter any interest rate that you like – the value of ‘guess’ that you submit rarely has any impact on the solution that Excel obtains. To find the rate of return on Google’s equity in its first 15 years, you could type into Excel =rate(15,0,85,-1125,0.10), and Excel would give you 19% as the answer.

FIGURE 3.6 USING A SPREADSHEET TO FIND RATE OF RETURN ON INVESTMENT

Spreadsheet		
Column	A	B
Row		
1	Present value	\$85
2	Future value	-\$600
3	Number of years	7
4	Guess	10%
5	Interest rate	32.2%
6	<i>Formula B5: =RATE(B3,0,B1,B2,0,B4)</i>	

How did Google's equity achieve such spectacular performance? At least in theory, a company's share price ought to reflect the underlying performance of the company (as well as investors' expectations about future performance). The next example shows how to use **Equation 3.1** to develop a simple measure of how Google performed as a company from 2004 to 2018.

► EXAMPLE

More Google Calculations

In 2004, the year of its IPO, Google generated total revenue of about \$3.2 billion. Fourteen years later, the company reported 2018 revenues of about \$137 billion. What was the annual growth rate in Google's revenues during this period? Again, we apply **Equation 3.1**, substituting the values that we know as follows:

$$\begin{aligned}FV &= PV(1 + r)^n \\ \$137 &= \$3.2(1 + r)^7 \\ (\$137 \div \$3.2)^{1+7} &= (1 + r) \\ 1.71 &= 1 + r \\ r &= 0.71 = 71\%\end{aligned}$$

Notice here that we are still solving for r , just as we did in the previous example. In this case, the *interpretation* of r is a little different. It is not the rate of return (or the rate of interest) on some investment, but rather the *compound annual growth rate* between Google's 2004 and 2018 revenues. It is a simple measure of how fast the company was growing during this period. Repeating the algebraic manipulations (spreadsheet keystrokes) from the prior example, we can determine that Google's revenues increased at an annual rate of 71% from 2004 to 2018.

Sources: Google, https://abc.xyz/investor/static/pdf/2018Q4_alphabet_earnings_release.pdf. Accessed 25 June 2019.

A final example illustrates how you might use **Equation 3.1** to make a wise decision when confronted with *different options for borrowing money to purchase a consumer durable good*.

► EXAMPLE

Time Value of Borrowings

You observe a new piece of equipment available from a manufacturer for a price of \$5,200 for immediate delivery, but payment due in one year; or the equipment could be collected immediately, but payment now would be \$4,500. You can charge your credit card with the amount of \$4,500 to obtain the discount, but you need to pay 12% interest in one year for using the card. Is it cheaper for you to pay \$4,500 now with credit card interest of 12%, or to pay nothing now and pay \$5,200 in one year?

Once again, let's write down **Equation 3.1** and plug in values that we know. You can spend \$4,500 today and pay 12% interest for a year. In this case, we could write **Equation 3.1** as follows:

$$FV = \$4,500(1 + 0.12)^1 = \$5,040$$

Borrowing \$4,500 today on your credit card will cost you \$5,040 in one year. The second option is to pay nothing today and pay the retailer

\$5,200 at the end of the year. You save \$160 by using your credit card and repaying the credit card company \$5,040 next year rather than paying the retailer \$5,200. Another way to frame this problem is to determine the *implicit interest* rate that the retailer is charging if you accept the offer to pay \$5,200 in one year. The retailer is essentially lending you \$4,500 today (the amount that you would be charged if you paid up-front), but you have to pay the full price at the end of one year. In this case, **Equation 3.1** looks like this:

$$\begin{aligned}\$5,200 &= \$4,500(1 + r)^1 \\ (\$5,200 \div \$4,500) - 1 &= r \\ 0.1556 &= 15.56\% = r\end{aligned}$$

Solving for r , the implicit interest rate charged by the retailer, we obtain a rate of 15.56%. If you can borrow at a rate of 12% using your credit card, then that is preferable to accepting the retailer's loan, which carries a rate of 15.56%.

LO3.4

CONCEPT REVIEW QUESTIONS

- 7 In the first example in this section (on p. 75), we saw that a \$1,000 investment earning 8% would triple in 14.3 years. Suppose the investment earns just 4%, half as much as originally anticipated. A lower rate of return means that it will take more time for the investment to triple. Will it take exactly twice as long (28.6 years) to triple, more than that or less than that? Why?

LO3.5

3.5 FUTURE VALUE OF CASH FLOW STREAMS

Financial managers frequently need to evaluate *streams* of cash flows that occur in future periods. Though this is mechanically more complicated than computing the future or present value of a single cash flow, the same basic techniques apply.

mixed stream
A series of unequal cash flows reflecting no particular pattern

annuity
A stream of equal periodic cash flows over a stated period of time

Two types of cash flow streams are possible: the mixed stream and the annuity. A **mixed stream** is a series of unequal cash flows reflecting no particular pattern. An **annuity** is a stream of equal periodic cash flows over a stated period of time. Either of these cash flow patterns can represent *inflows* of returns earned on investments or *outflows* of funds invested to earn future returns. Because certain shortcuts are possible when evaluating an annuity, we discuss mixed streams and annuities separately.

3.5a FINDING THE FUTURE VALUE OF A MIXED STREAM

The future value of any stream of cash flows measured at the end of a specified year is merely the sum of the future values of the individual cash flows at that year's end. This future value is sometimes called the *terminal value*. The following example demonstrates such a calculation.

EXAMPLE

Future Value Calculation

Assume that we want to determine the balance in an investment account earning 9% annual interest, given the following five end-of-year deposits: \$400 in year 1, \$800 in year 2, \$500 in year 3, \$400 in year 4 and \$300 in year 5. These cash flows appear on the time line at the top of **Figure 3.7**, which also depicts the future-value calculation for this mixed stream of cash flows, followed by the spreadsheet solution.

Note that the first cash flow, which occurs at the end of year 1, earns interest for four years

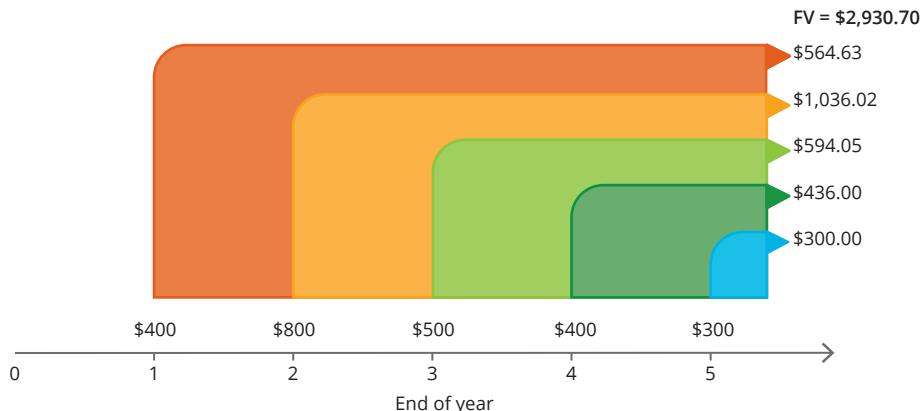
(end of year 1 to end of year 5). Similarly, the second cash flow, which occurs at the end of year 2, earns interest for three years (end of year 2 to end of year 5) and so on. Summing the future values of the five deposits yields the total future value of the mixed stream, which is \$2,930.70.⁴ The five deposits, which total \$2,400 before interest, have grown by nearly \$531 at the end of five years as a result of the interest earned.

⁴ There is a \$0.01 rounding difference between the future value given on the time line compared with the future-value calculation using a calculator or spreadsheet.



FIGURE 3.7 FUTURE VALUE AT THE END OF FIVE YEARS OF A MIXED CASH FLOW STREAM INVESTED AT 9%

The future value of a mixed stream of cash flows equals the sum of the future values of the individual cash flows. For the cash flows shown on the time line, the individual future values compounded at 9% interest to the end of year 5 are shown at the end of the arrows. Their total of \$2,930.70 represents the future mixed stream.



Letting CF_t represent the cash flow at the end of year t , the future value of an n -year mixed stream of cash flows (FV) is shown in [Equation 3.3](#):

$$(Eq. 3.3) \quad FV = CF_1 \times (1+r)^{n-1} + CF_1 \times (1+r)^{n-2} + \dots + CF_1 \times (1+r)^{n-n}$$

Substituting the annual cash flows and the 9% interest rate into [Equation 3.3](#), we would calculate the value for each year (shown to the right of the time line). These values would total \$2,930.70.

We can simplify the notation for [Equation 3.3](#), as shown in [Equation 3.3a](#), by using summation notation, which uses the Greek letter, capital sigma (Σ), as a shorthand way of saying that the future value of this n -year mixed stream is equal to the sum of the future values of individual cash flows from periods 1, 2, 3, ..., n :

$$(Eq. 3.3a) \quad FV = \sum_{t=1}^n CF_t \times (1+r)^{n-t}$$

Although summations economise on the notation needed to express most of the equations presented in this chapter, for clarity we present equations in their non-condensed format wherever possible, and we use the summation notation sparingly.

Sometimes it is necessary to blend the techniques that we have covered thus far to solve a problem. The following example illustrates how this works.

EXAMPLE

Filling in Missing Values Using PVs

The time line below shows a mixed stream of cash flows that has a future value in four years of \$846.95 if the interest rate is 7%. The mixed stream starts with an immediate cash flow of

\$100, but the question mark in year 2 indicates that you do not know the value of the cash flow that arrives in that period. How can you find that value of the missing piece of the mixed stream?

FV of mixed stream in year 4 = \$846.95 ($r = 7\%$)					
Cash flow	\$100	\$150	?	\$200	\$175
	0	1	2	3	4
Year					



First, calculate the future value of the four cash flows that you know using **Equation 3.3**:

$$FV = \$100(1 + 0.07)^4 + \$150(1 + 0.07)^3 + \$200(1 + 0.07)^1 + \$175 = \$703.84$$

If the future value of the entire stream is \$846.95, and the future value of the four cash flows shown on the time line is \$703.84, then the difference must be the future value of the missing cash flow in year 2. That difference is \$143.11. In other words, the cash flow in year 2 must grow to \$143.11 after earning interest for two years. We could also say that the missing cash flow on the time line equals the present value in year 2 of \$143.11 to be received in year 4. Therefore, we can use **Equation 3.2** as follows:

$$PV = \frac{\$143.11}{(1 + 0.07)^2} = \$125$$

These techniques allow you to calculate the future value of any cash flow stream. However, one category of cash flow, known as annuities, is very common in finance, and there are some helpful shortcuts that you can use to calculate the future value of an annuity.

3.5b TYPES OF ANNUITIES

ordinary annuity
An annuity for which the payments occur at the end of each period

annuity due
An annuity for which the payments occur at the beginning of each period

Before looking at future-value computations for annuities, we distinguish between the two basic types of annuities: the ordinary annuity and the annuity due. An **ordinary annuity** is an annuity for which the payments occur at the end of each period, whereas an **annuity due** is one for which the payments occur at the beginning of each period.

To demonstrate these differences, assume that you wish to choose the better of two annuities as a personal investment opportunity. Both are five-year, \$1,000 annuities. Annuity A is an ordinary annuity, and annuity B is an annuity due. Although the amount of each annuity totals \$5,000, the timing of the cash flows differs; each cash flow arrives one year sooner with the annuity due than with the ordinary annuity. As you might expect (given the core principle of the time value of money), for any positive interest rate, the future value of an annuity due is always greater than the future value of an otherwise identical ordinary annuity.⁵ Why? Because you receive the first cash flow today in the annuity due, giving you a longer time to earn interest.

3.5c FINDING THE FUTURE VALUE OF AN ORDINARY ANNUITY

The future value of an ordinary annuity can be calculated using the same method demonstrated earlier for a mixed stream.



More Future Value Calculations

You wish to save money on a regular basis to finance an exotic vacation in five years. You are confident that, with sacrifice and discipline, you can force yourself to deposit \$1,000 annually, at the end of each of the next five years, into a savings account paying 7% annual interest. This situation is depicted graphically at the top of **Figure 3.8**.



⁵ Because ordinary annuities arise frequently in finance, we use the term 'annuity' throughout this book to refer to ordinary annuities, unless otherwise specified.



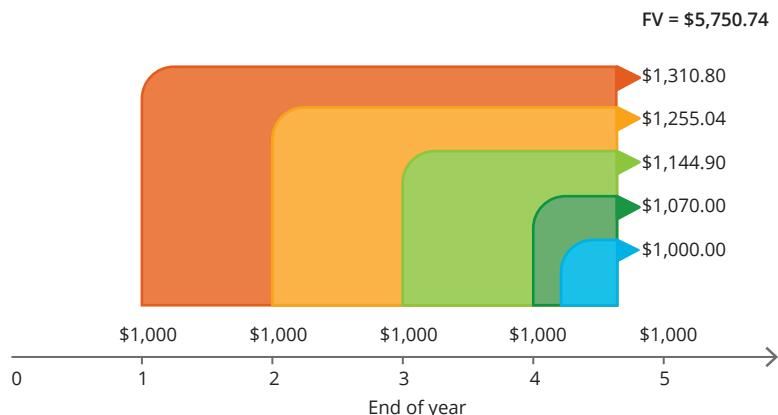
Compute the future value (FV) of this ordinary annuity using **Equation 3.3**. Use the assumed interest rate (r) of 7% and plug in the known values of each of the five yearly ($n = 5$) cash flows (CF^1 to CF^5), as follows:

$$\begin{aligned} FV &= CF_1 \times (1+r)^{n-1} + CF_2 \times (1+r)^{n-2} + \dots + CF_n \times (1+r)^{n-n} \\ FV &= CF_1 \times (1+r)^{5-1} + CF_2 \times (1+r)^{5-2} + \dots + CF_n \times (1+r)^{5-5} \\ &= \$1,000(1.07)^4 + \$1,000(1.07)^3 + \$1,000(1.07)^2 + \$1,000(1.07)^1 + \$1,000 \\ &= \$1,310.80 + \$1,225.04 + \$144.90 + \$1,070 + \$1,000 = \$5,750.74 \end{aligned}$$

The year 1 cash flow of \$1,000 earns 7% interest for four years, the year 2 cash flow earns 7% interest for three years, and so on. The future value of the ordinary annuity is \$5,750.74.

FIGURE 3.8 FUTURE VALUE AT THE END OF FIVE YEARS OF AN ORDINARY ANNUITY OF \$1,000 PER YEAR INVESTED AT 7%

The future value of the five-year, \$1,000 ordinary annuity at 7% interest at the end of year 5 is \$5,750.74, which is well above the \$5,000 sum of the annual deposits.



Spreadsheet

Column	A	B
Row		
1	Payment	-\$1,000
2	Number of periods	5
3	Interest rate	7%
4	Future value	\$5,750.74
5	Formula B4: =FV(B3,B2,B1)	

Making this calculation for a longer annuity would become cumbersome. Fortunately, a shortcut formula exists that simplifies the future-value calculation of an ordinary annuity. Using the symbol PMT to represent the annuity's annual payment, **Equation 3.4** gives the *future value of an annuity* that lasts for n years (FV), assuming an interest rate of $r\%$:

(Eq. 3.4)
$$FV = PMT \times \left\{ \frac{(1+r)^n - 1}{r} \right\}$$



EXAMPLE

Future Value Calculations with Excel

We can demonstrate that **Equation 3.4** yields the same answer obtained in the previous model by plugging in the values $PMT = \$1,000$, $n = 5$ and $r = 0.07$:

$$FV = \$1,000 \times \left\{ \frac{(1.07)^5 - 1}{0.07} \right\} = \$1,000 \times \left[\frac{1.4026 - 1}{0.07} \right] \\ = \$1,000 \times 5.75074 = \$5,750.74$$

Once again, we find the future value of this ordinary annuity to be \$5,750.74. You could also obtain this value using Excel's FV (future value) function. Recall that the syntax of that function is =fv(rate,nper,pmt,pv,type). Now that you are

dealing with problems involving cash flow streams rather than lump sums, you need to input particular values for the arguments 'pmt' and 'type'. The value for 'pmt' is simply the periodic cash flow that the annuity provides, and the value for 'type' equals 0 if the problem you are solving is an ordinary annuity ('type' equals 1 for an annuity due). For an annuity problem, the argument 'pv' requires some additional explanation. Excel will interpret any value entered for this argument as a lump sum payment that comes before the annuity begins. In this example, there is no initial lump sum ($pv = 0$), so you can obtain the future value of the annuity by entering = fv(0.07,5,-1000,0,0).

Next, consider a slight variation on the vacation saving problem that requires you to integrate what you've learned about finding the future value of both a lump sum and an annuity.



EXAMPLE

Future Value Calculations with Extras

As in the previous example, you plan to save \$1,000 at the end of each of the next five years to accumulate money for a vacation, and you expect to earn 7% on the money that you save. In addition, you just received a bonus at work, which gives you another \$5,000 to invest immediately. How much can you accumulate in five years if you invest your bonus in addition to the \$1,000 per year that you originally intended to save?

Previously, we found that the future value of a \$1,000 annuity invested over five years at 7% was \$5,750.74. To that total, we now want to add the future value of a \$5,000 lump sum invested immediately. Using **Equation 3.1**, we have:

$$\$5,000(1 + 0.07)^5 = \$7,012.76$$

Adding that to the future value of the annuity gives you a total of \$12,763.50 (\$7,012.76 + \$5,750.74) for your vacation. A quick way to solve this is to enter into Excel = fv(0.07,5,-1000,-5000,0). Notice here that you enter both the \$1,000 deposits and the initial \$5,000 lump sum as negative numbers. These inputs have the same sign because they both represent money flowing in the same direction (out of your wallet and into your savings account). Entering the values this way causes Excel to report the answer as a positive \$12,763.50.

Sometimes consumers know that they want to accumulate a certain amount of money by making regular deposits into a savings account. In this situation, the uncertainty is not the future value of the annuity, but rather the *amount of time needed to accumulate that future value*.



EXAMPLE

Calculating Implicit Time Horizons

Bruce and Mary Teiffel have just had their first child, and they want to begin saving for private school fees that they anticipate starting to pay when their child turns 15. They estimate they will need a pool of funds worth \$200,000 to pay for three years of private school fees. They plan to set aside \$6,300 at the end of each of the next 15 years, investing the money to earn 10% interest. Given that plan, how long will it take Bruce and Mary to accumulate the money they need?

One way to solve this problem is to modify **Equation 3.4** to solve for the value n , the number of periods in the annuity. We can rearrange **Equation 3.4** to produce the following expression:

$$\ln\left(\frac{FV \times r}{PMT} + 1\right) \div \ln(1+r) = n$$

Use \$200,000 for FV , 0.10 for r and \$6,300 for PMT and you obtain:

$$\ln\left(\frac{\$200,000 \times 0.10}{\$7,500} + 1\right) \div \ln(1+0.10) = 14.99 \text{ years}$$

Apparently, Bruce and Mary will have the money they need just in time.

As we did with lump sums, we can employ Excel's 'number of periods' function to obtain a quick solution to this problem. To apply this function, enter =nper(0.10,-6300,0,200000,0), and Excel will provide the answer, 14.99 years. In this syntax of this function, we use 0 for pv , because Bruce and Mary are just starting to save for the school fees and have accumulated nothing so far. Notice also that the payment (-\$6,300) and the desired future value (\$200,000) have opposite signs.

3.5d FINDING THE FUTURE VALUE OF AN ANNUITY DUE

The calculations required to find the future value of an annuity due involve only a slight change to those already demonstrated for an ordinary annuity. For the annuity due, the question is: how much money will you have at the end of five years (to finance your exotic vacation) if you deposit \$1,000 annually at the *beginning of each year* into a savings account paying 7% annual interest?

Figure 3.9 graphically depicts this scenario on a time line. Note that the ends of years 0 to 4 are respectively equivalent to the beginnings of years 1 to 5. As expected, the \$6,153.29 future value of the annuity due is greater than the \$5,750.74 future value of the comparable ordinary annuity.⁶ Because the cash flows of the annuity due occur at the beginning of the year, the cash flow of \$1,000 at the beginning of year 1 earns 7% interest for five years, the cash flow of \$1,000 at the beginning of year 2 earns 7% interest for four years, and so on. Comparing this to the ordinary annuity, you can see that each \$1,000 cash flow of the annuity due earns interest for one more year than the comparable ordinary annuity cash flow. As a result, the future value of the annuity due is greater than the future value of the comparable ordinary annuity.

We can convert the equation for the future value of an ordinary annuity, **Equation 3.4**, into an expression for the *future value of an annuity due*, denoted FV (annuity due). To do so, we must take into account that each cash flow of an annuity due earns an additional year of interest. Therefore, we simply multiply **Equation 3.4** by $(1+r)$, as shown in **Equation 3.5**:

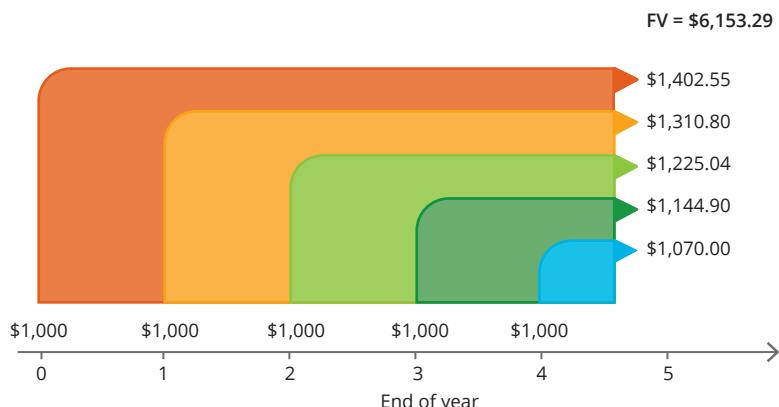
(Eq. 3.5)

$$FV(\text{annuity due}) = PMT \times \left\{ \frac{(1+r)^n - 1}{r} \right\} \times (1+r)$$

⁶ You can use the same Excel function to obtain the future value of an annuity due that you used to calculate the future value of an ordinary annuity, except that the value of 'type' changes from 0 to 1. If you enter into Excel =fv(0.075,-1000,0,1), then Excel produces the value \$6,153.29.

FIGURE 3.9 FUTURE VALUE AT THE END OF FIVE YEARS OF AN ANNUITY DUE OF \$1,000 PER YEAR INVESTED AT 7%

The future value at the end of five years of a five-year, \$1,000 annuity due that earns 7% annual interest is \$6,153.29, which exceeds the \$5,750.74 future value of the otherwise identical ordinary annuity (see [Figure 3.8](#)). Each deposit in the annuity due earns one more year of interest than the comparable deposit into the ordinary annuity.



Spreadsheet

Column	A	B
Row		
1	Payment	-\$1,000
2	Number of periods	5
3	Interest rate	7%
4	Future value	\$6,153.29
5	<i>Formula B4: =FV(B3,B2,B1,0,1)</i>	

[Equation 3.5](#) demonstrates that the future value of an annuity due always exceeds the future value of a similar ordinary annuity (for any positive interest rate) by a factor of 1 plus the interest rate. We can check this by comparing the results from the two different five-year vacation savings plans presented earlier. We determined that, given a 7% interest rate, after five years the value of the ordinary annuity was \$5,750.74, and that of the annuity due was \$6,153.29. Multiplying the future value of the ordinary annuity by 1 plus the interest rate yields the future value of the annuity due:

$$FV(\text{annuity due}) = \$5,750.74 \times (1.07) = \$6,153.29$$

The future value of the annuity due is greater because its cash flow occurs at the beginning of each period, not at the end. In our illustration, by shifting each saving date one year earlier, you earn about \$400 more with the annuity due and could enjoy a somewhat more luxurious vacation.

LO3.5

CONCEPT REVIEW QUESTIONS

- 8 Why is the future value of an ordinary annuity generally less than the future value of an identical annuity due?
- 9 Once you know the future value of an ordinary annuity, it is easy to calculate the future value of an identical annuity due. Explain.

THINKING CAP QUESTIONS

- 1 Our company invests money each month to pay future retirement benefits that are fixed contractually. If the return on our investment goes up, how does that affect the amount we must set aside each month?
- 2 What is another application of the annuity formula that you might use in your personal life? What are the important data that you need to use the formula in this application? Hint: retirement is a potential long-term investment.

LO3.6

3.6 PRESENT VALUE OF CASH FLOW STREAMS

Many decisions in corporate finance require financial managers to calculate the present values of cash flow streams that occur over several years. In this section, we show how to calculate the present values of mixed cash flow streams and annuities. We also demonstrate the present-value calculation for a very important cash flow stream known as a *perpetuity*.

3.6a FINDING THE PRESENT VALUE OF A MIXED STREAM

The present value of any cash flow stream is merely the sum of the present values of the individual cash flows. To calculate the present values of all kinds of cash flow streams, we can apply the same techniques we used to calculate present values of lump sums.

EXAMPLE

Matching Cash Flows with PVs

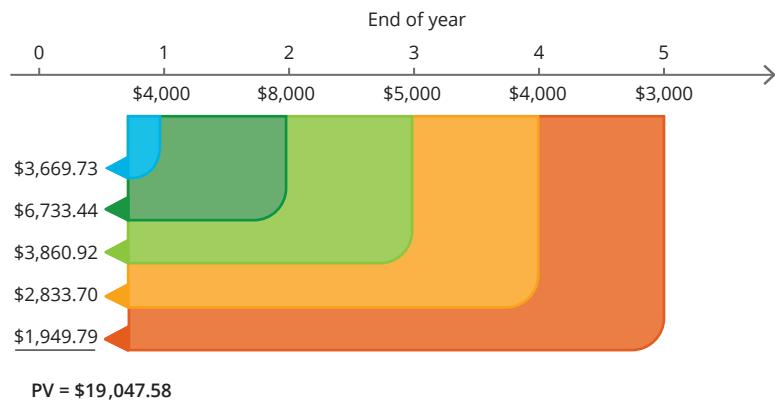
Shortly after graduation, you receive an inheritance that you use to purchase a small bed-and-breakfast hotel. Your plan is to sell the hotel after five years. The hotel is an old mansion, so you know that appliances, furniture and other equipment will wear out and need to be replaced or repaired on a regular basis. You estimate that these expenses will total \$4,000 during year 1, \$8,000 during year 2, \$5,000 during year 3, \$4,000 during year 4 and \$3,000 during year 5, the final year of your ownership. For simplicity, assume that these expenses will be paid at the end of each year.

Because you have some of your inheritance left over after purchasing the hotel, you want to set aside a lump sum today from which you can make annual withdrawals to meet these expenses when they come due, as shown on the time line in **Figure 3.10**. Suppose you invest the lump sum in a bank account that pays 9% interest. To determine the amount of money you need to put into the account, you must calculate the present value of the stream of future expenses, using 9% as the discount rate.



FIGURE 3.10 PRESENT VALUE OF A FIVE-YEAR MIXED STREAM DISCOUNTED AT 9%

The present value of the mixed stream is the sum of the present values of the individual cash flows discounted at the 9% rate. The present values of the individual cash flows shown at the end of the arrows are summed to find the \$19,047.58 present value of the stream of cash flows.



Spreadsheet		
Column	A	B
Row		
1	Cash flow 1	-\$4,000
2	Cash flow 2	-\$8,000
3	Cash flow 3	-\$5,000
4	Cash flow 4	-\$4,000
5	Cash flow 5	-\$3,000
6	Interest	9%
7	Number of periods	5
8	Net present value	\$19,047.58
9	<i>Formula B8: =NPV(B6,B1,B2,B3,B4,B5)</i>	

As you no doubt suspect, there is a general formula for computing the present value of a stream of future cash flows. Continuing to let CF_t represent the cash flow at the end of year t , the present value of an n -year mixed stream of cash flows (PV) is expressed as **Equation 3.6**:

$$(Eq. 3.6) \quad PV = \left[CF_1 \times \frac{1}{(1+r)^1} \right] + \left[CF_2 \times \frac{1}{(1+r)^2} \right] + \dots + \left[CF_n \times \frac{1}{(1+r)^n} \right]$$
$$= \sum_{t=1}^n CF_t \times \frac{1}{(1+r)^t}$$

Substitute the cash flows shown on the time line in [Figure 3.10](#) and the 9% discount rate into [Equation 3.6](#) to obtain the present value, \$19,047.58.⁷

Let's stop and consider the big picture for a moment. In the previous example, we are given a series of cash flows that are spread out over time, and *we want to place a value on the entire cash flow stream as of a specific date*. When we calculate the *present value* of the stream, we are determining the *value of the stream as of today*. When we calculate the *future value* of the stream, we are determining the *value of the stream as of a specific date in the future*. In both cases, we are placing a single value on the entire stream. The following example illustrates how the present and future values of cash flow streams are related.



Equivalences of FV and PV Calculations

Refer once more to the cash flow stream illustrated on the time line in [Figure 3.10](#). We've already seen that the stream's present value is \$19,047.58. Now let's review what we covered in section 3.5a and calculate the future value of this stream. Recall that the \$4,000 cash flow could earn 9% interest each year for four years, the \$8,000 cash flow could earn interest each year for three years, and so on. Applying [Equation 3.3](#) to this stream, we obtain:

$$\begin{aligned}FV &= \$4,000 \times (1 + 0.09)^4 + \$8,000 \times (1 + 0.09)^3 \\&\quad + \$5,000(1 + 0.09)^2 + \$4,000 \times (1 + 0.09)^1 \\&\quad + \$3,000 \\FV &= \$5,646.33 + \$10,360.23 + \$5,940.50 \\&\quad + \$4,360.00 + \$3,000.00 \\&= \$29,307.06\end{aligned}$$

In other words, \$29,307.06 is the amount of money you would have at the end of year 5 if you made annual deposits (shown in [Figure 3.10](#)) into an account earning 9% interest. In our example, the cash flow stream represents a series of maintenance expenditures, not deposits. In that context, the calculation we just completed implies that making a lump sum payment of \$29,307.06 in year 5 is equivalent to making the series of

payments spread out over five years and depicted in [Figure 3.10](#). Next, let's calculate the present value of this lump sum as of today using

[Equation 3.2](#):

$$PV = \frac{FV}{(1+r)^n} = \frac{\$29,307.06}{(1+0.09)^5} = \$19,047.58$$

This equation says that making a lump sum payment today of \$19,047.58 is equivalent to paying \$29,307.06 five years from now. That shouldn't be a surprise because \$19,047.58 is precisely the value that we obtained previously for the present value of the mixed stream. Therefore, we have three equivalent ways of expressing the costs of maintaining the bed and breakfast hotel:

- You can make the annual series of payments shown in [Figure 3.10](#).
- You can make a lump sum payment of \$19,047.58 today.
- You can make a lump sum payment of \$29,307.06 five years from today.

What the time value of money calculations are telling us is that these three options are equivalent as long as the interest rate is 9%.

3.6b FINDING THE PRESENT VALUE OF AN ORDINARY ANNUITY

The present value of an ordinary annuity is found in a manner similar to that used for a mixed stream. Discount each payment and then add up each term to find the annuity's present value.

⁷ A simple way to perform this calculation in Excel is to use the =function. To use that function, you simply enter the interest rate followed by the series of annual cash flows. For example, entering =npv(0.09,-4000,-8000,-5000,-4000,-3000) into Excel will generate the desired result, \$19,047.58.

EXAMPLE

Koalaburra's Service Contract

An equipment supplier has approached Koalaburra Company, a producer of plastic toys, with an intriguing offer for a service contract. Extruding Machines Pty Ltd (EM) offers to take over all of Koalaburra's equipment repair and servicing for five years in exchange for a one-time payment today. Koalaburra's managers know their company spends \$7,000 at the end of every year on maintenance, so EM's service contract would reduce Koalaburra's cash outflows by this \$7,000 annually for five years.

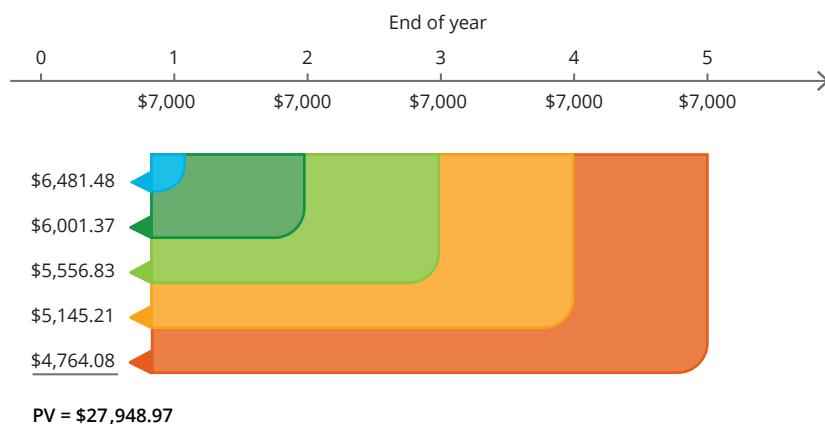
Because these are equal annual cash benefits, Koalaburra can determine what it should be willing to pay for the service contract by valuing it as a five-year ordinary annuity with a \$7,000 annual cash flow. If Koalaburra requires a minimum return of 8% on all its investments, how much is it willing to pay for EM's service contract? The time line in **Figure 3.11** shows the present value calculation for this annuity.

We find the present value of this ordinary annuity by using the same method used in the preceding section to find the present value of a mixed stream. That is, we discount each end-of-year \$7,000 cash flow back to time 0, and then sum the present values of all five cash flows. As **Figure 3.11** shows, the present value of this annuity (EM's service contract) is \$27,948.97. If Koalaburra were to initially deposit \$27,948.97 into an account paying 8% annual interest, then it could withdraw \$7,000 at the ends of years 1 through 5. After the final withdrawal (at the end of year 5), the account balance would exactly equal zero.

Therefore, if EM offers the service contract to Koalaburra for a lump-sum price of \$27,948.97 or less, Koalaburra should accept the offer. Otherwise, Koalaburra should continue to perform its own maintenance.

FIGURE 3.11 PRESENT VALUE OF A FIVE-YEAR ORDINARY ANNUITY DISCOUNTED AT 8%

The present value of the five-year, \$7,000 ordinary annuity discounted at 8% is \$27,948.97, which is merely the sum of the present values of the individual cash flows shown at the end of the arrows.



Spreadsheet		
Column	A	B
Row		
1	Payment	-\$7,000
2	Number of periods	5
3	Interest rate	8%
4	Present value	\$27,948.97
5	<i>Formula B4: =PV(B3,B2,B1,0,0)</i>	

As was the case with the future value of an annuity, a shortcut formula is available to simplify the present-value calculation for an annuity. Using the symbol PMT to denote the annual cash flow, the formula for the *present value of an n-year ordinary annuity* (PV) appears in **Equation 3.7**.

(Eq. 3.7)

$$PV = \frac{PMT}{r} \times \left[1 - \frac{1}{(1+r)^n} \right]$$



Using Excel for Koalaburra Calculations

We can use **Equation 3.7** to calculate the present value of the service contract EM has offered to the Koalaburra Company. Substituting in $n = 5$ years, $r = 0.08$ and $PMT = \$7,000$, we find the present value (PV) of this ordinary annuity to be \$27,948.97, as shown below:

$$PV = \frac{\$7,000}{0.08} \times \left[1 - \frac{1}{(1.08)^5} \right] = \frac{\$7,000}{0.08} \times [1 - 0.680583]$$

Alternatively, we could use Excel's PV (present value) function, entering 8% for the rate, 5 for the number of periods, negative \$7,000 for the payment and 0 for the future value and type of annuity =pv(0.08,5,-7000,0,0). This yields the answer \$27,948.97.

In some applications, the present value of the annuity is known, along with the number and size of the annual payments. What is missing is the rate of return.



Excel Calculation for Discount Rate Calculation

You have just moved to Singapore and have picked out a new car that costs \$50,000. You need to borrow the full amount, and a bank has offered you a six-year loan with annual end-of-year payments of \$12,000. What is the interest rate that the bank is charging on this loan?

In this case, we have a five-year annuity with annual payments of \$12,000. Because these payments fully repay the loan, we know that the present value of the annuity is equal to the

amount borrowed, \$50,000. In principle, we could try to solve **Equation 3.7** for the missing value r . Solving that equation algebraically is extremely difficult, but you can use the 'rate' function in Excel. To use that function, enter = rate(6,-12000,50000,0,0,0), and Excel will reveal that the interest rate on the loan is 12%. In the syntax of the rate function, you enter the payment as a negative number and the present value (the amount that must be repaid) as a positive value.

3.6c FINDING THE PRESENT VALUE OF AN ANNUITY DUE

We can find the present value of an annuity due in much the same way we found the present value of an ordinary annuity. Remember that each cash flow for an annuity due occurs one period earlier than for an ordinary annuity. Thus, an annuity due would have a higher present value than an ordinary annuity with the same cash flows, discount rate and life.

To find the present value of the annuity due, we use the same method used to find the present value of an ordinary annuity, with one difference: each of the cash flows of the annuity due occurs one year earlier – at the beginning rather than the end of the year. The expression for the *present value of an annuity due*, shown in **Equation 3.8**, is similar to the equation for the present value of an ordinary annuity (PV) given in **Equation 3.7**.

$$(Eq. 3.8) \quad PV(\text{annuity due}) = \frac{PMT}{r} \times \left[1 - \frac{1}{(1+r)^n} \right] \times (1+r)$$

Comparing **Equations 3.7** and **3.8**, you can see that the present value of an annuity due is merely the present value of a similar ordinary annuity multiplied by $(1+r)$.



New Timing of Koalaburra's Cash Flows

To demonstrate, assume that the Koalaburra Company wishes to determine the present value of the five-year, \$7,000 service contract at an 8% discount rate, and assume also that each of the maintenance expenditures occurs at the beginning of the year. This means that the first payment for maintenance expenses would occur today.

The present value of this annuity due is simply $(1+r)$ times the value of the ordinary annuity: $PV(\text{annuity due}) = \$27,948.97 \times (1.08) = \$30,184.89$. If Koalaburra pays its maintenance costs at the start of each year, the most it is willing to pay EM for the service contract increases by more than \$2,000 to \$30,184.89.

3.6d FINDING THE PRESENT VALUE OF A PERPETUITY

perpetuity
A level cash flow stream that continues forever

A **perpetuity** is an annuity with an infinite life; it promises to pay the same amount at the end of every year *forever*. The British government was an early user of perpetuities for borrowing funds from investors to cope with major expenses: it issued debt instruments ('consol' bonds) to obtain public funds instead of tax revenues to repay investors hurt in the South Sea Bubble crash of 1720–21; and it made a very large consol bond issue after the Napoleonic Wars ended in 1815. These bond issues were so named because they 'consolidated' all the existing relevant British government debts into a single issue that paid a constant annual amount of interest in perpetuity. The issue itself never matured, meaning that the principal was never to be repaid. These bonds could be still traded, but the British government decided to buy them back from their holders during the late 20th century.

Currently, not many corporations or governments issue perpetual bonds.⁸ Perhaps the simplest modern example of a perpetuity is preferred equity issued by corporations. Preferred shares promise investors a constant annual (or quarterly) dividend payment forever. Therefore, we simply express the lifetime (n) of this security as infinity (∞), and modify our basic valuation formulation for an annuity accordingly. For example, we wish to determine the present value of an annuity (PV) that pays a constant annual dividend amount (PMT) for a perpetual number of years ($n = \infty$) discounted at a rate r . Here, the Greek summation notation is helpful in expressing the formula in **Equation 3.9**:

$$(Eq. 3.9) \quad PV = PMT \times \sum_{t=1}^{\infty} \frac{1}{(1+r)^t} = \frac{PMT}{r}$$

⁸ Some long-term bonds are nearly perpetuities. In July 1993, the Walt Disney Company sold \$300 million of bonds that will mature in the year 2093, 100 years after they were issued. The market dubbed these 'Sleeping Beauty bonds' because their maturity matches the amount of time that Sleeping Beauty slept before being kissed by Prince Charming in the classic story.

Fortunately, **Equation 3.9** also comes in a simplified version, which says that the present value of a perpetuity equals the annual, end-of-year payment divided by the discount rate. We can see this from **Equation 3.7**: if we let n go to infinity, **Equation 3.10** results as the expression for the *present value of a perpetuity (PV)*:

(Eq. 3.10)

$$PV = PMT \times \frac{1}{r} = \frac{PMT}{r}$$

It is important to make a subtle point here. **Equations 3.9** and **3.10** calculate the present value of a perpetuity that makes its first payment one year from today. We may need to make an adjustment to these equations if we want to know the present value of a perpetuity that begins sooner or later than one year from now.



PV of Perpetuity for Warren Buffett

In September 2008, following a series of tumultuous events that included the bankruptcy of Lehman Brothers and the bail-out of insurance giant AIG, Warren Buffett expressed his faith in the US markets by purchasing perpetual preferred shares from Goldman Sachs. These shares had no maturity and promised to pay \$500 million annually in dividends.

Assuming that Buffett wanted a 10% annual return on his investment, the purchase price would be:

$$PV = \$500,000,000 \div 0.10 = \$5 \text{ billion}$$

A \$5 billion purchase price makes sense, because each year Buffett would receive \$500 million in dividends, exactly the 10% return that he sought.

Even though preferred equity usually offers the promise of paying dividends every year forever, sometimes companies are unable to make those dividend payments. When a company decides to suspend preferred dividends, it usually must make up lost dividends before it can pay dividends on ordinary shares. The following example illustrates that, even when companies pay extra preferred dividends to make up for dividends that they previously skipped, preferred shareholders must endure some loss in value of their shares.



PVs of Mixed Cash Flows I

Bangalore Mining Pty Ltd (BM) is a large mining company in New Zealand that has had preferred shares outstanding for many years. BM's preferred shares promise an annual dividend payment of \$4 per share. Assuming that investors require an 8% return on those shares, the share market price should be \$50:

$$PV = \$4 \div 0.08 = \$50$$

Unfortunately, BM recently suffered large losses and has had to suspend its preferred dividends for the next two years. The company says that it expects to begin paying preferred dividends again three years from now. To make up for the dividends that it skipped, BM will pay

a one-time dividend of \$12 in three years (\$8 for the dividends it skipped plus \$4 for the normal dividend in year 3), and after that preferred shareholders will continue to receive the annual \$4 dividend that they have come to expect. What is the present value of the dividend stream that BM is now promising? Stated differently, what price would investors be willing to pay today for BM preferred shares (assume that their required return is still 8%)?

The best way to approach this problem is to break it into two parts. First, there is the \$12 dividend payment expected in three years. Second, there is a perpetuity paying \$4 per year





starting four years from now. We need to take the present value of each part and then add them together. The market value of the preferred equity should equal the present value of the entire dividend stream.

We can find the present value of the \$12 dividend by using **Equation 3.1**:

$$PV = \$12 \div (1 + 0.08)^3 = \$9.53$$

Next, we will use **Equation 3.10** to find the present value of the perpetuity. However, remember that **Equation 3.10** calculates the present value of a perpetuity that makes its first payment one year in the future. If we apply this equation to the perpetuity that begins in year 4, we will actually be calculating the value of the perpetuity as of year 3. Once we have that value, we must discount it three more periods to find the present value of the perpetuity.

You might wonder why anyone would continue to hold BM preferred shares if it pays no dividends for three years. It turns out that as time goes by, and the date on which BM's dividend stream will begin again draws near, the market value of the preferred shares will rise. In other words, a preferred shareholder can expect the shares to increase in value even if they are not paying dividends.



PVs of Mixed Cash Flows II

Imagine that two years and 364 days have gone by, and Bangalore Mining Pty Ltd has announced that it will pay the one-time \$12 dividend tomorrow. After that, the company expects the annual \$4 preferred dividends to resume. What is the present value now of the expected dividend stream?

As before, we can break the dividend stream into two parts. First, there is the \$12 dividend, *which will be paid immediately*. Clearly, its present value is \$12. Second, there is the perpetual \$4 dividend stream that starts in one year. From **Equation 3.10**, we know that the value of this perpetuity is \$50 ($\$4 \div 0.08$). Just add these two components together to find the value of BM's shares today:

$$\text{Value of each preferred share} = \$12 + \$50 = \$62$$

Now consider the position of a BM preferred shareholder who purchased the shares three

$$\begin{aligned} PV(\text{year } 3) &= \$4 \div 0.08 = \$50 \\ PV &= \$50 \div (1 + 0.08)^3 = \$39.69 \end{aligned}$$

At last we are ready to calculate the present value of the entire BM preferred dividend stream, or equivalently, the market value of BM's preferred shares.

$$\begin{aligned} \text{Value of preferred shares} &= \text{value of \$12 dividend} \\ &\quad + \text{value of \$4 perpetuity} \end{aligned}$$

$$\begin{aligned} \text{Value of preferred shares} &= \$9.53 + \$39.69 \\ &= \$49.22 \end{aligned}$$

Under normal circumstances, when BM's preferred shareholders expect to receive their \$4 dividend annually, the preferred shares sell for \$50. In this case, even though BM promises to eventually make up for the dividend payments that it must skip in the next two years, the value of the preferred shares dips slightly.

years ago, when the company suspended its dividends. In the previous example we determined that the value of BM preferred shares at that time was \$49.22, and we have just discovered that its value today is \$62. What rate of return did the investor earn over this period? Again, we can apply **Equation 3.1**:

$$\begin{aligned} FV &= PV(1+r)^n \\ \$62 &= \$49.22(1+r)^3 \end{aligned}$$

We solved a problem like this in section 3.4. To find the answer, you can use Excel's 'rate' function, use a financial calculator or solve algebraically as follows:

$$r = \left(\frac{\$62}{\$49.22} \right)^{\frac{1}{3}} - 1 = 0.08 = 8\%$$





An investor who purchased BM shares for \$49.22 three years ago and held them until they recently reached \$62 would have earned 8% per year, exactly the required return. The return

comes entirely from price appreciation in the shares because no dividends were paid during this period.

3.6e FINDING THE PRESENT VALUE OF A GROWING PERPETUITY

By definition, perpetuities pay a constant periodic amount forever. However, few aspects of modern life are constant, and most of the cash flows we care about have a tendency to grow over time. This is true for items of income such as wages and salaries, many dividend payments from corporations and pension payments from the Australian government.⁹ Inflation is only one factor that drives increasing cash flows. Because of this tendency for cash flows to grow over time, we must determine how to adjust the present value of a perpetuity formula to account for expected growth in future cash flows.

Suppose we want to calculate the present value (PV) of a stream of cash flows growing forever ($n = \infty$) at rate g . Given a discount rate of r , the *present value of the growing perpetuity* is given by the following equation, which is sometimes called the **Gordon growth model**:¹⁰

$$(Eq. 3.11) \quad PV = \frac{CF_1}{r-g} \quad (r > g)$$

Note that the numerator in **Equation 3.11** is CF_1 , the first year's cash flow that occurs exactly one year from today. This cash flow is expected to grow at a constant annual rate (g) from now to the end of time. We can determine the cash flow for any specific future year (t) by applying the growth rate (g) as follows:

$$CF_t = CF_1 \times (1 + g)^{t-1}$$



EXAMPLE

PV of Growing Perpetuity

Assume that Zark Muckerberg is a wealthy individual who now wishes to endow a medical foundation with sufficient money to fund ongoing research. Zark is particularly impressed with the research proposal submitted by the Strangelove Cancer Institute (SCI). The Institute requests an endowment sufficient to cover its expenses for medical equipment, which will total \$15 million next year, and then grow by 4% in perpetuity afterwards.

Assume the Institute can earn a 12% return on Zark's contribution. How much must Zark contribute to finance the institute's medical equipment expenditures in perpetuity? We can

consider the total PV as comprising two parts: a constant (non-growing) perpetuity earning 12% each year forever, and a growing element (increasing by 4% per year). The overall PV is calculated by dividing \$15,000,000 by the return net of growth (12% – 4%), which gives an overall value of \$187,500,000.

Conceptually, Zark would have to make an investment of only \$125,000,000 (\$15,000,000 ÷ 0.12, using **Equation 3.10**) to fund a non-growing perpetuity of \$15 million per year. The remaining growth element of the PV is \$187,500,000 – \$125,000,000 = \$62,500,000.

growing perpetuity
A cash flow stream that grows each period at a constant rate and continues forever

Gordon growth model
The valuation model that views cash flows as a growing perpetuity

9. Unfortunately, this is also true for expense items such as rent and utility expenses, car prices and tuition payments.

10. For this formula to work, the discount rate must be greater than the growth rate. When cash flows grow at a rate equal to or greater than the discount rate, the present value of the stream is infinite.

LO3.6

CONCEPT REVIEW QUESTIONS

- 10 You are given a mixed cash flow stream and an interest rate, and you are asked to calculate both the present and future values of the stream. Explain how the two numbers you calculate are related.
- 11 How is the present value of an annuity due related to the present value of an identical ordinary annuity?
- 12 Does a perpetuity pay an infinite amount of cash? Why is the present value of a perpetuity not infinite?
- 13 How would you calculate the present value of a perpetuity that had payments that were declining by a fixed percentage each year?

THINKING CAP QUESTION

- 3 Some companies (such as IBM) have issued bonds that are perpetuities. What sort of information do you think the companies have to tell investors in the market about the perpetuities to convince them to buy them?

LO3.7

3.7 ADVANCED APPLICATIONS OF TIME VALUE

The techniques we have studied thus far have many different applications in business as well as in personal finance. Some of those applications involve compounding interest more frequently than once per year. When interest compounds more often, the stated interest rate on a loan or an investment doesn't always accurately measure the *true rate of return*, or the *effective rate* of interest. In this section, we relax the assumption maintained so far that interest compounds once per year, and we examine several additional applications of the time value of money.

3.7a COMPOUNDING MORE FREQUENTLY THAN ANNUALLY

In many applications, interest compounds more frequently than once a year. Financial institutions compound interest semiannually, quarterly, monthly, weekly, daily or even continuously. This section explores how the present-value and future-value techniques change if interest compounds more than once a year.

Semiannual Compounding

semiannual compounding
Interest compounds twice a year

The **semiannual compounding** of interest involves two compounding periods within the year. Instead of the stated interest rate being paid once per year, one-half of the rate is paid twice a year.

To demonstrate, consider an opportunity to deposit \$100 in a savings account paying 8% interest with semiannual compounding. After the first six months, your account grows by 4% to \$104. Six months later, the account again grows by 4% to \$108.16. Notice that after one year, the total increase in the account value is \$8.16, or 8.16% ($\$8.16 \div \100.00). This return slightly exceeds the stated rate of 8% because semiannual compounding allows you to earn *interest on interest* during the year, increasing the overall rate of return. **Figure 3.12** shows how the account value grows every six months for the first two years. At the end of two years, the account value reaches \$116.99.

FIGURE 3.12 THE FUTURE VALUE FROM INVESTING \$100 AT 8% INTEREST COMPOUNDED SEMIANNUALLY OVER TWO YEARS

PERIOD	BEGINNING PRINCIPAL (1)	FUTURE VALUE FACTOR (2)	FUTURE VALUE AT END OF PERIOD [(1) × (2)] (3)
6 months	\$100.00	1.04	\$104.00
12 months	104.00	1.04	108.16
18 months	108.16	1.04	112.49
24 months	112.49	1.04	116.99

Quarterly Compounding

As the name implies, **quarterly compounding** describes a situation in which interest compounds four times per year. An investment with quarterly compounding pays one-fourth of the stated interest rate every three months.

quarterly compounding
Interest compounds four times per year

For example, assume that after further investigation, you find an institution that pays 8% interest compounded quarterly. After three months, your \$100 deposit grows by 2% to \$102. Three months later, the balance again increases 2% to \$104.04. By the end of the year, the balance reaches \$108.24. **Figure 3.13** tracks the growth in the account every three months for two years. At the end of two years, the account is worth \$117.17, which is greater than the sum attained after two years with semiannual compounding.

FIGURE 3.13 THE FUTURE VALUE FROM INVESTING \$100 AT 8% INTEREST COMPOUNDED QUARTERLY OVER TWO YEARS

PERIOD	BEGINNING PRINCIPAL (1)	FUTURE VALUE FACTOR (2)	FUTURE VALUE AT END OF PERIOD [(1) × (2)] (3)
3 months	\$100.00	1.02	\$102.00
6 months	102.00	1.02	104.04
9 months	104.04	1.02	106.12
12 months	106.12	1.02	108.24
15 months	108.24	1.02	110.41
18 months	110.41	1.02	112.62
21 months	112.62	1.02	114.87
24 months	114.87	1.02	117.17

As you should expect by now, the more frequently that interest compounds, the greater the amount of money that accumulates.

A General Equation

We can generalise the preceding examples in a simple equation. Suppose that a lump sum, denoted by PV , is invested at $r\%$ for n years. If m equals the number of times per year that interest compounds, the future value grows as shown in the following equation:

$$(Eq. 3.12) \quad FV = PV \times \left(1 + \frac{r}{m}\right)^{m \times n}$$

Notice that if $m = 1$, this reduces to **Equation 3.1**. The next several examples verify that this equation yields the same ending account values after two years, as shown in **Figures 3.12** and **3.13**.



Illustrations of Semiannual and Quarterly Compounding Effects

We have calculated the amount that you would have at the end of two years if you deposited \$100 at 8% interest compounded semiannually and quarterly. For semiannual compounding, $m = 2$ in **Equation 3.12**; for quarterly compounding, $m = 4$. Substituting the appropriate values for semiannual and quarterly compounding into **Equation 3.12** yields the following results.

For semiannual compounding:

$$FV = \$100 \times \left(1 + \frac{0.08}{2}\right)^{2 \times 2} = \$100 \times (1 + 0.04)^4 = \$116.99$$

For quarterly compounding:

$$FV = \$100 \times \left(1 + \frac{0.08}{4}\right)^{4 \times 2} = \$100 \times (1 + 0.02)^4 = \$117.17$$

Continuous Compounding

continuous compounding

Interest compounds literally at every moment as time passes

As we switch from annual, to semiannual, to quarterly compounding, the interval during which interest compounds gets shorter, while the number of compounding periods per year gets larger. Theoretically, there is almost no limit to this process – interest could be compounded daily, hourly or second by second. **Continuous compounding**, the most extreme case, occurs when interest compounds literally at every moment as time passes. In this case, m in **Equation 3.12** would approach infinity, and **Equation 3.12** converges to this expression:

(Eq. 3.13)

$$FV(\text{continuous compounding}) = PV \times (e^{r \times n})$$

The number e is an irrational number, like the number π from geometry, which is useful in mathematical applications involving quantities that grow continuously over time. The value of e is approximately 2.7183. As before, increasing the frequency of compounding, in this case by compounding as frequently as possible, increases the future value of an investment.



Future Values with Increased Compounding

To find the value at the end of two years of your \$100 deposit in an account paying 8% annual interest compounded continuously, substitute $PV = \$100$, $r = 0.08$ and $n = 2$ into **Equation 3.13**:

$$\begin{aligned} FV(\text{continuous compounding}) &= \$100 \times (e^{0.08 \times 2}) \\ &= \$100 \times 2.7183^{0.16} \\ &= \$100 \times 1.1735 \\ &= \$117.35 \end{aligned}$$

The future value with continuous compounding therefore equals \$117.35, which, as expected, is larger than the future value of interest compounded semiannually (\$116.99) or quarterly (\$117.17).

stated annual rate

The contractual annual rate of interest charged by a lender or promised by a borrower

effective annual rate (EAR)

The annual rate of interest actually paid or earned, reflecting the impact of compounding frequency. Also called the *true annual return*

3.7b STATED VERSUS EFFECTIVE ANNUAL INTEREST RATES

Consumers and businesses need to make objective comparisons of loan costs or investment returns over different compounding periods. To put interest rates on a common basis for comparison, we must distinguish between *stated* and *effective annual interest rates*. The **stated annual rate** is the contractual annual rate of interest charged by a lender or promised by a borrower. The **effective annual rate (EAR)**, or *true annual return*,

is the annual rate of interest *actually* paid or earned. Why the difference? The effective annual rate reflects the effect of compounding frequency; the stated annual rate does not.

Using the notation introduced earlier, we can calculate the *effective annual rate* by substituting values for the stated annual rate (r) and the compounding frequency (m) into **Equation 3.14**:

$$(Eq. 3.14) \quad EAR = \left(1 + \frac{r}{m}\right)^m - 1$$

We can apply this equation using data from preceding examples.



Effective Annual Rates Increase with Increased Compounding Frequency

Find the effective annual rate associated with an 8% stated annual rate ($r = 0.08$) when interest is compounded annually ($m = 1$), semiannually ($m = 2$) and quarterly ($m = 4$). Substituting these values into **Equation 3.14** obtains the following results:

For annual compounding:

$$EAR = \left(1 + \frac{0.08}{1}\right)^1 - 1 = (1 + 0.08)^1 - 1 = 1.08 - 1 \\ = 0.08 = 8.0\%$$

For semiannual compounding:

$$EAR = \left(1 + \frac{0.08}{2}\right)^2 - 1 = (1 + 0.04)^2 - 1 = 1.0816 - 1 \\ = 0.0816 = 8.16\%$$

For quarterly compounding:

$$EAR = \left(1 + \frac{0.08}{4}\right)^4 - 1 = (1 + 0.02)^4 - 1 = 1.0824 - 1 \\ = 0.0824 = 8.24\%$$

The results mean that 8% compounded semiannually is equivalent to 8.16% compounded annually, and 8% compounded quarterly is equivalent to 8.24% compounded annually. These values demonstrate two important points: (1) the stated and effective rates are equivalent for annual compounding; and (2) the effective annual rate increases with increasing compounding frequency.

Not surprisingly, the maximum effective annual rate for a given stated annual rate occurs when interest compounds continuously. The effective annual rate for this extreme case can be found by using the following equation:

(Eq. 3.14a)

$$EAR (\text{continuous compounding}) = e^r - 1$$

For the 8% stated annual rate ($r = 0.08$), substitution into **Equation 3.14a** results in an effective annual rate of 8.33%, as follows:

$$e^{0.08} - 1 = 1.0833 - 1 = 0.0833 = 8.33\%$$

For example, in Australia credit card suppliers are required to advise holders of their cards of the **average annual percentage rate (AAPR)**. This also applies to those with loans from lenders covered by the ‘truth-in-lending’ requirements of the National Credit Code. The AAPR is based on the stated nominal annual rate charged on the credit card or loan, and is found by multiplying the periodic rate by the number of periods in one year; but it is also required to include fees such as up-front, ongoing and exit fees.

The AAPR, however, understates the actual cost of a credit card account. The actual cost is determined by calculating the **annual percentage yield (APY)**. The APY is the same as the *effective annual rate* (sometimes called the *effective APR*), which, as discussed earlier, reflects the impact of compounding frequency. For a credit card charging 1.5% per month interest, the effective annual rate is $[(1.015)^{12} - 1] = 0.1956$, or 19.56%. This means that paying interest at 1.5% per month is the same as paying 19.56% if interest were charged annually.

average annual percentage rate (AAPR)
The stated annual rate calculated by multiplying the periodic rate by the number of periods in one year

annual percentage yield (APY)
The annual rate of interest actually paid or earned, reflecting the impact of compounding frequency. The same as the *effective annual rate* (sometimes called the *effective APR*)

3.7c CALCULATING DEPOSITS NEEDED TO ACCUMULATE A FUTURE SUM

Suppose that an investor wishes to determine the *annual deposit necessary to accumulate a certain amount of money at some point in the future*. As a specific example, assume that you want to buy a house five years from now and estimate that an initial down payment of \$20,000 will be required. You want to make equal end-of-year deposits into an account paying annual interest of 6%, so you must determine what size annuity results in a lump sum equal to \$20,000 at the end of year 5. The solution can be derived from the equation for finding the future value of an ordinary annuity.

Earlier in this chapter, we found the future value of an n -year ordinary annuity (FV) by applying [Equation 3.4](#). Solving that equation for PMT , in this case the annual deposit, we get [Equation 3.15](#):

$$(Eq. 3.15) \quad PMT = \frac{FV}{\left\{ \frac{(1+r)^n - 1}{r} \right\}}$$

Once this is done, we substitute the known values of FV , r and n into the right-hand side of the equation to find the annual deposit required.



Using Formula to Find Annual Payments for a Multi-Period Loan

As a demonstration of this formula, you would need to make equal annual end-of-year deposits of \$3,547.93 each year to accumulate \$20,000 (the FV) at the end of five years ($n = 5$), given an interest rate of 6% ($r = 6\%$):

$$PMT = \frac{\$20,000}{\left\{ \frac{(1.06)^5 - 1}{0.06} \right\}} = \$3,547.93$$

As usual, Excel provides a shortcut for this calculation in the form of the payment PMT (payment) function. The syntax of this function is $=pmt(rate,nper,pv,fv,type)$. To solve this particular problem using the PMT (payment) function, you would enter $=pmt(0.06,5,0,20000,0)$, and Excel generates the result \$3,547.93. Notice that in this function you enter 0 for the present value because you start with nothing saved towards the down payment. Also, the value entered for ‘type’ is 0 because this is an ordinary annuity – you are making equal end-of-year deposits to achieve your goal.

Spreadsheet		
Column	A	B
Row		
1	Future value	-\$20,000
2	Number of periods	5
3	Interest rate	6%
4	Payment	\$3,547.93
5	Formula B4: =PMT(B3,B2,0,B1)	

3.7d LOAN AMORTISATION

Loan amortisation refers to a situation in which a borrower pays down the principal (the amount borrowed) on a loan over the life of the loan. Often, the borrower makes equal periodic payments. For instance, with a conventional, 30-year home mortgage, the borrower makes the same payment each month for 30 years until the mortgage is completely repaid. To amortise a loan (that is, to calculate the periodic payment that pays off the loan), you must know the total amount of the loan (the amount borrowed), the term of the loan, the frequency of periodic payments and the interest rate.

In terms of the time value of money, the loan amortisation process involves finding a level stream of payments (over the term of the loan) with a present value (calculated at the loan interest rate) equal to the amount borrowed. Lenders use a **loan amortisation schedule** to determine these payments and the allocation of each payment to interest and principal.

For example, suppose that you borrow \$25,000 at 8% annual interest for five years to purchase a new car. To demonstrate the basic approach, we first amortise this loan assuming that you make payments at the end of years 1 through 5. We then modify the annual formula to compute the more typical monthly car loan payments. To find the size of the annual payments, the lender determines the amount of a five-year annuity discounted at 8% that has a present value of \$25,000. This process is actually the inverse of finding the present value of an annuity.

loan amortisation
Occurs when a borrower pays back the principal over the life of the loan, often in equal periodic payments

loan amortisation schedule
Used to determine loan amortisation payments and the allocation of each payment to interest and principal

FINANCE IN THE REAL WORLD



SAVING FOR YOUR RETIREMENT

It is important to begin saving for retirement when you start your first real job. Most people begin later. Let's assume that you are in your mid-thirties, and have two children and an annual income of \$150,000 before taxes. You now want to get serious about retirement, and have made the following estimates.

Years till retirement	35 years
Estimated years in retirement (based on actuarial tables)	25 years
Current level of household expenditures	\$92,000
Per cent of current household expenses needed in retirement	75%
Estimated annual end-of-year income in retirement from:	
Government pension	\$32,000
Employer superannuation contribution	11,000
Personal superannuation savings	20,000
Total	\$63,000
Expected annual inflation rate during retirement	5%
Expected annual rate of return on investments <i>before</i> retirement	7%
Expected annual rate of return on investments <i>during</i> retirement	9%

Using your estimates, you wish to determine the annual end-of-year savings needed to fund your retirement. This value can be calculated as follows:

$$\text{Estimated annual household expenditures in retirement} = 0.75 \times \$92,000 = \$69,000$$

$$\text{Additional annual retirement income needed} = \$69,000 - \$63,000 = \$6,000$$



(Eq. 3.1) Inflation-adjusted annual retirement income needed = $\$6,000 \times (1 + 0.05)^{30} = \$25,932$

(Eq. 3.7) Lump sum needed in 30 years to fund additional

$$\begin{aligned}\text{annual retirement income} &= \$25,932 / 0.09 \times \{1 - [1 / (1 + 0.09)^{25}]\} \\ &= \$288,131 \times 0.8840 = \$25,470\end{aligned}$$

(Eq. 3.15) Annual end-of-year savings required to fund lump sum = $\$25,470 / \{[(1 + 0.07)^{35} - 1] / 0.07\}$
= $\$25,470 / 138.243 = \184.24

So, in order to fund your retirement goal over your 25 years of retirement, you need to save \$184.24 at the end of each of the next 35 years. Note that your assumed rate of return during the 35 years you are accumulating funds is 7%, and during retirement, when funds are being distributed, you are assumed to earn a 9% rate of return. If you earn lower returns, you would need to save more each year.



Using Excel to Find Annual Payments for a Multi-Period Loan

To find the annual payment required on the five-year, \$25,000 loan with an 8% annual interest rate, we substitute the known values of $PV = \$25,000$, $r = 0.08$ and $n = 5$ into the right-hand side of the equation:

$$PMT = \frac{\$25,000}{\left\{ \frac{1}{0.08} \times \left[1 - \frac{1}{(1.08)^5} \right] \right\}} = \$6,261.41$$

Five annual payments of \$6,261.41 are needed to fully amortise this \$25,000 loan. We could also solve this problem using Excel's payment function. This time, the present value is \$25,000, and we want the future value to be \$0 (that is, the loan balance in five years should be \$0). In Excel, you would enter =pmt(0.08,5,25000,0,0), and obtain the same answer, \$6,261.41.

Spreadsheet

Column Row	A	B
1	Present value	-\$25,000
2	Number of periods	5
3	Interest rate	8%
4	Payment	\$6,261.41
5	Formula B4: =PMT(B3,B2,B1)	

Earlier, we found the present value (PV) of an n -year ordinary annuity, using **Equation 3.7**. Solving that equation for PMT , the annual loan payment, we get **Equation 3.16**:

$$\text{(Eq. 3.16)} \quad PMT = \frac{PV}{\left\{ \frac{1}{r} \times \left[1 - \frac{1}{(1+r)^n} \right] \right\}}$$

Each loan payment consists partly of interest and partly of the loan principal. Columns 3 and 4 of the loan amortisation schedule in **Figure 3.14** show the allocation of each loan payment of \$6,261.41 to interest and principal. Observe that the portion of each payment representing interest (column 3) declines over the

repayment period, and the portion going to principal (column 4) increases. This pattern is typical of amortised loans. With level payments, the interest component declines and a larger portion of each subsequent payment is left to repay principal.

Computing amortised loan payments is the present value formulation that people use most frequently in their personal lives to calculate car loan and home mortgage payments. Because lenders typically require monthly payments (rather than annual) on consumer loans, we now demonstrate amortisation calculations using monthly rather than annual payments. First, **Equation 3.16a** is simply a modified version of **Equation 3.16**:

$$(Eq. 3.16a) \quad PMT = \frac{PV}{\left[(1+r)^n - 1 \right]} \times (1+r)^n \times PV$$

FIGURE 3.14 LOAN AMORTISATION SCHEDULE, \$25,000 PRINCIPAL, FOR 8% INTEREST, FIVE-YEAR REPAYMENT PERIOD

END OF YEAR	LOAN PAYMENT (1)	BEGINNING OF YEAR PRINCIPAL (2)	PAYMENTS		END-OF-YEAR PRINCIPAL [(2) – (4)] (5)
			INTEREST [0.08 × (2)] (3)	PRINCIPAL [(1) – (3)] (4)	
1	\$6,261.41	\$25,000.00	\$2,000.00	\$4,261.41	\$20,738.59
2	6,261.41	20,738.59	1,659.09	4,602.32	16,136.27
3	6,261.41	16,136.27	1,290.90	4,970.51	11,165.76
4	6,261.41	11,165.76	893.26	5,368.15	5,797.61
5	6,261.41	5,797.61	463.80	5,797.61	0

Second, we can generalise this formula to more frequent compounding periods by dividing the interest rate by m and multiplying the number of compounding periods by m . This changes the equation as follows:

$$(Eq. 3.16b) \quad PMT = \frac{\frac{r}{m}}{\left[\left(1 + \frac{r}{M} \right)^{m \times n} - 1 \right]} \times \left(1 + \frac{r}{m} \right)^{m \times n} \times PV$$



PVs with Payments with a Year

Use **Equation 3.16b** to calculate what a monthly car payment will be if you borrow \$25,000 for five years at 8% annual interest. Once again, PV will be the \$25,000 amount borrowed, but the periodic interest rate ($r \div m$) will be 0.00667, or 0.667% per month (0.08 per year \div 12 months per year). There will be $m \times n = 60$ compounding periods (12 months per year \times 5 years = 60 months). Substituting these values into **Equation 3.16b** yields a car loan payment of just under \$507 per month:

$$\begin{aligned} PMT &= \frac{0.08}{\left[\left(1 + \frac{0.08}{12} \right)^{12 \times 5} - 1 \right]} \times \left(1 + \frac{0.08}{12} \right)^{12 \times 5} \times \$25,000 \\ &= \frac{0.00667}{\left[\left(1.00667 \right)^{60} - 1 \right]} \times \left(1.00667 \right)^{60} \times 25,000 \\ &= \$506.91 \end{aligned}$$





The monthly payment is less than one-twelfth the annual payment that we calculated in the previous example ($\$506.91 \times 12 < \$6,261.41$). The reason for this is that when payments are made more frequently, less interest accrues between payments, and therefore a lower payment is required to repay the entire loan. (Note that to obtain the precise figure of \$506.91, it is necessary to carry the monthly interest rate out

several digits beyond where we have rounded here.)

As a test of your command of the monthly payment formula, see if you can compute the monthly mortgage payment for a home purchased using a 30-year, \$100,000 loan with a fixed 7.5% annual interest rate. Note that there are 360 compounding periods (12 months per year \times 30 years).¹¹

LO3.7

CONCEPT REVIEW QUESTIONS

- 14 Why is the effective annual rate often greater than the stated annual rate?
- 15 On a 30-year mortgage, would the total amount of money paid by the borrower over the life of the loan be greater if there were weekly payments or monthly payments?

¹¹ The amount of the mortgage payment is \$699.21. To find this solution, just enter the formula '=pmt(0.00625,360,100000)' in Excel. The first argument in this function is the monthly interest rate, 7.5% divided by 12.

STUDY TOOLS

SUMMARY

LO3.1

- Financial managers can use future-value and present-value techniques to equate cash flows occurring at different times to compare decision alternatives. Managers rely primarily on present-value techniques and commonly use financial calculators or spreadsheet programs to streamline their computations.

LO3.2

- The future value of a lump sum is found by adding the accumulated interest earned to the present value (the initial investment) over the period of concern. The higher the interest rate and the further in the future the cash flow's value is measured, the higher its future value.

LO3.3

- The present value of a lump sum is found by discounting the future value at the given interest rate. It is the amount of money today that is equivalent to the given future amount, considering the rate of return that can be earned on the present value. The higher the interest rate and the further in the future the cash flow occurs, the lower its present value.

LO3.4

- Given the basic formulae for calculating the time value of lump sums at different dates (future and present values), more adjustments can be made, such as estimating compound annual growth rates.

LO3.5

- The future value of any cash flow stream – mixed stream, ordinary annuity or annuity due – is the sum of the future values of the individual cash flows. Future values of mixed streams are determined

by valuing each cash flow separately and summing them, whereas future values of annuities are easier to calculate because they have the same cash flow each period. The future value of an ordinary annuity (end-of-period cash flows) can be converted into the future value of an annuity due (beginning-of-period cash flows) merely by multiplying it by 1 plus the interest rate.

LO3.6

- The present value of a cash flow stream is the sum of the present values of the individual cash flows. The present value of a mixed stream requires discounting each cash flow separately and summing them, whereas present values of annuities are easier to calculate because they have the same cash flow each period. The present value of an ordinary annuity can be converted to the present value of an annuity due merely by multiplying it by 1 plus the interest rate. The present value of an ordinary perpetuity – a level stream that continues forever – is found by dividing the amount of the annuity by the interest rate.
- Implied interest or growth rates can be found using the basic future-value equations for lump sums and annuities.
- Given present and future cash flows and the applicable interest rate, the unknown number of periods can be found using the basic equations for future values of lump sums and annuities. The annual deposit needed to accumulate a given future sum is found by manipulating the future value of an annuity equation.

LO3.7

- Combinations of cash flow patterns can be calculated with some simplifications of the relevant formulae.
- There are special applications of time value adjustments, including compounding interest more frequently than annually, stated and effective annual rates of interest, deposits needed to accumulate a future sum and loan amortisation. The more frequently interest is compounded at a stated annual rate, the larger the future amount that will be accumulated and the higher the effective annual rate.
- Loan amortisation – determination of the equal periodic payments necessary to fully repay loan principal and interest over a given time at a given interest rate – is performed by manipulating the present value of an annuity equation. An amortisation schedule can be prepared to allocate each loan payment to principal and interest.

IMPORTANT EQUATIONS

TABLE OF IMPORTANT EQUATIONS

3.1 $FV = PV \times (1+r)^n$

3.2 $PV = \frac{FV}{(1+r)^n} = FV \times \frac{1}{(1+r)^n}$

3.3a $FV = \sum_{t=1}^n CF_t \times (1+r)^{n-t}$

3.4 $FV = PMT \times \left\{ \frac{[(1+r)^n - 1]}{r} \right\}$

3.5 $FV(\text{annuity due}) = PMT \times \left\{ \frac{[(1+r)^n - 1]}{r} \right\} \times (1+r)$

3.6 $PV = \sum_{t=1}^n CF_t \times \frac{1}{(1+r)^t}$

3.7 $PV = \frac{PMT}{r} \times \left[1 - \frac{1}{(1+r)^n} \right]$

$$3.8 \quad PV(\text{annuity due}) = \frac{PMT}{r} \times \left[1 - \frac{1}{(1+r)^n} \right] \times (1+r)$$

$$3.10 \quad PV = PMT \times \frac{1}{r} = \frac{PMT}{r}$$

$$3.11 \quad PV = \frac{CF_1}{r-g} \quad (r > g)$$

$$3.12 \quad FV = PV \times \left(1 + \frac{r}{m} \right)^{mn}$$

$$3.13 \quad FV(\text{continuous compounding}) = PV \times (e^{rn})$$

$$3.14 \quad EAR = \left(1 + \frac{r}{m} \right)^m - 1$$

$$3.14a \quad EAR(\text{continuous compounding}) = e^r - 1$$

$$3.15 \quad PMT = \frac{FV}{\left\{ \frac{\left[(1+r)^n - 1 \right]}{r} \right\}}$$

$$3.16 \quad PMT = \frac{PV}{\left\{ \frac{1}{r} \times \left[1 - \frac{1}{(1+r)^n} \right] \right\}}$$

$$3.16a \quad PMT = \frac{PV}{\left[(1+r)^n - 1 \right]} \times (1+r)^n \times PV$$

$$3.16b \quad PMT = \frac{\frac{r}{m}}{\left[\left(1 + \frac{r}{m} \right)^{mn} - 1 \right]} \times \left(1 + \frac{r}{m} \right)^{mn} \times PV$$

SELF-TEST PROBLEMS

Answers to these 'Self-test problems' and the 'Concept review' questions throughout the chapter appear on the Student Companion Website (<http://login.cengagebrain.com>) or via your instructor.

ST3-1 Starratt Alexander is considering investing specified amounts in each of four investment opportunities described below. For each opportunity, determine the amount of money Starratt will have at the end of the given investment horizon.

Investment A: Invest a lump sum of \$2,750 today in an account that pays 6% annual interest and leave the funds on deposit for exactly 15 years.

Investment B: Invest the following amounts at the beginning of each of the next five years in a venture that will earn 9% annually and measure the accumulated value at the end of exactly five years:

BEGINNING OF YEAR	AMOUNT
1	\$ 900
2	1,000
3	1,200
4	1,500
5	1,800

Investment C: Invest \$1,200 at the end of each year for the next 10 years in an account that pays 10% annual interest and determine the account balance at the end of year 10.

Investment D: Make the same investment as in investment C, but place the \$1,200 in the account at the beginning of each year.

ST3-2 Gregg Snead has been offered four investment opportunities, all equally priced at \$45,000.

Because the opportunities differ in risk, Gregg's required returns – applicable discount rates – are not the same for each opportunity. The cash flows and required returns for each opportunity are summarised below.

OPPORTUNITY	CASH FLOWS		REQUIRED RETURN
A	\$7,500 at the end of 5 years		12%
B	Year	Amount	15%
	1	\$10,000	
	2	12,000	
	3	18,000	
	4	10,000	
	5	13,000	
	6	9,000	
C	\$5,000 at the <i>end of each year</i> for the next 30 years		10%
D	\$7,000 at the <i>beginning of each year</i> for the next 20 years		18%

- a Find the present value of each of the four investment opportunities.
- b Which, if any, opportunities are acceptable?
- c Which opportunity should Gregg take?

ST3-3 Imagine that you are a professional personal financial planner. One of your clients asks you the following two questions. Use the time value of money techniques to develop appropriate responses to each question.

- a I need to save \$37,000 over the next 15 years to fund my three-year-old daughter's university education. If I make equal annual end-of-year deposits into an account that earns 7% annual interest, how large must this deposit be?
- b I borrowed \$75,000, am required to repay it in six equal (annual) end-of-year instalments of \$16,718.98 and want to know what interest rate I am paying.

QUESTIONS

Q3-1 What is the importance for an individual of understanding time value of money concepts? What about for a corporate manager? Under what circumstance would the time value of money be irrelevant?

- Q3-2** Actions that maximise profit may not maximise shareholder wealth. What role can the time value of money play in explaining the discrepancy between maximising profits and maximising value?

Q3-3 In many countries which have government lotteries, the jackpots are often paid out in the form of a 20- or 30-year annuity, but they also give winners the option to collect their winnings as a much smaller lump sum. Explain how you would use time value of money analysis to choose between the annuity and the lump sum if you won the lottery.

Q3-4 What happens to the present value of a cash flow stream when the discount rate increases? Place this in the context of an investment. If the required return on an investment goes up, but the expected cash flows do not change, are you willing to pay the same price for the investment, or to pay more or less for this investment than before the required return changed?

Q3-5 Look at the formula for the present value of an annuity. What happens to the present value as the number of periods increases? What distinguishes an annuity from a perpetuity? Why is there no separate formula for the future value of a perpetuity?

Q3-6 Under what circumstances is the effective annual rate different than the stated annual rate, and when are they the same?

PROBLEMS

FUTURE VALUE OF A LUMP SUM RECEIVED TODAY

- P3-1** You have \$1,500 to invest today at 7% interest compounded annually.

 - a How much will you have accumulated in the account at the end of the following number of years?
 - i Three years
 - ii Six years
 - iii Nine years
 - b Use your findings in part (a) to calculate the amount of interest earned in:
 - i years 1 to 3
 - ii years 4 to 6
 - iii years 7 to 9.
 - c Compare and contrast your findings in part (b). Explain why the amount of interest earned increases in each succeeding three-year period.

PRESENT VALUE OF A LUMP SUM RECEIVED IN THE FUTURE

- P3-2** A state savings bond from New South Wales can be converted to \$100 at maturity six years from purchase. If the state bonds pay 8% annual interest (compounded annually), at what price must the state sell its bonds? Assume no cash payments on savings bonds before redemption.

P3-3 You have a trust fund that will pay you \$1 million exactly 10 years from today. You want cash now, so you are considering an opportunity to sell the right to the trust fund to an investor.

 - a What is the least you will sell your claim for if you could earn the following rates of return on similar risk investments during the 10-year period?
 - i 6%
 - ii 9%
 - iii 12%
 - b Rework part (a) under the assumption that the \$1 million payment will be received in 15 rather than 10 years.
 - c Based on your findings in parts (a) and (b), discuss the effect of both the size of the rate of return and the time until receipt of payment on the present value of a future sum.

FUTURE VALUE OF CASH FLOW STREAMS

- P3-4** Liliana Alvarez's employer offers its workers a two-month paid sabbatical every seven years. Liliana, who just started working for the company, plans to spend her sabbatical touring Europe at an estimated cost of \$25,000. To finance her trip, Liliana plans to make six annual end-of-year deposits of \$2,500 each, starting this year, into an investment account earning 8% interest.
- Will Liliana's account balance at the end of seven years be enough to pay for her trip?
 - Suppose Liliana increases her annual contribution to \$3,150. How large will her account balance be at the end of seven years?
- P3-5** For the following questions, assume an ordinary annuity of \$1,000 and a required return of 12%.
- What is the future value of a 10-year ordinary annuity?
 - If you earned an additional year's worth of interest on this annuity, what would be the future value?
 - What is the future value of a 10-year annuity due?
 - What is the relationship between your answers in parts (b) and (c)? Explain.
- P3-6** Kim Edwards and Hiroshi Suzuki are both newly minted 30-year-old MBAs. Kim plans to invest \$1,000 per month into her defined contribution superannuation plan beginning next month. Hiroshi intends to invest \$2,000 per month in his superannuation plan, but he does not plan to begin investing until 10 years after Kim begins investing. Both Kim and Hiroshi will retire at age 67, and their superannuation plans average a 12% annual return. Who will have more superannuation funds available at retirement?
- P3-7** To supplement your planned retirement, you estimate that you need to accumulate \$220,000 in 42 years. You plan to make equal annual end-of-year deposits into an account paying 8% annual interest.
- How large must the annual deposits be to create the \$220,000 fund in 42 years?
 - If you can afford to deposit only \$600 per year into the account, how much will you have accumulated by the end of the 42nd year?

PRESENT VALUE OF CASH FLOW STREAMS

- P3-8** Given the mixed streams of cash flows shown in the following table, answer parts (a) and (b) below.

YEAR	CASH FLOW STREAM	
	A	B
1	\$ 50,000	\$ 10,000
2	40,000	20,000
3	30,000	30,000
4	20,000	40,000
5	10,000	50,000
Totals	\$150,000	\$150,000

- Find the present value of each stream, using a 15% per year discount rate.
 - Compare the calculated present values, and discuss them in light of the fact that the undiscounted total cash flows amount to \$150,000 in each case.
- P3-9** As part of your personal budgeting process, you have determined that at the end of each of the next five years you will incur significant maintenance expenses on your home. You'd like to cover these expenses by depositing a lump sum in an account today that earns 8% per year. You will gradually draw down this account each year as maintenance bills come due.

END OF YEAR	EXPENSE
1	\$ 5,000
2	4,000
3	6,000
4	10,000
5	3,000

- a How much money must you deposit today to cover all of the expenses?
- b What effect does an increase in the interest rate have on the amount calculated in part (a)? Explain.

P3-10 Ruth Nail receives two offers for her seaside home. The first offer is for \$1 million today. The second offer is for an owner-financed sale with annual payments as follows:

YEAR	PAYMENT
0 (Today)	\$200,000
1	200,000
2	200,000
3	200,000
4	200,000
5	300,000

Assuming that Ruth earns a return of 8% each year on her investments, which offer should she take?

P3-11 Assume that you just won the lottery. Your prize can be taken either in the form of \$40,000 at the end of each of the next 25 years (\$1 million over 25 years) or as a lump sum of \$500,000 paid immediately.

- a If you expect to be able to earn 5% annually on your investments over the next 25 years, which alternative should you take? Why?
- b Would your decision in part (a) be altered if you could earn 7% rather than 5% on your investments over the next 25 years? Why?
- c At approximately what interest rate will the two plans yield the same present value?

P3-12 Use the following table of cash flows to answer parts (a) and (b). Assume an 8% annual discount rate.

END OF YEAR	CASH FLOW
1	\$10,000
2	10,000
3	10,000
4	12,000
5	12,000
6	12,000
7	12,000
8	15,000
9	15,000
10	15,000

- a Solve for the present value of the cash flow stream by summing the present value of each individual cash flow.
- b Solve for the present value by summing the present value of the three separate annuities (one current and two deferred).

P3-13 Consumer Insurance Pty Ltd sells extended warranties on appliances that provide coverage after the manufacturers' warranties expire. An analyst for the company forecasts that the company will

have to pay warranty claims of \$5 million per year for three years, with the first claims expected to occur four years from today. The company wants to set aside a lump sum today to cover these costs, and money invested today will earn 10%. How much does the company need to invest now?

- P3-14** Jill Chu wants to choose the best of four immediate retirement annuities available to her. In each case, in exchange for paying a single premium today, she will receive equal annual end-of-year cash benefits for a specified number of years. She considers the annuities to be equally risky and is not concerned about their differing lives. Her decision will be based solely on the rate of return she will earn on each annuity. The key terms of each of the four annuities are shown in the following table:

ANNUITY	PREMIUM PAID TODAY	ANNUAL BENEFIT	LIFE (YEARS)
A	\$30,000	\$3,100	20
B	25,000	3,900	10
C	40,000	4,200	15
D	35,000	4,000	12

- a Calculate to the nearest 1% the rate of return on each of the four annuities Jill is considering.
- b Given Jill's stated decision criterion, which annuity would you recommend?

- P3-15** Evaluate each of the following three investments, each costing \$1,000 today and providing the returns noted below, over the next five years.

Investment 1: \$2,000 lump sum to be received in five years

Investment 2: \$300 at the end of each of the next five years

Investment 3: \$250 at the beginning of each of the next five years

- a Which investment offers the highest return?
- b Which offers the highest return if the payouts are doubled (that is, \$4,000, \$600 and \$500)?
- c What causes the big change in the returns on the annuities?

- P3-16** Consider the following three investments of equal risk. Which offers the greatest rate of return?

END OF YEAR	INVESTMENT		
	A	B	C
0	-\$10,000	-\$20,000	-\$25,000
1	0	9,500	20,000
2	0	9,500	30,000
3	24,600	9,500	-12,600

ADVANCED APPLICATIONS OF TIME VALUE

- P3-17** You plan to invest \$2,000 in an individual retirement arrangement (IRA) today at a stated interest rate of 8%, which is expected to apply to all future years.

- a How much will you have in the account at the end of 10 years if interest is compounded as follows?
 - i Annually
 - ii Semiannually
 - iii Daily (assume a 365-day year)
 - iv Continuously
- b What is the effective annual rate (EAR) for each compounding period in part (a)?
- c How much greater will your IRA account balance be at the end of 10 years if interest is compounded continuously rather than annually?
- d How does the compounding frequency affect the future value and effective annual rate for a given deposit? Explain in terms of your findings in parts (a)–(c).

P3-18 Binh Tran has shopped around for the best interest rates for his investment of \$10,000 over the next year.

STATED RATE	COMPOUNDING
6.10%	Annual
5.90%	Semiannual
5.85%	Monthly

- a Which investment offers Binh the highest *effective annual rate* of return?
- b Assume that Binh wants to invest his money for only six months, and the annual compounded rate of 6.10% is not available. Which of the remaining opportunities should Binh choose?

P3-19 Tara Cutler is newly married and preparing a surprise gift of a trip to Europe for her husband on their tenth anniversary. Tara plans to invest \$5,000 per year until that anniversary, and to make her first \$5,000 investment on their first anniversary. If she earns an 8% annual rate on her investments, how much will she have saved for their trip if the interest is compounded in each of the following ways?

- a Annually
- b Quarterly
- c Monthly

P3-20 Determine the annual deposit required to fund a future annual annuity of \$12,000 per year. You will fund this future liability over the next five years, with the first deposit to occur one year from today. The future \$12,000 liability will last for four years, with the first payment to occur seven years from today. If you can earn 8% on this account each year, how much will you have to deposit each year over the next five years to fund the future liability?

P3-21 Mary Chong, capital expenditure manager for PDA Manufacturing, knows that her company is facing a series of monthly expenses associated with installation and calibration of new production equipment. The company has \$1 million in a bank account right now that it can draw on to meet these expenses. Funds in this account earn 6% interest annually, with monthly compounding. Ms Chong is preparing a budget that will require the company to make equal monthly deposits into its bank account, starting next month, to ensure that it can pay the repair costs it anticipates over the next 24 months (shown as follows). How much should the monthly bank deposit be?

MONTHS	REPAIR COSTS PER MONTH
1–4	\$100,000
5–12	200,000
13–24	500,000

P3-22 Joan Messineo borrowed \$15,000 at a 14% annual interest rate to be repaid over three years. The loan is amortised into three equal annual end-of-year payments.

- a Calculate the annual end-of-year loan payment.
- b Prepare a loan amortisation schedule showing the interest and principal breakdown of each of the three loan payments.
- c Explain why the interest portion of each payment declines with the passage of time.

P3-23 You are planning to purchase a caravan for \$40,000, and you have \$10,000 to apply as a down payment. You may borrow the remainder under the following terms: a 10-year loan with semiannual repayments and a stated interest rate of 6%. You intend to make \$6,000 in payments, applying the excess over your required payment to the reduction of the principal balance.

- a Given these terms, how long (in years) will it take you to fully repay your loan?
- b What will be your total interest cost?
- c What would be your interest cost if you made no prepayments and repaid your loan by strictly adhering to the terms of the loan?

P3-24 You are the pension fund manager for Tanju's Toffees. The fund collects contributions (inflows) from workers each year and pays benefits (outflows) to retirees. Your CFO wants to know the minimum annual return required on the superannuation fund in order to make all required payments over the next five years and not diminish the existing asset base. The fund currently has assets of \$500 million.

- a Determine the required return if outflows are expected to exceed inflows by \$50 million per year.
- b Determine the required return with the following fund cash flows.

END OF YEAR	INFLOWS	OUTFLOWS
1	\$55,000,000	\$100,000,000
2	60,000,000	110,000,000
3	60,000,000	120,000,000
4	60,000,000	135,000,000
5	64,000,000	145,000,000

- c Consider the cash flows in part (b). What will happen to your asset base if you earn 10%? What about 20%?

P3-25 You plan to start saving for your son's university education. He will begin university when he turns 18 and will need \$4,000 then and in each of the following three years. You will make a deposit at the end of this year in an account that pays 6% compounded annually and an identical deposit at the end of each year, with the last deposit occurring when he turns 18. If an annual deposit of \$1,484 will allow you to reach your goal, how old is your son now?

CASE STUDY

PRESENT VALUE

Casino.com Corporation is building a \$25-million office building in Manila, and is financing the construction at an 80% loan-to-value ratio, where the loan is in the amount of \$20,000,000. This loan has a 10-year maturity, calls for monthly payments, and has a stated annual interest rate of 8%.

ASSIGNMENT

Using the above information, answer the following questions.

- 1 What is the monthly payment?
- 2 How much of the first payment is interest?
- 3 How much of the first payment is principal?
- 4 How much will Casino.com Corporation owe on this loan after making monthly payments for three years (the amount owed immediately after the 36th payment)?

- 5 Should this loan be refinanced after three years with a new seven-year, 7% loan, if the cost to refinance is \$250,000? To make this decision, calculate the new loan payments and then the present value of the difference in the loan payments.
- 6 Returning to the original 10-year 8% loan, how much is the loan payment if these payments are quarterly rather than monthly?
- 7 For this loan with quarterly payments, how much will Casino.com Corporation owe on this loan after making quarterly payments for three years (the amount owed immediately after the twelfth payment)?
- 8 What is the annual percentage rate on the original 10-year 8% loan?
- 9 What is the *effective annual rate (EAR)* on the original 10-year 8% loan?



REAL-WORLD CASE STUDY

ALL IN THE FAMILY

The Egibi family operated a series of businesses of quite diverse natures over five generations, and left a reasonable record of its activities for us to analyse. The start of the business is not particularly clear, although it seems that it came from a marriage link when a man of some means married a less wealthy woman and took up business with his brother-in-law. The Egibi brother-in-law claims to have taught his sororal nephew to read and write, and later adopted him, but without granting him an inheritance share beside his three natural sons. In the following generations, the eldest sons married upward, to women 'of good families' who had good connections and provided rich dowries. By contrast, their daughters were married off to business partners with dowries that typically cost only a fraction of what their eldest sons received.

The Egibis invested their profits in farmland, which they rented out on a sharecropping basis. The leasing arrangements focused on the long term, and encouraged tenants on their lands to invest in cultivating more capital-intensive crops, shifting from grain to dates. The Egibis effected this substitution of planting by allowing the tenants to pay little rent in the early years of a contract, substituting short-term grain rents for higher, long-term returns from date palms, which take several years to mature and yield a crop. The date palms also require a good supply of water, and need to be grown near rivers and irrigation canals.

Over the years, the Egibis also obtained licences from the government to become tax farmers – that is, they were allowed to collect taxes on behalf of the government and to remit a (large) fraction to the government while keeping the remainder. The Egibi family concentrated its tax-farming business in rural areas along the canals of the country, hiring boats and boatmen to transport goods. Landowners had to pay specific rates to maintain canals and the local irrigation system. The Egibis set up contracts with the local

officials responsible for maintaining the canals and collecting fees from their users in which the family paid the officials to pay the government, in return for the right to extract the fees in kind. In effect, the Egibis set up a strong shipping, storage and food-processing network, with tax-farming as a sideline operation. This work built enough financial support from the external market that, in two generations, the family was considered one of the wealthiest in the country adjacent to the capital city. The primary organisational structure used by the Egibis was the partnership arrangement, with local entrepreneurs who specialised in related production, such as beer-brewing or buying local crops, and selling them in the capital. The businesses maintain working capital at steady levels and distribute profits to the individual partners, to allow them to invest on their own in other businesses.

To extend their own investments, the Egibis moved into real estate. They developed a special relationship with the household of the local crown prince, and acquired a house adjacent to the crown prince's palace. They arranged a loan-rental mortgage transaction by borrowing the funds from the man who rented the house, with the rent corresponding to the usual interest charge of 20%, which covered asset price, rent and carrying charges for the property. The tenant was the administrator of the crown prince's palace. Because the Egibis were not debtors in financial distress, the transaction was effectively an interest-free loan, and did not require any real flow of funds until the debt was eventually repaid. The contract was occasionally renewed, and ran for many decades.

When the Egibi family wealth was divided among the fourth-generation sons, the family owned 16 houses in the capital city and a major rural town, along with other agricultural land, as well as having control over more than 100 employees. In some ways, this story is certainly not a unique one of a rise to wealth



for a family over many generations; but the diversity of organisational arrangements, the movement from agricultural production through contracted government service to real estate management and the range of financial instruments that accompanied these developments are worthy of attention because the Egibi family lived during the century from 626 BCE to around 540 BCE in Babylon. It is almost chastening to realise that many of the business and financial contractual arrangements that we consider 'modern' were in regular use at least 2,500 years ago – and, indeed, some were already at least a millennium old at that time. We can still learn a great deal from history.

Source: Wunsch, Cornelia, 'Neo-Babylonian Entrepreneurs' in Landes, David S., Mokyr, Joel and Baumol, William J. (eds). *The Invention of Enterprise Entrepreneurship from Ancient Mesopotamia to Modern Times* (Princeton and Oxford: Princeton University Press, 2010: pp. 41–61).

ASSIGNMENT

- 1 Do you think that the use of family relationships to build a business overcame agency issues?
- 2 If you were to take the role of financial adviser to the Egibi family with respect to its real-estate rental arrangements, what would you consider to be the risks associated with the loan-rental mortgage transaction they set up with the administrator of the crown prince's palace?
- 3 What other examples can you think of in which there is a sacrifice of short-term profits for long-term higher expected gains?

SOUND BITES: ETHICS IN CORPORATE FINANCE – PART 1

WRITTEN BY BORIS BIELER

Boris Bieler has over twenty years of risk management experience mainly gained in senior audit leadership roles at foreign corporate and investment banks in Australia.

Boris studied at the University of Bayreuth in Germany and at the University of Warwick in England. He is a CFA charter holder, a Fellow of CPA Australia (FCPA) and a signatory of the Banking and Finance Oath (BFO) in Australia.

He has been a speaker and chairperson at conferences held by the Institute of Internal Auditors Australia and CPA Australia and has supported the CFA Institute globally with their programs and curriculum. Boris has also been a guest lecturer and panellist at Macquarie University and University of Technology Sydney on topics around auditing, risk management,

corporate governance and ethics in banking. He is currently a member of the advisory board at the department of accounting and corporate governance at Macquarie University.

He has contributed to publications on ethics and the banking royal commission in Australia released on the CFA Institute's online portals and the BFO newsletter.

Boris has been working on youth education and mentoring initiatives and is passionate about sharing his knowledge to students and assisting them with their first steps into the corporate world.



WEEK 1 INTO JANE WONG'S M&A ANALYST ROLE

Jane Wong has just secured a full-time position as a mergers and acquisitions (M&A) analyst in an Asia-Pacific-wide operating corporate and investment bank. Taking her technical expertise for granted, Jane Wong's job interviews focused on the company's values, and how those values were formalised in the company's governance framework. After the introductory training and group discussions on expected employee behaviour, all new hires were asked to attest to the company's code of ethics and conduct. At the end of a busy first week, Jane and her manager then formalised her performance indicators, which were mapped against the corporation's values and behavioural expectations.

Born and bred in Hong Kong, she migrated to Australia when she was seventeen. Jane is proud of her appointment, and has been impressed by her company's focus on team work, honesty, reliability and service commitment to its clients. Those values and principles have been embedded in the company's governance

framework and are an integral part of everyone's day-to-day activity. Jane was willing to embrace them as she could relate to them.

The module 'Sound bites – Ethics in Corporate Finance' follows Jane Wong's on-boarding process and consists of five case studies that can be found at the end of each part of this text:

Part 1 – The Framework: Codifying the Employer's Expectation on Staff Behaviour

Part 2 – The History: Past Examples of Unethical Decision-Making

Part 3 – The Activities: Measures to Facilitate Ethical Conduct

Part 4 – The Expectations: Regulatory and 'Community' Standards

ONLINE CHAPTERS: Part 5 – The Pipeline: Market Trends and Regulatory Initiatives



THE FRAMEWORK

Jane's company's ethical framework consists of a purpose or mission statement explaining why the organisation exists, and a code of ethics and conduct which defines the values and principles of the organisation and guides the decision making and behaviour of individuals and the entity as a whole.

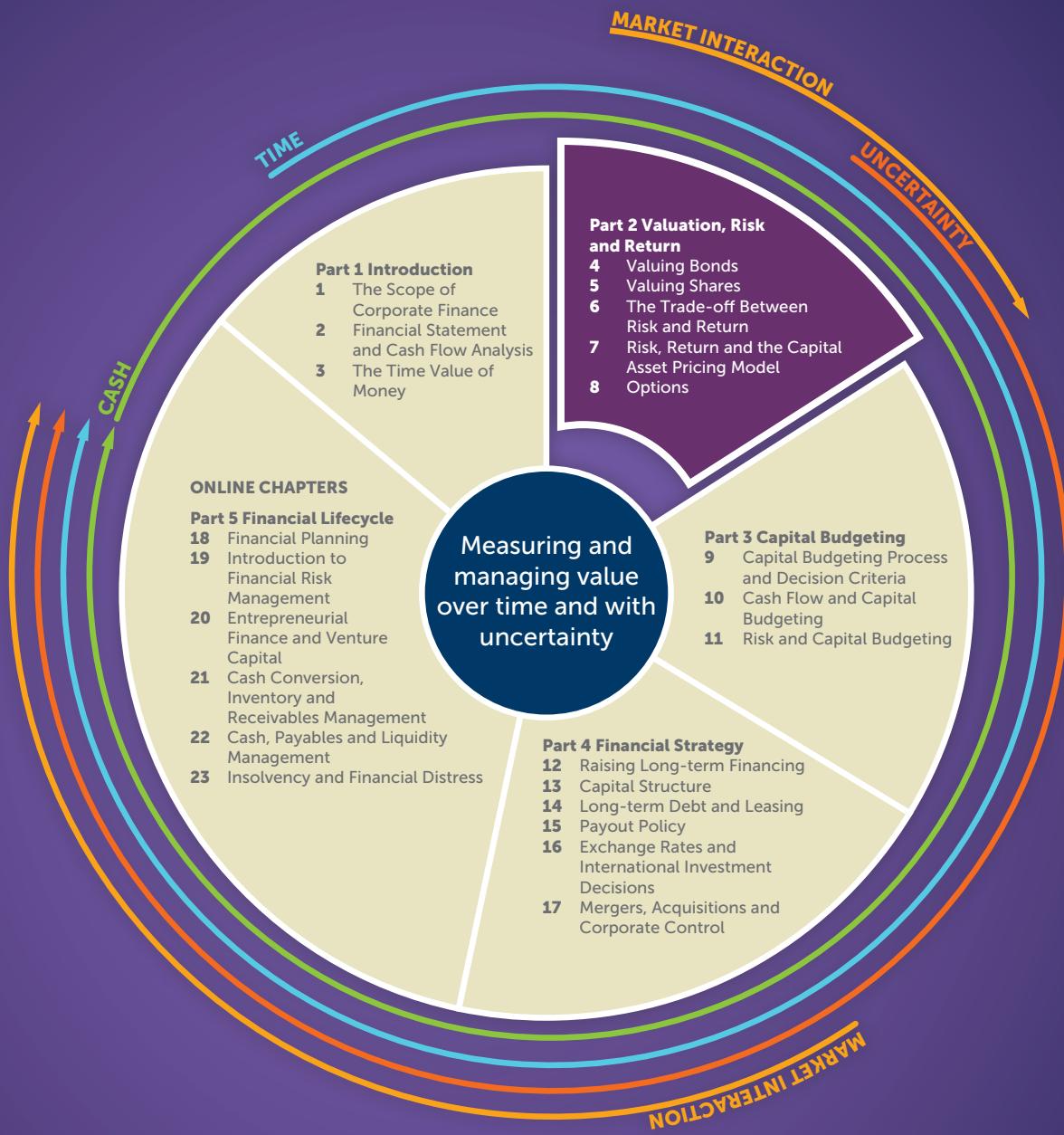
The code helps the employees distinguish between 'right' or 'wrong', and to apply judgement to make the 'right' choice in situations of competing values and interests. It also encourages Jane and her colleagues to speak up when they see others involved in unethical behaviour. Core ethical values formalised in the code include trustworthiness, respect, responsibility, fairness and care, which are applicable to all employees in Jane's organisation.

An effectively implemented code is role-modelled by senior management, continuously discussed and reflected upon within the organisation, and therefore applies in everyone's day-to-day decision making. At Jane's company, employees are periodically asked to attest in writing that they understand and adhere to the code, which is integrated into the organisation's mandatory training programs. The attestation process holds Jane and her colleagues accountable for their actions.

Failure to comply with the principles is investigated by the organisation and may lead to remedial actions in the form of enhanced training, warnings or even termination of employment if the case is serious.

ASSIGNMENTS

- Have you been in a situation where you faced an ethical dilemma, and how did you cope with the dilemma? Did you set up your values and define what you stood for?
- Looking across countries in Asia, would you say that ethical standards or ethical decision making differ in different countries? Are values different? Can you identify at least one example where you feel a situation would be differently assessed as ethical and unethical in different countries of Asia? (Suggestion: you may wish to undertake an internet search to find some specific cases.)
- How much have you, or a person you are familiar with, been influenced by the ethical standards of an organisation you have worked for? Do you rank the organisation's ethical standards as important as salary and career progression when you select your preferred company?
- What do you think are the key challenges for an organisation in successfully implementing an ethical standards code? Consider whether you think it is about defining ethical awareness and identifying ethically challenging situations, or is it more about educating and incentivising staff members to speak up about any observed wrongdoing?



Corporate finance is the art of measuring and managing value over time and with uncertainty

Cash is the physical measure of value, which is embedded in the flow of **Time** and affected by **Uncertainty**. Exchange of value occurs through **Market interaction**.

PART 2

Valuation, Risk and Return

- 4 Valuing Bonds**
- 5 Valuing Shares**
- 6 The Trade-off Between Risk and Return**
- 7 Risk, Return and the Capital Asset Pricing Model**
- 8 Options**

A note of wisdom attributed to the English poet Geoffrey Chaucer says, 'Nothing ventured, nothing gained'. Financial markets give us ample evidence that Chaucer knew what he was talking about. Over time, high-risk investments tend to earn higher returns than do low-risk investments. When managers invest corporate funds, or when individuals decide how to allocate their money between different types of investments, they must weigh the trade-off between risk and return. The purpose of the next four chapters is to explore that trade-off in depth. We begin in chapters 4 and 5 by describing two of the most common types of investments available in the market: bonds and shares.

The bond market is vast, and it plays an extremely important role in the global economy. In Australia and many other countries, national and state governments issue bonds to finance public works projects and to cover budget deficits. Companies, both financial and non-financial, sell bonds

within their own countries and overseas to raise funds to meet daily operating needs and to pay for major investments. Chapter 4 describes the basic bond features and explains how investors value bonds.

Chapter 5 examines the stock market. Valuing shares is more complex than valuing bonds because shares do not promise fixed payment streams, as do most bonds. Therefore, Chapter 5 discusses methods that investors and analysts use to estimate share values. The chapter also provides a brief explanation of how companies work with investment bankers to sell shares to the public, and how investors can trade shares with each other.

With the essential features of bonds and shares in hand, Chapter 6 explores the historical returns earned by different classes of investments. The data illustrate that a fundamental trade-off between risk and return confronts investors. Chaucer was right: investors who want to get rich have to accept risk as part of the deal.

Chapter 7 quantifies exactly what we mean by the term *risk*. The chapter also introduces one of the most important theories in finance, the capital asset pricing model, or CAPM. The CAPM attempts to quantify the risk–return trade-off, providing an estimate of the return that an investor can expect to earn on an investment with a particular level of risk. The CAPM can help investors decide how to allocate their funds across different types of investments, and it also helps corporate managers decide whether it is better to invest a company's money in a high-risk venture, like building a manufacturing plant in a foreign country, or in a low-risk undertaking, such as upgrading old equipment.

As an extension of asset and liability valuation methods in Chapters 4, 5, 6 and 7, Chapter 8 provides us with a description of how we can adjust our investment decisions if we identify choices or options embedded in them, such as the option to delay the start of an investment, or the option to stop it before it is complete. Using theories of option pricing, Chapter 8 illustrates how options can be used to construct unique trading strategies and provide insight into how prices of different kinds of options are linked together in the market. Together with the contents of Chapters 4 to 7, this gives us the valuation basis for thoroughly understanding capital budgeting in Part 3.

4

VALUING BONDS

WHAT COMPANIES DO

FORREST GUMP BONDS

When Forrest Gump uttered the memorable line, 'Life is like a box of chocolates – you never know what you're gonna get', no one could have imagined how the British confectionery company, Hotel Chocolat, would put that notion into practice. Founded as a catalogue company more than 25 years ago, Hotel Chocolat needed £5 million for a major expansion starting in July 2010. That sum was too small to justify the costs of a traditional bond issue. The company could have borrowed the money from a bank, but at the time lending standards were tight, and management did not want to pay the relatively high interest rate that it believed a bank would charge.

Instead, Hotel Chocolat issued its own promissory notes, raising money from its existing customers who were members of its 'Tasting Club'. Club members could purchase a £2,000 note paying 6.72% interest, or a £4,000 note paying 7.29% interest. What made these notes unique was that they did not make interest payments in cash. Instead, investors received a monthly box of chocolates with a

retail value equivalent to the stated interest rate. After three years, investors could redeem the notes and get their original investment back – in cash.

The idea succeeded, with further issues of these bonds with 'payment in kind' attached. By selling these new bonds, Hotel Chocolat went on to use the funds raised to expand its manufacturing and retail operations, fund international expansion, increase employment and further develop Rabot Estate, the firm's cocoa plantation in Saint Lucia. The chocolate bonds were repaid in full at maturity during 2018.

Sources: Bruce Watson, 'Chocolate Bonds Offer a Uniquely Tasty Dividend', *Daily Finance*, 22 July 2010; Dean Best, 'Hotel Chocolat's Chocolate Bond', *Just Food*, 24 May 2010; 'Hotel Chocolat Bonds: Earn 7.33% a Year Interest ... in Chocolate', *MSN News*, 8 June 2014. <http://www.msn.com/en-gb/news/other/hotel-chocolat-bonds-earn-733percent-a-year-interest-in-chocolate/ar-AA5EKKV>. Accessed 12 October 2015; and Ben Chapman, 'Hotel Chocolat Pays Back £6.4m of "Chocolate Bonds" It Sold to Customers', *Independent*, 4 June 2018, <https://www.independent.co.uk/news/business/news/hotel-chocolat-bonds-pay-back-customers-luxury-chocolate-investment-borrowing-interest-a8382156.html>; '£6.4m "Chocolate Bonds" Repaid by Hotel Chocolat', *Insider*, 4 June 2018, <https://www.insidermedia.com/news/central-and-east/6.4m-chocolate-bonds-repaid-by-hotel-chocolat>; both accessed 17 February 2020.

LEARNING OBJECTIVES

After completing this chapter, you should be able to:

- LO4.1 understand applications of the basics of valuation, focusing on the basic valuation formula
- LO4.2 explain how bond prices are determined over different time periods, how they relate to interest rates and how they change
- LO4.3 discuss how bonds differ by issuer and feature
- LO4.4 evaluate how bond markets share information using rating systems
- LO4.5 analyse the term structure of interest rates through yield curves, the preferred habitat theory and liquidity preference models.

Perhaps the most fundamental question in finance is, 'What is it worth?' Finance is all about valuing things. This chapter introduces the key principle that financial analysts use to value financial assets like bonds and shares as well as physical assets such as machinery or entire manufacturing plants. That principle says that the value of any asset equals the present value of future benefits accruing to the asset's owner.

Our primary objective in this chapter is to describe models used to value debt or fixed-income securities, generically called bonds. In the next chapter, we learn about pricing shares. Why do corporate managers need to understand how to price bonds and shares? First, companies must occasionally approach bond and share markets to raise capital for new investments. Understanding how investors in these markets value the company's securities helps managers determine how to finance new projects.

Second, companies periodically make investments by acquiring privately held companies, just as they divest themselves of past investments by selling divisions. In either case, knowing how the market values an enterprise guides a manager's expectations regarding the appropriate price for an acquisition or divestiture.

Further, a company's share price in particular can provide an external, independent performance assessment of top management, one that a diligent board of directors watches closely. Surely managers who will be judged (and compensated) based on the value of their company's share price need to understand the determinants of that price.

Finance theory also suggests that a key objective of corporate management is to maximise the share price by correctly weighing the marginal benefits and costs of alternative actions. How can managers take actions to maximise share prices if they don't know what causes share prices to rise or fall?

This chapter presents an introduction to bonds and bond valuation. We begin by laying out the principles of valuation – principles that can be applied to a wide variety of valuation problems. After that, we describe the essential features of bonds, and show how to apply the principles of valuation to calculate bond prices.

4.1 VALUATION BASICS

The owner of an asset is entitled to the net benefits generated by the asset. These benefits may be tangible, such as the interest payments on bonds (even when they are paid in chocolate!), or intangible, such as the pleasure one experiences when viewing a beautiful painting. Either way, *the value of any asset equals the present value of all its future net benefits*. Finance theory focuses primarily on tangible net benefits, typically measured by the cash flows that an asset pays over time. For instance, a landlord who owns a block of apartments receives a stream of rental payments from tenants. The landlord is also responsible for maintaining the block, paying

taxes and covering other expenses. If the landlord wants to sell the apartment block, what price should he expect to receive? According to our fundamental valuation principle here, the price should equal the present value of all future net cash flows. Investors value financial assets such as bonds and shares in much the same way. First, they estimate how much cash a particular investment distributes over time. Second, investors discount the expected cash payments using the time value of money mathematics we covered in Chapter 3. The investment's value, or its current market price, equals the sum of the present values of all its future cash flows, positive and negative.

This implies that pricing an asset requires knowledge of its current and future net benefits, the time horizons over which those benefits will occur and the appropriate discount rate that converts those benefits into a present value. For some assets, investors know with a high degree of certainty what the future net benefit stream will be. For other investments, the future net benefit stream is much harder to predict. Generally, *the greater the risk or uncertainty surrounding an asset's future net benefits, the higher the discount rate investors will apply when discounting those benefits to the present.*

Consequently, the valuation process links an asset's future benefits and the risk surrounding those benefits to determine its price. Holding future net benefits (net cash flows) constant, an inverse relationship exists between risk and value. If two investments promise identical net cash flows for each of the time periods in the future, investors will pay a higher price for the one with the more credible (less risky) promise. Or, to state that relationship another way, if a risky asset and a safe asset trade at the same price, the risky asset must offer investors higher future returns.

4.1a THE FUNDAMENTAL VALUATION MODEL

Chapters 6 and 7 present an in-depth analysis of the relationship between risk and return. For now, we take as given the market's **required rate of return**, which is the rate of return that investors expect or require a specific investment to earn, given its risk. The riskier the asset, the higher will be the return required by investors in the marketplace. We can also say that the required rate of return on an asset is the return available in the market on another equally risky investment. When someone purchases a specific investment, he or she loses the opportunity to invest their money in another asset. The forgone return on the alternative investment represents an *opportunity cost*.

required rate of return
The rate of return that investors expect or require an investment to earn given its risk

How do investors use this required rate of return to determine the prices of different types of securities? **Equation 4.1** expresses the *fundamental valuation model* mathematically:

$$(Eq. 4.1) \quad P_0 = \frac{CF_1}{(1+r)^1} + \frac{CF_2}{(1+r)^2} + \dots + \frac{CF_n}{(1+r)^n}$$

In this equation, P_0 represents the asset's price today (at time 0), CF_t represents the asset's expected cash flow at time t , and r is the required return – the discount rate that reflects the asset's risk. **Equation 4.1** establishes a price that accounts for the asset's cash flows and the risk associated with those cash flows. The letter n stands for the asset's life, the period over which it distributes cash flows to investors, usually measured in years. As you will see, n may be a finite number, as in the case of a bond that matures in a certain number of years; or it may be infinite, as in the case of an ordinary share with an indefinite life span. In either case, this equation provides us with a vehicle for valuing almost any type of asset.

 **EXAMPLE**
Valuing Leases

Manila Hostels Company entered into a sale-leaseback transaction with real-estate management company Philippines Estate Corporation (PEC). In this type of transaction, one party sells an asset to another and agrees to lease the asset back from the buyer. In this transaction, Manila Hostels sold eight buildings, agreeing to lease them back from PEC for \$960,000 (or \$120,000 per building) per year for 25 years following the deal. Suppose that PEC's required return on this deal is 10%. We can use **Equation 4.1** to calculate the price PEC would be willing to pay today in exchange for lease payments over the next 25 years.¹

$$P_0 = \frac{\$960,000}{(1+0.10)^1} + \frac{\$960,000}{(1+0.10)^2} + \dots + \frac{\$960,000}{(1+0.10)^{25}} \\ = \$8,713,958$$

Remember that **Equation 3.7** provided a mathematical shortcut for solving a problem like this one. The \$960,000 annual payments

represent an annuity, and **Equation 3.7** says that the present value of an ordinary annuity can be found as follows:

$$PV = \frac{PMT}{r} \times \left[1 - \frac{1}{(1+r)^n} \right]$$

Substituting \$960,000 for the annual payment (or cash flow), 10% for the required rate of return and 25 for the number of years, we can calculate the present value (or price) of this stream of payments:

$$P_0 = \frac{\$960,000}{0.10} \times \left[1 - \frac{1}{(1+0.10)^{25}} \right] = \$9,600,000 \\ \times \left[1 - \frac{1}{10.8347} \right] = \$8,713,958$$

The lease payments are worth more than \$8.7 million to PEC. Note that this positive figure means that the investment is earning more than 10% for PEC.

With this simple framework in hand, we turn to the problem of pricing bonds. Though bond-pricing techniques can get very complex, we focus on 'plain-vanilla' bonds: those that promise a fixed stream of cash payments over a finite time period. Among the largest issuers of such fixed-income securities are national governments and large, multinational corporations.

LO4.1 **CONCEPT REVIEW QUESTIONS**

- 1 Why is it important for corporate managers to understand how bonds and shares are priced?
- 2 Holding constant an asset's future benefit stream, what happens to the asset's price if its risk increases?
- 3 Holding constant an asset's risk, what happens to the asset's price if its future benefit stream increases?
- 4 Discuss how one might use **Equation 4.1** to determine the price per hectare of rural land.

¹ We can use Excel to solve for the present value of 25 annual lease payments by using the PV (present value) function. The correct syntax for this example is =pv(0.10,25,-960000,0,0).

LO4.2

4.2 BOND PRICES AND INTEREST RATES

Bonds are very important financial interests in the capital markets, allowing companies to borrow, as well as lenders to sell their loans if they need to liquidate their investments. Bonds are also very ancient as financial instruments – dating back almost to Sumerian times (around 3,000 BCE) in some forms – so they have acquired a special vocabulary to describe their elements. The next section provides a guide to the special terms for bonds; we then examine the intricacies of finding out how to value bonds in later sections of 4.2.

4.2a BOND VOCABULARY

Fundamentally, a bond is a loan. Unlike car loans and home mortgages, which require borrowers to make regular payments including both an interest component and some repayment of the original loan amount or *principal*, bonds make interest-only payments until they mature. On the **maturity date**, a bond's life formally ends, and both the final interest payment and the original principal amount are paid to investors. For Australian or New Zealand corporate bonds, the *principal value* of a bond, also known as the bond's **face value** or *par value*, is typically \$100 in local currency. This conventional face value of corporate bonds in Australia and New Zealand is smaller than the conventional face value of \$1,000 in the US or Singapore, or for multinational companies issuing bonds on international capital markets. In the UK, the conventional face value of a corporate bond is £100. The smaller scale of the Australian and New Zealand corporate bond markets, and the relatively smaller investor size, explains the smaller face value compared with that of US, Singapore or UK bonds. Of course, the formulae used for bond valuation are the same regardless of the face value.

Although bonds come in many varieties, most bonds share certain basic characteristics. First, many bonds promise to pay investors a fixed amount of interest, called the bond's **coupon**.² Most Australian or Singapore corporate bonds make coupon payments every six months, or semiannually; state and federal government bonds usually pay quarterly. International bonds tend to pay annually because of the additional effort involved in contacting and paying investors scattered around the globe. Because a bond's cash flows are contractually fixed, traders often refer to bonds as *fixed-income securities*. The legal contract between the borrower who issues bonds and the investors who buy them, called the bond **indenture**, specifies the dollar amount of the coupon and when the borrower must make coupon payments. A bond's **coupon rate** equals its annual coupon payment divided by its par value. A bond's **coupon yield** (or *current yield*) equals the coupon divided by the bond's current market price (which does not always equal its par value).

To illustrate, suppose that a government entity or a company issues a bond with a \$100 face value and promises to pay investors \$3.50 every six months until maturity. Then this bond's **coupon** is \$7 per year, and its **coupon rate** is 7% ($\$7 \div \100). If the current market value of this bond is \$98, then its **coupon (current) yield** is 7.14% ($\$7 \div \98).

Bonds can have a variety of additional features, such as a *call feature* that allows the issuer to redeem the bond at a predetermined price prior to maturity, or a *conversion feature* that grants bondholders the right to redeem their bonds for a predetermined number of shares of equity in the borrowing company. Chapter 14 discusses these and other features in detail. For now, we focus our attention on pricing ordinary bonds. We will begin with the basic bond valuation equation, then describe its application to risk-free and risky bonds.

maturity date
The date when a bond's life ends and the borrower must make the final interest payment and repay the principal

face value (bonds)
The nominal value of a bond, which the borrower repays at maturity

coupon
The periodic interest payment that a bond pays to investors

indenture
A legal contract between the borrower (issuer) and investor stating the conditions under which a bond has been issued

coupon rate
The rate derived by dividing the bond's annual coupon payment by its face value

coupon yield
The amount obtained by dividing the bond's coupon by its current market price (which does not always equal its face value). Also called *current yield*

² Historically, bond certificates were printed with coupons attached that the bondholder would literally clip and mail in to receive an interest payment. That is the origin of the term 'coupon'. Not all bonds make fixed coupon payments. Some bonds pay variable coupons that are tied to an underlying interest rate (such as the rate on Australian government Treasury bonds) or to the rate of inflation.

4.2b THE BASIC EQUATION (ASSUMING ANNUAL INTEREST)

We can value ordinary bonds by developing a simplified version of [Equation 4.1](#). With annual interest, remember that a bond makes a fixed coupon payment each year. Assume that the bond makes annual coupon payments of $\$C$ for n years, and at maturity the bond makes its final coupon payment and returns the par value, $\$M$, to investors. (We will deal with the more common occurrence of semiannual coupon payments shortly.) Using these assumptions, we can replace [Equation 4.1](#) with the following:

$$(Eq. 4.2) \quad P_0 = \frac{C}{(1+r)^1} + \frac{C}{(1+r)^2} + \dots + \frac{C}{(1+r)^n} + \frac{M}{(1+r)^n}$$

[Equation 4.2](#) says that the *bond's price* equals the present value of an n -year ordinary annuity plus the present value of the lump-sum principal payment.

$$\text{Price} = PV \text{ of annuity} + PV \text{ of lump sum}$$

The annuity consists of a stream of coupon payments, and the lump sum is the bond's principal or face value. The bond's price is simply the sum of the present values of these two components:

$$\text{Price} = PV \text{ of coupons} + PV \text{ of principal}$$

Next, we modify the bond-pricing equation once more, borrowing from [Equation 3.7](#) to highlight that the price equals the sum of the present value of an annuity and the present value of a lump-sum payment at maturity.

$$(Eq. 4.2a) \quad P_0 = \frac{C}{r} \times \left[1 - \frac{1}{(1+r)^n} \right] + \frac{M}{(1+r)^n}$$

EXAMPLE

Valuing Bonds

On 1 January 2020, Platypus United had a bond outstanding with a coupon rate of 9.125% and a face value of \$1,000. At the end of each year, this bond pays investors \$91.25 in interest ($0.09125 \times \$1,000$), and it matures at the end of 2030. [Figure 4.1](#) illustrates the sequence of cash flows that the bond promises investors over time. Notice that we break up the bond's cash payments into two separate components. The first component is an 11-year annuity of \$91.25 annual payments. The second component is a lump-sum payment of \$1,000 at maturity.

To calculate the price of this bond, we need to know what rate of return investors demand on bonds that are as risky as Platypus' bonds. Assume that the market currently requires an 8% return on these bonds. Substituting the required

return and the payments into [Equation 4.2](#), we can express the current price of this bond as follows:

$$\begin{aligned} \text{Price} &= \frac{\$91.25}{(1.08)^1} + \frac{\$91.25}{(1.08)^2} + \frac{\$91.25}{(1.08)^3} + \dots \\ &\quad + \frac{\$91.25}{(1.08)^{11}} + \frac{\$1,000}{(1.08)^{11}} = \$1,080.31 \end{aligned}$$

[Figure 4.1](#) shows that the present value of the 11-year coupon stream is \$651.43, and the present value of the principal repayment is \$428.88. That gives a combined bond value of \$1,080.31, as shown below.

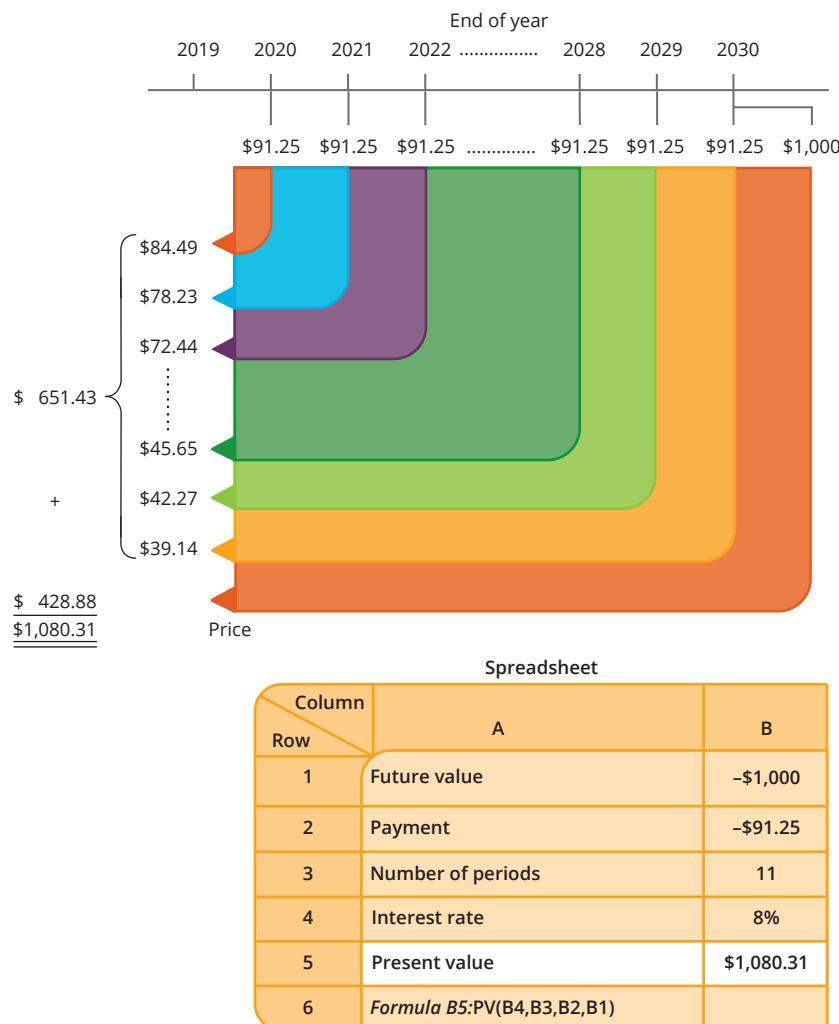
$$PV \text{ of coupons} = \left(\frac{\$91.25}{0.08} \right) \times \left[1 - \left(\frac{1}{1.08^{11}} \right) \right] = \$651.43$$

$$PV \text{ of principal} = \frac{\$1,000}{1.08^{11}} = \$428.88$$

$$\text{Price of bond} = \$651.43 + \$428.88 = \$1,080.31$$

FIGURE 4.1 TIME LINE FOR BOND VALUATION (ASSUMING ANNUAL INTEREST PAYMENTS)

Platypus United 9.125% coupon, \$1,000 face value bond, maturing at end of 2030; required return equals 8%



EXAMPLE

To calculate this value in Excel, once again we use the PV function, entering 0.08 for the rate, 11 for the number of periods, -91.25 for the payments, and -1,000 for the future value. (In this Excel function, the 'future value' argument simply refers

to any payment, above and beyond the regular annuity cash flow, coming at the very end of the final period.) By entering the coupon payments and the principal repayment as negative values, we will obtain a positive value for the bond's price.

$$=PV(0.08,11,-91.25,-1000) = 1,080.31$$

Notice that this bond sells *above* face value because the price, \$1,080.31, is greater than the \$1,000 face or par value. When a bond sells for more than its face value, we say that the bond trades at a **premium**. Why are Platypus' bonds trading at a premium? By assumption, the market's required return on an investment like this is just 8%, but Platypus' bonds offer a coupon rate of 9.125%. Therefore, if Platypus' bonds sold at their

premium

A bond trades at a premium when its market price exceeds its face or par value

face value, they would offer investors a particularly attractive return, and investors would rush to buy them. As more and more investors purchase Platypus bonds, the market price of those bonds rises.

Think about the return that an investor earns if she purchases Platypus bonds today for \$1,080.31 and holds them to maturity. Every year, the investor receives a \$91.25 cash payment. At the current market price, this represents a coupon yield of about 8.4% ($\$91.25 \div \$1,080.31$), noticeably above the 8% required return in the market. However, when the bonds mature, the investor receives a final interest payment plus the \$1,000 face value. In a sense, this bond has a built-in loss of \$80.31 (\$1,000 face value – \$1,080.31 purchase price) at maturity because the bond's principal is less than the current price of the bond. The net effect of receiving an above-market return on the coupon payment and realising a loss at maturity is that the investor's overall return on this bond is exactly 8%, equal to the market's required return.

yield to maturity (YTM)

The discount rate that equates the present value of the bond's cash flows to its market price

discount

A bond trades at a discount when its market price is less than its face value

In the example above, 8% is the required rate of return on the bond in the market, also called the bond's **yield to maturity (YTM)**. The YTM is simply the discount rate that equates the present value of a bond's future cash flows to its current market price.³ As a general rule, when a bond's coupon rate exceeds its YTM, the bond will trade at a premium, as Platypus' bonds do. Conversely, if the coupon rate falls short of the YTM, the bond will sell at a **discount** to face value.

EXAMPLE

Revaluing Bonds

Suppose the market's required return on Platypus bonds is 10% rather than 8%. In that case, the price of the bonds would be determined using this equation:

$$P_0 = \frac{\$91.25}{(1+0.10)^1} + \frac{\$91.25}{(1+0.10)^2} + \frac{\$91.25}{(1+0.10)^3} + \dots + \frac{\$91.25}{(1+0.10)^{11}} + \frac{\$1,000}{(1+0.10)^{11}}$$

Breaking this calculation into the annuity and lump sum components, we have:

$$\text{PV of coupons} = \left(\frac{\$91.25}{0.10} \right) \times \left[1 - \left(\frac{1}{1.10^{11}} \right) \right] = \$592.68$$

$$\text{PV of principal} = \left(\frac{\$1,000}{1.10^{11}} \right) = \$350.49$$

$$\text{Price of bond} = \$592.68 + \$350.49 = \$943.17$$

We could replicate the bond-price calculation in Excel by entering = PV(0.10,11,-91.25,-1000,0) to obtain \$943.17.

In this case, the bonds trade at a discount because each month investors receive a coupon yield of about 9.7% ($\$91.25 \div \943.17), a little less than the required rate of 10%. Offsetting that, the bond has a built-in gain at maturity of \$56.83 (\$1,000 face value – \$943.17 purchase price). The net effect of the below-market coupon payments and the gain at maturity is that investors who buy and hold this bond earn a yield to maturity of exactly 10%.

EXAMPLE

Valuing Bonds with Excel

Rotorua Enterprises has an outstanding bond issue that pays a 6% annual coupon, has a \$1,000 face value and matures in five years. The current market value of one Rotorua bond is \$1,021.35. What yield to maturity do these bonds offer investors?

Because the bond sells at a premium, we can infer that the yield to maturity is less than the bond's coupon rate. We can use Excel to calculate the answer very quickly, but let's try a trial-and-error approach first, to strengthen our intuition about the relationship between a bond's price

³ The holding period yield is a similar measure of return used by investors to measure the realised return on a bond that is sold before its maturity date. It represents the compound annual return earned by the investor over the holding period for the bond. The calculation of the holding period yield is the same as that for yield to maturity, except that the actual holding period and sale price are substituted into Equation 4.2 for years to maturity (n) and the maturity value (M), respectively.



and its YTM. We will start by determining the bond's value if it offers a YTM of 5%. At that rate, the price of the bond would be the following:

$$PV \text{ of coupons} = \left(\frac{\$60}{0.05} \right) \times \left[1 - \frac{1}{(1.05)^5} \right] = \$259.77$$

$$PV \text{ of principal} = \frac{\$1,000}{(1.05)^5} = \$783.53$$

$$\text{Price of bond} = \$259.77 + \$783.53 = \$1,043.30$$

Our initial guess of 5% produces a price that exceeds the market price of Rotorua's bond. Because we initially calculated a price that is too high, we need to try again using a higher YTM. Discounting the bond's cash flows at a higher YTM results in a lower price. Suppose the YTM equals 5.5%. Now we have:

$$PV \text{ of coupons} = \left(\frac{\$60}{0.055} \right) \times \left[1 - \frac{1}{(1.055)^5} \right] = \$256.22$$

$$PV \text{ of principal} = \frac{\$1,000}{(1.055)^5} = \$765.13$$

$$\text{Price of bond} = \$256.22 + \$765.13 = \$1,021.35$$

The YTM equals 5.5%, because that is the discount rate that equates the present value of the bond's cash flows with its current market price. In Excel, you can find a bond's yield to

maturity by using the IRR (internal rate of return) function. The spreadsheet information is given below, with the coupon payments identified for each period they occur, as well as the return of principal in period 6.

To calculate the yield to maturity using this function, simply enter the bond's market price as a negative number and its cash flows as positive numbers, as shown below. Then type the IRR function and highlight the cells containing the values. Be sure that the cell in which you type the IRR function is formatted to show the answer to several decimal places.

Spreadsheet

Column	A	B
Row		
1	Price	-1021.35
2	Coupon	60
3	Coupon	60
4	Coupon	60
5	Coupon	60
6	Coupon + Principal	1060
7	IRR	5.50%
8	Formula B7:=IRR(B1:B6)	

4.2c SEMIANNUAL COMPOUNDING

Many bonds make two interest payments per year rather than one, and some pay even more frequently. Adjusting our *bond-pricing* framework to handle, for example, *semiannual interest payments* is easy. A bond paying semiannual interest has twice as many coupon payments, but each payment is half as much compared to the bond with annual payments. If the bond matures in n years and the annual coupon equals $\$C$, then the bond now makes $2n$ payments equal to $\$C/2$. Similarly, if the bond's annual yield to maturity equals r , we replace that with a semiannual yield of $r/2$. This produces a modified version of [Equation 4.2](#):⁴

(Eq. 4.3)

$$P_0 = \frac{C/2}{\left[1 + \frac{r}{2}\right]^1} + \frac{C/2}{\left[1 + \frac{r}{2}\right]^2} + \dots + \frac{C/2}{\left[1 + \frac{r}{2}\right]^{2n}} + \frac{M}{\left[1 + \frac{r}{2}\right]^{2n}}$$

A slightly modified version of [Equation 3.7](#) expresses the equation above as a sum of the present value of an ordinary annuity and the present value of a lump sum:

(Eq. 4.3a)

$$P_0 = \frac{C/2}{\frac{r}{2}} \times \left[1 - \frac{1}{\left(1 + \frac{r}{2}\right)^{2n}} \right] + \frac{M}{\left(1 + \frac{r}{2}\right)^{2n}}$$

4 The yield to maturity on a bond is typically quoted like an annual percentage rate. That is, the bond's annual YTM equals the semiannual yield times 2. This implies that the effective annual YTM is slightly above the quoted YTM.

► EXAMPLE

More Bond Valuation

Peterson Fishing Pty Ltd issues a three-year \$1,000 face value bond that offers a 6% coupon rate paid semiannually. This means that the annual coupon equals \$60, and there are two \$30 payments each year. Suppose that 6% per year is also the market's required return on Peterson bonds. The market price of the bond equals:

$$PV \text{ of coupons} = \left(\frac{\$30}{0.03} \right) \times 1 - \frac{1}{(1.03)^6} = \$162.52$$

$$PV \text{ of principal} = \frac{\$1,000}{(1.03)^6} = \$837.48$$

$$\text{Price of bond} = \$162.52 + \$837.48 = \$1,000$$

In Excel, the solution is the same as with annual payments, except that the rate and the size of the payment are cut in half, and the number of periods doubles. To calculate the price of Peterson's bonds in Excel, simply type = PV(0.03/2, 6, -30, -1000, 0).

Because this bond offers investors a return exactly equal to the required rate in the market, the bond sells at par value.⁵

FINANCE IN THE REAL WORLD



HOW MUCH HOUSE CAN YOU AFFORD?

Before they begin their home search, most homebuyers, particularly first-time buyers, need to estimate how expensive a home they can afford. Many lenders require that the monthly mortgage payment plus monthly payments for property taxes and homeowner insurance cannot exceed a given percentage of the borrower's monthly gross income. As a first homebuyer, you would also like to make a deposit (down payment) equal to at least 20% of your home's value. To keep things simple, we will assume that there are no closing costs, that loan payments are made at the *end* of each month, that all the monthly payments must be less than 28% of monthly income and that you have made the following estimates of the relevant values.

Monthly gross income (annual income \$87,500 ÷ 12)	\$7,292
Estimated monthly property taxes and insurance	\$300
Approximate average monthly interest rate on mortgage loan (annual rate 7.00% ÷ 12)	0.58333%
Planned term of mortgage	360 months
Deposit	20% of purchase price
Funds available for making deposit	\$50,000

Using your estimates, we can calculate how expensive a home you can currently afford. Remember, the amount that you borrow must equal the present value of the loan payments that you will make over the next 30 years (360 months), and the value of the home that you buy must equal the sum of your deposit and your mortgage.

$$\text{Maximum allowable monthly housing expense} = 0.28 \times \$7,292 = \$2,042$$

$$\begin{aligned}\text{Maximum monthly loan payment} &= \text{housing expense} - \text{taxes and insurance} \\ &= \$2,042 - \$300 = \$1,742\end{aligned}$$

⁵ Notice, too, that the *effective annual yield* on this bond is slightly higher than the 6% coupon rate. If the semiannual yield is 3%, the effective annual yield equals 6.09% ($(1.03^2 - 1)$).



[Using Eq. 3.7]

$$\begin{aligned}\text{Maximum loan amount} &= PV \text{ of 360 monthly payments of } \$1,742 \\ &= (\$1,742 \div 0.0058333) \times [1 - (1 \div 1.0058333^{360})] \\ &= \$298,630 \times 0.87679 \\ &= \$261,836\end{aligned}$$

- 1 Maximum purchase price based on monthly income = \$261,836 + \$50,000 = \$311,836
- 2 Maximum purchase price based on deposit = \$50,000 ÷ 0.20 = \$250,000

The maximum purchase price is the lower of 1 and 2 above. Although your assumed income would support a \$261,836 mortgage, resulting in a maximum purchase price of about \$311,836, you only have enough funds for a deposit on a \$250,000 home. Therefore, with the given values, you can afford a \$250,000 home.

Again, we emphasise the fundamental lesson: *the price of a bond equals the present value of its future cash flows*. We now turn to a more in-depth development of the concepts underlying bond valuation, starting with a discussion of interest rate risk.

4.2d BOND PRICES AND INTEREST RATES

A bond's market price changes frequently as time passes. Whether a bond sells at a discount or a premium, its price will converge to face value (plus the final interest payment) as the maturity date draws near. Imagine a bond that matures one day from now. The bond's final cash flow consists of its face value plus the last coupon payment. If this payment arrives just one day in the future, you determine the bond's price by discounting this payment for one day. Therefore, the price and the final payment are virtually identical.

Interest Rate Risk

Between the time that a bond is issued and when it matures, a variety of economic forces can change its price, but the most important factor is the prevailing market interest rate. In turn, the market interest rate may change as a result of numerous macroeconomic factors such as alterations to the money supply, inflation expectations and real growth of the economy.

When the market's required return on a bond changes, the bond's price changes in the opposite direction. The higher the bond's required return, the lower its price, and vice-versa. **Interest rate risk** is the risk resulting from changes in market interest rates causing changes in bond prices. How much a bond's price responds to changes in required returns (and, therefore, how much interest rate risk is associated with a particular bond) depends on several factors, especially the bond's maturity.

Figure 4.2 shows how the prices of two bonds change as their required returns change. Both bonds pay a 6% coupon, but one matures in two years, whereas the other matures in 10 years. As the figure shows, when the required return equals the coupon rate, 6%, both bonds trade at their face values. However, as the required return increases, the bonds' prices fall. The decline in the 10-year bond's price exceeds that of the two-year bond. Likewise, as the required return decreases, the prices of both bonds increase. But the 10-year bond's price increases faster than does that of the two-year bond. The general lessons are: (1) *bond prices and interest rates move in opposite directions*; and (2) *the prices of long-term bonds display greater sensitivity to changes in interest rates than do the prices of short-term bonds*.⁶

interest rate risk
The risk resulting from changes in market interest rates causing fluctuations in a bond's price. Also, the risk of suffering losses as a result of unanticipated changes in market interest rates

⁶ Another, more technical factor affecting the bond price changes in response to changes in interest rates is the magnitude of the coupon rate. All else being equal, the value of a bond with a lower coupon rate will be more responsive to changes in interest rates than will a bond with a higher coupon rate. This occurs because a given change in interest rates – say, 1% – would represent a greater percentage rate change for a low coupon bond (for example, 16.7% [1%/6%] change for a 6% coupon bond) than for a higher coupon bond (for example, 12.5% [1%/8%] change for an 8% coupon bond).

Forces Driving Interest Rate Risk

Figure 4.2 illustrates the importance of interest rate risk – the risk that results from changes in market interest rates moving bond prices. **Figure 4.3** shows just how volatile interest rates have been in Australia. The graph shows the historical YTM on 10-year Australian government bonds for the period 1970–2018.⁷ The yields offered by these bonds reached high points over 15% in the early 1980s, then fell almost to 1% by the end of 2018. The point of the graph is simple: because interest rates fluctuate widely, investors must be cognisant of the interest rate risk inherent in these instruments.

FIGURE 4.2 THE RELATIONSHIP BETWEEN BOND PRICES AND REQUIRED RETURNS FOR BONDS WITH DIFFERENT TIMES TO MATURITY BUT THE SAME 6% COUPON RATE

Bond prices move in the opposite direction of market interest rates. This figure shows that the prices of two-year and 10-year bonds fall as the required return rises (and vice-versa), but the magnitude of this effect is much greater for the 10-year bond. Typically, long-term bond prices are much more sensitive to rate changes than are short-term bond prices.

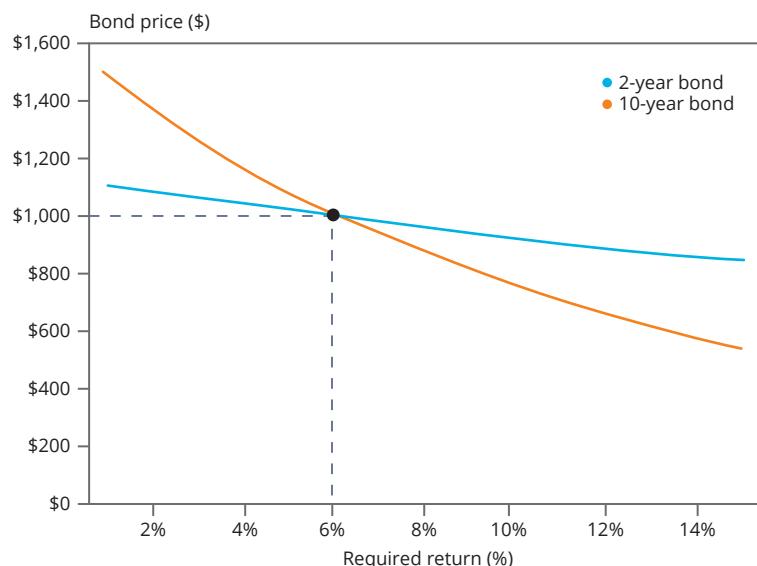
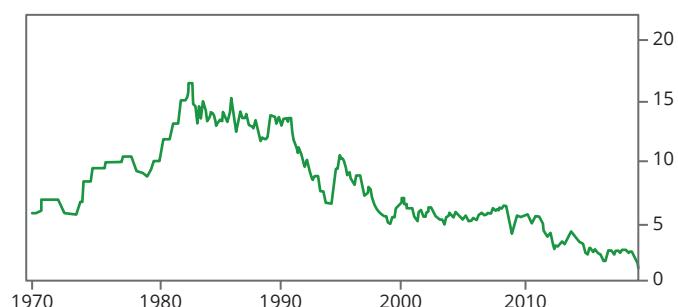


FIGURE 4.3 AUSTRALIAN GOVERNMENT BOND YIELDS 1970–2018

This figure shows how volatile interest rates have been over time. The line shows the yield to maturity on a 10-year Treasury bond. Because changes in interest rates cause bond prices to fluctuate, bond investors must be aware of interest rate risk.



Source: Based on Treasury data.

⁷ <http://tradingeconomics.com/australia/government-bond-yield>

Inflation and Interest Rates

One of the main factors causing interest rate movements is inflation, which is a rise in the prices of goods and services. When investors buy financial assets, they expect these investments to provide a return that exceeds the inflation rate. This is important because people want a better standard of living from saving and investing their money. If asset returns keep up only with inflation, then investors are not better off for investing their funds. To illustrate, say you want to expand your gizmo collection. You have \$150 to spend, and each gizmo costs \$15, so you can purchase 10 new gizmos. Or suppose you save your money and invest it in an asset earning a 10% return. You reason that after one year, you will have \$165 ($\150×1.10), and with that you can buy 11 gizmos rather than 10. But imagine that, while your money is invested, the price of gizmos increases by 10%, from \$15 to \$16.50. Thus, at the end of the year, your \$165 enables you to purchase just 10 gizmos – exactly what you could have purchased a year earlier. In real terms, you are no better off at the end of the year than you were at the start.

The lesson is that bond yields must offer investors a positive **real return**. The real return on an investment plus the inflation rate *approximately* equals the stated or **nominal return**. Mathematically, if r equals the nominal interest rate, i equals the inflation rate and r_{real} equals the real rate, the *nominal interest rate formula* is:

(Eq. 4.4)

$$(1+r) = (1+i)(1+r_{real}) \\ r = i + r_{real} + i \times r_{real}$$

Notice that the last term in the previous equation is the product of the inflation rate and the real interest rate. When both of these rates are relatively low, their product is very small, so we often ignore that term and simply express the nominal interest rate as (approximately) the sum of the inflation rate and the real interest rate:

(Eq. 4.4a)

$$r \approx i + r_{real}$$

In the gizmo example, the nominal rate of return on your investment is 10%, but so is the inflation rate, so the investment's real return is zero. To earn a positive real return, the nominal return on the investment would need to be greater than 10%.

real return

The inflation-adjusted return; approximately equal to the difference between an investment's stated or nominal return and the inflation rate

nominal return

The stated return offered by an investment; includes the real return plus any additional return due to expected inflation

EXAMPLE

Real Interest Rates

The approximation in **Equation 4.4** is relatively accurate as long as neither the real rate nor the inflation rate is very high. For example, in the second quarter of 2014, the nominal interest rate on government bonds in Spain was about 2.75%, and the rate of inflation averaged about 0.25%. Substitute these values into **Equation 4.4** and solve for the real interest rate:

$$(1 + 0.0275) = (1 + 0.0025)(1 + r_{real})$$

$$r_{real} = 0.0249 \text{ or } 2.49\%$$

This is almost exactly equal to the approximate value for the real rate obtained from **Equation 4.4a**:

$$0.0275 = 0.0025 + r_{real}$$

$$r_{real} = 0.0250 \text{ or } 2.50\%$$

Now consider the situation in India, where the inflation rate stood around 6.5% on average in 2014. Suppose an investment in India offered a nominal return of 9%, so the approximate real return from **Equation 4.4a** would be 2.50%, the same real return offered on Spanish bonds at the time:

$$0.09 = 0.0650 + r_{real}$$

$$r_{real} = 0.0250 \text{ or } 2.50\%$$

However, if we use **Equation 4.4** to find the exact value of the real interest rate, we find that



the approximation in Equation 4.4a overstates the real rate by more than two-thirds of a percentage point:

$$(1 + 0.09) = (1 + 0.065)(1 + r_{real})$$

$$r_{real} = 0.0235 \text{ or } 2.35\%$$

In most cases, **Equation 4.4a** provides a reasonably close approximation for the real rate of return, but be aware that the quality of that approximation declines as the inflation rate or the real interest rate rises.

Consider **Figure 4.4**. The bars plot the quarter-by-quarter annual rates of inflation for Australia from 1951 to 2018. The graph shows that inflation rates were high in 1980, at the same time that nominal interest rates were high, as shown in **Figure 4.3**. Over the past two decades, as the inflation rate gradually fell, so too did interest rates. Bonds are generally priced to offer a positive real return, so nominal interest rates are high when inflation is high – as was the case around 1975 – and rates are low when inflation is low.

FIGURE 4.4 AUSTRALIAN INFLATION RATE



Source: Based on Australian Bureau of Statistics data.

Expected Inflation and Real Interest Rates

Figures 4.3 and **4.4** clearly show a connection between interest rates and the inflation rate; but the correlation is not 100%. For example, during the period 2000–2002, the Australian inflation rate suddenly rose, then fell abruptly, while the nominal bond rate moved in a very limited range, mostly downward. If inflation was very volatile during this period, why did interest rates not move directly in concert?

There are at least two possible answers. First, when investors decide whether they want to purchase a bond that offers a particular interest rate, what matters to them is not what the past inflation rate *has been*, but rather what the inflation rate *will be* over the bond's life. To determine whether the nominal rate of return on a bond is high enough to provide a reasonable real return, investors must estimate how much inflation they *expect* in the future. Even if inflation in the recent past has been volatile, bond yields may not move greatly if investors expect inflation to settle down (perhaps due to monetary policy action to contain the inflation).

A reason that interest rates may change even when inflation remains unchanged is that the real return required by investors may change. If the real rate falls while inflation (or expected inflation) remains steady, bond yields will decrease. The real return required by investors may fluctuate with the overall state of the economy as investors' willingness to accept risk changes.

EXAMPLE

Nominal Bond Yields

Suppose it is late 2019, and with the economy in the doldrums, most investors expect very low inflation, perhaps 1% per year. Still-cautious investors are willing to buy government bonds as long as they offer a real return of 2%, so using **Equation 4.4a**, we would expect nominal government bond yields to be approximately 3% (1% inflation + 2% real return).

Imagine that by 2020 the economy is growing rapidly again. Investors still expect just 1% inflation, but now their investment alternatives are much more attractive, and they will only hold government bonds if they offer a real return of 4%. Under these conditions, the nominal yield on government bonds must rise to approximately 5% (1% inflation + 4% real return).

Changes in Issuer Risk

When macroeconomic factors change, yields may change simultaneously on a wide range of bonds. But the market's required return on a particular bond can also change because the market reassesses the borrower's **default risk**, the risk that the issuer may not make all scheduled payments. For example, if investors perceive that a certain bond issuer is experiencing financial problems that could make it difficult for it to repay its debts, the required return will increase and the price of the issuer's bonds will fall. Conversely, when the market is more optimistic about a bond issuer's financial health, the required return will fall and the issuer's outstanding bonds will increase in value.

default risk
The risk that the bond issuer may not make all scheduled payments

EXAMPLE

Asian Regional Bond Markets

Although a number of key economies in east Asia suffered a sudden decline in economic prospects in the late 1990s, recovery was soon established and 20 years on there was clear evidence of long-term growth and improvement. This was reflected in the local bond markets. An Asian Development Bank press release in mid-2019 provided cautious reporting of economic success as expressed in the local currency bond markets:

MANILA, PHILIPPINES (19 June 2019) – The local currency bond markets in emerging east Asia continued to expand over the first quarter of 2019 despite trade conflicts and moderating global growth, according to the Asian Development Bank's (ADB) latest issue of the *Asia Bond Monitor*. Housing bonds and green bonds are potential areas of future growth, the quarterly report said.

'The region's bond markets are holding firm but the risks are still to the downside,' said ADB Chief Economist Mr Yasuyuki Sawada. 'That said, we see potential in the

development of housing bonds to finance growing demand for homes as countries urbanize and for green bonds to fund clean energy and other climate-friendly projects.'

At the end of March, there were \$15 trillion in local currency bonds outstanding in emerging east Asia, 2.9% more than at the end of 2018 and 14.0% more than at the end of March 2018. Bond issuance in the region, meanwhile, amounted to \$1.4 trillion in the first quarter, 10.0% higher than in the last quarter of 2018 on the back of stronger issuance of government debt.

Emerging east Asia comprises the People's Republic of China (PRC); Hong Kong, China; Indonesia; the Republic of Korea; Malaysia; the Philippines; Singapore; Thailand; and Viet Nam [sic].

Foreign investors were upbeat on the PRC in the first quarter of 2019 due



to a better-than-expected economic performance. Indonesia also enjoyed greater foreign investment but foreign holdings in the Philippines took a hit as

investors cashed out profits. Uncertainty over the general election spurred a wait-and-see approach among foreign investors in Thailand.

Source: Asian Development Bank, News Release, 19 June 2019, <https://www.adb.org/news/asia-bond-market-expanding-housing-bonds-green-bonds-are-potential-growth-areas>.

You might argue that this entire discussion is irrelevant if an investor holds a bond to maturity. If a bond is held to maturity, there is a good chance that the investor will receive all interest and principal payments as promised, so any price decrease (or increase) that occurs between the purchase date and the maturity date is just a ‘paper loss’. Though the tax code may ignore investment gains and losses until investors realise them, financial economists argue that losses matter, whether investors realise them by selling assets or whether the losses exist only on paper.

LO4.2

CONCEPT REVIEW QUESTIONS

- 5 How is a bond's coupon rate different from its coupon (current) yield?
- 6 In general, when will a bond sell at a discount?
- 7 Explain the meaning of the term interest rate risk.
- 8 Why do bond prices and bond yields move in opposite directions?

LO4.3

4.3 TYPES OF BONDS

The variety of bonds trading in modern financial markets is truly remarkable. In this section, we offer a brief description of the most common types of bonds available today. Many investors see bonds as a rather unexciting investment that provides a steady, predictable stream of income. That description fits some bonds reasonably well, but many bonds are designed with exotic features that make their returns as volatile and unpredictable as ordinary shares.

Bond trading occurs in either the primary or secondary market. *Primary market* trading refers to the initial sale of bonds by companies or government entities. Primary market trading varies depending on the type of bond being considered. For example, the Australian government sells its Commonwealth Government bonds through an auction process operated by the Australian Office of Financial Management (AOFM). Most bonds sold at these auctions go to a relatively small group – about 18 organisations – of authorised government bond dealers or ‘registered bidders’. Individual investors can buy or sell Australian government bonds through the Australian Securities Exchange (ASX). These are known as ‘exchange-traded Treasury Bonds’ or eTBs, and are traded on the ASX as one would buy and sell shares. The dominant dealers in the Australian bond market are associated with the ‘big four’ banks (ANZ, Commonwealth, NAB and Westpac) and large overseas banks.

State governments also issue bonds in Australia: these are usually called ‘semi-government bonds’, and the funds raised are used for state government infrastructure projects (about two-thirds of the funds raised) and operational spending. At the end of 2019, the total of long-term and short-term semi-government bonds was over \$260 billion.⁸ Queensland and New South Wales were the largest issuers of semi-government bonds at this time.

8 <https://www.rba.gov.au/chart-pack/bond-issuance.html>. Accessed 8 July 2019.

In New Zealand, government bonds are sold to registered tender counterparties, who may on-sell them to individuals, but such sales must be recorded in government databases.

In Singapore, government bonds are issued directly to the private investing market. They are tax exempt for income earned by individuals, and there is no capital gains tax imposed. Maturities range from two to 30 years, and the bonds are all AAA-rated.

When corporations and state government bodies issue bonds in the primary market, they do so with the help of *investment bankers*. Investment bankers assist bond issuers with the design, marketing and distribution of new bond issues.

Once bonds are issued in the primary market, investors trade them with each other in the *secondary market*. However, many bonds issued in the primary market are purchased by institutional investors who hold the bonds for a long time. As a result, secondary market trading in bonds can be somewhat limited. For instance, if the Commonwealth Bank in Australia raises money by conducting a new bond offering, it is likely that its bonds will not trade as actively as Commonwealth Bank ordinary shares do. Although some specific bond issues do not trade a great deal once they are issued, the sheer size of the global bond market means that investors interested in adding bonds to their portfolio have a wide range of choices. We now turn to an overview of the choices available to bond investors. There are several ways to structure an overview of the bond market, beginning with the types of bond issuers.

4.3a BY ISSUER

Bonds come in many varieties and are classified in different ways. Perhaps the simplest classification scheme puts bonds into categories based upon the identity of the issuer. Large non-financial companies that need money to finance new investments and to fulfil other needs issue **corporate bonds**. Corporations issue bonds with maturities ranging from one to 100 years. When a company issues a debt instrument with a maturity of one to three years, that instrument is usually called a *note* rather than a bond; but notes and bonds are essentially identical instruments. Up until about 2000, the Australian corporate bond market was relatively small in comparison with the state and federal government bond markets mentioned in section 4.2d. Since then, the financial and non-financial corporate bond market in Australia has grown very rapidly. It had nearly \$600 billion of bonds on issue in the early months of 2019.⁹

corporate bonds
Bonds issued by corporations

In New Zealand, the corporate bond market is dominated by bond issues from banks and from utilities such as energy companies, airports and NZ Post. New Zealand's government bond market – based on the national government – is relatively larger than the corporate bond market, echoing the pattern in Australia.

The Australian federal and state governments significantly increased their bond issues from 2008. This was a fundraising measure in response to the global financial crisis, which ran from mid-2007. The governments adopted policies requiring significantly higher levels of spending in order to support aggregate demand in the economy, which had fallen because of the sudden decline of spending by the private sector in response to considerable reductions of Australian bank lending at that time. Although the apparent requirement for cash to buttress the Australian economy during the crisis diminished after 2010, the level of bond issues by all Australian governments has continued at a strong rate.

Another class of bond issuer has emerged in recent years: 'green bond' issuers. Issuers have included governments, private-sector investors and supranational entities such as the World Bank. A green bond, or climate bond, is a bond specifically designed to raise funds for climate and environmental projects. These bonds are typically asset-linked and backed by the issuer's balance sheet rather than the cash flows that may come from the investment projects in the more traditional bond valuation method.

⁹ <https://www.rba.gov.au/chart-pack/bond-issuance.html>. Accessed 9 July 2019.

The sorts of projects financed by green bonds may include investments intended to prevent pollution, to improve energy efficiency – use of solar cells or wind farms – or to protect aquatic and terrestrial ecosystems. With government support, green bonds may be sold with tax exemptions and tax credits, thereby reducing the required returns demanded by investors when the bonds are compared with regular taxable bonds issued by corporations.

China, Europe and the United States are the leading countries and areas where the bonds have been issued over the last five years. The World Bank has also been an active issuer of green bonds, to finance projects such as India's Rampur Hydropower Project, which aims to provide low-carbon hydroelectric power to northern India's electricity grid.¹⁰

Why do companies and government entities sell bonds? The simple answer is that bond issuers need money – money to finance a deficit, to build public infrastructure or to pay for expanded manufacturing facilities. An important characteristic that distinguishes corporations from government entities is that when the latter group needs to issue a security to raise funds, they are essentially limited to issuing a bond or other debt instrument. Corporations, on the other hand, can issue either debt (bonds) or equity (shares).

Debt securities offer a series of cash payments that are, for the most part, contractually fixed. The cash payout that bond investors expect from a company generally does not fluctuate each quarter, as the company's earnings do, and if a company fails to live up to its promise to make interest and principal payments, bondholders can take legal action against the company and force it into bankruptcy court.

In contrast, ordinary shares, which we cover in the next chapter, represent an ownership or equity claim on the company's cash flows. Unlike bondholders, shareholders generally have the right to vote on corporate matters ranging from electing a board of directors to approving mergers and acquisitions. However, ordinary shareholders have no specific legal entitlement to receive periodic cash payments. Whether they receive any cash payments at all depends on the company's profitability and on the board of directors' decision to distribute cash to investors.

As we will see, some bonds have features that put them into a grey area between pure debt and equity. In the rest of this section, we discuss a wide range of bond features commonly observed in the bond markets.

4.3b BY FEATURES

To comprehend the range of bonds in the capital markets, it is easier to sort them by their characteristics – fixed versus floating rates, secured versus unsecured, callable and putable, and so on. This section runs you through a range of these pairings. A given bond may have one of each characteristic – for example, a floating rate, unsecured, callable bond – in order to meet a specific market segment of lenders that the company is hoping to attract.

Fixed versus Floating Rates

As we have already discussed, most bonds require the borrower to make periodic coupon payments and to repay the bond's face value at maturity. The coupon payments themselves may be fixed in dollar terms over the bond's life, or the coupons may adjust occasionally, if the benchmark market interest rate changes while the bond is outstanding. **Floating-rate bonds**, also called *variable-rate bonds*, provide some protection against interest rate risk. If market interest rates increase, then eventually, so do the bond's coupon payments. Of course, this makes the borrowers' future cash obligations somewhat unpredictable because the interest rate risk of floating-rate bonds is effectively transferred from the buyer to the issuer.

The interest rate on floating-rate bonds is typically tied to a widely quoted market interest rate. In Australia, some of the benchmark interest rates that are used to determine how a floating-rate bond's interest

floating-rate bonds

Bonds that make coupon payments that vary through time. The coupon payments are usually tied to a benchmark market interest rate. Also called *variable-rate bonds*

¹⁰ <https://www.investopedia.com/terms/g/green-bond.asp>. Accessed 10 July 2019.

rate changes over time are the short-maturity (less than one year) Australian government bond rate, and the prime rate charged by Australian banks for funds loaned overnight to each other (the ‘**cash rate**’ or the Bank Bill Swap Rate).

The interest rate on floating-rate bonds is typically specified by starting with one of the benchmark rates above and then adding a **spread**. The spread, also called the *credit spread*, is added to the benchmark interest rate, according to the risk of the borrower. Lenders charge higher spreads for less creditworthy borrowers.

EXAMPLE

Bonds from BHP Billiton

In September 2013, BHP Billiton announced an issue of \$5.0 billion of bonds into global capital markets; its press release at the time read, in part:

The Global Bond comprises US\$500 million Senior Floating Rate Notes due 2016 paying interest at 3 month US Dollar LIBOR [London Interbank Offered Rate] plus 25 basis points [the spread above a short-

term interbank offer rate], US\$500 million 2.050% Senior Notes due 2018, US\$1,500 million 3.850% Senior Notes due 2023, and US\$2,500 million 5.000% Senior Notes due 2043.

Once you have finished this chapter, you should be able to decipher the challenging jargon of the press release.

Source: [http://www.bhpbilliton.com/~/media/bhp/documents/investors/news/2013/130926_bhpbillitonpricesus\\$5.pdf?la=en](http://www.bhpbilliton.com/~/media/bhp/documents/investors/news/2013/130926_bhpbillitonpricesus$5.pdf?la=en). Accessed 9 July 2019. Used with permission.

In common with many governments, the Australian government also issues **capital indexed bonds**. Capital indexed bonds generally pay interest on a quarterly basis at a fixed coupon rate, applied to the face value of the bond.

Unlike fixed coupon bonds, the face value of a capital indexed bond is adjusted each year by indexing the principal amount of the bond to match changes in inflation. It is expected that inflation is positive, so that the principal amount of the bond will increase at each adjustment date. At maturity, bondholders are repaid the adjusted principal value of the security. This is the face value increased by inflation over the life of the bond. Under this scheme, the coupon payment increases year to year because it is calculated as a percentage of the increased face value of the bond. For these reasons, capital indexed bonds are often called **inflation linked bonds**.¹¹

Secured versus Unsecured

What assurances do lenders have that borrowers will fulfil their obligations to make interest and principal payments on time? In the case of **unsecured debt**, the only assurance is the borrower’s promise to repay, combined with the recourse offered by the legal system if the borrower does not make all promised payments.

If a corporation has conducted more than one offering of unsecured debt, some issues may have a lower priority claim than others. The term **subordinated unsecured debt** refers to bonds that have legal claims inferior to, or subordinate to, other outstanding unsecured bonds. The terms *senior* and *junior* describe the relative standing of different bond issues, with senior bonds having a higher-priority claim than junior bonds.

In some cases, however, companies pledge **collateral** when they issue bonds. Collateral refers to assets the bondholders can legally claim if a borrower defaults on a loan. When a bond is backed by collateral, we say that the bond is *secured*. In Australia, New Zealand and other countries using English legal terminology, these bonds are also often called **debentures**. Examples of secured bonds are **mortgage bonds**, which are bonds secured by real estate or buildings; **collateral trust bonds**, which are bonds secured by financial assets held

cash rate

The interest rate that Australian banks charge each other for overnight loans

spread

The difference between the rate that a lender charges for a loan and the underlying benchmark interest rate. Also called the *credit spread*

capital indexed bonds or inflation linked bonds

Bonds issued in which the face value is changed each year in line with inflation

unsecured debt

Debt instruments issued by an entity which is backed only by the general faith and credit of the borrowing company

subordinated unsecured debt

Debt instruments issued by an entity which is backed only by the credit of the borrowing entity and which is paid only after senior debt is paid

¹¹ These bonds are described at <http://www.australiagovernmentbonds.com/types-of-bonds>.

collateral
The assets pledged to secure a loan

debentures
Bonds usually backed by a claim over tangible property

mortgage bond
A bond secured by real estate or buildings

collateral trust bond
A bond secured by financial assets held by a trustee

equipment trust certificate
A bond often secured by various types of transportation equipment

pure discount bonds
Bonds that pay no interest and sell below face value. Also called zero-coupon bonds

by a trustee; and **equipment trust certificates**, which are bonds that are often secured by various types of transportation equipment.

Zero-Coupon Bonds

Most bonds make periodic interest payments called *coupons*, but a few bonds, called *zero-coupon bonds*, pay no interest at all. Why would anyone purchase a bond that pays no interest? The incentive to purchase zero-coupon bonds is that they sell below face value. For that reason, zero-coupon bonds are also called discount bonds or **pure discount bonds**.¹² An investor who purchases a discount bond receives a capital gain when the bond matures and pays its face value.

Here is an example. The Australian government issues zero-coupon bonds under the acronym DINGO. This represents a bond that is a ‘discounted investment in negotiable government obligations’, and is a zero-coupon bond stripped of the principal and coupons that usually form an Australian government bond.

As another example, in New Zealand, government bonds can be stripped into two pieces – the coupons and the principal – and the coupons can then be traded as a unit or further subdivided into the individual payment dates. The principal is then traded as a zero-coupon bond.

However, government is not the only source for such instruments. Private-sector investors can also create ‘zeros’ from regular bonds: by ‘stripping’ the bond payments of coupon and final return of principal into separate financial instruments, individual zero-coupon bonds can be created. For example, a three-year regular fixed-income bond with a face value of \$100 and a 10% coupon rate paid annually can be separated into four zeros: a one-year zero bond paying \$10 in one year; a two-year zero bond paying \$10 at the end of two years; a three-year zero bond paying \$10 at the end of three years; and a different three-year zero bond paying \$100 at the end of three years. The price of each of the four zero-coupon bonds would be the relevant present value of the payments to be received.

Special tax rules apply to zero-coupon bonds. Although it seems that the gains to zero-coupon bonds are in the form of capital gains that accrue to owners of zero-coupon bonds, taxation authorities in many countries, including Australia and New Zealand, argue that they are a kind of implicit interest payment. An investor in zero-coupon bonds must pay taxes on this accrued interest (at ordinary income tax rates) each year, whether or not the investor sells the bond and realises a gain. **Figure 4.5** shows how the price of a zero-coupon bond rises as time passes (assuming that the yield to maturity remains fixed at 5.5%) and illustrates the capital gain each year.

FIGURE 4.5 ZERO-COUPON BOND PRICES AND TAXABLE INCOME

Suppose a zero-coupon bond paid no interest, so investors earned their return by purchasing the bonds at a discount and letting their price appreciate over time. This table illustrates how the price of a \$1,000 par value discount bond rises as maturity approaches, assuming that the yield to maturity remains at 5.5%. The final column shows the investor’s capital gain each year.

YEARS TO MATURITY	YIELD TO MATURITY	BOND PRICE	CAPITAL GAIN
5	0.055	\$ 765.13	
4	0.055	\$ 807.22	\$42.09
3	0.055	\$ 851.61	\$44.39
2	0.055	\$ 898.45	\$46.84
1	0.055	\$ 947.87	\$49.42
0	0.055	\$ 1,000.00	\$52.13

12 Be sure you understand the difference between a pure discount bond – a bond that makes no coupon payments at all – and an ordinary bond that sells at a discount. An ordinary bond sells at a discount when its coupon rate is below the rate of return that investors require to hold the bond.

Convertible and Exchangeable Bonds

Some bonds issued by corporations combine the features of debt and equity. Like ordinary bonds, **convertible bonds** pay investors a relatively safe stream of fixed coupon payments. But convertible bonds also give investors the option to convert their bonds into the ordinary shares of the company that issued the bonds.¹³ This means that if the share price increases, bondholders can share in that gain. The following example illustrates this.



EXAMPLE 9

The Original Modern Bond

It seems that the first convertible bonds of 'modern' times were issued by the Rome, Watertown and Ogdensburg Railroad [in 1874 in the United States]. Unable to finance an ambitious project to build one of the first railway lines in the US from its own capital, the company made history issuing a convertible bond with a maturity of 30 years, a coupon of 7% and a value of \$1,000. In today's money, this would equate to roughly \$200,000 (€176,000) per bond and a total issuance of between \$1–2 billion.

The usual reason advanced today for convertible bonds is that there is a good chance that the investment raising the funds will succeed

once it passes through its initial set-up period, but that capital investors need the safety of prior claims for return of capital afforded by debt (as opposed to equity) in those early years in order to accept a low rate of return.

Unfortunately for the railroad, the bond issue was not a success because the bond was never converted, as the share failed to appreciate substantially and the company had to refinance in 1904. It was repaid almost 50 years later – at a coupon of 5%. Fortunately for investors in general, the capital market was forgiving, and still encouraged the growth of convertible issues over subsequent years.

Source: 'Convertible Bonds: Key Lessons from 150 Years of Issuance', Investment and Pensions Europe. <http://www.ipe.com/reports/convertible-bonds-key-lessons-from-150-years-of-issuance/10007311.fullarticle>. Accessed 9 July 2019. Used with permission.

Exchangeable bonds work in much the same way that convertible bonds do, except that exchangeable bonds are convertible into ordinary shares of a company other than the company that issued the bonds. Exchangeable bonds are often used when one company owns a large block of shares in another company that it wants to divest. Although the option to convert bonds into shares generally resides with the investor who holds a convertible bond, exchangeable bonds' conversion rights can vary. Sometimes the bond indenture requires that, at maturity, bondholders accept ordinary shares in the underlying company. In that case, the securities are called *mandatory exchangeable bonds*.

Callable and Putable Bonds

Bonds may be **callable**. This means that the bond issuer retains the right to repurchase the bonds in the future at a predetermined price known as the **call price**. That right is valuable when market interest rates fall. Recall that bond prices generally rise as market interest rates fall. A company that issued non-callable bonds when rates were high may want to retire those bonds and reissue new ones after a decline in interest rates. However, retiring the outstanding bonds requires paying a significant premium over face value. With callable bonds, the call price establishes an upper limit on how much the company must pay to redeem previously issued bonds. Investors recognise that the call feature works to the advantage of the bond issuer, so callable bonds must generally offer higher coupon rates than otherwise similar non-callable bonds.

Putable bonds work in just the opposite way. **Putable bonds** allow investors to sell their bonds back to the issuing company at a predetermined price under certain conditions. This option is valuable to bondholders

convertible bond

A bond that gives investors the option to convert it into the issuer's ordinary shares

exchangeable bonds

Bonds issued by corporations that may be converted into shares of a company other than the one that issued the bonds

callable (bonds)

Bonds that the issuer can repurchase from investors at a predetermined price known as the call price

call price

The price at which a bond issuer may call or repurchase an outstanding bond from investors

putable bonds

Bonds that investors can sell back to the issuer at a predetermined price under certain conditions

¹³ Some convertibles have a mandatory conversion feature, meaning that the issuer can force investors to convert their bonds into shares.

because it protects them against a decline in the value of their bonds. Therefore, putable bonds typically have lower coupon rates than otherwise similar non-putable bonds.

The Australian corporate bond market currently has almost no putable bonds issued by local companies, and a relatively small number of corporate bonds are callable. The same is true of New Zealand's corporate bond market. A key explanation for the lack of some variety is that both bond markets are small, especially relative to the respective government and semi-government markets in Australia and, in New Zealand, the markets for bonds issued by the banks and utilities (power, airport or NZ Post).

In Hong Kong, callable bull/bear contracts (CBBCs) are a type of bond that follows the performance of an underlying financial asset but are priced so that investors need not pay the full price required to own the actual asset. Callable bonds are issued either as bull or bear contracts with a fixed expiry date, allowing investors to take bullish (expected price rise) or bearish (expected price fall) positions on the underlying asset. A CBBC is issued by a third party, usually an investment bank, independent of Hong Kong Exchange (HKEX) and of the issuer of the underlying asset.

CBBCs are issued with the condition that during their lifespan they will be called or bought back before maturity by the issuers when the price of the underlying asset reaches a level (known as the 'call price') specified in the listing document. 'If the call price is reached before expiry, the CBBC will expire early and the trading of that CBBC will be terminated immediately. The specified expiry date from the listing document will no longer be valid', according to the CBBC webpage.¹⁴

CBBCs may be issued with a lifespan of three months to five years. They are settled in cash only, and are traded on the cash market of HKEX. (Source: Hong Kong Exchanges and Clearing Limited, <http://www.hkex.com.hk>)

Protection from Default Risk

Besides interest rate risk, bond investors also have to worry about *default risk* – the possibility that a bond issuer may not be able to make all scheduled interest and principal payments on time and in full. The *bond indenture*, the contract between a bond issuer and its creditors, usually contains a number of provisions designed to protect investors from default risk. We have already discussed some of these features, including a bond issue's seniority and whether it is secured or unsecured. Additional examples of these provisions include sinking funds and protective covenants. A **sinking fund** provision requires the borrower to make regular payments to a third-party trustee. The trustee then uses those funds to repurchase outstanding bonds. Usually, sinking fund provisions require the trustee to retire bonds gradually, so that by the time a bond issue's maturity date arrives, only a fraction of the original issue remains outstanding. The trustee may purchase previously issued bonds on the open market, or the trustee may repurchase bonds by exercising a call provision, as described above.

Protective covenants, part of the bond indenture, specify requirements that the borrower must meet as long as bonds remain outstanding. *Positive covenants* specify things that the borrower must do. For example, positive covenants may require a borrower to file quarterly audited financial statements, maintain a minimum amount of working capital or maintain a certain level of debt coverage ratios. *Negative covenants* specify things that the borrower must not do, such as pay unusually high dividends, sell off assets or issue additional senior debt.

Clearly, investors have a lot of choices when they consider buying bonds. The number and variety of fixed-income investments available in the market is truly astounding, and far exceeds the number of ordinary shares available for trading. Let us turn now to the bond markets to see how bonds are traded, how bond prices are quoted and what external information is available to bond traders to help them make investment decisions.

sinking fund

A provision in a bond indenture that requires the borrower to make regular payments to a third-party trustee for use in repurchasing outstanding bonds, gradually over time

protective covenants

Provisions in a bond indenture that specify requirements the borrower must meet (positive covenants) or things the borrower must not do (negative covenants)

14 Source: https://www.hkex.com.hk/Products/Securities/Callable-Bull-Bear-Contracts?sc_lang=en. Accessed 9 July 2019.

LO4.3

CONCEPT REVIEW QUESTIONS

- 9 What are the main types of issuers of bonds in Australia and New Zealand?
- 10 What is the difference between a pure discount bond and an ordinary bond that sells at a discount?
- 11 Explain who benefits from the option to convert a bond into ordinary shares, and who benefits from the option to call a bond.

LO4.4

4.4 BOND MARKETS

In terms of the dollar volume of securities traded each day around the world, the bond market is much larger than the stock market. Although some bonds are listed on stock exchanges, many international bonds trade in an electronic over-the-counter (OTC) market. The OTC market is not a single physical location where bonds are traded. It is a collection of dealers around the world who stand ready to buy and sell bonds. Dealers communicate with one another and with investors via an electronic network. Because trades are decentralised and negotiated privately, it is usually difficult to obtain accurate, up-to-date price information on most bonds. Nevertheless, it is useful to see how bond prices are quoted in different segments of the market.

4.4a BOND-PRICE QUOTATIONS

Let us take an example of a corporate bond quoted for Qantas in November 2018. This is an exchange-traded bond (XTB), as identified above in section 4.3. For example, ASX-code YTMQF3 is an XTB that would give you exposure to the following Qantas corporate bond:

- Underlying issuer: Qantas Airlines Limited (QAN)
- Maturity date: 19 May 2022
- Coupon: 7.75% p.a.
- XTB Price: \$115.48
- Face Value at Maturity: \$100
- Yield to Maturity (YTMQF3) 3.06% p.a. as at 20 Nov 2018.¹⁵

The date of the quote is 20 November 2018. This bond is issued by Qantas Airlines Limited (ASX-code QAN) with a maturity date of 19 May 2022. It offers a coupon rate of 7.75% per year, with a current trading price of \$115.48, which is above the face value at maturity of \$100. Taking the period to maturity (19 May 2022), a bond trading at \$115.48 will have a YTM of 3.06% per year. With the Australian government short bond yield in November 2018 being about 2.0%, this means the **yield spread** was about 1.06% or around 106 **basis points**.

As you might expect, bond yield spreads reflect a direct relationship with default risk. The greater the risk that the borrower may default on its debts, the higher the spread that bonds issued by the borrower must

yield spread
The difference in yield to maturity between a corporate bond and a government bond at roughly the same maturity

basis point
1/100 of 1%; 100 basis points equal 1.000%

¹⁵ Source: <https://xtbs.com.au/what-are-xtbs/>. Accessed 9 July 2019.

offer investors to compensate them for the risk that they take. For investors, estimating the default risk of a particular bond issue is a crucial element in determining what the required return on the bond should be. Fortunately, bond investors have several resources at their disposal to help them make this evaluation.

4.4b BOND RATINGS

bond ratings

Letter ratings assigned to bonds by specialised agencies that evaluate the capacity of bond issuers to repay their debts. Lower ratings signify higher default risk

junk bonds

Bonds rated below investment grade. Also known as *high-yield bonds* or *speculative bonds*

For information on the likelihood that a particular bond issue may default, investors turn to bond rating agencies such as Moody's, Standard & Poor's (S&P) and Fitch. While there are other ratings agencies in different countries, these 'big three' international agencies dominate the global market, covering up to 90% of it, by some estimates. These organisations provide assessments of the risk of most publicly traded bond issues, and they assign a letter **bond rating** to each issue to indicate its degree of risk. **Figure 4.6** lists the major bond rating categories provided by each of the agencies and the interpretation associated with each rating class. Bonds rated BBB– or higher by S&P and Fitch, and Baa3 or higher by Moody's, fall into the investment-grade category. Bonds rated lower than that are called high-yield, speculative or **junk bonds**. The term 'junk bonds' has a derogatory connotation, but simply means that these bonds are riskier than investment-grade bonds. For example, for bonds in the investment grade category, the probability of default is extremely low, perhaps as low as 1%. When markets are more uncertain, the rate rises: for example, in March 2019 Moody's global speculative-grade default rate closed at 3.1% for the 12 months ended February 2019, up from 2.9% in January that year. The number of corporate debt defaults rose to 10 in February, from seven in January.¹⁶

FIGURE 4.6 BOND RATINGS

Bond rating agencies such as Moody's, Standard & Poor's and Fitch assign bond ratings based on their assessment of the borrower's ability to repay. Bonds in the top four ratings categories are investment-grade bonds, while those rated lower are junk bonds.

RATING CLASS	MOODY'S	S&P AND FITCH	
Highest quality	Aaa	AAA	Investment-grade bonds
High quality	Aa1, Aa2, Aa3	AA+, AA, AA-	
Upper medium	A1, A2, A3	A+, A, A-	
Medium	Baa1, Baa2, Baa3	BBB+, BBB, BBB-	
Non-investment grade	Ba1, BB+		
Speculative	Ba2, Ba3	BB, BB-	Junk bonds
Highly speculative	B1, B2, B3	B+, B, B-	
Very risky, default	Caa1 or lower	CCC+ or lower	

Figure 4.7 shows the relationship between bond ratings and yield spreads for corporate bonds at different maturities at a given point in time. The data given on yield spreads are for the US, but the three ratings agencies use the terminology on a global basis. The yield spreads are quoted in *basis points*. The first entry in the top-left corner of the table shows a corporate bond with the highest possible Aaa/AAA rating and a maturity of one year. It offered investors a YTM that was just 10 basis points higher than a one-year US Treasury bill (short-term note) at the given point in time. Moving across the row, we see that yield spreads increase with time to maturity. As expected, yield spreads increase as we move down the rows. The bottom row shows that the lowest-rated bonds, those that are at or near the point of default, offer yields that are 9–10% higher than comparable US Treasury securities of comparable maturity. To illustrate an extreme case, suppose that the YTM on a 10-year US Treasury bond equals 3%. The last entry in **Figure 4.7** shows that a

¹⁶ Source: https://www.moodys.com/research/Moody's-Global-speculative-grade-default-rate-up-in-February-but--PR_380651. Accessed 9 July 2019.

10-year US corporate bond rated Caa/CCC must offer a yield that is 9.55% higher than the US Treasury bond, or 12.55%. If that seems like an attractive return, remember the risk dimension. An investor who buys a large number of bonds rated Caa/CCC will almost certainly not earn an average yield of 12.55% because some of these bonds will default. When default occurs, bondholders usually do not receive all the payments they were originally promised, so the yield they realise on their bonds falls short of the promised YTM.¹⁷

FIGURE 4.7 THE RELATIONSHIP BETWEEN BOND RATINGS AND SPREADS AT DIFFERENT MATURITIES IN THE US AT A GIVEN POINT IN TIME, EXPRESSED IN BASIS POINTS

The table shows the difference in yields, at given points in time, between US corporate bonds in different ratings categories and US Treasury securities having the same maturity. For instance, five-year bonds with a AAA rating offered a yield that was 29 basis points higher than the five-year US Treasury note at the given point in time. Note that yield spreads rise with maturity just as they rise as the bond rating falls.

RATING	1 YR.	2 YR.	3 YR.	5 YR.	7 YR.	10 YR.	30 YR.
Aaa/AAA	10	12	23	29	46	58	78
Aa1/AA+	19	27	28	40	56	69	90
Aa2/AA	21	33	35	44	59	71	93
Aa3/AA-	22	36	37	49	63	75	101
A1/A+	44	49	53	61	76	90	113
A2/A	47	52	55	63	78	92	117
A3/A-	51	55	58	67	81	95	118
Baa1/BBB+	59	69	77	87	117	139	165
Baa2/BBB	62	77	5	92	124	147	172
Baa3/BBB-	69	82	87	97	129	154	177
Ba1/BB+	330	340	350	360	380	400	420
Ba2/BB	340	350	360	370	390	410	430
Ba3/BB-	350	360	370	380	400	420	440
B1/B+	470	480	490	520	560	600	650
B2/B	480	490	500	530	570	610	660
B3/B-	490	500	510	540	580	620	670
Caa/CCC	890	900	910	935	945	955	985

Thus far, we have maintained a simplifying assumption in our valuation models. You can see that assumption embedded in [Equations 4.1](#) and [4.2](#). Both equations assume that we can apply a single discount rate, r , to determine the present value of cash payments made at any and all future dates. In other words, the models assume that investors require the same rate of return on an investment that pays cash one year from now and on one that pays cash 10 years from now. In reality, required rates of return depend on the exact timing of cash payments, as the next section illustrates.

¹⁷ According to the Salomon Center for the Study of Financial Institutions, the default rate among US junk bonds reached a record 12.8% in 2002. In a very rough sense, this means that one of eight junk bond issues in the market defaulted that year. The Center estimates that investors who held defaulted bonds recovered only 25% of par value. With the improving economy in 2003, the default rate fell to 4.6% and the recovery rate increased to 45%.

LO4.4

CONCEPT REVIEW QUESTIONS

- 12 Calculate a bond's yield to maturity using its last price along with its coupon rate, par value and maturity date.
- 13 The price of a certain corporate bond is quoted as 97.847. What is the dollar price of this bond if its par value is \$1,000?
- 14 Explain why the yield spread on corporate bonds versus government bonds must always be positive. How do these spreads change: (a) as the bond rating declines; and (b) as the time to maturity increases?

THINKING CAP QUESTIONS

- 1 Yield spreads vary through time. Suppose you plot the yield spread on AAA bonds over several years. How would you expect this spread to behave during recessions compared with economic booms?
- 2 Why might companies try to maintain a given target rating on their outstanding debt?
- 3 A bond with a B rating offers a yield to maturity of 8%. Is the market's required return on this bond less than, equal to or greater than 8%?

LO4.5

4.5 THE TERM STRUCTURE OF INTEREST RATES

We now turn to an important insight about how interest rates relate to each other over differing maturities. We find that we can systematically explain the relationship between short-term and long-term interest rates (yields) for bonds not only with historical data, but with a useful model of how investors behave over time with respect to risk. We start with the empirical observation of the yield curve, then consider why it has its typical shape.

4.5a THE YIELD CURVE

term structure of interest rates

The relationship between time to maturity and yield to maturity for bonds of equal risk

yield curve

A graph that plots the relationship between time to maturity and yield to maturity for a group of equal-risk bonds

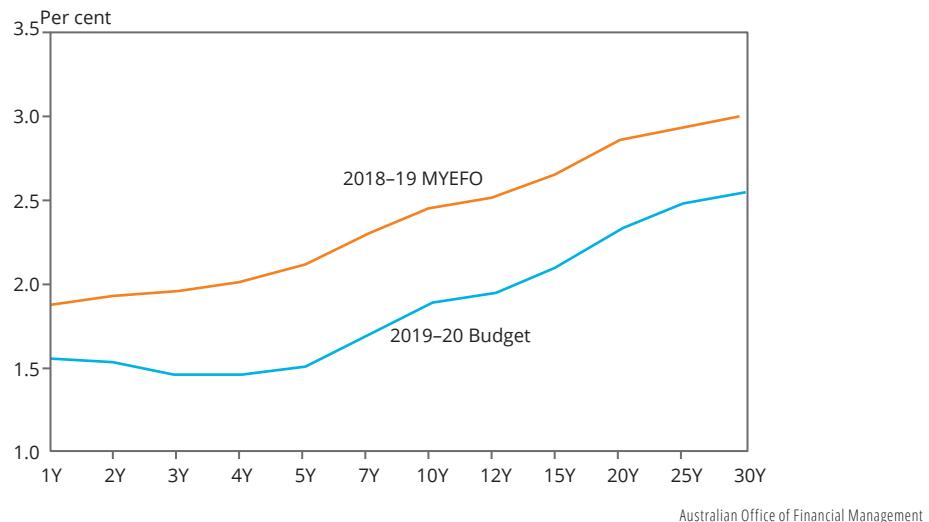
A quick glance at [Figure 4.7](#) reveals an important fact: bond yields vary with maturity. The difference in the yield spread between a one-year and a 30-year bond varies from 68 (78 – 10) basis points for Aaa/AAA bonds to 100 basis points, or more, for junk bonds. Although [Figure 4.7](#) reports yield spreads rather than yields, the data suggest that a positive relationship usually exists between time to maturity and yield to maturity for bonds in any risk category.

Financial experts refer to the relationship between time to maturity and yield to maturity for bonds of equal risk as the **term structure of interest rates**. The term structure of interest rates indicates whether yields rise, fall or remain constant across bonds with different maturities. The simplest way to communicate information about the term structure is to draw a graph that plots yield to maturity on the y-axis and time to maturity on the x-axis. You can find a graph like this in many financial publications and on many websites. A graph showing the term structure of interest rates is called the **yield curve**.

Figure 4.8 shows the yield curve assumed by the Australian Government Budget 2019 for Australian government bonds from April 2019.

FIGURE 4.8 YIELD CURVES FOR AUSTRALIAN GOVERNMENT BONDS

The figure shows the yield curve assumed for Australian government bonds in the 2019 Australian Government Budget. The shape is overall positively sloped, which is a characteristic shape for a yield curve.



Usually, long-term bonds offer higher yields than do short-term bonds, and the yield curve slopes upward as the maturity lengthens. That was the case for the curves in April 2019, and for the average shape over the period 2019–2049, and is regarded as a ‘normal’ slope for an interest rate yield curve; but it is interesting to note that the average shape for 2021–2024 actually suggests that interest rates for this longer period will be lower than for the one-year period 2019–2020. This is an example of a (short-run) negatively sloped yield curve.

Why the yield curve sometimes slopes up and at other times slopes down is a complex problem. However, there is an interesting link between the slope of the yield curve and overall macroeconomic growth. Historically, when the yield curve inverts – that is, switches from an upward slope to a downward slope – a recession usually follows. In fact, several research studies show that economic forecasts based on the yield curve’s slope more accurately predict recessions than many forecasts produced using complex statistical models. One reason for this pattern is as follows. Suppose a company receives new information from its sales force indicating that orders for the company’s products are likely to fall in the near term. This prompts the company to cut back on planned investment. That means the company’s need for long-term borrowing to finance new investment is diminished. If this happens to just a few companies, it is not likely to have a noticeable effect on financial markets. But if it happens to many companies simultaneously (because demand is falling for many products at once, as happens during a recession), the aggregate demand for new financing to pay for investment will fall. Companies will not need to issue long-term bonds to borrow money for new factories or new equipment. A reduction in the demand for long-term borrowing can then cause long-term interest rates to fall relative to short-term rates, and the yield curve may invert. We can see that the inversion of the yield curve may thus act as a leading indicator for a potential recession. This insight encourages many financial analysts to monitor the yield curve closely over time to help them understand how the economy may be predicted to behave. We explore this logic in the next section.

4.5b USING THE YIELD CURVE TO FORECAST INTEREST RATES

As a result of much research by economists and financial analysts, we know that economic growth forecasts which include the slope of the yield curve perform well relative to forecasts which ignore the yield curve. Can the yield curve also tell us something about the direction in which interest rates are headed? The answer is a highly qualified yes. To understand the logic underlying the hypothesis that the slope of the yield curve may predict interest rate movements, consider the following example.

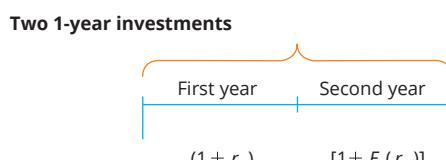
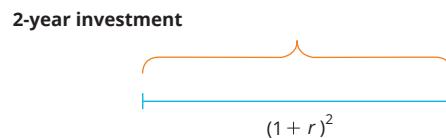
Russell is an Australian financial planner who wants to invest \$1,000 for two years. He does not wish to take much risk, so he decides to invest his funds in government securities. Consulting the Australian Office of Financial Management website, Russell learns that one-year Treasury bonds currently offer a 2% YTM, and two-year bonds offer a 2.5% YTM. At first, Russell thinks his decision about which investment to purchase is easy. He wants to invest for two years, and the two-year bond pays a higher yield, so why not just buy that one? Thinking further, Russell realises that he could invest his money in a one-year bond and reinvest the proceeds in another one-year bond when the first bond matures. Whether that strategy will ultimately earn a higher return than that of simply buying the two-year bond depends on what the yield on a one-year bond will be one year from now. For example, if the one-year bond rate rises to 4%, Russell will earn 2% in the first year and 4% in the second year, for a grand total of 6% (6.08% after compounding). Over the same period, the two-year bond offers just 2.5% per year or 5% total (5.06% after compounding). In this scenario, Russell earns more by investing in two one-year bonds than in one two-year bond. But what if the yield on a one-year bond is just 2% next year? In that case, Russell earns 4% over two years (or 4.04% after compounding), and he is better off buying the two-year bond. If next year's yield on the one-year bond is about 3%, then Russell will earn approximately the same return over the two years no matter which investment strategy he chooses.

expectations theory

In equilibrium, investors should expect to earn the same return whether they invest in long-term Treasury bonds or a series of short-term Treasury bonds

FIGURE 4.9 THE EXPECTATIONS THEORY

The expectations theory says that investors should earn the same expected return by purchasing one two-year bond or two one-year bonds. In this example, equilibrium occurs when the expected return on a one-year bond next year, $E(r_2)$, is about 3%. Only then do the two investment strategies provide the same expected return.



Equilibrium occurs when

$$\begin{aligned}(1 + r_1)[1 + E(r_2)] &= (1 + r)^2 \\ (1 + 0.02)[1 + E(r_2)] &= (1 + 0.025)^2 \\ E(r_2) &= 0.03003 \approx 3\%\end{aligned}$$

This example illustrates the **expectations theory** (or expectations hypothesis): in equilibrium, investors should expect to earn the same return whether they invest in long-term Treasury bonds or a series of short-term Treasury bonds. If the yield on two-year bonds is 2.5% when the yield on one-year bonds is 2%, then investors must expect next year's yield on a one-year bond to be 3%. Suppose not. If they expect a higher yield than 3%, investors are better off purchasing a series of one-year bonds than the two-year bond. Conversely, if investors expect next year's bond rate to be less than 3%, they will flock to the two-year bond. Equilibrium occurs when investors' expectations are such that the expected return on a two-year bond equals the expected return on two one-year bonds. In this example, equilibrium occurs when investors believe that next year's interest rate will be 3%.

Figure 4.9 illustrates this idea. The first part of the figure shows that the value of \$1 invested in one two-year bond will grow to $(1 + r)^2$. In this expression, r represents the current interest rate on a two-year bond. Next, the figure shows that investors expect \$1 invested in a sequence of two one-year bonds to grow to $(1 + r_1)[1 + E(r_2)]$. Here, r_1 represents the current

one-year bond rate, and $E(r_2)$ represents the expected one-year bond rate in the second year. Equilibrium occurs when the two strategies have identical expected returns, or when the expected one-year interest rate is about 3%.

The expectations theory implies that when the yield curve is sloping upward – that is, when long-term bond yields exceed short-term bond yields – investors must expect short-term yields to rise. According to the theory, only if investors expect short-term rates to rise will they be willing to forgo the higher current yield on a long-term instrument by purchasing a short-term bond. Conversely, when the yield curve inverts, and short-term yields exceed long-term yields, investors must expect short-term rates to fall. Only then would investors willingly accept the lower yield on long-term bonds.

EXAMPLE

Bond Yield Structure Over Time

Suppose a one-year bond currently offers a yield of 5%, and a two-year bond offers a 4.5% yield. Under the expectations theory, what interest rate do investors expect on a one-year bond next year? Remember that the expectations theory says that investors should earn the same expected return by investing in either two one-year bonds or one two-year bond. Therefore, the break-even calculation is:

$$\begin{aligned}(1+0.05)(1+E(r_2)) &= (1+0.045)^2 \\(1+E(r_2)) &= \frac{(1.045)^2}{(1.05)} \\E(r_2) &= 0.04, \text{ or } 4\%\end{aligned}$$

The term $E(r_2)$ refers to the expected return on a one-year bond next year (year 2). On the left-hand side of the equation, we have the return that an investor expects to earn by purchasing a one-year bond this year and another one next year. That should equal the return earned by purchasing a two-year bond today and holding it to maturity. Only when the expected one-year bond rate is 4% are investors indifferent between these two strategies.

4.5c THE LIQUIDITY PREFERENCE AND PREFERRED HABITAT THEORIES

Unfortunately, the slope of the yield curve does not always provide a reliable signal of future interest rate movements, perhaps because the expectations theory ignores several factors that are important to investors and that influence the shape of the yield curve. The first factor is that investors may prefer to invest in short-term securities. As we have seen, when market interest rates change, the prices of long-term bonds fluctuate more than the prices of short-term bonds. This added risk might deter some investors from investing in long-term bonds. To attract investors, perhaps long-term bonds must offer a return that exceeds the expected return on a series of short-term bonds. Therefore, when the yield curve slopes up, we cannot be sure whether this is the result of investors expecting interest rates to rise in the future, or simply a reflection of compensation for risk. The **liquidity preference theory** of the term structure recognises this problem. It says that the slope of the yield curve is influenced not only by expected interest rate changes but also by the liquidity premium that investors require on long-term bonds.

A second factor clouds the interpretation of the slope of the yield curve as a signal of interest rate movements if certain investors always purchase bonds with a particular maturity. For instance, pension funds that promise retirement income to investors and life insurance companies that provide death benefits to policyholders have very long-term liabilities. These companies may have a strong desire to invest in long-

liquidity preference theory

States that the slope of the yield curve is influenced not only by expected interest rate changes, but also by the liquidity premium that investors require on long-term bonds

preferred habitat theory

A theory that recognises that the shape of the yield curve may be influenced by investors who prefer to purchase bonds having a particular maturity; also called *market segmentation theory*

term bonds (the longest available in the market) to match their liabilities, even if long-term bonds offer low expected returns relative to a series of short-term bonds. Economists use the **preferred habitat theory** (or the *market segmentation theory*) to describe the effect of this behaviour on the yield curve. If short-term bond rates exceed long-term rates, the cause may be that the demand for long-term bonds is very high relative to their supply. This demand drives up long-term bond prices and drives down their yields. If the investors purchasing long-term bonds have a strong preference for investing in those securities, despite their low yields, then a yield curve that slopes down does not necessarily imply that investors expect interest rates to fall.

4.5d CONCLUSION

Valuing assets, both financial assets and real assets, is about the focus of finance. In this chapter, we have learned some simple approaches to pricing bonds, which are among the most common and most important financial instruments in the market. A bond's price depends on how much cash flow it promises investors; how that cash flow is taxed; how likely it is that the issuers will fulfil their promises (default risk); whether investors expect high or low inflation; and whether interest rates rise or fall over time. In the next chapter, we apply many of these same ideas to the pricing of preferred and ordinary shares.

LO4.5

CONCEPT REVIEW QUESTIONS

15 Explain why the height of the yield curve depends on inflation.

16 Suppose the Australian government issues two five-year bonds. One is an ordinary bond that offers a fixed nominal coupon rate of 4%. The other is an inflation-indexed bond. When the latter bond is issued, will it have a coupon rate of 4%, more than 4% or less than 4%?

STUDY TOOLS

SUMMARY

LO4.1

- Valuation is a process that links an asset's return with its risk. To value most types of assets, one must first estimate the asset's future cash flows and then discount them at an appropriate discount rate.
- Pricing bonds is an application of the general valuation framework. A bond's price equals the present value of its future cash flows, which consist of coupon and principal payments.
- The yield to maturity is a measure of the return that investors require on a bond. The YTM is the discount rate that equates the present value of a bond's cash flows to its current market price.
- Bond rating agencies help investors evaluate the risk of bonds. Bonds with lower ratings must offer investors higher yields.

LO4.2

- The return that is most important to investors is the real, or inflation-adjusted, return. The real return is roughly equal to the nominal return minus the inflation rate.

- Bond prices are set using the implied cash flows from coupons and an appropriate discount rate. Bond prices and interest rates are inversely related. When interest rates rise (fall), bond prices fall (rise), and the prices of long-term bonds are more responsive in general to changes in interest rates than are short-term bond prices.

LO4.3

- Bonds are categorised based on who issues them or on any number of features such as convertibility, callability, maturity and so on.

LO4.4

- Bond pricers share information both formally and informally. Bond rating systems provide arm's-length evaluations of the quality of bonds to the market.

LO4.5

- The 'term structure of interest rates' describes the relationship between time to maturity and yield to maturity on bonds of equivalent risk. A graph of the term structure is called the yield curve. The slope of the yield curve is highly correlated with future economic growth.
- Preferred habitat theory and liquidity preference models have been developed to explain how the yield curves are created.

IMPORTANT EQUATIONS

TABLE OF IMPORTANT EQUATIONS

4.1 The fundamental valuation model $P_0 = \frac{CF_1}{(1+r)^1} + \frac{CF_2}{(1+r)^2} + \dots + \frac{CF_n}{(1+r)^n}$

4.2 The basic equation $P_0 = \frac{C}{(1+r)^1} + \frac{C}{(1+r)^2} + \dots + \frac{C}{(1+r)^n} + \frac{M}{(1+r)^n}$

4.2a $P_0 = \frac{C}{r} \times \left[1 - \frac{1}{(1+r)^n} \right] + \frac{M}{(1+r)^n}$

4.3 Semiannual compounding $P_0 = \frac{C/2}{\left[1 + \frac{r}{2}\right]^1} + \frac{C/2}{\left[1 + \frac{r}{2}\right]^2} + \dots + \frac{C/2}{\left[1 + \frac{r}{2}\right]^{2n}} + \frac{M}{\left[1 + \frac{r}{2}\right]^{2n}}$

4.3a $P_0 = \frac{C/2}{\frac{r}{2}} \times \left[1 - \frac{1}{\left(1 + \frac{r}{2}\right)^{2n}} \right] + \frac{M}{\left(1 + \frac{r}{2}\right)^{2n}}$

4.4 $(1+r) = (1+i)(1+r_{real})$
 $r = i + r_{real} + i \times r_{real}$

4.4a $r \approx i + r_{real}$

SELF-TEST PROBLEMS

Answers to these 'Self-test problems' and the 'Concept review' questions throughout the chapter appear on the Student Companion Website (<http://login.cengagebrain.com>) or via your instructor.

ST4-1 A five-year bond pays interest annually. Its face value is \$1,000 and its coupon rate equals 7%. If the market's required return on the bond is 8%, what is the bond's market price?

ST4-2 A bond that matures in two years makes semiannual interest payments. Its face value is \$1,000, its coupon rate equals 4% and the bond's market price is \$1,019.27. What is the bond's yield to maturity?

ST4-3 Two US bonds offer a 5% coupon rate, paid annually, and sell at face value of \$1,000. One bond matures in two years and the other matures in 10 years.

a What is the YTM on each bond?

- b** If the YTM changes to 4%, what happens to the price of each bond?
- c** What happens if the YTM changes to 6%?

QUESTIONS

- Q4-1** What is the relationship between the price of a financial asset and the return that investors require on that asset, holding other factors constant?
- Q4-2** Define the following terms commonly used in bond valuation: (a) face or par value; (b) maturity date; (c) coupon; (d) coupon rate; (e) coupon yield; (f) yield to maturity; and (g) yield curve.
- Q4-3** Under what circumstances will a bond's coupon rate exceed its coupon yield? Explain in economic terms why this occurs.
- Q4-4** A company issues a bond at face or par value. Shortly thereafter, interest rates fall. If you calculate the coupon rate, coupon yield and YTM for this bond after the decline in interest rates, which of the three values is highest and which is lowest? Explain.
- Q4-5** Twenty years ago, the Singapore government issued 30-year bonds with a coupon rate of about 8%. Five years ago, the Singapore government sold 10-year bonds with a coupon rate of about 5%. Suppose that the current coupon rate on newly issued five-year Singapore government bonds is 3.5%. For an investor seeking a low-risk investment maturing in five years, do the bonds issued 20 years ago with a much higher coupon rate provide a more attractive return than the new five-year bonds? What about the 10-year bonds issued five years ago?
- Q4-6** Describe how and why a bond's interest rate risk is related to its maturity.
- Q4-7** Under the expectations theory, what does the slope of the yield curve reveal about the future path of interest rates?
- Q4-8** If the yield curve typically slopes upward, what does this imply about the long-term path of interest rates if the expectations theory holds true?

PROBLEMS

VALUATION BASICS

- P4-1** A best-selling author decides to cash in on her latest novel by selling the rights to the book's royalties for the next six years to an investor. Royalty payments arrive once per year, starting one year from now. In the first year, the author expects \$400,000 in royalties, followed by \$300,000, then \$100,000, then \$10,000 in the three subsequent years. If the investor purchasing the rights to royalties requires a return of 7% per year, what should the investor pay?

BOND PRICES AND INTEREST RATES

- P4-2** A \$100 par value bond makes two interest payments each year of \$45 each. What is the bond's coupon rate?
- P4-3** A \$100 par value bond has a coupon rate of 8% and a coupon yield of 9%. What is the bond's market price?
- P4-4** Calculate the price of a five-year, \$1,000 face value bond that makes semiannual payments, has a coupon rate of 8%, and offers a YTM of 7%. Recalculate the price assuming a 9% YTM. What is the general relationship that this problem illustrates?

- P4-5** A \$100 face value bond makes annual interest payment of \$75. If it offers a YTM of 7.5%, what is the price of the bond?
- P4-6** Griswold Travel has issued six-year bonds that pay \$30 in interest twice each year. The face value of these bonds is \$1,000, and they offer a YTM of 5.5%. How much are the bonds worth?
- P4-7** Bennifer Jewellers recently issued 10-year bonds that make annual interest payments of \$50. Suppose you purchased one of these bonds at face value when it was issued. Right away, market interest rates jumped, and the YTM on your bond rose to 6%. What happened to the price of your bond?
- P4-8** You are evaluating two similar bonds from the US market. Both mature in four years, both have a \$1,000 face value, and both pay a coupon rate of 10%. However, one bond pays that coupon in annual instalments, whereas the other makes semiannual payments. Suppose you require a 10% return on either bond. Should these bonds sell at identical prices, or should one be worth more than the other? Use **Equations 4.2a** and **4.3a**, and let $r = 10\%$. What prices do you obtain for these bonds? Can you explain the apparent paradox?
- P4-9** Johanson VI Advisers issued \$1,000 par value bonds a few years ago with a coupon rate of 7%, paid semiannually. After the bonds were issued, interest rates fell. Now, with three years remaining before they mature, the bonds sell for \$1,055.08. What YTM do these bonds offer?

P4-10 You have gathered the following data on three bonds:

BOND	MATURITY	COUPON %
A	10 yrs	9%
B	9 yrs	1%
C	5 yrs	5%

- a If the market's required return on all three bonds is 6%, what are the market prices of the bonds? (You can assume annual interest payments.)
- b The market's required return suddenly rises to 7%. What are the new bonds' prices, and what is the percentage change in price for each bond?
- c If the market's required return falls from the initial 6% to 5%, what are the new prices, and what is the percentage change in each price relative to the answer obtained in part (a)?
- d Which bond's price is most sensitive to interest rate movements? Does this answer surprise you? Why or why not? Can you explain why this bond's price is so sensitive to rate changes?
- e Which bond's price is least sensitive to interest rate movements? Explain.

TYPES OF BONDS

- P4-11** Suppose investors face a tax rate of 40% on interest received from corporate bonds. Further suppose AAA-rated corporate bonds currently offer yields of about 7%. Approximately what yield would AAA-rated tax-free bonds need to offer to be competitive?
- P4-12** Investors face a tax rate of 33% on interest received from corporate bonds. If tax-free bonds currently offer yields of 6%, what yield would equally risky corporate bonds need to offer to be competitive?
- P4-13** You purchase an Australian government capital indexed bond at face value of \$100. The bond offers a coupon rate of 6% paid semiannually. During the first six months that you hold the bond, prices in Australia rise by 2%. What is the new par value of the bond, and what is the amount of your first coupon payment?
- P4-14** A zero-coupon bond has a \$100 face value, matures in 10 years and currently sells for \$781.20.
- a What is the market's required return on this bond?
 - b Suppose you hold this bond for one year and sell it. At the time you sell the bond, market rates have increased to 3.5%. What return did you earn on this bond?

- c** Suppose that, rather than buying the 10-year zero-coupon bond described at the start of this problem, you instead purchased a 10-year 2.5% coupon bond. (Assume annual payments.) Because the bond's coupon rate equalled the market's required return at the time of purchase, you paid face value (\$100) to acquire the bond. Again assume that you held the bond for one year, received one coupon payment, and then sold the bond, but that at the time of sale, the market's required return was 3.5%. What was your return for the year? Compare your answer here to your answer in part (b).

BOND MARKETS

P4-15 A corporate bond's price index is quoted as 98.110. What is the price of the bond if its face value is \$100?

THE TERM STRUCTURE OF INTEREST RATES

P4-16 A one-year government security offers a 4% YTM. A two-year government security offers a 4.25% YTM. According to the expectations theory, what is the expected interest rate on a one-year security next year?

P4-17 A one-year government short-term bond offers a 6% yield to maturity. The market's consensus forecast is that one-year government bonds will offer 6.25% next year. What is the current yield on a two-year government bond if the expectations theory holds?

CASE STUDY

BOND PURCHASE DECISION

As you browse opportunities for investment, you come across Horsham Industries, which has some bonds on issue.

Based on this online information, answer the following questions.

ISSUER NAME	COUPON	MATURITY	RATING MOODY'S	HIGH	LOW	LAST	CHANGE	YIELD %
Horsham Industries	5.550%	Mar. 2037	Aa3	96.124	95.933	96.124	-0.245	5.825

ASSIGNMENT

- 1 What is the YTM for this Horsham Industries company bond?
- 2 What is the coupon yield of this bond over the next year?
- 3 If your required rate of return for a bond of this risk class is 6.2%, what value do you place on this Horsham Industries bond?

- 4 At the required rate of return of 6.2%, are you interested in purchasing this bond?
- 5 If you purchased this Horsham Industries bond for \$961.24 yesterday and the market rate of interest for this bond increased to 6.0% today, do you have a gain or a loss? How much is the gain or loss in dollars?

5

VALUING SHARES

WHAT COMPANIES DO

PETRONAS GAS ENDS Q1 FY2019 ON A STRONG NOTE

PETRONAS Gas Berhad ended Q1 FY2019 on a strong note with improved first quarter profit year-on-year, backed by strong plant performance and new remuneration terms for its Gas Processing business.

This was achieved amidst new tariffs for its Gas Transportation and Regasification businesses. Revenue was higher at RM1.4 billion with high operating efficiencies across all businesses, supported by higher tariff [sic] from the company's Gas Processing Agreement (GPA) with PETRONAS.

Remuneration for the second term of the 20-year contract was revised commencing on 1 January 2019 to reflect the operating targets and planned expenditure for PGB's Gas Processing business in the next five years. The first term of the GPA took effect on 1 April 2014.

Profit grew by 5% to RM531 million, taking into account a one-time foreign currency impact at one of the Group's subsidiaries and higher share of profit from a joint venture company with the completion of the Group's Air Separation Unit (ASU) project in Pengerang, Johor.

Comparing against the preceding quarter, Group revenue was comparable as higher Gas Processing revenue offset lower income from Gas Transportation and Regasification. Profit improved from RM342 million to RM531 million.

PGB also announced its first quarter dividend at 16 sen per share.

Source: Press release, <https://www.petronasgas.com/media/news/Pages/PRESS-RELEASE.aspx>. Accessed 5 July 2019.

The share price for the company rose from \$M16.3 to \$M17.8 over the period from the press release in late May to mid-June 2019.

This volatility in the share market illustrates how sensitive the value of shares of an organisation, especially one with a public listing on a national share exchange, may be to forecasts of events that may affect the organisation. Good news, such as an anticipated decline in costs, may encourage more buying of shares. Bad news, such as the report of an unusual loss, may make the holders of shares particularly concerned that there will be a decline in the value of their



shareholdings and cause many of them to try to sell their shares quickly, driving the price down further.

Valuing an entire company, or assessing whether its ordinary shares are correctly valued, is a difficult task, and there are many methods

available to professionals conducting this type of analysis. Some methods rely on the discounted cash flow methods, which are covered in chapters 3 and 4. Other approaches rely on 'market multiples' such as EBITDA multiples. This chapter introduces you to these methods.

LEARNING OBJECTIVES

After studying this chapter, you will be able to:

- LO5.1 describe the differences between preferred and ordinary shares
- LO5.2 calculate the estimated value of preferred and ordinary shares using zero, constant and variable growth models
- LO5.3 value an entire company using the free cash flow approach
- LO5.4 apply alternative approaches for pricing shares that do not rely on discounted cash flow analysis
- LO5.5 understand how companies issue equity securities in the primary market and trading in the secondary market.

This chapter focuses on valuing preferred and ordinary shares. We begin by describing the essential features of these instruments, comparing and contrasting them with the features of bonds, which we covered in the previous chapter. Next, we apply the information from this chapter's first three sections to the basic discounted cash flow valuation framework from Chapter 4 to develop a method for pricing preferred and ordinary shares. The focus here is to show that expected cash flows from the company drive the value of its shares, so that if a company is doing well in terms of its operations and financial activities in generating net positive cash flows, the value of its shares will rise.

We introduce three simple approaches for valuing shares – the zero, constant and variable growth models – based on the dividend streams each pays over time. We also present the free cash flow approach for valuing the entire enterprise. Then, we review some other popular share valuation measures, including book value, liquidation value and comparable company multiples. Finally, we explain how companies, with the assistance of investment bankers and other advisers, issue these securities to investors, and how trades between investors occur on an ongoing basis once the securities have been issued.



5.1 THE ESSENTIAL FEATURES OF PREFERRED AND ORDINARY SHARES

How do companies raise money when they need to fund a new investment project? If a company does not have enough internal funding (such as past profits), it will often turn to the capital markets to raise funds by issuing debt or equity securities. Debt securities, such as bonds, generally offer investors a legally enforceable claim to cash payments that are either fixed or vary according to a predetermined formula. Because the cash flow streams offered by bonds are typically fixed, valuing bonds is a relatively straightforward exercise,

as Chapter 4 demonstrated. The market price of a bond should equal the present value of the cash payments that the bond promises to make.

The same valuation principle applies to equity securities, such as ordinary shares, but investors confront a difficult challenge when they estimate the value of these securities. Companies issuing ordinary shares make no specific promises to investors about how much cash they will receive, or when. Companies may choose to make cash payments to shareholders, called **dividends**, but they are under no obligation to do so. Generally speaking, a company distributes cash to ordinary shareholders if it is generating more cash from its operations than it needs to pay expenses and fund new profitable investment opportunities. For this reason, shareholders are sometimes referred to as *residual claimants* – their claim is only on the cash remaining after the company pays all of its bills and makes necessary new investments in the business. Because it is very hard to predict the magnitude of these residual cash flows and the timing of their distribution to shareholders, valuing ordinary shares is much more difficult than valuing bonds.

dividends

Periodic cash payments that companies make to shareholders

Given this discussion, it should not surprise you to learn that debt and equity securities differ, both in terms of the risks they require investors to bear and the potential rewards for taking those risks. Debt securities offer a relatively safe and predictable return; but safety comes at a price. Bond returns are rarely high enough to generate wealth quickly, and bondholders (creditors) exercise almost no direct influence on corporate decisions, except when a missed payment allows bondholders to force a company into insolvency. Ordinary shareholders accept more risk than do bondholders or creditors. For example, an investor who purchased \$10,000 worth of shares of Inabox (a telecommunications company) when it debuted in July 2013 saw that investment grow by July 2014 to more than \$13,400 in the company's first year of operation, a 34% increase. A year further on, in July 2015, the share price for Inabox was trading at \$1, making the value of the original investment now \$10,000. In October 2018, Inabox sold itself to MNF Group for about 80 cents per share, compared with the then market price of about 50 cents. The latter price reflected some poor performance of one subsidiary of Inabox.¹ As this example shows, because ordinary shareholders are asked to take large risks, they expect higher returns on average than do bondholders.

Investors who own ordinary shares also have opportunities to exercise some control over corporate decisions through their voting rights. Usually, investors are entitled to one vote for each ordinary share that they own, and they may exercise their right to vote at shareholders' meetings. At these meetings, shareholders elect the board of directors to oversee management and approve major decisions such as a large acquisition. As a practical matter, however, most investors do not attend shareholder meetings, but they can still exercise their voting rights by signing proxy statements. **Proxy statements** are documents that describe the issues that will be voted on at the shareholder meeting. By signing these documents, shareholders transfer their voting rights to another party. Usually, shareholders give their proxies to the company's current board of directors, but, occasionally, outsiders who are dissatisfied with the company's management or who view the company as an attractive takeover target will wage a **proxy fight**. In a proxy fight, outsiders try to acquire enough votes from shareholders to elect a new slate of directors and thereby take control of the company, or at least effect a change in company policy.

proxy statements

Documents that describe the issues to be voted on at an annual shareholders meeting

proxy fight

An attempt by outsiders to gain control of a company by soliciting a sufficient number of votes to elect a new slate of directors and effect a change in company policy

Not all shareholders have voting rights. Preferred shares represent a kind of hybrid security, meaning that they have some of the features of debt and some of ordinary shares. The cash payments that preferred shareholders receive are called dividends, just like the payments that ordinary shareholders receive, but these dividends are usually fixed, like the interest payments made to bondholders. That makes valuing preferred shares easier than valuing ordinary shares. Like bondholders, preferred shareholders may not have voting rights, but their claims are *senior to ordinary shares*, meaning that preferred shareholders have a higher priority claim on a company's cash flows. For instance, companies usually must pay the dividend on preferred shares before they can pay a dividend on their ordinary shares. Many preferred shares have a feature known

1 <https://www.crn.com.au/news/inabox-sold-to-mnf-group-for-up-to-33.5-million-513619>. Accessed 2 July 2019.

as *cumulative dividends*, meaning that if a company misses any preferred dividend payments, it must catch up and pay preferred shareholders for all the dividends they missed (along with the current dividend) before it can pay dividends on ordinary shares. In all these instances, preferred shares seem more like debt than equity.

In other respects, preferred shares look more like equity than debt. Dividends on preferred and ordinary shares are not a tax-deductible expense for the company, but interest payments on debt are deductible.² Preferred shareholders hold a claim that is *junior to bonds*, meaning that preferred shareholders hold a lower-priority claim than bondholders, and they cannot take a company to court for failure to pay dividends. Finally, many preferred shares do not have a specific maturity date and can remain outstanding indefinitely, like ordinary shares.

Despite the differences among bonds, preferred shares and ordinary shares, analysts use some of the same methods to value all of these securities. The most basic valuation methods rely on the discounted cash flow techniques introduced in Chapter 3 and applied to bond valuation in Chapter 4. In the next section, we shall see how to use discounted cash flow methods to value preferred and ordinary shares.

LO5.1

CONCEPT REVIEW QUESTION

- 1 How do you think preferred shares compare to bonds and ordinary shares in terms of the risks that investors must face and the rewards that they expect?

LO5.2

5.2 VALUING PREFERRED AND ORDINARY SHARES

The principles involved in valuing shares mirror those we adopted to determine bond prices in Chapter 4. First, we estimate the cash flows that a shareholder expects to receive over time. Unlike bonds, preferred and ordinary shares have no definite maturity date, so estimates of the cash flows going to shareholders must necessarily take a long-term view. Second, we determine a discount rate that reflects the risk of those cash flows. In the case of a bond, the discount rate is relatively easy to find. You simply use the *yield to maturity (YTM)*, which is the discount rate that equates the bond's cash flows to its market price, for a similar-risk bond. Because the cash flows provided by ordinary shares are uncertain and the maturity date is undefined, there is no mechanical calculation equivalent to a bond's YTM that can provide a precise figure for the required return on a share – it has to be estimated by some other means. Third, despite the difficulties just noted, we estimate the share's price by calculating the present value of its expected future cash flows. In other words, valuing shares is simply another application of **Equation 4.1**.

5.2a PREFERRED SHARE VALUATION

We shall start with valuing preferred shares because calculating their value is simpler than dealing with ordinary shares. Preferred shares typically offer a fixed stream of cash flows with no specific maturity date. For that reason, we can treat a preferred share as a security that behaves like a simple perpetuity bond. In Chapter 3, you learned a shortcut for valuing a *perpetuity*. For a perpetuity that makes annual cash payments, with the first payment arriving in one year, the present value equals the next payment divided by the discount

2 In the US, the dividends on some kinds of 'trust preferred shares' are tax deductible for the company.

rate. To find today's value of a preferred share, PS_0 , we use the equation for the present value of a perpetuity, dividing the preferred dividend, D_p , by the required rate of return on the preferred share, r_p :

(Eq. 5.1)

$$PS_0 = \frac{D_p}{r_p}$$



Basic Share Valuation

Nuku Company has preferred shares outstanding that pay a dividend of \$3.75 per share each year. The share paid a dividend on 8 September 2020. If investors require a 5.5% return on this investment, what would you expect the price of these shares to be on 9 September 2020?

Recognising that the next \$3.75 dividend comes one year in the future, we can apply **Equation 5.1** to estimate the value of Nuku Company's preferred shares:

$$PS_0 = \frac{\$3.75}{0.055} = \$68.18$$

Equation 5.1 is valid if dividend payments arrive annually and if the next dividend payment comes in one year. Suppose the preferred shares pay dividends quarterly. How do we modify **Equation 5.1** to value a preferred share paying quarterly dividends? One approach is to divide both the annual dividend and the required rate of return by four to obtain quarterly figures. If we apply that logic to Nuku Company's preferred shares, we obtain:

$$PS_0 = \frac{(\$3.75 \div 4)}{(0.055 \div 4)} = \frac{\$0.9375}{0.01375} = \$68.18$$

Our calculations so far indicate that Nuku Company's preferred shares are worth \$68.18 each, whether it pays dividends annually or quarterly. That can't be right. The time value of money implies that investors are better off if they receive dividends sooner rather than later. In other words, if Nuku Company's preferred shares pay \$3.75 in dividends per year, the value of that dividend should be greater if it is paid in quarterly instalments rather than in one payment per year. In fact, Nuku Company shares would be worth more than \$68.18 each if it paid quarterly dividends, as the next example demonstrates.



Share Valuation with Quarterly Data

When we attempted to adjust **Equation 5.1** for quarterly dividends, we assumed that investors required a quarterly return of 1.375%, or one-quarter of the 5.5% required return used in the example with annual dividends. However, if the quarterly required return is 1.375%, this translates into an effective annual return that is higher than 5.5%. Using **Equation 3.14**, we can calculate that a quarterly rate of 1.375% translates into an effective annual rate of about 5.6%:

$$\text{Effective annual rate} = \left(\frac{1 + 0.055}{4} \right)^4 - 1 = 0.056$$

That means our examples with annual and quarterly dividends are not making a true 'apples with apples' comparison because we have assumed a slightly higher effective discount rate in the quarterly calculations. If the effective annual required return is in fact 5.5%, then we can use **Equation 3.14** to determine that the quarterly rate is just 1.35%:

$$0.055 = \left(1 + \frac{r}{4} \right)^4 - 1$$

$$\frac{r}{4} = 0.0135$$





Discounting the quarterly dividend at the appropriate quarterly rate would result in a higher value for Nuku Company preferred shares:

$$PS_0 = \frac{\$0.937}{0.0135} = \$69.44$$

Now let's turn our attention to the more challenging problem of using discounted cash flow techniques to value ordinary shares.

5.2b ORDINARY SHARE VALUATION EQUATION

Valuing ordinary shares is a much more difficult task than valuing preferred shares because the cash flows that ordinary shareholders receive are not set in advance by a contract. In this section, we introduce a simple technique that connects the price of a share to the dividends that the shareholder receives. In practice, the methods used by professional investors to value ordinary shares are more complex than the approach we first present here. Nevertheless, the simplified valuation model provides a framework that will help you understand the factors that determine ordinary share values. Later, we will introduce some of the alternative approaches that investors use to value shares.

When you buy a share, you may expect to receive a periodic dividend payment from the company, and you probably hope to sell the share for more than its purchase price. But when you sell the share, you are simply passing the rights to receive dividends to the buyer. The buyer purchases the share from you in the belief that the dividends and capital gains justify the purchase price. This logic extends to the next investor who buys the share from the person who bought it from you, and so on, forever. This implies that the value of ordinary shares equals the present value of all future dividends that investors expect the share to distribute.³

The easiest way to understand this argument is as follows:

(1) Suppose an investor buys a share in a company today for price P_0 , receives a dividend equal to D_1 at the end of one year and immediately sells the share for price P_1 . The return on this investment is easy to calculate:

$$r = \frac{D_1 + P_1 - P_0}{P_0}$$

The numerator of this expression equals the dollar profit or loss. Dividing that by the purchase price converts the return into percentage form. Rearrange this equation to solve for the *current share price*:

$$(Eq. 5.2) \quad P_0 = \frac{D_1 + P_1}{(1+r)^1}$$

This equation indicates that the value of a share today equals the present value of cash that the investor receives in one year. But what determines P_1 , the selling price at the end of the year?

(2) Use **Equation 5.2** again, changing the time subscripts to reflect that the price next year will equal the present value of the dividend and selling price received two years from now:

$$P_1 = \frac{D_2 + P_2}{(1+r)^1}$$

³ Companies can distribute cash directly to shareholders in forms other than dividends. For instance, many companies regularly buy back their own shares. This has been a strong trend in shares markets in the US, Australia and Canada in recent years. Also, when an acquiring company buys a target, it may distribute cash to the target's shareholders. In this discussion, we assume, for simplicity, that cash payments always come in the form of dividends, but the logic of the argument does not change if we allow for other forms of cash payments.

Now, take this expression for P_1 and substitute it back into **Equation 5.2**:

$$P_0 = \frac{D_1 + \frac{D_2}{(1+r)^2}}{(1+r)^2} = \frac{D_1}{(1+r)^1} + \frac{D_2 + P_2}{(1+r)^2}$$

We have an expression that says that the price of a share today equals the present value of the dividends it will pay over the next two years, plus the present value of the selling price in two years. Again we could ask, what determines the selling price in two years, P_2 ?

(3) By repeating the last two steps over and over, we can determine the price of a share today, as shown in **Equation 5.3**:

$$(Eq. 5.3) \quad P_0 = \frac{D_1}{(1+r)^1} + \frac{D_2}{(1+r)^2} + \frac{D_3}{(1+r)^3} + \frac{D_4}{(1+r)^4} + \frac{D_5}{(1+r)^5} + \dots$$

The *price of a share* today equals the present value of the entire dividend stream that the share will pay in the future. Now consider the problem that an investor faces if she or he tries to determine whether a particular share is overvalued or undervalued. In deciding whether to buy the share, an investor needs two inputs to apply **Equation 5.3**: the projected dividends and the discount rate. Neither input is easy to estimate. For a share that already pays a dividend, predicting what the dividend will be over the next few quarters is not terribly difficult, but forecasting far out into the future is another matter. For shares that currently do not pay a dividend, the problem is even more difficult because the analyst must estimate when the dividend stream will begin.

Likewise, the discount rate, or the rate of return required by the market on this share, depends on the share's risk. We defer a full discussion of how to measure a share's risk and how to translate that into a required rate of return until chapters 6 and 7.

For now, we focus on the problem of estimating dividends.⁴ In most cases, analysts can formulate reasonably accurate estimates of dividends in the near future. The real trick is to determine how quickly dividends will grow over the long run. Our discussion of share valuation centres on three possible scenarios for dividend growth: zero growth, constant growth and variable growth.

5.2c ZERO GROWTH

The simplest approach to dividend valuation, the **zero growth model**, assumes a constant dividend stream. That assumption is not particularly realistic for most companies, but it may be appropriate in some special cases. If dividends do not grow, we can write the following equation:

$$D_1 = D_2 = D_3 = \dots = D$$

zero growth model
The simplest approach to share valuation that assumes a constant dividend stream

Plugging the constant value D for each dividend payment into **Equation 5.3**, you can see that the valuation formula simply reduces to the equation for the present value of a perpetuity:

$$P_0 = \frac{D}{r}$$

In this special case, the formula for valuing ordinary shares is essentially identical to that for valuing preferred shares.

⁴ For shares that do not pay dividends, analysts can estimate the value of the share either by discounting the free cash flow that the company produces or by using a 'multiples' approach. Both of these alternatives are described later in this chapter.

 **EXAMPLE****Valuing HP Shares**

As an historical note, Hewlett-Packard (HP), the US computer giant, paid a constant quarterly dividend of US\$0.08 per share without interruption from June 1998 to March 2011. Perhaps after receiving the same dividend for more than 12 years, investors believed that HP's dividend would remain at US\$0.08 (or US\$0.32 per year) forever. What price would they be willing to pay for HP shares?

The answer depends on investors' required rate of return. If investors demanded a 10% annual return, then the share should be worth $\text{US\$}0.32 \div 0.10$ or US\$3.20 (making the simplifying assumption that the dividend is paid annually).⁵ In fact, in the first half of 2011, HP shares actually

traded close to US\$40 per share. This implies one of two things: either investors required a rate of return that was very low (in fact, less than 1%) – which is implausible – or they expected that dividends would eventually grow, even though they had remained steady for many years. Expectations of higher dividends were realised when HP increased its dividend by 50% in the spring of 2011 and announced its intention to make double-digit dividend increases during the next few years. HP then continued to lift its dividend from 2011 to September 2015, when it cut it to US\$0.124 per quarter, before raising it again over time to US\$0.1604 per quarter in late 2019.⁶

5.2d CONSTANT GROWTH

Of all the relatively simple share valuation models that we consider in this chapter, the *constant growth model* is probably most used in practice. The model assumes that dividends will grow at a constant rate, g . If dividends grow at a constant rate forever, we calculate the value of that cash flow stream by using the formula for a growing perpetuity, as given in Chapter 3. Denoting next year's dividend as D_1 , we determine the value today of a share that pays a dividend growing at a constant rate:⁷

(Eq. 5.4)

$$P_0 = \frac{D_1}{r - g}$$

The *constant growth model* in **Equation 5.4** is commonly called the *Gordon growth model*, after Myron Gordon, who popularised this formula.

 **EXAMPLE****Valuing Cochlear Shares**

Cochlear Limited is undoubtedly an Australian corporate success story. Its value is based on its primary product, a bionic ear implant that enhances hearing for those with impairments. The device is made up of two main sections, an external sound processor and coil, and an

internal implant. The sound processor captures sound and converts it into digital code, while the sound processor transmits the digitally coded sound through the coil to the implant. The implant converts the digitally coded sound to electrical impulses and sends them along

5 You can apply the same formula to quarterly dividends as long as you make an appropriate adjustment in the interest rate. For example, if investors expect a 10% effective annual rate of return on HP shares, they expect a quarterly return of $(1.10)^{0.25} - 1$, or 2.41%. Using this figure, you can recalculate the share price by dividing \$0.08, the quarterly dividend, by 0.0241 to obtain \$3.32. Why are HP shares more valuable in this calculation? Since HP's dividends arrive more often than once a year, the present value of the dividend stream is greater.

6 https://www.streetinsider.com/dividend_history.php?q=HPQ. Accessed 2 July 2019.

7 To apply this equation, one must assume that $r > g$ and that g itself is constant. Of course, some companies may grow very rapidly for a time, so that $g > r$ temporarily. We treat the case of companies that grow rapidly for a finite period later in the discussion. In the long run, it is reasonable to assume that r must eventually exceed g . If the growth rate exceeded the discount rate forever, the value of the share would be infinite because it would grow faster over time than it would be discounted.



the electrode array, which is positioned in the cochlea. The company listed on the ASX in 1995 and was still, as of 2019, growing in value.

Since 1997, Cochlear has paid an annual dividend, rising nearly every year. The compound annual average growth rate of the dividend was about 1% over the period 2000–2001, but clearly this could not remain the annual growth rate forever, or even for each year. The total dividend payment for 2018–2019 was \$4.50 per share. Although the dividend is normally paid semiannually, here we shall assume, for simplicity, that the dividend is paid annually, and that it is expected to grow at 4% each year, forever. If we continue to use this dividend growth model, what would have been the predicted price of Cochlear shares in December 2018?

Assume that the required rate of return on Cochlear shares is about 10%. Substituting into the constant growth model – **Equation 5.4** – the result suggests that Cochlear’s share price should be the following:

$$P = \{[\$4.50]/[0.10 - 0.04]\} = \$75$$

In fact, in mid-December 2018, Cochlear shares were trading for about \$174. Although the growth model’s estimate of Cochlear’s share price is below the company’s actual market value in 2018, it only takes small adjustments in the model’s inputs to obtain an estimate that is much closer to Cochlear’s actual market value. For example, if we lower the required return from 10% to 8% and increase the dividend growth rate from 4% to 5.5%, the estimated value of Cochlear’s shares increases from \$75 to \$180.

The preceding example illustrates that, by making small adjustments to the required rate of return or the dividend growth rate, we could easily obtain an estimate for Cochlear’s shares that matches the actual market price. But we could also obtain a very different price with an equally reasonable set of assumptions. For instance, increasing the required rate of return from 10% to 11% and decreasing the dividend growth rate from 4% to 3% decreases the price all the way to about \$56. Obviously, analysts want to estimate the inputs for **Equation 5.4** as precisely as possible, but the amount of uncertainty inherent in estimating required rates of return and growth rates makes obtaining precise valuations very difficult.

Nevertheless, the constant growth model provides a useful way to frame share-valuation problems, highlighting the important inputs and, in some cases, providing price estimates that seem reasonable. But the model should not be applied blindly to all types of companies, especially not to those enjoying rapid, if temporary, growth.

5.2e VARIABLE GROWTH

The zero and constant growth ordinary share valuation models just presented do not allow for any change in expected growth rates. Many companies go through periods of relatively rapid growth followed by a period of more stable growth. Valuing the shares of such a company requires a **variable growth model**, one in which the dividend growth rate can vary. Using our earlier notation, let D_0 equal the last or most recent per-share dividend paid, g_1 equal the initial (rapid) growth rate of dividends, g_2 equal the subsequent (constant) growth rate of dividends and N equal the number of years in the initial growth period. We can write the general equation for the variable growth model as follows:

(Eq. 5.5)

$$P_0 = \underbrace{\frac{D_0(1+g_1)}{(1+r)^1} + \frac{D_0(1+g_1)^2}{(1+r)^2} + \dots + \frac{D_0(1+g_1)^N}{(1+r)^N}}_{\text{PV of dividends during initial growth phase}} + \underbrace{\left[\frac{1}{(1+r)^N} \times \frac{D_{N+1}}{r-g_2} \right]}_{\text{PV of all dividends beyond the initial growth phase}}$$

variable growth model
Assumes that the dividend growth rate will vary during different periods of time, when calculating the value of a company’s shares

As noted by the labels, the first part of the equation calculates the present value of the dividends expected during the initial rapid-growth period. The last term, $D_{N+1} \div (r - g_2)$, equals the value, *as of the end of the rapid-growth stage*, of all dividends that arrive after year N . To calculate the *present value* of this growing perpetuity, we must multiply the last term by $1 \div (1 + r)^N$.

EXAMPLE

Valuing Shares with Variable Dividend Growth Rates

Suppose the rapid growth of a telecommunications company has carried the market for shares in this firm upwards in a rapid way. Over time, however, as the relevant technology become more widespread and copied, the growth rates of the company will reach a steady state. At that point, the company may grow at the same rate as the overall economy, perhaps 5% or less per year. Assume that the market's required rate of return on these shares is 14%.

To value the telecommunication company's shares, we split the future stream of cash flows into two parts. The first part is the rapid-growth period, and the second is the constant-growth phase. Suppose that the company's most recent (Year 0) dividend was \$1 per share. We anticipate that the company will increase the dividend by 25% per year for the next three years, and that after that, dividends will grow at 4% per year indefinitely. The expected dividend stream for the next seven years looks like this:

RAPID-GROWTH PHASE ($g_1 = 25\%$)		CONSTANT-GROWTH PHASE ($g_2 = 4\%$)	
Year 0	\$1.00	Year 4	\$2.03
Year 1	1.25	Year 5	2.11
Year 2	1.56	Year 6	2.197
Year 3	1.95	Year 7	2.28

The value of the dividends during the rapid-growth phase is calculated as follows:

PV: of dividends

$$\begin{aligned} (\text{Initial phase}) &= \frac{\$1.25}{(1.14)^1} + \frac{\$1.56}{(1.14)^2} + \frac{\$1.95}{(1.14)^3} \\ &= \$1.09 + \$1.20 + \$1.32 = \$3.61 \end{aligned}$$

The stable-growth phase begins with the dividend paid four years from now and continues

forever. The final term of **Equation 5.5** is similar to **Equation 5.4**, which indicates that the value of a constant-growth share at time t equals the dividend a year later, at time $t + 1$, divided by the difference between the required rate of return and the constant-growth rate. Applying that formula here means valuing the share at the end of Year 3, just before the constant-growth phase begins:

$$P_3 = \frac{D_4}{r - g_2} = \frac{\$2.03}{0.14 - 0.04} = \$20.30$$

Don't forget that \$40.33 is the estimated price of the share three years from now. To express that in today's dollars, we must discount it for three additional years as follows:

$$\frac{\$20.30}{(1.14)^3} = \$13.70$$

This represents the value today of all dividends that occur in Year 4 and beyond. To estimate the present value of the entire dividend stream, which of course represents the price of the share today, we simply put the two pieces together:

$$\begin{aligned} \text{Total value of the share, } P_0 &= \$3.61 + \$13.70 \\ &= \$17.31 \end{aligned}$$

The following single algebraic expression shows the information in a compact form:

$$P_0 = \frac{\$1.25}{(1.14)^1} + \frac{\$1.56}{(1.14)^2} + \frac{\$1.95 + \$20.30}{(1.14)^3} = \$17.31$$

The numerator of the last term contains both the final dividend payment of the rapid-growth phase, \$1.95, and the present value as of the end of Year 3 of all future dividends, \$20.30. The value of the company's shares using the variable growth model is \$17.31.

As with most of our valuation models, it is possible to take the share's market price as given and to use the model to 'reverse-engineer' the growth rate. In other words, a share analyst might use this model to estimate how much dividend growth investors are expecting given the price they are willing to pay for the shares.

EXAMPLE

Historical Valuation of Variable Growth at BHP Billiton

BHP Billiton, a global mining company with its primary origins in Australia, announced in mid-2012 that it would be paying a final dividend that represented an increase of 11% on its dividend for the previous year. The company noted that it had achieved a compound annual dividend growth rate of 26% over the previous 10 years.

BHP Billiton is, clearly, a long-surviving, successful company, but its size as the world's largest miner, and its maturity, suggest that it is not able to grow at the same rate as its dividend over time. Indeed, for the year 2011–2012, its profits fell relative to the previous year, due in part to some substantial write-offs.

We can use the historical BHP Billiton data to see how the capital markets valued this company relative to the value implied by its dividend growth. Only by using historical data are we able to make this relative comparison.

Let's assume that investors required a 10% return on BHP Billiton shares, and that they expected the company to continue to increase dividends by 20% per year for a time. However, let us suppose that eventually, annual dividend growth settled down to 4%. During 2012, a share in the company was selling for an average of \$33. If the 2012 dividend was \$0.68 per share, how long would BHP Billiton have to sustain a 20% growth rate to justify the \$33 share price?

We apply **Equation 5.5** by using a trial-and-error approach to estimate how long investors expected the 20% growth rate to continue. For example, suppose they expected dividends to continue growing at that rate to 2016. The expected dividend stream would have been as follows.

Year	Dividend calculation	
2012	\$0.68(1 + 0.20) ¹	= \$0.82
2013	\$0.68(1 + 0.20) ²	= \$0.98
2014	\$0.68(1 + 0.20) ³	= \$1.18
2015	\$0.68(1 + 0.20) ⁴	= \$1.41
2016	\$0.68(1 + 0.20) ⁵	= \$1.69
2017	\$0.68(1 + 0.20) ⁵ (1.04)	= \$1.76

Plugging these values into **Equation 5.5**, we have:

$$\begin{aligned} P_0 &= \frac{\$0.82}{(1+0.10)^1} + \frac{\$0.98}{(1+0.10)^2} + \frac{\$1.18}{(1+0.10)^3} \\ &\quad + \frac{\$1.41}{(1+0.10)^4} + \frac{\$1.69}{(1+0.10)^5} \\ &= \left[\frac{1}{(1+0.10)^5} \times \frac{\$1.76}{0.10 - 0.04} \right] = \$22.66 \end{aligned}$$

Given these assumptions, the estimated price of BHP Billiton shares is two-thirds of its average market value in 2012; so investors may have been anticipating a more prolonged period of rapid dividend growth than assumed in our calculation. We could repeat this process, extending the rapid-growth phase by a few years each time, until the estimated price is close to the actual market price. For example, if we assume that BHP Billiton dividends will grow at a 20% rate for 15 years, then the estimated share price is \$65.41.⁸

$$\begin{aligned} P &= \frac{\$0.82}{(1+0.10)^2} + \frac{\$0.98}{(1+0.10)^2} + \dots + \frac{\$10.48}{(1+0.10)^{15}} \\ &= \left[\frac{1}{(1+0.10)^{15}} \times \frac{\$10.96}{0.10 - 0.04} \right] = \$65.41 \end{aligned}$$


⁸ Notice in this equation that the dividend in the fifteenth year equals \$0.68(1.20)¹⁵ and the first dividend in the constant-growth period – i.e. the year 16 dividend – is just 4% more than the previous year's dividend.



An investor who believed that BHP Billiton was unlikely to achieve 20% growth in dividends for such a long period of time may have concluded that in 2012 the company's shares were overvalued. Of course, some investors

may have believed that the company's dividends would grow rapidly for a longer period of time, and in that case, the shares may seem like a bargain at \$33.

Source: http://www.bhpbilliton.com/home/investors/reports/Documents/2012/120822_BHP%20Billiton%20Results%20for%20the%20Year%20Ended%2030%20June%202012.pdf: from BHP Billiton. Accessed 2 January 2013.

5.2f HOW TO ESTIMATE GROWTH

By now, it should be apparent that a central component in many share-pricing models is the growth rate. Unfortunately, analysts face a tremendous challenge in estimating a company's growth rate, whether that growth rate refers to dividends, earnings, sales or almost any other measure of financial performance. A company's rate of growth depends on several factors. Among the most important, however, are the size of the investments it makes in new and existing projects and the rate of return those investments earn.

A simple method for estimating how fast a company will grow uses information from financial statements. This approach acknowledges the importance of new investments in driving future growth. First, calculate the magnitude of new investments that the company can make by determining its *retention rate*, rr : the fraction of the company's earnings that it retains. Second, calculate the company's return on ordinary equity, ROE (see Chapter 2), to estimate the rate of return that new investments will generate. The product of those two values is the company's growth rate, g :

(Eq. 5.6)

$$g = rr \times \text{ROE}$$



Share Valuation with Retention Rates

Suppose in 2020 PNG Mining Company reported net income of \$243 million and total shareholders' equity of \$1,602 million. Therefore, the company's ROE was 15.2% ($\$243 \div \$1,602$). Suppose PNG Mining paid \$32 million in cash

dividends that year, so its retention rate was 86.8% ($1 - \$32 \div \243). By taking the product of the ROE and the retention rate, we can estimate PNG Mining Company's growth rate at 13.2% (0.152×0.868).

An alternative approach to estimating growth rates makes use of historical data. Analysts track a company's sales, earnings and dividends over several years in an attempt to identify growth trends. But how well do growth rates from the past predict growth rates in the future? Unfortunately, the relationship between past and future growth rates for most companies is surprisingly weak. The fact that growth rates are largely unpredictable, however, should not come as a great surprise. One of the most fundamental ideas in economics is that competition limits the ability of a company to generate abnormally high profits for a sustained period. When one company identifies a profitable business opportunity, people notice, and entrepreneurs (or other companies) attempt to enter the same business. For example, consider the proliferation of smartphones and tablet devices following the success of Apple's iPhone and iPad. As more and more companies enter, profits (or the growth rate in profits) fall. At some point, if the industry becomes sufficiently competitive, profits fall to such a low level that some companies exit. As companies exit, profits for the remaining companies rise again. The constant pressure created by these competitive forces means that it is rare to observe a company with a consistent, long-term growth trend. Perhaps one reason that companies such as Microsoft, Intel and Cochlear are so well known is that their histories of exceptional long-run growth are so uncommon.

5.2g WHAT IF THERE ARE NO DIVIDENDS?

After seeing the different versions of the dividend growth models, students usually ask, ‘What about companies that don’t pay dividends?’ Though many large, well-established companies in developed countries have been paying regular dividends, there is a rise in the number of companies deciding not to pay dividends at all. Younger companies with excellent growth prospects are less likely to pay dividends than are more mature companies, and recent decades have seen considerable growth in the number of young, high-growth companies in emerging countries. Companies that are in their early stage of growth, or their lifecycle, usually have an acute shortage of cash for operations. This means there is no further cash available to pay dividends. Indeed, most advisers to start-up and high-growth companies, such as angel investors or venture capital investors, will require the owners of these new companies to plough back any cash flows into the businesses, so that they can sustain the growth. The payment of dividends, which diverts cash out of the company, is not a good idea at this time. So new companies may not have a dividend flow to provide a basis for valuation by the model outlined above.

Can we apply the share-valuation models covered thus far to companies that pay no dividends? Yes and no. On the affirmative side, companies that do not currently pay dividends may begin paying them in the future. In that case, we simply modify the equations presented earlier to reflect that the company pays its first dividend not in one year’s time, but several years in the future. However, predicting when companies will begin paying dividends and what the monetary value of those far-off dividends will be is extremely difficult. Consider the problem of forecasting dividends for a company such as Microsoft. Following its IPO in 1986, Microsoft paid no cash dividends until 2003 even though its revenues rose to more than \$30 billion by the time of the first cash dividend.⁹ During the period of no dividend payments, analysts attempting to estimate the value of Microsoft used other methods, such as the free cash flow method or the ‘comparables’ approach described in the next sections of this chapter.

What happens if a company never plans to pay a dividend or to otherwise distribute cash to investors? Our answer to this question is that for a share to have value, there must be an expectation that the company will distribute cash in some form to investors at some point in the future. That cash could come in the form of dividends or share repurchases. If the company is acquired by another company for cash, the cash payment comes when the acquiring company purchases the shares of the target. Investors must believe that they will receive cash at some point in the future. If you have a hard time believing this, we invite you to buy shares in Graham/Adam/Gunasingham Limited, a company expected to generate an attractive revenue stream from selling its products and services. This company promises never to distribute cash to shareholders in any form. If you buy shares, you will have to sell them to another investor later to realise any return on your investment. How much are you willing to pay for these shares?

LO5.2

CONCEPT REVIEW QUESTIONS

- 2 Why is it appropriate to use the perpetuity formula from Chapter 3 to estimate the value of preferred shares?
- 3 When a shareholder sells ordinary shares, what is being sold? What gives ordinary shares their value?

⁹ ‘Microsoft to Pay Dividend for First Time in Its History’, from 17 January 2003, published on Information Age on 10 February 2006. <https://www.information-age.com/microsoft-to-pay-dividend-for-first-time-in-its-history-294386/>. Accessed 12 February 2020.



- 4 Using a dividend forecast of \$4.50, a required return of 10% and a growth rate of 2.75%, we obtained a price for Cochlear Limited of \$62.07. What would happen to this price if the market's required return on Cochlear shares increased?

THINKING CAP QUESTIONS

- 1 Holding all other factors constant, if investors become less risk averse, meaning that they are willing to accept lower returns when investing in risky assets, what would happen to share values generally?
- 2 Why do you think that some product lines are more successful for companies than others?

LO5.3

5.3 THE FREE CASH FLOW APPROACH TO ORDINARY SHARE VALUATION

One way to deal with the valuation challenges presented by a company that does not pay dividends is to value the free cash flow generated by the company. This approach makes sense because, if you buy a company, you obtain rights to all of its free cash flow. The advantage of this procedure is that it requires no assumptions about when the company distributes cash dividends to shareholders. In practice, most analysts estimate the value of a share using several different methods to see how widely the alternative estimates vary. Therefore, the free cash flow approach is widely used, even for shares that do pay dividends. When using the free cash flow approach, we begin by asking, what is the total operating cash flow generated by a company? Next, we subtract from the company's operating cash flow the amount needed to fund new investments in both fixed assets and working capital. The difference is total free cash flow (FCF). We introduced the equation for free cash flow in Chapter 2, but here it is again:

$$FCF = OCF - \Delta FA - DWC$$

Free cash flow represents the amount of cash that a company could distribute to investors after meeting all of its other obligations. Note that we used the word *investors* in the previous sentence. Total free cash flow is the amount that the company could distribute to *all types of investors*, including bondholders, preferred shareholders and ordinary shareholders. Once we have estimates of the FCFs that a company will generate over time, we can discount them at an appropriate rate to obtain an estimate of the total enterprise value.

FINANCE IN THE REAL WORLD



SHOULD I BUY A 25% INTEREST IN SAWFT PTY LTD?

A friend offers you the opportunity to buy into his two-year-old software business, Sawft Pty Ltd. Your friend will give you a 25% interest in the company for \$50,000. Some of the company's key financial data are summarised below.

Free cash flow (prior year)	\$27,800
Expected annual growth in free cash flow:	
Next 3 years	12%
Year 4 to ∞	5%
Your required return	20%



You need to determine: (1) the value of the business; and (2) whether a 25% interest in the business is worth \$50,000. Use the variable growth model to estimate the value of the business, starting with estimates of the free cash flows (FCFs) at the end of each of the next four years:

Year 1	$FCF = \$27,800 \times 1.12 = \$31,136$
Year 2	$FCF = \$31,136 \times 1.12 = \$34,872$
Year 3	$FCF = \$34,872 \times 1.12 = \$39,057$
Year 4	$FCF = \$39,057 \times 1.0 = \$41,010$

Next, we calculate the present value (PV_0) of the FCFs for the first three years:

$$\begin{aligned}PV_0 &= \$31,136 \div 120^1 + \$34,872 \div 120^2 \\&\quad + \$39,057 \div 120^3 \\&= \$25,947 + \$24,217 + \$22,602 \\&= \$72,766\end{aligned}$$

Then we calculate the PV_3 (at the end of year 3) of the FCFs from year 4 to ∞ .

$$\begin{aligned}PV_3 &= \$41,010 \div (0.20 - 0.05) \\&= \frac{\$41,010}{0.15} \\&= \$273,400\end{aligned}$$

Discounting the end-of-year-3 cash flow above back to time 0, we get:

$$\begin{aligned}PV_0 &= \frac{\$273,400}{120^3} \\&= \$158,218\end{aligned}$$

Adding the PV_0 s for the first three years to those for year 4 to ∞ , we get:

- 1 Current value of the business = $\$72,766 + \$158,218 = \$230,984$

Taking 25% of the current value of the business, we get:

- 2 Value of a 25% interest in the business = $0.25 \times \$230,984 = \$57,746$

Assuming your estimates are correct, you should pay \$50,000 for a 25% interest in Sawft Pty Ltd, given that it is in fact worth \$57,746.

But what do we mean by ‘an appropriate discount rate’? This is a subtle issue that we discuss in much greater detail in Chapter 11. To understand the main idea, recall that FCF represents the total cash available for all investors. We suspect that debt is not as risky as preferred shares, and that preferred shares are not as risky as ordinary shares. This means that bondholders, preferred shareholders and ordinary shareholders each have a different required return in mind when they buy a company’s securities. Somehow, we should capture these varying required rates of return to come up with a single discount rate to apply to free cash flow, the aggregate amount available for all three types of investors. The solution to this problem is known as the **weighted average cost of capital (WACC)**.¹⁰ The WACC is the after-tax, weighted average required return on all types of securities issued by the company, where the weights equal the percentage of each type of financing in the company’s overall capital structure. For example, suppose a company finances its operation with 50% debt and 50% equity. Further suppose the company pays an after-tax return of 8% on its outstanding debt, and that investors require a 16% return on the company’s shares. The WACC for this company would be calculated as follows:

$$WACC = (0.50 \times 8\%) + (0.50 \times 16\%) = 12\%$$

If we obtain forecasts of the FCFs, and if we discount those cash flows at a 12% rate, the resulting present value is an estimate of the total value of the company, which we denote $V_{company}$.

When analysts value free cash flows, they use some of the same types of models that we have used to value other kinds of cash flow. We could assume that a company’s free cash flows will experience zero, constant or variable growth. In each instance, the procedures and equations would be the same as those introduced earlier for dividends, except we would now substitute FCF for dividends.

weighted average cost of capital (WACC)

The after-tax, weighted average required return on all types of securities issued by a company, where the weights equal the percentage of each type of financing in a company’s overall capital structure

¹⁰ We provide only a brief sketch of the WACC concept at this point, deferring a deeper analysis until Chapter 11.

Remember, our goal in using the free cash flow approach is to develop a method for valuing a company's shares without making assumptions about its dividends. The free cash flow approach begins by estimating the total value of the company. To find out what the company's shares, V_{share} , are worth, we subtract from the total enterprise value, $V_{company}$, the value of the company's debt, V_{debt} , and the value of the company's preferred shares, $V_{preferred}$. **Equation 5.7** depicts this relationship:

(Eq. 5.7)

$$V_{shares} = V_{company} - V_{debt} - V_{preferred}$$

We already know how to value bonds and preferred shares, so this step is relatively straightforward. Once we subtract the value of debt and preferred shares from the total enterprise value, the remainder equals the total value of the company's shares. Simply divide this total by the number of shares outstanding to calculate the value per share, P_0 .

The free cash flow approach offers an alternative to the dividend discount model that is especially useful when valuing shares that pay no dividends. As we will see in the next section, security analysts have several alternative approaches at their disposal for estimating the value of shares. Not all of these methods involve discounted cash flow calculations, but in many cases, they may arrive at similar estimates for the value of a share.

LO5.3

CONCEPT REVIEW QUESTION

- 5 How can the free cash flow approach to valuing an enterprise be used to resolve the valuation challenge presented by companies that do not pay dividends? Compare and contrast this model with the dividend valuation model.

LO5.4

5.4 OTHER APPROACHES TO ORDINARY SHARE VALUATION

So far, we have discussed valuation methods that require analysts to discount future dividends or free cash flows. These methods tend to work best for relatively mature, stable companies. Other methods may be used to value companies in different circumstances. For example, when a company is performing very poorly and is on the verge of going bankrupt, the value of the company's shares may reflect only the amount that analysts believe can be recovered by liquidating the company's assets and paying off its debts. Or consider a relatively young, high-growth company. Such a company may have no dividends and negative free cash flow because the investments that it needs to make in working capital and fixed assets may exceed the company's operating cash flow. In this situation, an analyst may value the company by comparing it with other existing companies.

5.4a LIQUIDATION VALUE, BOOK VALUE AND RESIDUAL INCOME MEASUREMENT

liquidation value

The value that remains after a company's assets are sold and its liabilities are paid

To calculate **liquidation value**, analysts estimate the amount of cash that remains if the company's assets are sold and all liabilities paid. In most cases, a company's liquidation value is far below its market value. That's because a healthy company has competitive advantages, such as brand value or intellectual property, which make it more valuable as a going concern. For instance, the total market value of outstanding shares in late

2018 for Alphabet Inc., the owner of Google, was about US\$830 billion, but the total assets that the company owned (cash, plant and equipment) totalled about US\$233 billion.¹¹ Google's market equity value in 2018 was based primarily on its ability to generate cash in the future by developing innovative products and services.

However, there are times when it may be better to liquidate a company than to keep operating it. For example, if a company owns valuable assets that could be sold, but it is not able to use those assets to generate a profit, the shareholders may be better off if the company liquidates.

Unfortunately, estimating liquidation value is a challenge because it is often difficult to know the value of the assets appearing on a company's balance sheet. As a starting point, analysts might look at the company's **book value**, meaning the value of the company's equity as shown on its balance sheet. The book value of equity reflects the historical cost of the company's assets, adjusted for depreciation, net of the company's liabilities.

book value
The value of equity as shown on the company's balance sheet

Liquidation value may be more or less than book value, depending on the marketability of the company's assets and the depreciation charges that have been assessed against fixed assets. For example, an important asset on many corporate balance sheets is real estate. For many organisations, the value of raw land appears on the balance sheet at historical cost, but, in many cases, its market value is much higher. In that instance, liquidation value may exceed book value. In contrast, suppose that the largest assets on a company's balance sheet are highly customised machine tools purchased two years ago. If the company carries them at historical cost and depreciates the tools on a straight-line basis over five years, the value shown on the books would equal 60% of the purchase price. However, there may be no secondary market for tools that have been customised for the company's manufacturing processes. If the company goes bankrupt, and the machine tools have to be liquidated, they may sell for much less than book value.

Continuing with the concept of book value as a basis for equity valuation, we can note the concept of the **residual income measure (RIM)**. This combines the accounting and finance elements of valuation. The RIM for each period in the future requires us first to forecast expected future earnings or income for the company for each future period. This will be income that is owned by the equity invested in the company. We then project the expected future book value of ordinary shares at the start of each period. Against this book value of equity, we set the expected cost of equity: in our terms, this is the return on equity that we require the company to earn (r_e). The product of the return on equity and the book value of equity gives us an estimate of expected future required income – that is, what we need to earn on equity in order that it continues to invest in the company.

residual income measure (RIM)
The present value of the difference between the forecast expected future (accounting) income for equity in a company and the expected future required income. The measure can be used to value equity if the income measures and book values of equity are known, even if no dividends are being paid

The residual income for a given period is then the difference between the forecast expected future income and the expected future required income. Once we have generated the expected future residual income measures for each period, we can take a present value of them and use this as a valuation of equity for the company.

The method is akin to the economic value added (EVA) technique of valuing projects, which we shall meet in Chapter 9. Differences lie in the use of book value of all equity for the RIM concept, where EVA uses invested capital for the project; and the focus on accounting earnings (profits) for the company in RIM as opposed to the cash flows for the project in EVA. Perhaps a key value in using RIM is that it can be applied for valuing equity even when no dividends are being paid, as we noted in section 5.2g earlier in this chapter.

5.4b MARKET MULTIPLES OF COMPARABLE COMPANIES

Because of the uncertainty surrounding the inputs to any valuation model, analysts routinely employ different methods to analyse the same company to estimate a range of plausible values. The two most

¹¹ <https://www.marketwatch.com/investing/stock/goog/financials/balance-sheet>. Accessed 2 July 2019.

comparable multiples method

A valuation method that calculates a valuation ratio or multiple for each company in a sample of similar companies, then uses the average or median pricing multiple for the sample companies to estimate a particular company's value

widespread valuation techniques are the discounted cash flow method, covered in section 5.2, and the comparable multiples method. The **comparable multiples method** involves three steps.

First, collect a sample of similar, publicly traded companies. By similar, we mean that these companies should have similar lines of business and similar risk profiles, growth prospects and capital structures. Of course, no two companies are exactly alike, but an analyst using this approach attempts to gather many companies that are as much alike as possible.

Second, for each company in the sample, divide the company's value (either its total value or its value per share) by some measure of operating performance to get a 'pricing multiple'. For example, one common multiple is the price/earnings (P/E) ratio introduced in Chapter 2, where value per share is divided by the performance metric earnings per share. Other multiples frequently used by analysts include the ratio of the market value of a company's equity to its book value (the price-to-book ratio), and the ratio of company value ($V_{company}$) to earnings before interest, taxes and depreciation and amortisation (EBITDA).

Third, take the average or median (middle value) pricing multiple from your sample of comparable companies, and multiply that by the operating variable (such as earnings) for the company you want to value.

The intuition for this approach is relatively straightforward. Simply stated, the multiples method says that similar companies should sell at similar prices relative to their operating results, where operating results are often measured by sales revenue, earnings or cash flows. For example, consider two companies, which we will call Twilight and Potter. These companies operate in the book publishing business, so their operating risks should be similar, which means that investors should expect about the same return from each company (we shall assume the required return is 10%). Further, we assume that both companies have been growing at a steady 5% per year in the recent past. For simplicity, we will also assume that neither company has any debt financing or preferred shares.

One big difference between the two companies is that Potter generates substantially more free cash flow than Twilight. In fact, investors believe that next year Potter will generate \$2.0 billion in free cash flow, and Twilight will deliver \$1.0 billion. Let's value each company by discounting its free cash flows.

FINANCE IN THE REAL WORLD



HOW INVESTMENT BANKERS VALUE COMPANIES

When one company attempts to acquire another, both the bidder and the target company may hire an investment banker to provide fairness opinions, written reports that provide the banker's expert opinion regarding the fairness of the price offered by the bidder. Matt Cain and David Denis have investigated which methods bankers use in their fairness opinions to value target companies. As the authors show, bankers almost always perform a discounted cash flow valuation as part of their analysis; but they sometimes use other methods. In a slight majority of acquisitions, bankers value the target company by using

comparisons to public-company multiples such as P/E ratios. Public-company multiples are an example of valuation using the market multiples of comparable companies, which we discussed in section 5.4b. Bankers also use transaction multiples (price paid relative to target earnings in recent acquisitions) and transaction premia (what bidders have paid for targets, above and beyond their market values, in recent deals) when advising their clients.

Source: Matt Cain and David Denis, 'Information Production by Investment Banks: Evidence from Fairness Opinions Working paper', May 2012; https://papers.ssrn.com/sol3/papers.cfm?abstract_id=971069. Accessed 22 September 2019.

Remember, because the companies have no debt or preferred shares, the enterprise value and the share value are one and the same.

$$V_{\text{Twilight}} = \$1,000,000,000 / (0.10 - 0.05) = \$20,000,000,000$$

$$V_{\text{Potter}} = \$2,000,000,000 / (0.10 - 0.05) = \$40,000,000,000$$

Potter is twice as valuable because it generates twice as much cash flow as does Twilight. However, these two companies have one more thing in common. Divide the company value by next year's cash flow to get a value-to-cash flow multiple:

$$\text{Twilight multiple} = \$20,000,000 / \$1,000,000 = 20$$

$$\text{Potter multiple} = \$40,000,000 / \$2,000,000 = 20$$

The companies have the same multiple because their risks and growth prospects are identical. Another way of saying this is that in a discounted cash flow valuation of these companies, the denominator, $r - g$, is the same for Twilight and Potter ($10\% - 5\% = 5\%$). For these two companies, each dollar of additional free cash flow adds \$20 to company value ($\$20 = \$1 \div (10\% - 5\%)$). Therefore, if we apply a multiple of 20 to a similar company's cash flow, we are simply taking a shortcut to get the same answer that we would get if we did a discounted cash flow valuation for that company. Given these results, an analyst might value a third book publishing company by forecasting its cash flows one year ahead and simply multiplying that number by 20, the multiple for comparable companies.

In practice, things do not work out as precisely as in the preceding example. The next illustration shows a more realistic application of valuation using multiples.



Share Valuation with Multiples

You work for a large technology company that is considering making an offer to buy Green Phonz Apps, a young, privately held start-up company. By doing careful due diligence work, you have estimated that this company's revenues next year will be \$195 million and its earnings before interest, taxes, depreciation and amortisation (EBITDA) \$100 million. Green Phonz has \$100 million of outstanding debt. Performing a discounted cash flow valuation of this company would require you to estimate both the company's

WACC and its growth rate. Before doing that, you decide to conduct a public-company multiples analysis on three similar companies. Companies A, B and C are all companies that went public via an initial public offering (IPO) of ordinary shares in the last few years, and each of these companies has a staff of software engineers who write programs for apps for smartphones and tablet devices. **Figure 5.1** summarises some key information for each of these companies.

FIGURE 5.1 KEY INFORMATION ABOUT COMPANIES A, B AND C

COMPANIES COMPARABLE TO GREEN PHONZ	OUTSTANDING SHARES (MILLIONS)	SHARE PRICE	DEBT OUTSTANDING (\$ MILLIONS)	REVENUES (\$ MILLIONS)	EBITDA (\$ MILLIONS)
Company A	100	\$5	\$100	\$100	\$68
Company B	200	\$2	\$150	\$95	\$65
Company C	50	\$7.50	\$200	\$150	\$63



From this information, you calculate two multiples for each company: (1) the ratio of total company value to revenues; and (2) the ratio of total company value to EBITDA. To illustrate for Company A, company value equals the market value of outstanding equity plus the value of outstanding debt:

$$V_{company} A = V_{shares} + V_{debt} = (100,000,000 \times \$5) + \$100,000,000 = \$600,000,000$$

Next, divide this figure by total revenues or by EBITDA to obtain the desired multiple:

$$\frac{Value}{Revenues} = \frac{\$600,000,000}{\$100,000,000} = 6.0$$

$$\frac{Value}{EBITDA} = \frac{\$600,000,000}{\$68,000,000} = 8.8$$

Repeating these calculations for companies B and C, we obtain the results shown in [Figure 5.2](#).

FIGURE 5.2 COMPANY VALUES FOR COMPANIES A, B AND C

	EQUITY VALUE (\$ MILLIONS)	COMPANY VALUE (\$ MILLIONS)	VALUE-TO-REVENUE MULTIPLE	VALUE-TO-EBITDA MULTIPLE
Company A	\$500	\$600	6.0	8.8
Company B	400	550	5.8	8.5
Company C	375	575	3.8	9.1
Average			5.2	8.8

Now, simply use the average value of each multiple to estimate the total company value for Green Phonz (see [Figure 5.3](#)). Based on the multiple of company value to revenues, Green Phonz should be worth about \$1.014 billion (\$195 million times 5.2), and based on the multiple of company value to EBITDA, the value

of Green Phonz is slightly lower at \$924 million (\$105 million times 8.8). You might then conduct a separate discounted cash flow valuation of Green Phonz to see whether that estimate is also roughly in line with the estimate of about \$1 billion that you just calculated based on multiples.

FIGURE 5.3 TOTAL COMPANY VALUES OF GREEN PHONZ

	GREEN PHONZ VALUATION BASED ON:	
	REVENUES (\$ MILLIONS)	EBITDA (\$ MILLIONS)
Average comparable multiple	5.2	8.8
Green Phonz operating metric	\$195	\$105
Estimated value of Green Phonz	\$1,014	\$924

If you wanted to estimate the equity value of Green Phonz, you could simply subtract its debt value from the enterprise values just calculated. This indicates that Green Phonz's equity is worth about \$900 million (\$1 billion enterprise value minus \$100 million debt). Alternatively, you could calculate the equity value directly using equity comparable multiples, such as the P/E ratio (the price per share divided by earnings per share). It is important to recognise that if equity value is in the numerator of the ratio ('price' in the P/E ratio), then to make the ratio apples-to-apples,

the denominator must represent a flow that goes to shareholders only ('earnings' in the P/E ratio). That is, if the numerator is share price, you should not use a number like EBITDA in the denominator because EBITDA can be used to pay both shareholders and bondholders.¹²

To summarise, if share price or total equity value is in the numerator of the comparable multiple, then use a denominator that is associated only with equity holders (like earnings or book equity). In contrast, in the calculations

¹² Earnings before interest, taxes, depreciation and amortisation (EBITDA) represents funds that can be used to pay bondholders (via debt interest), government (via taxes), shareholders (via earnings that can be paid out as dividends) and 'real capital' (via the depreciation and amortisation).





done in the tables above, because total company value was in the numerator of the comparable multiple, we used a denominator (EBITDA) that is associated with all investors, both bondholders and shareholders.

There is one other important consideration when you use multiples to perform valuation analysis: when the denominator of a ratio is small, the overall ratio becomes large. For example, if earnings fall to \$0.01 for one comparable

company, then its P/E ratio might be very large (if the price is \$20, then its P/E multiple would be 2,000 [$= 20 \div 0.01$]) and also vary greatly with small movements in the denominator (if earnings increased to \$0.10, the P/E multiple would become 200). Careful analysts watch for extreme outliers, like a P/E ratio of 2,000, and when extreme values appear in a sample of comparables, they exclude the outliers or use the median value for the group rather than the average.

LO5.4

CONCEPT REVIEW QUESTIONS

- 6 Why might the terms *book value* and *liquidation value*, used to determine the value of a company, be characterised as viewing the company as 'dead rather than alive'? Explain why those views are inconsistent with the discounted cash flow valuation models.
- 7 When comparing P/E ratios of different companies, analysts sometimes say that companies with higher P/E ratios are expected to grow faster than companies with lower P/E ratios. What is the discounted cash flow basis for this statement? Use a discounted cash flow argument to illustrate how two companies that are expected to grow at the same rate might still have different P/E ratios.

THINKING CAP QUESTIONS

- 3 Considering the banking industry, do you think that the mix of bank investments in company loans and asset holdings is likely to remain the same for the next five years? Why or why not?
- 4 Why might an investor want to use more than one method for valuing a target company in a takeover bid?

LO5.5

5.5 PRIMARY AND SECONDARY MARKETS FOR EQUITY SECURITIES

In this section, we look at how shares are sold to investors in the primary market, and how investors trade shares with each other in the secondary market. As previously noted, the *primary market* refers to the market in which companies originally issue new securities. Once the securities have been issued in the primary market, investors can trade them in the *secondary market*.

5.5a INVESTMENT BANKING FUNCTIONS AND THE PRIMARY MARKET

investment banks

Financial institutions that assist companies in raising long-term debt and equity financing in the world's capital markets, advise companies about major financial transactions and are active in the business of selling and trading securities in secondary markets

seasoned equity offering (SEO)

An equity issue by a company that already has ordinary shares outstanding

negotiated offer

A process used by an issuer to hire an investment banker with whom it directly negotiates the terms of the offer

lead underwriter

The investment bank that takes the primary role in assisting a company in a public offering of securities

underwrite

The investment banker purchases shares from a company and resells them to investors

firm-commitment offering

An offering in which the investment bank agrees to *underwrite* the company's securities, thereby guaranteeing that the company will successfully complete its sale of securities

underwriting spread

The difference between the net price and the offer price of an underwritten security issue

Investment banks play an important role in helping companies raise long-term debt and equity financing in the world's capital markets. Investment banks sell new security issues and assist and advise corporations about major financial transactions, such as mergers and acquisitions, in exchange for fees and commissions.

The three principal lines of business of an investment bank are:

- 1 corporate finance
- 2 trading
- 3 asset management.

Of the three business lines, corporate finance enjoys the highest visibility, and includes activities such as merger and acquisitions (M&A) advisory work and new security issues. Corporate finance tends to be the most profitable line of business, especially for large banks such as Macquarie Bank or Goldman Sachs, which can charge the highest underwriting and advisory fees. Investment banks earn revenue from trading debt and equity securities, either by acting as dealers, by facilitating trade between unrelated parties or by holding inventories of securities that can make or lose money for the bank as inventory values fluctuate. Finally, asset management encompasses several different activities, including managing money for individuals with high net worth, operating and advising mutual funds and managing pension funds.

When they advise corporations that want to issue ordinary shares in the public markets, investment banks play several different roles. The complexity of the investment banker's job depends on: (1) whether a company is selling equity for the first time, and in the process, converting from private to public ownership; or (2) whether the company has previously issued shares and is simply going back to the equity market to raise money. The first type of transaction is much more complex and is called an *initial public offering (IPO)*. The second type is known as a **seasoned equity offering (SEO)**, implying that the shares offered for sale have previously been seasoned in the market. Usually, companies hire investment bankers through a process known as a **negotiated offer**, where, as the name implies, the issuing company negotiates the terms of the offer directly with one investment bank.¹³ Companies issuing securities often enlist the services of more than one investment bank. In these cases, it is typical for one of the banks to be named the **lead underwriter**, and the other participating banks are known as *co-managers*.

In most equity deals, the investment bank agrees to **underwrite** the issue in a **firm-commitment offering**, which means that the bank actually purchases the shares from the company and resells them to investors. In firm-commitment offerings, investment banks receive compensation for their services via the **underwriting spread**, the difference between the price at which the banks purchase shares from companies (the *net price*) and the price at which they sell the shares to institutional and individual investors (the *offer price*). Underwriting fees can be quite substantial, especially for companies issuing equity for the first time. Underwriting spreads vary in value, reaching as high as 10% for particular organisations. As an example, suppose a company conducting an IPO wants to sell shares worth \$100 million. If the underwriting spread is 7%, it will receive \$93 million in proceeds from the offer. The underwriter earns the gross spread of \$7 million as long as it can sell the shares on to the market for a total value of \$100 million. At the other extreme, large debt offerings of well-known issuers have underwriting spreads in the 0.5% range.

Just what do investment banks do to earn their fees? Investment banks perform a wide variety of services, ranging from carrying out the analytical work required to price a new security offering, to assisting the company with regulatory compliance, marketing the new issues and developing an orderly market for the company's securities once they begin trading.

¹³ Less common is a competitively bid offer in which the company issuing securities announces the terms of its intended sale, and investment banks bid for the business.

Early in the process of preparing for an equity offering, an investment bank helps file the necessary documents with regulators, starting with the *registration statement*, which provides information about the securities being offered. The investment bank involved with the equity offering would also usually prepare a **prospectus**, a document containing extensive details about the issuer and the security it intends to offer.

While it is preparing the necessary legal documents, the investment bank must also begin to estimate the value of the securities the company intends to sell. Investment banks use a variety of methods to value IPO shares, including discounted cash flow models and the comparable multiples approach.

Several weeks before a large scheduled offering, the company and its bankers take a tour of potential major investors, most of which are institutions. Affectionately called the **road show**, this gruelling process usually lasts a week or two. It gives managers the opportunity to pitch their business plan to prospective investors. The investment banker's goal in this process is to build a book of orders for shares that is greater (often many times greater) than what the company intends to sell. The expressions of interest by investors during the road show are not binding purchase agreements, and the investment bank does not commit to an offer price at this point. Instead, bankers give investors a range of prices at which the offer might sell based on their assessment of demand. Given the tentative nature of the demand expressed on the road show, the banker seeks to **oversubscribe** the offering to minimise the bank's underwriting risk. Naturally, one way to create excess demand for an offering is to set the offer price below the market-clearing level. The majority of IPOs are underpriced, meaning that once IPO shares begin trading, they do so at a price that is above the original offer price set by the company and its bankers.

After a share offering is successfully sold, the lead underwriter often serves as the principal *market maker* for trading in the company's shares. In this role, the lead underwriter purchases shares from investors wishing to sell, and sells shares to investors wishing to buy, thus 'making a market' in the new issue. The lead underwriter also assigns one or more research analysts to cover the issuing company. The research reports these analysts write (which naturally tend to be flattering) help generate additional interest in trading the company's securities.

To conclude this section, we want to highlight the conflicts that investment bankers may face. Companies issuing securities, on the one hand, want to obtain the highest possible price for their shares (or bonds). Companies also want favourable coverage from securities analysts employed by their investment bankers. Investors, on the other hand, want to purchase securities at prices low enough to ensure that they will earn a high return on their investments. Investors also value dispassionate, unbiased advice from analysts. Investment bankers must therefore walk a thin line, both ethically and economically, to please their constituents. Companies issuing securities are wise to remember this. Investment bankers deal with investors, especially large institutional investors, on a repeated basis. They must approach this group each time a new offering comes to the market. In contrast, over its entire life, a company conducts just a single IPO.

prospectus

A document that contains extensive details about the issuer and describes the security it intends to offer for sale

road show

A tour of major investors undertaken by a company and its bankers several weeks before a scheduled offering; the purpose is to pitch the company's business plan to the prospective investors

oversubscribe

When the investment banker builds a book of orders for shares that is greater than the number of shares the company intends to sell

5.5b SECONDARY MARKETS FOR EQUITY SECURITIES

The secondary markets permit investors to execute transactions among themselves – this is the marketplace where an investor can easily sell his or her holdings to someone else. In Australia, for listed shares, the Australian Securities Exchange (ASX) conducts its operations entirely by computer, using the Stock Exchange Automated Trading System (SEATS).

The New Zealand Stock Market (NZSX Market) is the primary market for share trading in New Zealand, with more than 200 companies listed; but there is also the NZ Alternative Market (NZAX Market), which is aimed at small to medium-sized companies with fast growth. The latter provides its trading services at lower cost than the NZSX Market.

We shall focus on the ASX, the largest stock exchange in the Australasian region. Brokers can enter the SEATS on behalf of their clients who wish to buy and sell shares in listed companies; and another computer

system (Clearing House Electronic Sub-register System, or CHESS) automatically clears the trades when it finds matches of price and volume. Australian company shares can also be traded in the *over-the-counter (OTC) market*, which deals in smaller, unlisted securities.

Stock Exchange Automated Trading System (SEATS)

The internet-based brokerage system operated by the ASX to allow investors to buy and sell their share orders electronically through their brokers

Clearing House Electronic Sub-register System (CHESS)

The computer-based settlement and transfer system used by the ASX to finalise trades in shares and their payments

As we have noted, the trading of shares on the Australian Securities Exchange (ASX), starts at the **Stock Exchange Automated Trading System (SEATS)** computer system. An individual or a company contacts a brokerage company to carry out trades in shares through an auction system that underpins SEATS. Those with shares for sale, or those wishing to buy shares, post their sell and buy orders through their brokers on SEATS, with the expectation that buy orders will be filled at the lowest acceptable price and sell orders filled at the highest acceptable price. If the computer program registers that, for example, a person wishes to buy 100 shares of company XYQ at a price no more than \$10.00, and another person wishes to sell 50 shares of XYQ at a price no less than \$9.50, then a deal can be struck automatically by SEATS for trading 50 shares (the minimum number acceptable to both parties) for a price that is calculated as a weighted average between \$9.50 and \$10.00. This price would satisfy both buyer and seller. The satisfied deal is then cleared through **Clearing House Electronic Sub-register System (CHESS)**, arranging the transfer of shares from seller to buyer, and the payment going in the opposite direction, within two working days following the initial deal. The information that there is a new shareholder in the company is also transmitted to the company. Companies must know the contact details of their shareholders (or their agents) in order to be able to communicate important information to them or to send them their dividends when due.

FINANCE IN THE REAL WORLD



BUYING THE ASX?

In October 2010, the operator of Australia's stock exchange, ASX, proposed an agreement to merge with the Singapore Stock Exchange (SGX) to create the second largest exchange in the Asia-Pacific region. The purchase price for the SGX was \$A8.4 billion, with which the SGX would buy all the shares in the ASX (since ASX itself is a listed company). The deal valued the ASX at \$A48 per share.

Each exchange was to retain its own brand and legal existence. The board of directors of the holding company that would run the two exchanges, ASX-SGX, was to have directors from both Singapore and Australia. The boards of both stock exchanges approved the merger.

The proposal encountered strong resistance from several groups, including,

finally, the Australian government's Treasurer, whose approval was required for the sale to be finalised.

By April 2011, it became clear that the Australian Treasurer was going to reject the proposed merger, on the basis of concerns about financial market control for Australia and the difficulties that small companies might encounter when trying to list on the new exchange. The Australian government's Foreign Investment Review Board, which considers the levels of foreign investment in Australia, unanimously rejected the proposal; and the Australian government finally did reject it.

Source: <https://www.smh.com.au/business/how-the-asx-sgx-merger-failed-2010421-1dqb2.html>. Accessed 5 July 2019.

bid price

The price at which a market maker offers to purchase a security; the price at which an investor can sell a security

ask price

The price at which a market maker offers to sell a security; the price at which an investor can purchase a security

Regardless of where a share trade takes place, someone must facilitate that trade, and the compensation he or she earns for doing so is known as the *bid-ask spread*. The **bid price** and **ask price** represent, respectively, the price at which a market maker offers to buy or sell a security. In effect, an investor pays the ask price when *buying* securities and receives the bid price when *selling* them. For example, an investor who buys 100 shares of Google may pay \$1,100 per share, and another investor who sells 100 Google shares at the same time may receive just \$1,099 per share. The *bid-ask spread* (here, \$1 per share) represents the market maker's compensation.

5.5c SOCIAL INVESTING THROUGH EQUITY

In a press release in 2018,¹⁴ Larry Fink, chief executive of the world's largest asset management company, BlackRock, pledged significant resources towards developing 'sustainable investing'. For example, this would mean offering funds that invest using environmental, social and governance (ESG) criteria along with other considerations to make asset allocation decisions. Mr Fink viewed sustainable investing as being in its early stages. Increasingly, investors worried about climate change seek portfolios of companies that are consistent with their values – in much the same way as an earlier generation embraced ethical investing or divestment-from-sin stocks. According to Professor Harrison Hong, 'To the extent that markets are too short-termist to confront long-run risks, high ESG stocks might have high risk-adjusted returns. Depending on how large these excess returns are, a fund portfolio tilted toward high ESG stocks might outperform, or at least not underperform, passive indices.'¹⁵

As noted by Professor Hong, this proposition is controversial among academics and practitioners. Because ESG funds typically have higher fees (due to the costs of in-house research or licensing third-party sustainability scores) and tracking errors (since the mandate often requires tilting away from large market capitalisation stocks), it is far from a foregone conclusion that ESG scores contain enough expected return information to overcome these initial drags on performance. Indeed, the performance of funds currently using sustainability scores generated by leading ESG ratings agencies is mixed.

Historically, academic studies have found similarly divergent results on whether picking stocks with better environmental, social and good-governance criteria have higher, comparable or lower average returns than asset allocations that ignore these considerations. In Professor Hong's view, a critical question in evaluating past performance is whether the differential returns of allocation strategies that include ESG considerations are attributable to ESG factors, or whether measures of ESG ranking are capturing other firm characteristics that are correlated with ESG scores.

Ongoing research by Professor Hong and his colleagues suggests that the differences in economic performance of firms declaring support for ESG or sustainable investments and economic performance (including costs of capital), and of those that do not make such declarations, are not very great on the historical record up to 2010; but there may be an expectation of greater differences in performance as the markets define more clearly what good ESG performance or sustainable investment means over the coming years.

LO5.5

CONCEPT REVIEW QUESTIONS

- 8 What is the difference between a primary market and a secondary market?
- 9 How are underwriters compensated?
- 10 What do companies and their investment bankers hope to learn on the road show?
- 11 When you buy a share in the secondary market, does the company that issued the share receive cash?

14 A. Mooney and P. Smith, 'As the Climate Changes, ESG Investing Powers into the Mainstream', *Financial Times*, 18 November 2018.

15 H. Hong, 'The Sustainable Investing Proposition', NBER Reporter 2019:2, National Bureau of Economic Research, <https://www.nber.org/reporter/2019number2/hong.html>. Accessed 10 July 2019.

STUDY TOOLS

SUMMARY

- LO5.1**
 - Preferred shares have both debt- and equity-like features, and do not usually represent an ownership position in the company.
 - Ordinary shares represent a residual claim on a company's cash flows, and ordinary shareholders have the right to vote on corporate matters.
- LO5.2**
 - The same principles apply to the valuation of preferred and ordinary shares. The value of a share depends on the cash flow the share is expected to pay its owner over time.
 - Because preferred shares pay a constant dividend with no specific expiration date, they can be valued using the perpetuity formula from Chapter 3.
 - The approach used to value ordinary shares depends on investors' expectations of dividend growth. Zero dividend growth, constant dividend growth and variable dividend growth can all be incorporated into the basic valuation approach.
 - Estimating dividend growth is very difficult. A starting point is to multiply the retention rate times the return on equity.
- LO5.3**
 - Analysts use the free cash flow approach to value the entire enterprise. From that, they derive a price per share.
 - Other approaches to valuation rely on book value, liquidation value or valuation multiples of comparable companies.
- LO5.4**
 - Share markets can be classified as either primary or secondary. Shares are sold for the first time in the primary market, but after that, trading occurs in the secondary market.
- LO5.5**
 - Investment bankers play an important role in helping companies issue new securities; and active trading in secondary equity markets maintains market knowledge about the performance of listed companies.

IMPORTANT EQUATIONS

TABLE OF IMPORTANT EQUATIONS

$$5.1 \quad PS_0 = \frac{D_p}{r_p}$$

$$5.2 \quad P_0 = \frac{D_1 + P_1}{(1+r)^1}$$

$$5.4 \quad P_0 = \frac{D_1}{r-g}$$

$$5.5 \quad P_0 = \underbrace{\frac{D_0(1+g_1)^1}{(1+r)^1} + \frac{D_0(1+g_1)^2}{(1+r)^2} + \dots + \frac{D_0(1+g_1)^N}{(1+r)^N}}_{\text{PV of dividends during initial growth phase}} + \left[\frac{1}{(1+r)^N} \times \frac{D_{N+1}}{r-g_2} \right]$$

$$5.6 \quad g = rr \times ROE$$

$$5.7 \quad V_{shares} = V_{company} - V_{debt} - V_{preferred}$$

SELF-TEST PROBLEMS

Answers to these 'Self-test problems' and the 'Concept review' questions throughout the chapter appear on the Student Companion Website (<http://login.cengagebrain.com>) or via your instructor.

ST5-1 Omega Healthcare Investors pays a dividend on its Series B preferred shares of \$0.539 per quarter. If the price of Series B preferred shares is \$25 per share, what quarterly rate of return does the market require on this share, and what is the effective annual required return?

ST5-2 During 2014, McDonald's Corporation increased its annual dividend to \$US3.28 from \$US3.12 in 2013. This continued a long string of dividend increases. The company has paid a cash dividend to shareholders every year since 1976, and has increased its dividend payments for 38 consecutive years, including through the 2007–2011 global financial crisis. Suppose you are now in 2014 and want to use the dividend growth model to value McDonald's shares. You believe the dividend will grow at 5% per year indefinitely, and you think the market's required return on this share is 11%. Let's assume that McDonald's pays dividends annually and that the next annual dividend is expected to be \$US3.70 per share. The dividend will arrive in exactly one year. What would you pay for McDonald's shares right now? Suppose you buy the shares today, hold them just long enough to receive the next dividend, and then sell them. What rate of return will you earn on that investment?

QUESTIONS

Q5-1 How are preferred shares different from ordinary shares?

Q5-2 How do you estimate the required rate of return on a preferred share if you know its market price and its dividend?

Q5-3 The value of ordinary shares cannot be tied to the present value of future dividends because most companies don't pay dividends. Comment on the validity, or lack thereof, of this statement.

Q5-4 A common fallacy in share market investing is assuming that a good company makes a good investment. Suppose we define a good company as one that has experienced rapid growth (in sales, earnings or dividends) in the recent past. Explain the reasons why shares of good companies may or may not turn out to be good investments.

Q5-5 Why is it not surprising to learn that growth rates rarely show predictable trends?

Q5-6 The book value of a company's ordinary equity is usually lower than the market value of the ordinary shares. Why? Can you describe a situation in which the liquidation value of a company's equity could exceed its market value?

Q5-7 Why is the relationship between an investment banker and a company selling securities somewhat adversarial?

Q5-8 Does secondary market trading generate capital for the company whose shares are trading?

PROBLEMS

VALUING PREFERRED AND ORDINARY SHARES

P5-1 Argav Towers has outstanding an issue of preferred shares with a par value of \$100. It pays an annual dividend equal to 8% of par value. If the required return on Argav preferred shares is 6%, and if Argav pays its next dividend in one year, what is the market price of the preferred shares today?

- P5-2** Silaic Tools has issued preferred shares that offer investors a 10% annual return. Each share currently sells for \$80, and the next dividend will be paid in one year. How much is the dividend?
- P5-3** A particular preferred share pays a \$3 quarterly dividend and offers investors an effective annual rate of return of 10%. What is the price per share?
- P5-4** NSW Drugs just paid an annual dividend of \$1.35 per share. It is a mature company, but future EPS and dividends are expected to grow with inflation, which is forecast to be 2.75% per year.
- What is NSW Drugs' current share price? The nominal cost of capital is 9.5%.
 - Rework part (a) using forecast real dividends and a real discount rate.
- P5-5** The share dividend for PS company has grown at 10% per year for many years. Investors believe that a year from now, the company will pay a dividend of \$5, and that dividends will continue their 10% growth indefinitely. If the market's required return on PS shares is 15%, what do the shares sell for today? How much will they sell for a year from today after the shareholders receive their dividend?
- P5-6** Gail Dribble is analysing the shares of Petscan Radiology. Petscan's shares pay a dividend once each year, and it just distributed this year's \$0.85 dividend. The market price of each of the shares is \$12.14. Gail estimates that Petscan will increase its dividends by 7% per year forever. After contemplating the risk of Petscan shares, Gail is willing to hold the shares only if they provide an annual expected return of at least 13%. Should she buy Petscan shares or not?
- P5-7** Carbohydrates Anonymous (CA) operates a chain of weight-loss centres for carb lovers. Its services have been in great demand in recent years, and its profits have soared. CA recently paid an annual dividend of \$2.70 per share. Investors expect that the company will increase the dividend by 25% in each of the next three years, and after that, they anticipate that dividends will grow by about 6% per year. If the market requires an 11% return on CA shares, what should the shares sell for today?
- P5-8** Today's date is 30 March 2020. E-Pay shares pay a dividend every year on 29 March. The most recent dividend was \$3 per share. You expect the company's dividends to increase at a rate of 20% per year to 29 March 2023. After that, you expect that dividends will increase at 5% per year. Investors require a 14% return on E-Pay shares. Calculate the price of the shares on the following dates: 30 March 2020; 30 March 2024; and 30 September 2021.
- P5-9** One year from today, investors anticipate that Shanghai Distilleries shares will pay a dividend of \$3.25 per share. After that, investors believe that the dividend will grow at 20% per year for three years before settling down to a long-run growth rate of 4%. The required rate of return on Shanghai shares is 15%. What is the current share price?
- P5-10** Investors expect the following series of dividends from a particular ordinary share:

YEAR	DIVIDEND
1	\$1.10
2	\$1.25
3	\$1.45
4	\$1.60
5	\$1.75

After the fifth year, dividends will grow at a constant rate. If the required rate of return on this share is 9% and the current market price is \$45.64, what is the long-term rate of dividend growth expected by the market?

- P5-11** Stephenson Technologies (ST) produces the world's greatest single-lens-reflex (SLR) camera. The camera has been a favourite of professional photographers and serious amateurs for several

years. Unfortunately, the camera uses old film technology and does not take digital pictures. Ron Stephenson, owner and CEO of the company, decided to let the business continue for as long as it could without making any new research and development investments to develop digital cameras. Accordingly, investors expect ST ordinary shares to pay a \$2 dividend next year and shrink by 13% per year indefinitely. What is the market price of ST shares if investors require a 15% return?

THE FREE CASH FLOW APPROACH TO ORDINARY SHARES VALUATION

P5-12 Roban Corporation is considering going public but is unsure of a fair offering price for the company. Before hiring an investment banker to assist in making the public offering, managers at Roban decide to make their own estimate of the company's ordinary shares value. The company's chief financial officer gathered the following data for performing the valuation using the free cash flow valuation model. The company's weighted average cost of capital is 12%. It has \$1,400,000 of debt at market value and \$500,000 of preferred shares at its assumed market value. The estimated free cash flows over the next five years, 2021 to 2025, follow. Beyond 2025, to infinity, the company expects its free cash flow to grow by 4% annually.

YEAR	FREE CASH FLOW
2021	\$250,000
2022	290,000
2023	320,000
2024	360,000
2025	400,000

- a Estimate the value of Roban Corporation's entire company by using the free cash flow approach.
- b Use your finding in part (a), along with the data provided above, to find Roban Corporation's ordinary share value.
- c If the company plans to issue 220,000 ordinary shares, what is its estimated value per share?

P5-13 Deep and Eazy Pty Ltd (D&E) is a company that provides temporary employees to businesses. D&E's client base has grown rapidly in recent years, and the company has been quite profitable. The company's co-founders, Mr Deep and Mr Eazy, believe in a conservative approach to financial management, and therefore have not borrowed any money to finance their business. A larger company in the industry has approached D&E about buying them out. In the most recent year, 2016, D&E generated free cash flow of \$2.8 million. Suppose that D&E projects that these cash flows will grow at 13% per year for the next four years, and then settle down to a long-run growth rate of 7% per year. The co-founders want an 11% return on their investment. What should be their minimum asking price from the potential acquirer?

OTHER APPROACHES TO ORDINARY SHARE VALUATION

P5-14 A company, DBS, retains about half of its earnings each year and pays the rest out as a dividend. Recently, the company paid a \$3.25 dividend. Investors expect the company's dividends to grow modestly in the future, about 4% per year, and they require a 9% return on DBS shares. Based on next year's earnings forecast, what is DBS's price/earnings (P/E) ratio? How would the P/E ratio change if investors believed that DBS's long-term growth rate was 6% rather than 4%? Retaining the original assumption of 4% growth, how would the P/E ratio change if investors became convinced that DBS was not very risky and were willing to accept a 7% return on their shares going forward?

PRIMARY AND SECONDARY MARKETS FOR EQUITY SECURITIES

P5-15 Owners of the Internet bargain site FROOGLE.com have decided to take their company public by conducting an IPO of ordinary shares. They have agreed with their investment banker to sell 5 million shares to investors at an offer price of \$18 per share. The underwriting spread is 7%.

- a What is the net price that FROOGLE.com will receive for its shares?
- b How much money will FROOGLE.com raise in the offering?
- c How much do FROOGLE.com's investment bankers make on this transaction?

P5-16 Day trading, which typically refers to the practice of buying a share and selling it very quickly (on the same day), was a popular activity during the Internet share boom of the late 1990s. If a certain share currently has a bid price of \$20 and an ask price of \$22, by how much would the share price have to increase on a single day for a day trader to make a profit? (Assume that the bid-ask spread remains fixed throughout the day.)

CASE STUDY

VALUING SHARES

Your investment adviser has sent you three analyst reports, M, N and P, for a young, growing company named Wild Rydes Pty Ltd. These reports depict the company as speculative, but each one poses different projections of the company's future growth rate in earnings and dividends. All three reports show that Wild Rydes earned \$1.50 per share in the year just ended. There is consensus that a fair rate of return to investors for this ordinary share is 12%, and that management expects to consistently earn a 13% return on the book value of equity ($ROE = 13\%$).

ASSIGNMENT

- 1 The analyst who produced report M makes the assumption that Wild Rydes will remain a small, regional company that, although profitable, is not expected to grow. In this case, Wild Rydes' management is expected to elect to pay out 100% of earnings as dividends. Based on this report, what model can you use to value an ordinary share in Wild Rydes? Using this model, what is the value?
- 2 The analyst who produced report N makes the assumption that Wild Rydes will enter the national market and grow at a steady, constant rate. In this case,

Wild Rydes' management is expected to elect to pay out 30% of earnings as dividends. This analyst discloses news that this dividend has just been committed to current shareholders. Based on this report, what model can you use to value an ordinary share in Wild Rydes? Using this model, what is the value?

- 3 The analyst who produced report P also makes the assumption that Wild Rydes will enter the national market, but expects a high level of initial excitement for the product that is then followed by growth at a constant rate. Earnings and dividends are expected to grow at a rate of 50% over the next year, 20% for the following two years and then revert back to a constant growth rate of 9% thereafter. This analyst also discloses that Wild Rydes' management has just announced the payout of 30% of the recently reported earnings to current shareholders. Based on this report, what model can you use to value an ordinary share in Wild Rydes? Using this model, what is the value?
- 4 Discuss the feature(s) that drive the differing valuations of Wild Rydes. What additional information do you need to garner confidence in the projections of each analyst report?

6

THE TRADE-OFF BETWEEN RISK AND RETURN¹

WHAT COMPANIES DO

GOING GLOBAL IS GOOD FOR YOUR PORTFOLIO

As a recent report on Stockspot explains, diversification can be very beneficial to domestic investors. The article highlights three different aspects of diversification:

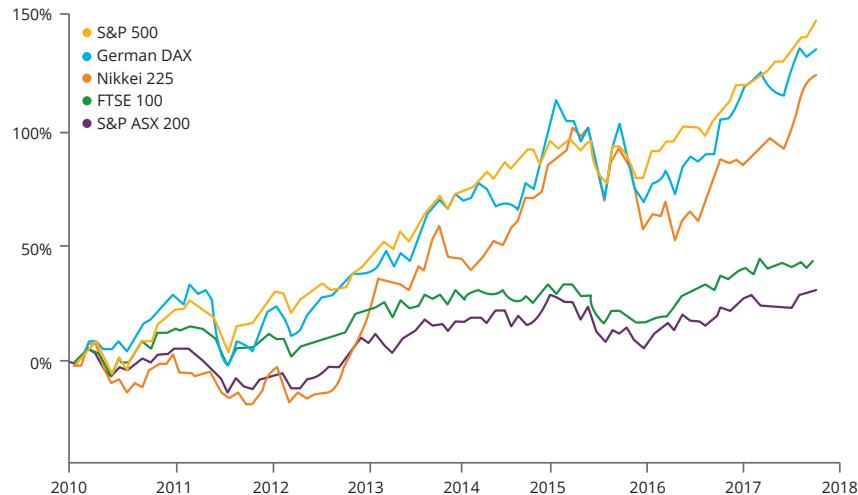
- 1 Diversifying across a broader range of domestic equities, which can also be achieved by investing in broad market Exchange Traded Funds (ETFs).
- 2 Diversifying by gaining exposure to equities from different countries – as the following chart shows, equities indices in different

global markets have performed very differently over the years from 2010.

- 3 Diversifying by investing in different asset classes – for example, Australian equities, Australian bonds and gold.

As the article highlights, in '2018 when Australian shares fell by -2% for the year, Australian bonds rose by 4% and gold by 8%. Furthermore, 'the last 7 times Australian shares fell in a calendar year, Australian bonds rose on every occasion!'

Source: <https://blog.stockspot.com.au/portfolio-diversify/>



1 Extra information from http://www.credit-suisse.com/investment_banking/doc/cs_global_investment_returns_yearbook.pdf and <http://www.wealthfoundations.com.au>.

LEARNING OBJECTIVES

After studying this chapter, you should be able to:

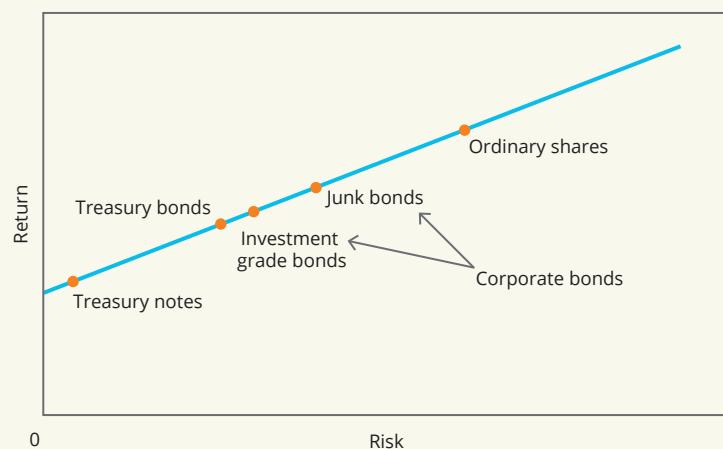
- LO6.1 calculate an investment's total return in dollar or percentage terms, identify the components of the total return and explain why total return is a key metric for assessing an investment's performance
- LO6.2 describe the historical performance of asset classes such as Treasury bills, Treasury bonds and ordinary shares, and articulate the important lessons that history provides
- LO6.3 calculate the standard deviation from a series of historical asset returns;
- LO6.4 describe its relationship to variance (as the square root of the variance of asset returns); and understand its importance in finance as a measure of non-systematic, unsystematic or diversifiable investment risk
- LO6.4 distinguish between systematic and unsystematic risk, explain why systematic risk is more closely linked to returns than is unsystematic risk and illustrate how diversification reduces volatility.

Finance teaches that investment returns are related to risk. From a purely theoretical perspective, it seems logical that risk and return should be linked, but the notion that an unavoidable trade-off between the two exists is grounded in fact. In countries around the world, historical capital market data offer compelling evidence of a positive relation between risk and return. That evidence is a major focus of this chapter.

In chapters 4 and 5, we argued that corporate bonds are more risky than Treasury securities and that ordinary shares are riskier than either corporate or Treasury bonds. Based on that assessment, we should expect a relationship such as that shown in **Figure 6.1**. If we arrange these assets from least to most risky, we expect returns to rise, as we move from left to right in the figure. Soon, we will see that this is exactly the pattern revealed by historical data.

FIGURE 6.1 THE TRADE-OFF BETWEEN RISK AND RETURN

Intuitively, we expect that investors seeking higher returns must be willing to accept higher risk. Moving along the line from safe assets such as Treasury notes to much riskier investments such as ordinary shares, returns should rise.



Perhaps the most important question in finance is, 'What is it worth?' For an investor contemplating a share purchase, or for a corporate manager weighing a new plant construction proposal, placing a value on risky assets is fundamental to the decision-making process. The procedure for valuing a risky asset involves three basic steps:

- 1 determining the asset's expected cash flows
- 2 choosing a discount rate that reflects the asset's risk
- 3 calculating the present value.

Finance professionals apply these three steps, known as discounted cash flow (DCF) analysis, to value a wide range of real and financial assets. Chapter 3 introduced you to the rather mechanical third step of this process – converting a sequence of future cash flows into a single number reflecting an asset's present value. Chapters 4 and 5 focused more on the first step in the process – projecting future cash flows. In this chapter and in Chapter 7, we will emphasise the second step in DCF valuation – determining a risk-appropriate discount rate.

We begin by establishing a precise measure of an investment's performance, called the total return. An asset's total return captures any income that it pays as well as any changes in its price. With the definition of total return in hand, we proceed to study the historical performance of broad asset classes such as shares and bonds. Our analysis examines both the nominal and real returns that different investments have earned over time. Because inflation gradually erodes the value of a dollar, we focus on the real returns offered by various asset classes, not just their nominal returns. When people save their money and invest it, they do so in the hope of living more comfortably in the future. Their objective is not just to accumulate a large sum of money, but to be able to spend that money to buy the necessities (and the luxuries) of life. Real returns matter because they measure the increase in buying power that a given investment provides over time.

All of this is relevant for financial managers because they work on behalf of the investors who provide money to corporations. Therefore, for managers to make value-maximising decisions when they consider building a new plant, upgrading machinery or launching a new product line, they have to assess each investment project's risk and then choose a discount rate that reflects the return that investors could obtain on similar investments elsewhere in the market. Choosing a discount rate to value a specific asset requires answers to two critical questions:

- 1 How risky is the asset, investment or project that we want to value?
- 2 How much return should the project offer, given its risk?

This chapter addresses the first question, showing how different ways of defining and measuring risk apply to individual assets as compared with portfolios (collections of different assets). Since the US market is the market that is most heavily studied, it is the market with the greatest abundance of research and data. In this chapter, we have drawn on this data to illustrate the theoretical concepts and principles associated with the trade-off between risk and return. However, these concepts and principles are applicable to all markets. To illustrate this, we have augmented the US data with domestic Australian data.

Building on this foundation, Chapter 7 will provide an answer to the second question. The *capital asset pricing model (CAPM)* proposes a specific way to measure risk and to determine what compensation the market expects in exchange for that risk. By quantifying the relationship between risk and return, the CAPM supplies finance professionals with a powerful tool for determining the value of financial assets such as shares, as well as real assets such as new factories and equipment.

LO6.1

6.1 UNDERSTANDING RETURNS

total return
A measure of the performance of an investment that captures both the income it paid out to investors and its capital gain or loss over a stated period of time

Probably the first question that investors ask when they decide whether or not to undertake an investment is, ‘How much money will this investment earn?’ In finance, we refer to the total gain or loss on an investment as the **total return**. The total return, expressed either in dollar terms or on a percentage basis, measures the change in wealth that an investor experiences from holding a particular asset, such as an ordinary share or a bond.

6.1a THE COMPONENTS OF TOTAL RETURN

An investment’s total return consists of two components. The first is the income stream the investment produces. For bonds, the income stream comes in the form of interest. For ordinary or preferred shares, dividends provide the income stream. As we learned in Chapters 4 and 5, the financial press regularly provides investment performance measures that primarily focus on an asset’s income stream. For example, the *coupon yield*, which equals the coupon payment divided by the bond’s market price, describes how much money the bondholder earns in interest as a percentage of the bond’s price. Similarly, the *dividend yield*, equal to a share’s annual dividend payment divided by the share price, highlights the income component of share returns.

Measures such as the coupon yield and dividend yield may provide investors with useful information, but any performance measure that focuses entirely on an investment’s income stream misses the second, and often the most important, component of total returns. That component is the change in the asset’s price, called the *capital gain* or *capital loss*. For some investments, such as zero-coupon bonds and shares that do not pay dividends, the capital gain or loss is the *only* component of total return because there is no income. For other investments, the price change may be more or less important than the income stream in determining the investment’s total return.

For example, suppose an investor spends \$1,000 to purchase a newly issued 10-year corporate bond that pays an annual coupon of \$60. In this case, the coupon rate and the coupon yield are both 6% ($\$60 \div \$1,000$). Because this bond sells at par value, we know that the market requires a 6% return on the bond. Suppose we want to assess the performance of this investment after one year. To do so, we need to add up both the income paid by the bond and any price change that occurs during the year. At the end of the year, the investor receives a \$60 coupon payment; but what is her bond worth? We know from Chapter 4 that the answer to that question depends on what happens to market interest rates during the year. Suppose the market’s required return has risen from 6% to 8%. At the end of the first year, the bond has nine years left until maturity. Discounting the remaining cash flows at 8%, we find that the bond’s market price equals just \$875.06:

$$P = \frac{\$60}{1.08^1} + \frac{\$60}{1.08^2} + \frac{\$60}{1.08^3} + \dots + \frac{\$1,060}{1.08^9} = \$875.06$$

The investor’s total return is considerably less than the 6% coupon yield. In fact, the capital loss caused by rising interest rates results in a negative total return. The investor earns income of \$60, but she also experiences a capital loss of \$124.94 ($\$1,000 - \875.06). That loss more than offsets the interest payment, and our investor ends the year with less wealth than she started it with.

Note that the investor’s total return this year does not depend on whether she sells the bond or continues to hold it. Selling or not selling the bond determines whether the capital loss in this example is *realised* or *unrealised*, but it has no effect on the investor’s wealth (at least if we ignore taxes). At the end of the year, the investor has \$60 in cash plus a bond worth \$875.06. That is equivalent to owning \$935.06 in cash, which would

be the investor's position if she sells the bond.² In any case, this example illustrates that both the income and capital gain or loss components influence an investor's wealth. The important lesson to remember is that *one must focus on the total return when assessing an investment's performance.*

6.1b DOLLAR RETURNS AND PERCENTAGE RETURNS

We can describe an investment's total return either in dollar terms or in percentage terms. Consider again the bond example in the previous three paragraphs. To calculate the *dollar return* on this investment, we simply add the income component to the capital gain or loss:

$$(Eq. 6.1) \quad \text{Total dollar return} = \text{Income} + \text{Capital gain or loss}$$

Earlier, we defined an investment's total return as the change in wealth that it generates for the investor. In the present example, the investor begins with \$1,000. A year later, she receives \$60, and she owns a bond worth \$875.06. Therefore, end-of-year wealth equals \$935.06. The change in wealth due to this investment's performance equals -\$64.94 (\$935.06 - \$1,000), which we can verify by plugging the appropriate values into **Equation 6.1:**

$$\text{Total dollar return} = \$60 + (-\$124.94) = -\$64.94$$

Dollar returns tell us, in an absolute sense, how much wealth an investment generates over time. Other things being equal, investors prefer assets that provide higher dollar returns. However, comparing the dollar returns of two different investments can be treacherous, as the following example illustrates.



Calculating Monetary Returns

Terrell purchases 100 shares of Micro-Orb for \$25 per share. A year later, the shares pay a

dividend of \$1 per share and sell for \$30 per share. Terrell's total dollar return is:

$$\text{Total dollar return} = (\text{Number of shares}) \times (\text{Dividend income} + \text{Capital gain})$$

$$\text{Total dollar return} = 100 \times (\$1 + \$5) = \$600$$

Meanwhile, Kumar purchases 50 shares of Garcia Transportation Ltd for \$15 per share. Garcia shares pay no dividends, but at the end

of the year, the shares sell for \$25 per share. Kumar's total dollar return equals:

$$\text{Total dollar return} = 50 \times (\$10) = \$500$$

Based on these figures, it appears that Terrell had a better year than Kumar. But before we reach that conclusion, we ought to recognise that

at the beginning of the year, Terrell's investment was much larger than Kumar's.

The preceding example illustrates a problem we encounter when comparing dollar returns on different investments. Terrell's dollar return exceeds Kumar's by \$100, but that does not necessarily mean that Terrell's investment performed better. Terrell spent \$2,500 to purchase 100 Micro-Orb shares, while Kumar devoted just \$750 to his investment in Garcia Transportation. Intuitively, we might expect Terrell to earn a higher dollar return than Kumar because he invested so much more than Kumar.

² Unrealised losses are sometimes called paper losses. This term simply means that the value of the paper that an investor holds (a bond or share certificate) has gone down. Some investors believe that paper losses are irrelevant and that losses only matter when they are realised because an investor sells. However, even a paper loss incurred by an investor will reduce her wealth.

Another way to compare outcomes is to calculate the *percentage return* on each investment. The total percentage return equals the total dollar return divided by the initial investment.

(Eq. 6.2)

$$\text{Total percentage return} = \frac{\text{Total dollar return}}{\text{Initial investment}}$$



Calculating Percentage Returns

Continuing from the previous example: given that Terrell initially invested \$2,500, while Kumar invested just \$750, we can calculate their total returns on a percentage basis as follows:

$$\text{Terrell's return} = \frac{100 \times (\$1 + \$5)}{\$2,500} = \frac{\$600}{\$2,500} = 0.24 = 24\%$$

$$\text{Kumar's return} = \frac{50 \times (\$10)}{\$750} = \frac{\$500}{\$750} = 0.67 = 67\%$$

On a percentage basis, Kumar's investment performed better than Terrell's, but on a dollar return basis, the opposite is true. The conflict arises here because the initial amount invested by Terrell is so much larger than Kumar's up-front investment. Which investment would you rather have: one that makes you \$600 richer, or one that

increases your initial stake by 67%? Comparing the returns on investments that involve different amounts of money is a fundamental problem to which we will return in Chapter 9. For now, we only say that dollar returns and percentage returns can lead to different relative rankings of investment alternatives.

Just as the total dollar return was the sum of an investment's income and its capital gain or loss, the *total percentage return equals the sum of the investment's yield and its percentage capital gain or loss*. Recall that the dividend yield equals a share's dividend divided by its market price. Using the beginning-of-year price of a Micro-Orb share to calculate its dividend yield, we have:

$$\text{Micro-Orb dividend yield} = \frac{\$1}{\$25} = 0.04 = 4\%$$

Similarly, the percentage capital gain equals:

$$\text{Micro-Orb capital gain} = \frac{\$5}{\$25} = 0.20 = 20\%$$

Therefore, the total percentage return on Micro-Orb equals the sum of the dividend yield and the percentage capital gain:

$$\text{Micro-Orb total percentage return} = 4\% + 20\% = 24\%$$

The return calculations described above refer to the return from holding an asset for a specified period. This is known as the *holding period return (HPR)*. The problem with using this data, is that it is difficult to compare different assets that may be held for different periods of time. Asset returns are therefore often converted to annualised returns, so that the performance of all assets can be compared to each other more effectively. Usually when asset managers quote their asset performance, or the performance of specific asset classes, these are quoted as annualised returns. Similarly, market rates that are quoted for different fixed

income securities are usually quoted on an annualised basis. (This is such a common way of quoting returns and rates that it may not be explicitly stated that these returns are annualised.)

Let us summarise the important points from this section:

- Measuring an investment's performance requires a focus on total return.
- The total return consists of two components, income and capital gain or loss.
- We can express total returns either in dollar terms or in percentage terms.
- If we consider the return of an asset over the entire time it was held, this is the holding period return. However, return is often quoted on an annualised basis (the annual return), so that different assets can be compared more effectively.
- When ranking the performance of two or more investments relative to each other, it is important to be careful that the amount of money initially invested in each asset is the same.
- If one asset requires a much larger up-front monetary commitment than the other, then dollar returns and percentage returns may lead to different performance rankings.

LO6.1

CONCEPT REVIEW QUESTIONS

- 1 In Chapter 4, we defined several bond return measures, including the coupon, the coupon rate, the coupon yield and the yield to maturity. Indicate whether each of these measures: (a) focuses on the total return or just one of the components of total return; and (b) focuses on dollar returns or percentage returns.
- 2 You buy a share for \$40. During the next year, it pays a dividend of \$2, and its price increases to \$44. Calculate the total dollar and total percentage returns, and show that each of these is the sum of the dividend and capital gain components.

LO6.2

6.2 THE HISTORY OF RETURNS (OR, HOW TO GET RICH SLOWLY)

The British author Aldous Huxley once wrote, 'That men do not learn very much from the lessons of history is the most important of all lessons that history has to teach us.' We are more optimistic that what we can learn from the history of financial markets benefits investors who study that history. Perhaps the most important lesson is that an unavoidable trade-off exists between risk and return, so investors seeking higher returns almost always have to accept higher risk.

Treasury bills

Treasury bills are the US equivalent of Australian Treasury notes. They are a form of debt investment and may be referred to as debt securities or fixed income assets

6.2a NOMINAL AND REAL RETURNS ON SHARES, BONDS AND BILLS

Figure 6.2 shows how a \$1 investment in each of three different asset classes grew over 110 years in the United States.³ The three types of investments shown in the figure are **Treasury bills**, Treasury bonds and ordinary shares.⁴

3 The term 'asset class' simply refers to a distinct type of investment or to a group of assets that share common characteristics.

4 Common stocks are the US equivalent of Australian ordinary shares. Common stocks are usually considered to be a separate asset class, but they are a form of equity investment, so may be classed as equities. Treasury bills are the US equivalent of Australian Treasury notes. Bills and bonds are forms of debt investment and may be referred to as debt securities or fixed income assets. Bills and notes are short-dated, while bonds are issued with a longer time to maturity.

common stocks

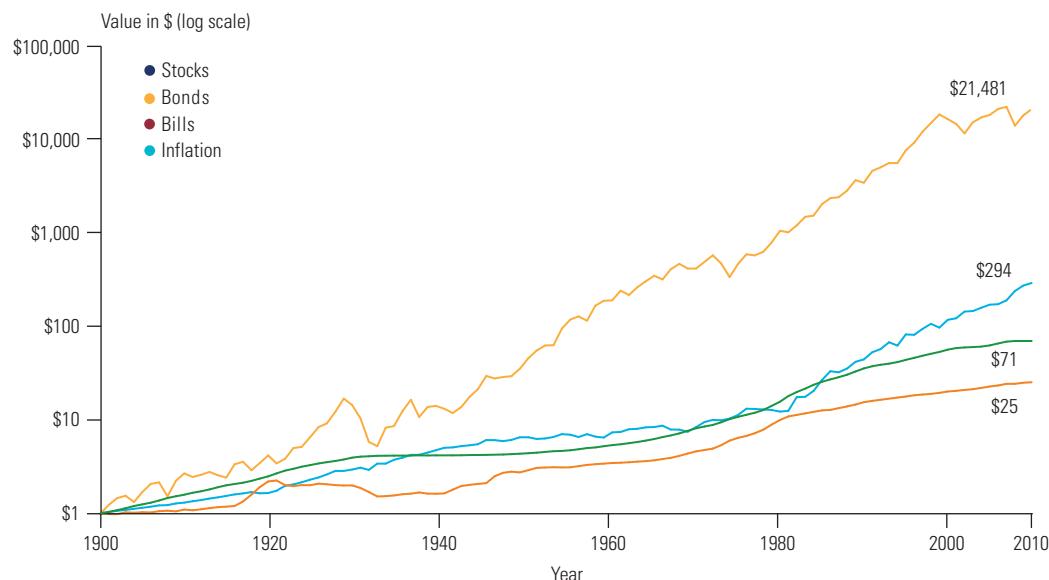
Common stocks are the US equivalent of Australian ordinary shares. Common stocks are usually considered to be a separate asset class, but they are a form of equity investment, so may be classed as equities

Recall from Chapter 4 that Treasury bills mature in one year or less, and thus are not highly sensitive to interest rate movements.⁵ Treasury bonds are long-term instruments, so their prices can fluctuate dramatically as interest rates change. **Common stocks**, or ordinary shares, are the riskiest of the three investments. As you know by now, the performance of a particular share depends on the ability of the company to generate cash. Investors have no guarantee when they buy shares that they will perform well.

A quick glance at **Figure 6.2** reveals that from 1900 to 2010, common stocks far outperformed Treasury bonds and bills.⁶ One US dollar invested in a portfolio of ordinary shares in 1900 grew to US\$21,481 by the end of 2010 (this grew to \$44,663 by the end of 2018). In contrast, an investment of US\$1 in T-bonds or T-bills grew to just US\$294 or US\$25, respectively by 2010 (changing to US\$292 or US\$76, respectively by the end of 2018). In comparing the values of these investments in 1900 to their recent levels, it is important to remember that prices of goods and services in the US were not constant over this period. The fourth line in **Figure 6.2** shows how inflation gradually changed the purchasing power of a dollar. The figure shows that the prices increased by a factor of 25 from 1900 to 2010 (increasing to 29 by the end of 2018) which means that the purchasing power of US\$1 in 1900 was roughly equivalent to the purchasing power of US\$25 in 2010 or US\$29 in 2018.

FIGURE 6.2 THE VALUE OF \$1 INVESTED IN SHARES, TREASURY BONDS AND BILLS, 1900–2010

The figure shows that US\$1 invested in ordinary shares in 1900 would have grown to US\$21,481 by 2010. In comparison, US\$1 invested in Treasury bonds would have grown to US\$294, while US\$1 invested in Treasury bills would have reached just US\$71 by 2010.



Source: Elroy Dimson, Paul Marsh and Mike Staunton, 'Triumph of the Optimists,' *Credit Suisse Global Investment Returns Yearbook 2010*.

Figure 6.3 takes inflation out of the picture by plotting the performance of the three types of investments in real, inflation-adjusted terms. Even after adjusting for inflation, **Figure 6.3** demonstrates that common stocks outperformed other investments, increasing in real terms from US\$1 to US\$1,396 in the 114 years to 2014. (This increased further to US\$1,521 in the 118 years to 2018). As before, the increase

5 Or, using terms we have learned, they carry negligible interest rate risk. In August 2011, the rating agency Standard & Poor's downgraded its rating on US government securities, suggesting that these securities were no longer free of default risk.

6 The lines in this figure incorporate both the income component and the capital gain component of returns, and they assume that the initial investment and the total dollar return on each asset are reinvested each year.

in wealth from investing in Treasury bonds or bills was substantially less. In fact, a one-dollar investment in Treasury bills grew, in real terms, to just US\$2.70 over the period to 2014 and US\$2.60 over the period to 2018 and this ignores taxes that investors must pay on interest, further reducing their cumulative earnings. You have to wait a long time to get rich if you are investing in Treasury bills.

Recall that the relationship between nominal returns, real returns and inflation is given by the following equation:

$$(1 + \text{nominal}) = (1 + \text{real})(1 + \text{inflation})$$

If the nominal return on a share is 15% in a certain year and the inflation rate is 10%, then we can solve for the real rate as follows:

$$(1 + 0.15) = (1 + \text{real})(1 + 0.10)$$

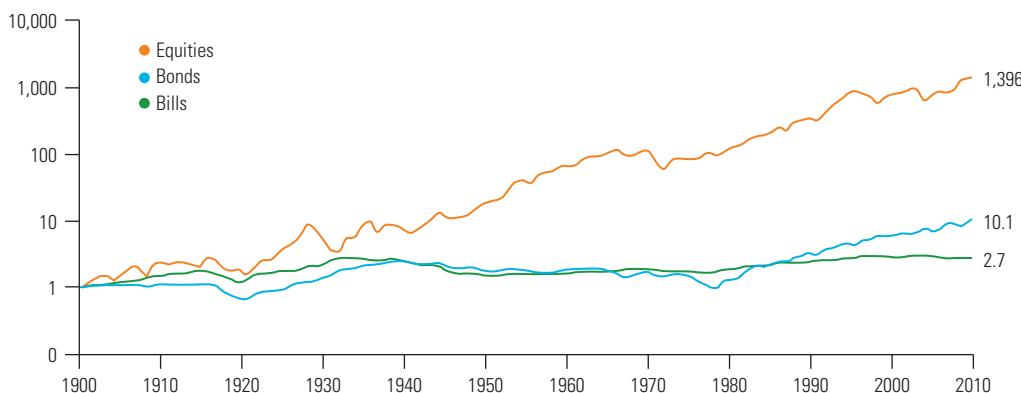
$$(1 + \text{real}) = (1 + 0.15) \div (1 + 0.10)$$

$$(1 + \text{real}) = 1.0455$$

$$\text{real} = 0.0455 = 4.55\%$$

FIGURE 6.3 THE REAL VALUE OF US\$1 INVESTED IN US STOCKS, US TREASURY BONDS AND US BILLS, 1900–2014

The figure shows that US\$1 invested in US common stocks in 1900 would have grown to a real value of US\$1,396 by 2014. By comparison, a US\$1 investment in US Treasury bonds or bills would have grown to just US\$10.10 or US\$2.70, respectively, by 2014.



Published by ABN AMRO, London. Updates provided by Dimson, et al. to 2009. Authors' estimates for 2010. Reprinted with permission.

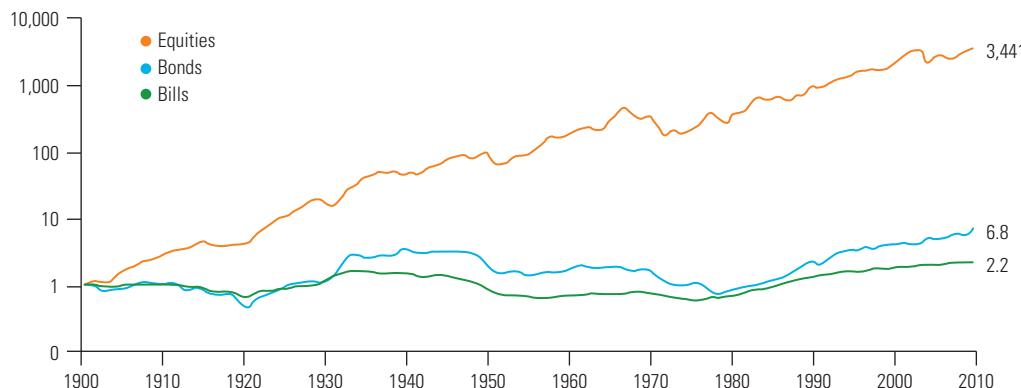
6.2b THE RISK DIMENSION

In both **Figure 6.2** and **Figure 6.3**, another important difference between the three asset classes emerges. The line plotting the growth of one dollar invested in Treasury bills is relatively smooth. The line for bonds moves up and down a little more, and the line representing common stocks looks very jagged indeed. This implies that although a portfolio invested entirely in common stocks grows more rapidly than a portfolio invested in either bonds or bills, the common stock portfolio displays more dramatic ups and downs from year to year. In the long run, common stock investors may grow wealthier than bond investors, but their path to riches is a bumpy one. Some investors may be willing to pass up higher returns on stocks in exchange for the additional security of bonds or bills.

Figure 6.4 shows that the performance of the Australian market was similar to the US market, with ordinary shares far outstripping the performance of bonds and notes. However, in contrast to Australian equities, which displayed a much greater real value growth than US equities, Australian bonds and notes underperformed the US market over this time frame.

FIGURE 6.4 THE REAL VALUE OF \$1 INVESTED IN AUSTRALIAN SHARES, AUSTRALIAN TREASURY BONDS AND AUSTRALIAN NOTES, 1900–2014

The figure shows that \$1 invested in Australian ordinary shares in 1900 would have grown to a real value of \$3,441 by 2014. By comparison, a \$1 investment in Australian Treasury bonds or notes would have grown to just \$6.80 or \$2.20, respectively, by 2014.



Source: Credit Suisse AG Research Institute, Adapted from Credit Suisse Global Investment Returns Yearbook 2015, page 36.

Figure 6.5 summarises real equity and bond returns in the US and Australia from 1900 to 2014. (Data for the US shows the same was true for the period to 2018). In all cases, the average return on equities is far higher than the average return on bonds.⁷ Notice the difference in returns between the best and worst years for equities, and compare this to the differences between the best and worst years for bonds. In 1933, US equities experienced their highest real return of 55.8%, but that outstanding performance followed on the heels of the worst year for US equities, 1931, with a real return of -38.6%. The difference between the best and the worst in returns is more than 100%! In contrast, US bonds moved within a narrower band, with a top real return of 35.2% and a minimum real return of -18.1%.

These examples illustrate an important point to which we will return later in this chapter: assets do not always move together. When one investment performs unusually well, other investments may earn low returns. Investors can benefit from the fact that different assets do not always move in tandem. We will see why this is so when we discuss diversification in section 6.4.

By now, the most important lesson from the history of financial markets should be clear: *there is a positive relationship between risk and return*. Asset classes that experience more ups and downs offer investors higher returns, on average, than investments that provide more stable returns. As yet, we have not precisely defined the term risk, but you probably expect that ‘risk’ must capture the uncertainty surrounding an investment’s performance. **Figure 6.5** indicates that bond returns are more predictable than equity returns.

risk premium

The additional return offered by a more risky investment relative to a safer one

The trade-off between risk and return leads us to an important concept known as a **risk premium**. The risk premium is the additional return offered by a more risky investment relative to a safer one. **Figure 6.6** reports risk premiums in the US by taking the differences between average equity, bond and bill returns, as reported in **Figure 6.5**. Globally, equities offered around 5.8% higher return than that on bills. The risk premium on global equities relative to bonds was around 1.7%.

7. The formula for calculating the average return is straightforward. If there are n years of historical data and the return in any particular year t is r_t , then the average return equals the sum

$$\text{of the individual returns divided by } n \text{ Average return} = \frac{\sum_{t=1}^n r_t}{n}$$

**FIGURE 6.5 PERCENTAGE RETURNS ON US BILLS, US BONDS AND US STOCKS, AND AUSTRALIAN SHARES
1900–2010**

Stocks earn the highest average returns (measured using an arithmetic mean), but they fluctuate over a wide range. Treasury bill returns move within a fairly narrow range, but T-bills earn low average returns. Treasury bonds fall between stocks and bills along both dimensions.

ASSET CLASS	NOMINAL (%)			REAL (%)		
	AVERAGE	BEST YEAR	WORST YEAR	AVERAGE	BEST YEAR	WORST YEAR
US bills	3.9	14.7	0.0	1.0	19.7	-15.1
US bonds	5.6	40.4	-9.2	2.4	35.1	-19.4
US stocks	11.4	57.6	-43.9	8.3	56.3 (1933)	-37.6 (1931)
REAL (%)*						
ASSET CLASS	AVERAGE (ARITHMETIC MEAN)		BEST YEAR	WORST YEAR		
Australian ordinary shares	9.1		51.5(1983)	-42.5(2008)		

*Over the same time period, Australian shares outperformed US stocks, but they also suffered from widely fluctuating returns. The best and worst annual performances for Australian shares were lower than those for US stocks. However, it is interesting to note that these extreme values occurred during very different timeframes for both markets.

Source: Elroy Dimson, Paul Marsh and Mike Staunton, 'Triumph of the Optimists,' *Global Investment Returns Yearbook 2010*. ABN AMRO, London. Updates provided by Dimson, et al. to 2009. Author's estimates for 2010. Reprinted with permission; Dimson, Marsh & Staunton: *Equity Risk Premium Around the World*, London Business School, July 2011.

Keep in mind that the relationship between risk and return suggests that riskier assets pay higher returns *on average*, but not necessarily every single year. If it is true that, on average, riskier investments pay higher returns than safer ones, then we can use historical risk premiums as a starting point to determine what returns we might expect in the future on alternative investments. Perhaps the most important reason to study the lessons of history in financial markets is to make better guesses about what the future holds.

**FIGURE 6.6 RISK PREMIUMS FOR US STOCKS,
US BONDS AND US BILLS, 1900–2010**

The risk premium refers to the additional return offered by an investment, relative to an alternative, because it is more risky than the alternative. Stocks offer a risk premium over Treasury bonds and bills, and T-bonds offer a risk premium over T-bills.

COMPARISON	RISK PREMIUM (%)
Stocks – bills	11.4 – 3.9 = 7.5
Stocks – bonds	11.4 – 5.6 = 5.8
Bonds – bills	5.6 – 3.9 = 1.7

Source: Elroy Dimson, Paul Marsh and Mike Staunton, 'Triumph of the Optimists,' *Global Investment Returns Yearbook 2010*. Published by ABN AMRO, London. Updates provided by Dimson et al. to 2009. Reprinted with permission.

EXAMPLE

Current Data Can Improve Forecasts

Suppose you want to construct a forecast for the return on US equities for the next year. One approach is to use the average historical value, 8.3% (from **Figure 6.5**), as your forecast. A problem with this method is that 8.3% represents an average over many years, some of them having high inflation and some experiencing low inflation. Similarly, in some past years, interest rates on bonds and bills were relatively high; in other years, rates were much lower. You can make use of current market information to construct a better forecast than the average historical return.

For example, suppose you look at Treasury bills trading in the market at the time that you want to develop a forecast for equity returns. At that time, you find that Treasury bills offer a yield to maturity of about 1%. From **Figure 6.6**, you see that the average risk premium on equities relative to T-bills is 5.6%. Add that premium to the current Treasury bill yield to arrive at a forecast for equity returns of 6.6% ($1\% + 5.6\%$). This should be a superior forecast compared to the simple historical average because the estimate of 6.6% reflects current market conditions (such as expected inflation rates and required returns on low-risk investments).

Analysts use data on risk premiums for many different purposes. In Chapter 4, we saw that bonds receiving lower ratings from bond-rating agencies must pay higher yields. Bond traders know this, and use data on the risk premium between relatively safe bonds (such as Treasury bonds or AAA-rated corporate bonds) and riskier bonds to price complex financial instruments. As we will see in later chapters, corporate executives use the risk premium on equities relative to Treasury securities to estimate the rate of return that their investors expect on major capital expenditures. We will return to the subject of the equity risk premium several times in this book, but next, we need to explore the meaning of the word *risk* in more depth.

FINANCE IN THE REAL WORLD



PLANNING FOR YOUR RETIREMENT

Sooner than you expect, you'll graduate from university and enter the workforce. When you do, your employer will need to make contributions to your superannuation account, and you will have to decide how to allocate this between different investment options. Suppose you plan to work for 35 years, and each year you will contribute \$4,000 to your superannuation account. We'll assume that these contributions occur annually, starting one year from now. We will use the equation for the future value of an annuity from Chapter 3 to estimate how much money will accumulate in your account by the time you retire, exactly 35 years from now. The answer will depend on how you invest.

You can invest your money in either equities or bonds. Suppose that over the next 35 years, the equities earn an average annual return of 11.4% and bonds earn 5.6% annually. The following table illustrates the superannuation account value in 35 years under three different investment allocation scenarios. The first scenario assumes you invest all contributions in equities. The second assumes you invest exclusively in bonds, and the third assumes you split your contributions evenly between equities and bonds. It should not surprise you that the more money you invest in equities, the greater is the future value of your retirement account. For example, if you invest everything in equities, then by using **Equation 3.4**, we can calculate the account value in 35 years as follows:

$$FV = \$4,000 \times \left[\frac{(1+0.114)^{35} - 1}{0.114} \right] = \$1,500,013$$

ALLOCATION DECISION	ACCOUNT VALUE IN 35 YEARS
100% equities	\$1,500,013
100% bonds	\$409,532
50% in each	\$954,772

From the table, it might seem that investing all your money in equities is obviously the best thing to do. However, there is no way for you to guarantee that your investments in equities will earn the historical average return, as our calculations assume. Consider what might happen if, in the years just before you retire, the return on the stock market is unusually low, as happened several times in the 1930s and as recently as 2008. In that case, the value of your investment account could fall by hundreds of thousands of dollars right before you need to start drawing upon those funds. Thus, the investment allocation decision involves an inevitable trade-off between the prospect of higher returns and the perils of higher risk.

This is borne out by the Australian data in **Figure 6.7**, which shows how returns for different asset classes have varied substantially over different time periods leading up to 31 January 2019.

FIGURE 6.7 AUSTRALIAN ASSET CLASS RETURNS TO 31 JANUARY 2019

ASSET CLASSES	3 MONTHS	1 YEAR	3 YEARS	5 YEARS	10 YEARS	20 YEARS	ANNUALISED STD. DEV. SINCE INCEPTION	INCEPTION DATE
	%	%	% p.a.	% p.a.	% p.a.	% p.a.	%	
Cash	0.5	2.0	1.9	2.1	3.1	4.4	1.4	jan-77
Australian bonds	2.4	5.5	3.5	4.6	5.1	5.7	3.8	oct-89
International bonds	2.9	3.3	3.3	4.7	6.5	6.8	3.0	jan-90
Property	7.5	13.1	9.3	13.7	12.4	6.8	13.9	jan-82
Australian shares	1.4	1.1	10.0	7.1	9.9	8.2	16.6	jan-80
International shares	-2.2	3.8	10.1	11.0	10.0	3.8	14.3	jan-75

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LO6.2

CONCEPT REVIEW QUESTIONS

- 3 Why do investors need to pay attention to real returns as well as nominal returns?
- 4 Look at **Figure 6.3**. The figure is drawn using a logarithmic vertical scale, which means that if an investment offers a constant rate of return over time, the growing value of that investment would plot as a straight line. This implies that the steeper the line is, the higher is the rate of return on the investment. Given this, which investment looks like it performed best in real terms from 1920–30? What about from 2000–2010?
- 5 In **Figure 6.4**, why are the average real returns lower than the average nominal returns for each asset class? Is it always true that an asset's nominal return is higher than its real return?

THINKING CAP QUESTIONS

- 1 What is the difference between an investment's nominal return and its real return? Which is more important to investors?
- 2 Because they are both issued by the US government, are the risks of Treasury bills and Treasury bonds equal? Why or why not?

LO6.3

6.3 VOLATILITY AND RISK

6.3a THE DISTRIBUTION OF HISTORICAL SHARE RETURNS

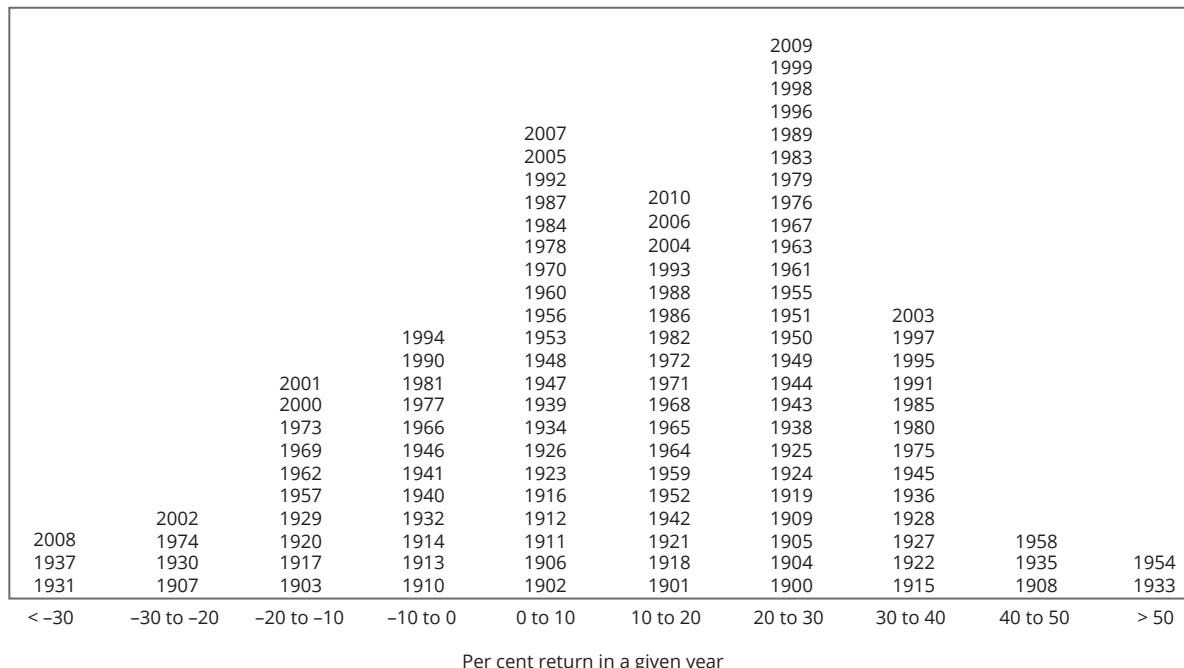
We begin our analysis of risk with one more historical illustration. **Figure 6.8** shows a histogram of equity returns between 1900 and 2010. The shape of this histogram is probably familiar to you because it is somewhat reminiscent of a bell curve, also known as a *normal distribution*. In most years, US stocks earned a return not far from the historical average of 11.4%. Of the 111 annual returns shown in the figure, more than half

(64, to be exact) fall in a range between 0% and 30%. Extremely high or low returns occur less frequently. The only years that showed losses of 30% or more were 1931, 1937 and 2008, while 1933 and 1954 were the only two years in which stocks rose more than 50%. Collectively, these years with very high or very low returns represent about 4.5% of the data from the 111 years.

Figure 6.8 gives us a sense that equity returns can be quite volatile, and it tells us something about the relative frequencies of different outcomes in the US stock market. We are interested in these frequencies not only for their historical significance but also for what they may tell us about future stock market returns. For example, a question that investors may want to ask is, ‘What is the probability that a portfolio of stocks will lose money in any given year?’ Without a crystal ball, no one can answer that question precisely, but a close inspection of **Figure 6.8** shows that returns were negative in 29 out of the 111 years, or about 26% of the time. At least as a starting point, we can estimate a 26% probability that equities will lose money in a particular year.

FIGURE 6.8 HISTOGRAM OF NOMINAL RETURNS ON US EQUITIES, 1900–2010

The figure illustrates the performance of stocks in the US in every year from 1900–2010. For example, stock returns were between –20% and –30% in 1907, 1930, 1974 and 2002. The figure suggests that the historical distribution of stock returns is at least roughly approximated by a bell curve, also known as a normal distribution.



Source: Elroy Dimson, Paul Marsh and Mike Staunton, in 'Triumph of the Optimists,' *Global Investment Returns Yearbook 2010*. Published by ABN AMRO, London. Updates provided by Dimson, et al. through 2009.
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If we could list every possible outcome that might occur in the share market and attach an exact probability to each outcome, then we would have a *probability distribution*. Some probability distributions are easy to describe. For example, the probability distribution that governs outcomes of a coin toss is given below:

OUTCOME	PROBABILITY
Heads	50%
Tails	50%

Unfortunately, the probability distribution for future stock returns is unknown. We rely on [Figure 6.8](#) to give us clues about the characteristics of this distribution. From the shape of the figure, we may surmise that the unknown distribution of stock returns is a normal curve with a mean return (or average return) of 11.4%. A normal distribution is symmetric, so there is an equal chance of experiencing an above-average and a below-average outcome. Since 1900, the split between above-average and below-average years in the stock market is 60 to 51, very close to even. This suggests that our assumption of an underlying normal distribution may be a good approximation of reality.⁸

6.3b THE VARIABILITY OF EQUITY RETURNS

Every normal distribution has two key characteristics: its mean and its variance. As you may recall from your study of statistics, the **variance** measures the dispersion of observations around the mean of the distribution. To be more precise, the variance is the expected value (or the average value) of squared deviations from the mean. In equations, variance is usually noted by the Greek symbol σ^2 . The standard deviation of these returns, represented by σ , is the square root of the variance, and is commonly used as a measure of non-systematic or unsystematic risk of an asset. Typically, this can be diversified away through portfolio construction techniques, as discussed in section 6.4.

Suppose we are estimating the variance of share returns using n years of historical data. The return in any given year t is r_t , and the average return is \bar{r} . We estimate the variance using the equation below:

$$\text{(Eq. 6.3)} \quad \text{variance } \sigma^2 = \frac{\sum_{t=1}^n (r_t - \bar{r})^2}{n-1}$$

variance
A measure of dispersion of observations around the mean of a distribution; it is equal to the expected value of the sum of squared deviations from the mean, divided by one less than the number of observations in the sample

[Figure 6.9](#) illustrates a variance calculation using stock returns in the US from 1993 to 2010. Over this period, the average annual return equals 10.3%, about one percentage point less than the 11.4% historical average from 1900–2010. In the table's third column, we subtract the average return from the actual return in each year. The fourth column squares that difference. We square deviations from the mean so that both positive and negative deviations contribute to the variance calculation. If we simply added up positive and negative deviations from the mean, then the resulting sum would be zero by virtue of the definition of a mean. To find the variance, add up the numbers in the fourth column and then divide the sum by 17.⁹ The calculations show that the variance of share returns equals 396.1. Interpreting the number 396.1 is a little tricky because it is expressed in units of % squared. Remember, to calculate the variance we worked with numbers in % form and then squared them. What exactly does 396.1%² mean?

Fortunately, we don't have to struggle to interpret these odd units. Instead, if we take the square root of the variance, we are back in percentage units, and we have the standard deviation. The **standard deviation** is just another measure of dispersion around the mean, but in the case of investment returns, it is easier to interpret because it is expressed in percentage terms.

$$\text{Standard deviation} = \sqrt{\text{variance}} = \sqrt{396.1} = 19.9\%$$

standard deviation
A measure of volatility equal to the square root of the variance

⁸ Extensive research on the distribution of equity return teaches us that the normal distribution is only a rough approximation of the actual returns distribution. For example, equity returns do not appear to be distributed symmetrically around the mean. This makes sense in light of the limited liability feature of the US legal system. A fortunate stockholder might earn a return in excess of 100% in any given year, but no investors can experience a loss greater than 100% (unless they are buying stocks using borrowed money). When we examine historical stock returns, we do observe outcomes that are far above the mean more frequently than we see outcomes well below the mean.

⁹ You may wonder why we are dividing by 17 if we have 18 years of data. The reason is technical, and has to do with a statistical concept known as degrees of freedom. The technical issue is not terribly important here, and with a very large sample, dividing by either n or $n-1$ will make little difference in the variance calculation.

FIGURE 6.9 ESTIMATING THE VARIANCE OF US SHARE RETURNS FROM 1993 TO 2010

To estimate the variance, first find the average return, 10.3% in this case. Next, take the difference between the actual return in each year and the average return, and then square that difference. Add up the squared differences and divide the sum by one less than the number of years in the sample. The standard deviation is the square root of the variance.

YEAR	RETURN (%)	RETURN(%) – 10.3	(RETURN(%) – 10.3) ²
1993	11.3	1.0	1.0
1994	0	-10.3	106.1
1995	36.4	26.1	681.2
1996	21.2	10.9	118.8
1997	31.3	21.0	441.0
1998	23.4	13.1	171.6
1999	23.6	13.3	176.9
2000	-10.9	-21.2	449.4
2001	-11.0	-21.3	453.7
2002	-20.9	-31.2	973.4
2003	31.6	21.3	453.7
2004	12.5	2.2	4.8
2005	6.4	23.9	15.2
2006	15.8	5.5	30.3
2007	5.6	-4.7	22.1
2008	-37.2	-47.5	2,256.3
2009	28.5	18.2	331.2
2010	17.1	6.8	46.2
Sum	184.7		6,733.0
Average	$184.7 \div 18 = 10.3\%$		
Variance			$(6,733.0 \div 17) = 396.1$
Standard deviation			$\sqrt{396.1} = 19.9\%$

Source: Elroy Dimson, Paul Marsh and Mike Staunton, 'Triumph of the Optimists,' in *Global Investment Returns Yearbook 2010*. Published by ABN AMRO, London. Updates provided by Dimson, et al. to 2009. Author's estimate for 2010. Reprinted with permission.

If we use the 111-year history of US returns (from 1900 to 2010), rather than just the last 18 years of the period (1993 to 2010), we arrive at the following estimates of the average and standard deviation of historical returns:

$$\text{Average return} = 11.4\% \quad \text{Standard deviation} = 20.0\%$$

These figures indicate that the US experience from 1993–2010, described in **Figure 6.9**, is roughly similar to the entire twentieth century.

Let's return to our assumption that the underlying probability distribution governing share returns is approximately normal. Using data from the 111-year period, we have estimates of the mean (11.4%) and the standard deviation (20.0%) of that distribution. Those estimates allow us to make a few other interesting descriptive statements about the behaviour of ordinary shares. First, for any normal distribution, 68% of all observations fall between one standard deviation above and one standard deviation below the mean, and 95% of the observations should be within two standard deviations of the mean. In the present context, this implies

that share returns should fall between -8.6% and 31.4% (11.4%, plus or minus 20.0%) in a little more than two-thirds of the years. How does that prediction compare with the historical evidence? From 1900–2010, returns fell within the range of -8.6 to 31.4% in 75 years, or 67.6% of the time. All in all, the distribution of historical returns seems close to a bell curve.

Figure 6.10 shows the average annual return and the standard deviation of returns for equities (shares), Treasury bonds and Treasury bills during the 111-year period discussed. We saw the average returns previously in **Figure 6.5**, but now we have a specific measure of risk to couple with the mean returns. Once again, we see evidence that risk and return are positively linked, at least if we define risk to mean volatility (as captured by the standard deviation). The average return on shares is more than double the average bond return, but shares are almost 2.5 times more volatile than bonds. Bonds offer a premium over bills, but the standard deviation of bond returns is roughly three times the standard deviation for bills. Switching from nominal to real returns lowers the average returns, but it does not change the basic story. Asset classes that display greater volatility pay higher returns on average.

FIGURE 6.10 AVERAGE RETURNS AND STANDARD DEVIATION FOR EQUITIES, BONDS AND BILLS, 1900–2010

ASSET	NOMINAL RETURNS		REAL RETURNS	
	AVERAGE (%)	STD. DEV. (%)	AVERAGE (%)	STD. DEV. (%)
Equities	11.4	20.0	8.3	20.3
Bonds	5.6	8.3	2.4	10.1
Bills	3.9	2.8	1.0	4.7

Source: Elroy Dimson, Paul Marsh and Mike Staunton, 'Triumph of the Optimists,' in *Global Investment Returns Yearbook 2010*. Published by ABN AMRO, London. Updates provided by Dimson et al. to 2009. Author's calculations for 2010. Reprinted with permission.

Figure 6.11 plots the relationship between average returns and standard deviation for shares, bonds and bills. In the figure, we chose to plot nominal returns, but switching to real returns would make very little difference. The figure also includes a trend line through the three data points. Notice that the relationship shown in the figure is almost perfectly linear, meaning that the dots fall very close to the trend line.¹⁰

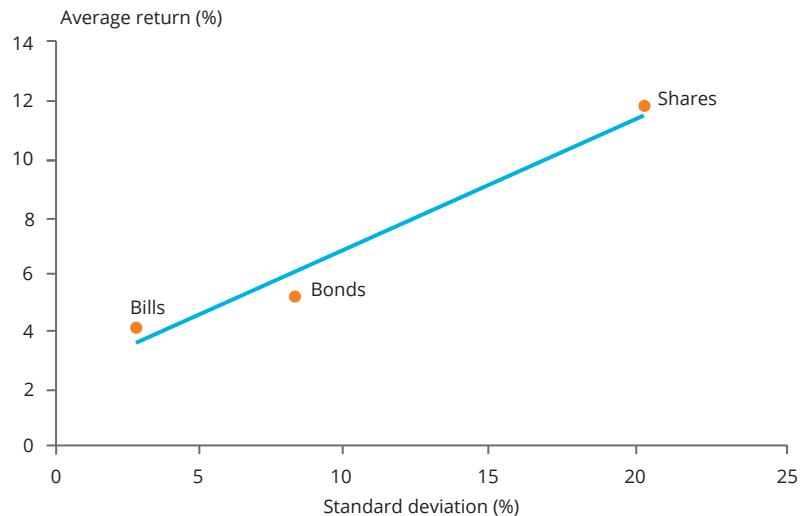
This is not the last time that we will see evidence of a straight-line relationship between risk and return. What are the implications of such a relationship? The most important implications are that: (1) investors who want higher returns have to take more risk; and (2) the incremental reward from accepting more risk is constant. In other words, if an investor wants to increase his return from 5% to 10%, the additional risk that he has to accept is the same as the additional risk that another investor has to accept to increase her returns from 10% to 15%. In economics, we frequently see evidence of diminishing returns. This evidence shows up in graphs as a curve with a decreasing slope. For example, a factory can produce more output if there are more workers present, but at some point the incremental output produced by an additional worker – the marginal product – begins to fall as diminishing returns set in. With respect to risk and return, **Figure 6.11** shows no similar evidence of diminishing returns to risk taking.

Thus far, we have seen that a trade-off between risk and return exists for major asset classes including equities, Treasury bonds and bills. Suppose we want to compare the investment performance of two specific assets, such as a share of General Electric and a share of Intel. Does this same trade-off appear when we examine individual securities? As we will see in the next section, the answer is, 'It depends.'

¹⁰ The trend line here is estimated using linear regression. We will discuss regression lines again in Chapter 7, but you may recall from your statistics class that a measure of 'goodness of fit' for a regression line is the R-square statistic. The R-square value ranges between 0% and 100%, with a higher number indicating a stronger relationship between the two variables. In Figure 6.11, the R-square value of our line is almost 97%, indicating a very tight relationship between standard deviation and returns.

FIGURE 6.11 THE RELATIONSHIP BETWEEN AVERAGE (NOMINAL) RETURN AND STANDARD DEVIATION FOR SHARES, TREASURY BONDS AND BILLS, 1900–2010

The figure indicates that a positive relationship exists between the average returns offered by an asset class and the standard deviation of returns for that class.



Source: Elroy Dimson, Paul Marsh and Mike Staunton, 'Triumph of the Optimists,' in *Global Investment Returns Yearbook 2010*. Published by ABN AMRO, London. Updates provided by Dimson et al. to 2009. Author's calculations for 2010. Reprinted with permission.

LO6.3

CONCEPT REVIEW QUESTIONS

- 6 Use **Figure 6.8** to estimate the probability that a portfolio of ordinary shares will earn a return of at least 20% in a given year.
- 7 Suppose nominal bond returns approximately follow a normal distribution. Using the data in **Figure 6.10**, construct a range that should contain 95% of historical bond returns. (Hint: Use the mean and standard deviation of bond returns to calculate the endpoints of this range.)
- 8 Suppose there is an asset class with a standard deviation that lies about halfway between the standard deviations of shares and bonds. Based on **Figure 6.11**, what would you expect the average return on this asset class to be?

LO6.4

6.4 THE POWER OF DIVERSIFICATION

6.4a SYSTEMATIC AND UNSYSTEMATIC RISK

In this section, our objective is to take the lessons we've learned about risk and return for major asset classes and apply those lessons to individual securities. As a starting point, examine **Figure 6.12**, which shows the average annual return and the standard deviation of annual returns from 1993–2010 for several well-known

FIGURE 6.12 AVERAGE RETURNS AND STANDARD DEVIATIONS FOR 10 SHARES FROM 1993–2010

Compared to the figures reported for all ordinary shares in [Figure 6.9](#), these shares earned slightly higher returns, but their standard deviations were also much higher.

COMPANY	AVERAGE ANNUAL RETURN (%)	STANDARD DEVIATION OF ANNUAL RETURNS (%)
Archer Daniels Midland	10.5	24.8
American Airlines	7.1	47.0
Coca-Cola Company	10.6	21.3
Exxon Mobil Corp.	13.3	16.6
General Electric Co.	12.6	29.9
Intel Corporation	22.8	50.3
Merck & Co.	11.2	32.3
Procter & Gamble	12.8	17.3
Walmart Stores	9.7	27.7
Wendy's International	10.3	46.7
Average for 10 shares	12.1%	31.4%
Equally weighted portfolio	12.1%	19.1%

shares. The average annual return and the average annual standard deviation for this group of shares appear in the table's next-to-last row. At the very bottom of the table, we show the average return and standard deviation of an equally weighted portfolio of all 10 of these shares. Several observations are in order.

First, the average return for this group of shares is higher than the average return for all shares since 1993, as shown in [Figure 6.9](#). This group's average return is 12.1%. Perhaps one reason these companies are so familiar is because they have performed relatively well in the recent past. Second, and more important, most of these individual shares have a much higher standard deviation than was reported in [Figure 6.9](#), where we showed that a *portfolio* of all ordinary shares had a standard deviation of 19.9% from 1993–2010. [Figure 6.12](#) illustrates that eight of these 10 individual shares have a standard deviation in excess of 20%. In fact, the average standard deviation across these 10 securities is 31.4%. However, observe that the standard deviation of a portfolio containing all 10 shares is just 19.1% (comparable to the figure from [Figure 6.9](#)). This raises an interesting question. *If the average share in [Figure 6.12](#) has a standard deviation of 31.4%, how can the standard deviation of a portfolio of those shares be 19.1%?*¹¹

This is a key point. Individual shares generally display much higher volatility than do portfolios of shares.¹² **Diversification**, the act of investing in a variety of different assets rather than just one or two similar assets, explains why a portfolio usually has a lower standard deviation than the individual securities that make up that portfolio. We can offer some simple intuition to explain this. In any given year, some securities in a portfolio will have high returns, while other securities in the portfolio will earn lower returns. Each year, the ups and downs of individual securities at least partially cancel each other out, so the standard deviation of the portfolio is less than the standard deviations of the individual securities. The diversification principle

diversification
The act of investing in a variety of different assets rather than just one or two similar assets

¹¹ The shares in [Figure 6.12](#) are less volatile than the average share. From 1993–2010, the standard deviation of the typical US stock was about 55%, yet we know from [Figure 6.9](#) that standard deviation of the entire market is far lower than that.

¹² The same statement could be made for other types of assets (for example, that individual bonds are more volatile than a portfolio of bonds).

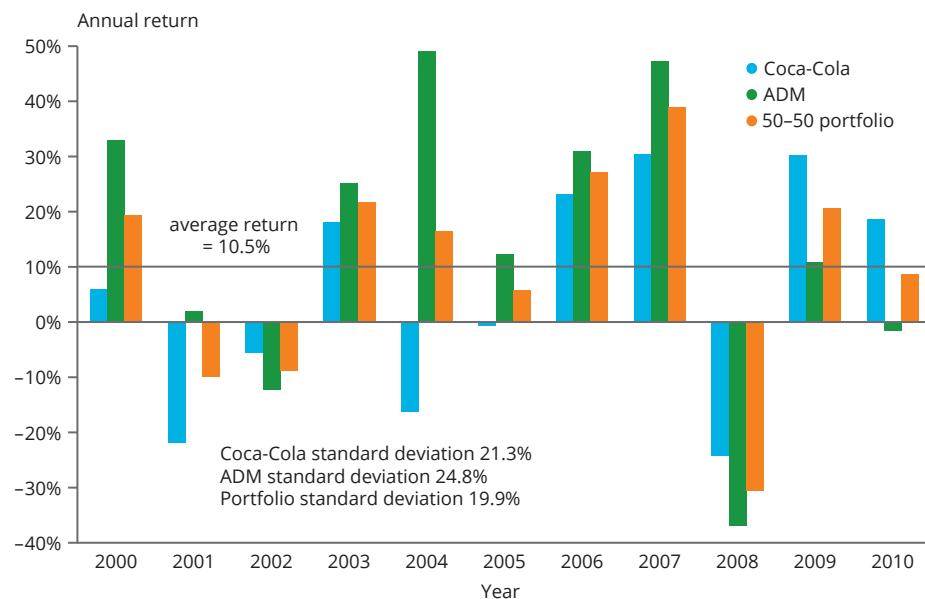
works not only for individual securities but also for broad classes of investments, which are often referred to as asset classes.

Figure 6.13 demonstrates the impact of diversification with just two stocks, Coca-Cola and Archer Daniels Midland (ADM).¹³ In each year from 2000–2010, we plot the return on these two stocks. Recall from **Figure 6.12** that both Coca-Cola and ADM have an average return close to 10.5%, so we have drawn a horizontal line across the bar chart to highlight the average performance for these companies. Also, recall that the standard deviation of Coke's returns is 21.3%, and for ADM the figure is 24.8%. Notice that in the years 2001–2003 and 2006–2008, Coca-Cola's returns and ADM's returns were moving together, in the sense that both stocks displayed above-average or below-average performance in the same year. However, in 2000, 2004, 2005, 2009 and 2010, one stock had an above-average year, while the other had a below-average year. What would have happened if we had formed a portfolio by investing some of our money in Coca-Cola and the rest in ADM?

The green bar in **Figure 6.13** plots the return on an equally weighted (50% invested in each stock) portfolio of Coca-Cola and ADM. In the years in which Coca-Cola and ADM moved together, our portfolio return was quite volatile, just as the individual stock returns were volatile. For example, our portfolio return in 2007 was very high because both stocks did well that year, and in 2008, the portfolio performed poorly because both stocks performed poorly. However, in some other years the excellent performance of one stock was partially offset by the sub-par performance of the other, and the portfolio's results were close to the average return of 10.5% (2004 and 2010 are good examples of this pattern). In other words, the portfolio's return does not deviate as far or as often from the average as the individual stock returns do. As a result, the

FIGURE 6.13 ANNUAL RETURNS ON COCA-COLA AND ARCHER DANIELS MIDLAND

The figure illustrates how diversification reduces volatility. Both Coca-Cola and ADM earned an average return of about 10.5% from 1993–2010, but the two stocks did not always move in sync. In some years, one stock had an above-average year while the other stock performed below average. The net effect of this is that a portfolio containing both Coca-Cola and ADM would be less volatile than either stock held in isolation.



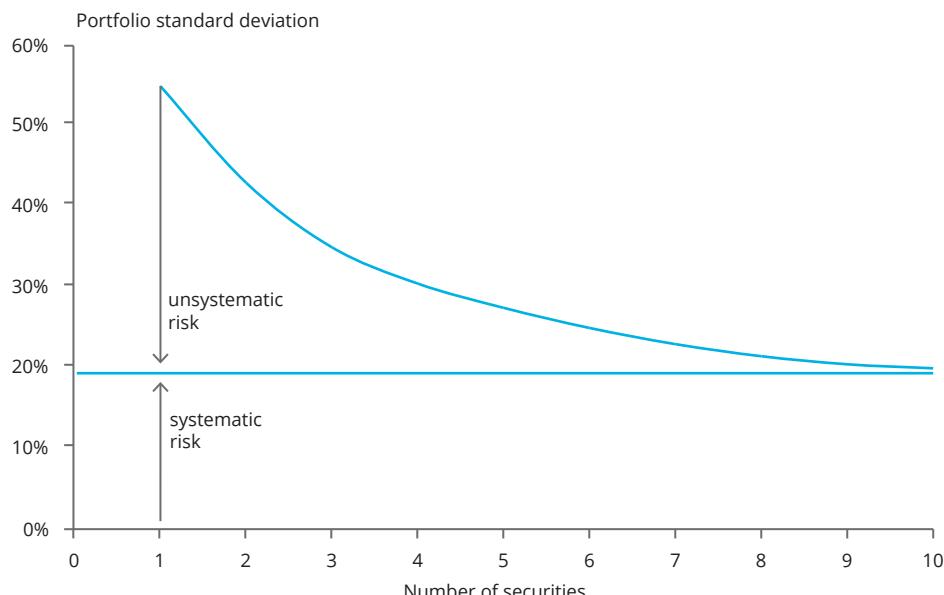
¹³ Figure 6.12 uses data from 1993–2010, but we only show the year-by-year returns from 2000–2010.

standard deviation for the portfolio is just 19.1%, less than the standard deviation of either Coca-Cola or ADM.

Now extend that logic to portfolios containing more than two securities. **Figure 6.14** indicates that the standard deviation of a portfolio falls as the number of securities in the portfolio rises. The dot in the upper-left corner of the graph represents a portfolio invested entirely in one randomly selected share. As previously noted, the typical share has a standard deviation of about 55%. Next, move down and to the right to the dot which represents a portfolio containing an equal share of two randomly selected securities. The standard deviation of this portfolio is considerably lower. Continuing down and to the right, we continue to add randomly selected securities, one at a time, and the resulting portfolio standard deviation declines. However, eventually, adding more securities to the portfolio does little to reduce the portfolio's standard deviation.

FIGURE 6.14 THE RELATIONSHIP BETWEEN PORTFOLIO STANDARD DEVIATION AND THE NUMBER OF SHARES IN THE PORTFOLIO

The standard deviation of a portfolio tends to decline as more securities are added to the portfolio. The standard deviation declines rapidly as securities are first added to the portfolio. However, at some point, adding more securities to the portfolio does little to reduce the standard deviation. The risk that diversification eliminates is called unsystematic risk. The risk that remains, even in a well-diversified portfolio, is called systematic risk.



FINANCE IN THE REAL WORLD

COMBINING EQUITIES AND BONDS

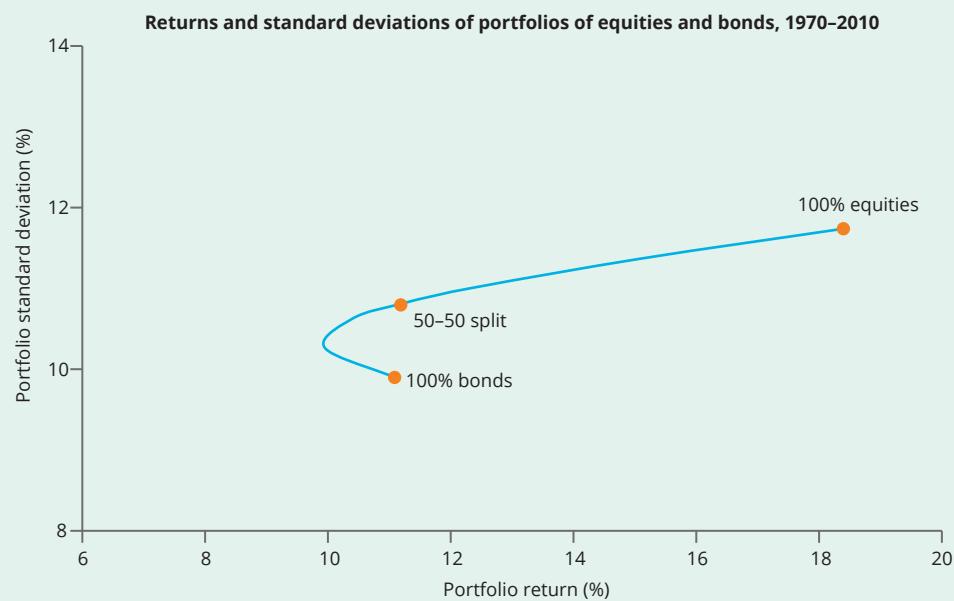
In section 6.2, we looked at an investor's decision to invest in equities or bonds when saving for retirement. As you might expect by now, there are likely to be advantages for the investor to hold both equities and bonds (that is, to diversify across asset classes) rather than to hold just one of these investments.



efficient frontier
The upper boundary created by charting the optimal investment combinations used to create portfolios that maximise expected returns for any level of expected risk, or that minimise expected risk for any level of expected return

The chart below uses data on the performance of shares and bonds from 1970–2010 to demonstrate the benefits of combining shares and bonds in a portfolio. The upper boundary of this type of chart is often referred to as an **efficient frontier**. It helps investors to assess how they should allocate their investments in order to maximise their investment return or minimise their investment risk. Remember that shares earn higher returns, but those returns are also more volatile than are bond returns. Does this imply that investors who place a high value on safety should invest 100% of their retirement savings in bonds?

The surprising answer is no. Even investors wanting to follow a very conservative investment strategy should probably hold at least some shares. Notice that, starting from a portfolio invested entirely in bonds, increasing the allocation devoted to shares simultaneously increases the portfolio's return and, at least up to a point, lowers the portfolio's standard deviation. In other words, the standard deviation of the portfolio is less than the standard deviations of either of the two assets in which the portfolio invests. How can this occur? The risk reduction occurs because equity and bond returns do not always move in the same direction, so sometimes their movements offset or mitigate each other, just as is the case with ADM and Coca-Cola. In fact, by looking at the graph we can make a very strong statement. As long as investors prefer higher returns over lower returns, and less volatility rather than more, investing exclusively in bonds doesn't make much sense. Notice that the diversified portfolio containing an equal mix of equities and bonds has about the same standard deviation as the bonds-only portfolio, but with a significantly higher return.



As you can see, there are diminishing returns to diversification. Adding more securities to this portfolio would lower the portfolio's volatility. But even if the portfolio contains every available security in the market, the standard deviation will not drop much more (recall that the standard deviation of the entire market is a little less than 20%). *Diversification reduces volatility, but only up to a point.* No matter how diversified the portfolio is, there will still be some volatility remaining. In finance, the risk that remains even in a well-diversified portfolio is called **systematic risk**.¹⁴ The term *systematic risk* refers to a risk that occurs systematically across many different shares. Examples of systematic risks include the recession/expansion phases of the macroeconomy, as well as changes in inflation, interest rates and exchange rates. On 11 September 2001, and in the days that followed, US investors learned that terrorism is a type of systematic risk, as the vast majority of shares fell in response to the attacks on the World Trade Center and the Pentagon.

systematic risk
Risk that cannot be eliminated through diversification

Look again at the point in **Figure 6.14** showing the standard deviation of a portfolio containing just one security. The standard deviation here is about 55%, which is a little lower than the standard deviation for the average share trading in the US market. If this security's standard deviation equals 55%, but the standard deviation of a portfolio containing this security (and many other assets) is roughly 20%, this suggests that most of an individual security's risk disappears once we put that security inside a portfolio. A substantial fraction of the volatility of an individual security vanishes when investors hold the security as part of a diversified portfolio. The risk of an individual security that disappears when one diversifies is called **unsystematic risk**.¹⁵ As the name implies, unsystematic risks are those risks which are not common to many securities. Instead, unsystematic risks affect just a few securities at a time.

unsystematic risk
Risk that can be eliminated through diversification

To understand the difference between systematic and unsystematic risk, consider the defence industry. Suppose the government announces that it will spend billions of dollars on a new, high-tech weapons system. Several defence contractors submit bids to obtain the contract for this system. Investors know that each of these contractors has some chance of winning the bid, but they don't know which company will prevail in the end. Before the government awards the contract, investors will bid up the prices of all defence shares, anticipating that for each company there is some chance of winning the bid. However, once the government announces the winning bidder, that company's share price will rise even more, while the prices of other defence shares will fall.

An investor who places an all-or-nothing bet by buying shares in only one defence contractor takes a lot of risk. Either the investor will guess the outcome of the bidding process successfully and the investment will pay off handsomely, or the investor will bet on the wrong company and lose money. Instead, suppose the investor diversifies and holds a position in each defence company. That way, no matter which company wins the contract, the investor will be sure to have at least a small claim on the value of that deal. By diversifying, the investor eliminates the unsystematic risk in this situation. However, suppose there is a chance that the defence department will cancel its plans to build the weapons system. When that announcement is made, all defence industry share prices will fall, and diversifying across all of these companies will not help an investor avoid that loss.¹⁶

¹⁴ Other terms used to describe this type of risk are non-diversifiable risk and market risk. The meaning of non-diversifiable risk is self-evident. Market risk conveys the sense that we are concerned with risks that affect the broad market, not just a few stocks or even a few sectors in the market.

¹⁵ Unsystematic risk is sometimes called diversifiable risk, unique risk, company-specific risk or idiosyncratic risk. Each of these terms implies that we are talking about risks that apply to a single company or to a few companies, not to many companies simultaneously, so this type of risk can be eliminated by holding a diversified portfolio.

¹⁶ A clever reader might argue that if the government spends less on defence, then more is spent on something else. So an investor may be able to diversify this risk away by holding a broad portfolio of securities rather than just a portfolio of defence shares. In that case, our illustration is once again about unsystematic rather than systematic risk.

6.4b RISK AND RETURN REVISITED

Remember that our goal in this section is to be able to say something useful about the relationship between risk and return for individual assets. We already know that asset classes that pay higher returns have higher standard deviations. Is the same true for securities within a particular asset class? Do individual shares with higher standard deviations earn higher returns over time?

Figure 6.15 plots the average return and standard deviation for the 10 shares featured in **Figure 6.12**. Unlike the predictable, almost linear relationship between standard deviation and returns that we observed for asset classes, no obvious pattern leaps out of this figure. If we compare the standard deviations and average returns of Intel to those of Walmart, then the positive relation between these two variables seems to hold. Clearly, Walmart shares were less volatile than Intel shares during this period, and Walmart investors earned much lower returns. However, comparing Walmart to American Airlines, Walmart shares were actually less volatile than were AMR shares, but shareholders of the airline earned returns even lower than those achieved by Walmart.

In contrast to the positive relationship between average returns and standard deviations for asset classes shown previously in **Figure 6.11**, this figure shows no such pattern for individual assets. There is no obvious tendency for the shares that have earned the highest returns to be the most volatile. This suggests that for an individual share, standard deviation may not be an appropriate measure of that share's risk because it is unrelated to the share's returns.

Why does the relationship between risk and return observed for asset classes in **Figure 6.11** seem to break down when we focus on specific securities? The horizontal axis in **Figure 6.15** offers a clue. Remember that the standard deviation of a single investment's return contains both systematic and unsystematic components. *If investors are wise enough to diversify, then the unsystematic component of risk is irrelevant because diversification eliminates unsystematic risks.* How difficult is it for investors to remove exposure to unsystematic risk? In fact, it is very easy for them to do so. The mutual fund industry is built on the idea of allowing many investors to pool their money so that even people with relatively little money to invest can buy a stake in a well-diversified portfolio. This chapter's 'What Companies Do' box shows that it is possible to eliminate some unsystematic risk by diversifying globally.

FIGURE 6.15 AVERAGE RETURN AND STANDARD DEVIATION FOR 10 SHARES, 1993–2010

The figure indicates that a positive relationship exists between the average returns offered by an asset class and the standard deviation of returns for that class.



FINANCE IN THE REAL WORLD



INVESTMENT RETURNS AROUND THE WORLD

The following chart summarises the historical performance of equities, bonds and bills for various countries around the world. It shows that Australian equities have substantially outperformed most other markets.

The tendency for shares to outperform safer investments like Treasury bills and bonds is a common phenomenon. As the table shows, the premium on equities relative to bills and relative to bonds was positive for all other countries assessed from 1900–2010. The relative performance of equities compared to both bills and bonds was highest in Australia and lowest in Denmark.

The second column of numbers shows the historical standard deviation of equities in each country. Finland, Germany, Japan and Italy had the most volatile share markets over the past century, but notice how many markets around the world had a standard deviation very close to that of the US market. Even more important, look at the bottom row of the table, which calculates the average real return, standard deviation and equity risk premium for a portfolio containing shares from all the countries. The world portfolio's standard deviation was just 17.7%. Only the Canadian share market was less volatile than the world market as a whole.

REAL ANNUALISED RETURNS (%) ON EQUITIES VERSUS BONDS AND BILLS INTERNATIONALLY, 1900–2010



Source: Adapted from Elroy Dimson, Paul Marsh and Mike Staunton, *Triumph of the Optimists*, Princeton University Press, 2002, and subsequent research.



Here again we see the power of diversification. The average real return and the equity risk premium on the world portfolio fell in the middle of the pack relative to the individual countries, but it managed to achieve those average returns with very low volatility.

With a standard deviation of 18.2%, the Australian equity market was the second least volatile, which is impressive, given that it was the best-performing with respect to equity returns. This suggests that over the 110-year period, Australia achieved one of the highest risk-adjusted returns.

The chart below shows global annualised equity returns around the world from 1900 to 2018. Despite including eight years of more recent data, Australia still maintained its position as the top performing equity market, in real terms.

REAL EQUITY RETURNS AND RISK PREMIA AROUND THE WORLD 1900–2010

COUNTRY	AVERAGE REAL RETURN ON EQUITIES (%) — GEOMETRIC MEAN	AVERAGE REAL RETURN ON EQUITIES (%) — ARITHMETIC MEAN	STANDARD DEVIATION OF ANNUAL REAL EQUITY RETURNS (%)	RISK PREMIUM VERSUS BILLS (%)	RISK PREMIUM VERSUS BONDS (%)
Australia	7.4	9.1	18.2	6.7	5.9
Belgium	2.5	5.1	23.6	2.9	2.6
Canada	5.9	7.3	17.2	4.2	3.7
Denmark	5.1	6.9	20.9	2.8	2.0
Finland	5.4	9.3	30.3	5.9	5.6
France	3.1	5.7	23.6	6.0	3.2
Germany*	3.1	8.1	32.2	5.9	5.4
Ireland	3.8	6.4	23.2	3.0	2.9
Italy	2.0	6.1	29.0	5.8	3.7
Japan	3.8	8.5	29.8	5.9	5.0
Netherlands	5.0	7.1	21.8	4.2	3.5
New Zealand	5.8	7.6	19.7	4.1	3.8
Norway	4.2	7.2	27.4	3.0	2.5
South Africa	7.3	9.5	22.6	6.2	5.5
Spain	3.6	5.8	22.3	3.2	2.3
Sweden	6.3	8.7	22.9	4.3	3.8
Switzerland	4.2	6.1	19.8	3.4	2.1
United Kingdom	5.3	7.2	20.0	4.3	3.9
United States	6.3	8.3	20.3	5.3	4.4
Europe	4.8	6.9	21.5	3.8	3.9
World excluding US	5.0	7.0	20.4	4.0	3.8
World	5.5	7.0	17.7	4.5	3.8

* Risk premia data for Germany covers 109 years, since it excludes the hyperinflationary period from 1922–23.

Source: Adapted from Dimson, Marsh and Staunton, *Equity Risk Premia Around the World*, London Business School, July 2011.

If diversification is easy, and if it eliminates unsystematic risk, then what reward should investors expect if they choose not to diversify and to bear systematic risk? Simple intuition predicts that bearing unsystematic risk offers no incremental reward. The reason is that investors can easily eliminate unsystematic risk by diversifying. In other words, investors do not have to bear this kind of risk, nor do they have to pay a lot to get rid of it. Therefore, *the market will reward investors only for bearing systematic risk*.

In [Figure 6.11](#), we observed an almost linear relation between standard deviation and average return for three asset classes: shares, bonds and bills. In [Figure 6.15](#), the relationship between standard deviation and return is not as clear. The difference between the figures is that in one case ([Figure 6.11](#)), we are looking at portfolios of assets, and in the other case ([Figure 6.15](#)), we are looking at individual assets. A well-diversified portfolio contains very little unsystematic risk. This is why the standard deviation of a portfolio of securities is typically so much lower than the standard deviation of a single security. For a portfolio, the standard deviation of returns consists almost entirely of systematic risk. For an individual asset, the standard deviation contains both types of risk. Therefore, if the market rewards systematic risk only, then in [Figure 6.11](#), we see a nice linear relationship between portfolio standard deviation (systematic risk) and average returns, but in [Figure 6.15](#), standard deviation (systematic + unsystematic risk) seems almost unrelated to average returns.

To conclude this chapter, let us take a step back and think about our original objective. The fundamental goal of finance is to value things. Usually, valuation involves projecting an asset's future cash flows, choosing a discount rate that is appropriate, given the asset's risk, then calculating the present value of the asset's future cash flows. In this chapter, we have made some progress in understanding the second step of the valuation process. We know that what really matters is an investment's total return, and we want to know how that return relates to risk. But not all risks are equal, so we need to focus on an asset's systematic risk because that is what should drive the asset's return. Diversified portfolios contain very little unsystematic risk; thus, a measure like the standard deviation of the portfolio's return provides a good measure of the portfolio's systematic risk. As expected, a portfolio's standard deviation and its return are closely linked.

But complications arise for individual assets because their fluctuations reflect both systematic and unsystematic factors. Therefore, the standard deviation of returns for a single share does not focus exclusively on the share's systematic risk. As a result, when we compare standard deviations and average returns across many different shares, we do not see a reliable pattern between those two variables.

This is an important problem because both managers and investors have to assess the risk of individual investments, not just portfolios. They need a way to measure the systematic risk, and only the systematic risk, of each and every asset. If it is possible to quantify an individual asset's systematic risk, then we should expect that measure of risk to be reliably related to returns. This is precisely our focus in Chapter 7.

CONCEPT REVIEW QUESTIONS 6.4

LO6.4

9 Why is the standard deviation of a portfolio usually smaller than the standard deviations of the assets that comprise the portfolio?

10 In [Figure 6.13](#), why does the line decline steeply at first and then flatten out?

11 Explain why the dots in [Figure 6.14](#) appear to be almost randomly scattered.

THINKING CAP QUESTION

3 A portfolio contains two investments, one that is quite volatile and one that is relatively stable. Does the standard deviation of the portfolio's returns fall between the standard deviations of the returns of the two investments in the portfolio?

STUDY TOOLS

SUMMARY

LO6.1

- An important measure of an investment's performance is its total return. The total return is the sum of the income that the investment pays out to investors, plus any change in the price of the investment.
- Total returns can be expressed either in dollar or percentage terms. These can be calculated using **Equation 6.1** and **Equation 6.2**, respectively, as shown in the 'Table of important equations' below.
- Real returns measure the change in purchasing power over time, whereas nominal returns measure the change in dollars accumulated. Investors who care about what they can consume with their wealth should focus on real returns.

LO6.2

- Historically, equities have earned higher average returns than bonds, and bonds have earned higher returns than bills. However, higher returns come at the price of higher volatility.

- Historically, equity returns are approximately normally distributed.

LO6.3

- One measure of risk is standard deviation, which captures deviations from the average outcome. This is referred to as the non-systematic, unsystematic or diversifiable risk of an investment.
- For broad asset classes, the relationship between average returns and standard deviation is nearly linear.
- The volatility (standard deviation) of individual securities is generally higher than the volatility of a portfolio. This suggests that diversification can reduce non-systematic risk.
- The standard deviation of a series of returns can be found by taking the square root of the variance of these returns, which can be calculated using **Equation 6.3** in the 'Table of important equations' below.

LO6.4

- There is a point beyond which additional diversification does not reduce risk. The risk that cannot be eliminated through diversification is called systematic risk, whereas the risk that disappears in a well-diversified portfolio is called unsystematic risk. The variance or standard deviation of any investment equals the sum of the systematic and unsystematic components of risk.
- Because investors can easily eliminate unsystematic risk by diversifying, the market should only reward investors based on the systematic risk that they bear.
- For individual investments, there is no strong linear relationship between average returns and standard deviation. This is the case because standard deviation includes both systematic and unsystematic risk, and returns should only be linked to systematic risk.

IMPORTANT EQUATIONS

TABLE OF IMPORTANT EQUATIONS

6.1 Total dollar return = Income + Capital gain or loss

6.2 Total percentage return = $\frac{\text{Total dollar return}}{\text{Initial investment}}$

6.3 Variance = $\sigma^2 = \frac{\sum_{t=1}^n (r_t - \bar{r})^2}{n-1}$

SELF-TEST PROBLEMS

Answers to these 'Self-test problems' and the 'Concept review' questions throughout the chapter appear on the Student Companion Website (<http://login.cengagebrain.com>) or via your instructor.

ST6-1 Using **Figure 6.9**, calculate the standard deviation of equity returns from 2006–2010. Over the last five years, were shares more or less volatile than they were over the last 18 years?

ST6-2 **Figure 6.9** shows that the average return on shares from 1993–2010 was 10.3%. Not shown in the table are the average returns on bonds and bills over the same period. The average return on bonds was 10.0%, and for bills the average return was 3.3%. From these figures, calculate the risk premiums for 1993–2010, and compare recent history to the long-run numbers using data in **Figure 6.6**.

ST6-3 Suppose that Treasury bill returns follow a normal distribution with a mean of 4.1% and a standard deviation of 2.8%. This implies that, 68% of the time, T-bill returns should fall within what range?

QUESTIONS

Q6-1 Why is it important to focus on total returns when measuring an investment's performance?

Q6-2 Why do real returns matter more than nominal returns?

Q6-3 Under what conditions will the components of a bond's return have the opposite sign?

Q6-4 Explain why dollar returns and percentage returns can sometimes send conflicting signals when comparing two different investments.

Q6-5 Do the rankings of investment alternatives depend on whether we rank based on nominal returns or real returns?

Q6-6 Look at **Figure 6.5**. Compare the best and worst years for T-bills in terms of their nominal returns, and then compare the best and worst years in terms of real returns. Comment on what you find.

Q6-7 Between 1900 and 2010, 1981 was the top year for nominal bill returns, and 1982 was the top year for nominal bond returns. Why do you think that these two years saw such high returns on bonds and bills?

Q6-8 When measuring the volatility of an investment's returns, why is it easier to focus on standard deviation rather than variance?

Q6-9 Are there diminishing returns to risk-taking?

Q6-10 Notice that in **Figure 6.12**, the average standard deviation among the 10 shares is 31.4%, yet **Figure 6.14** shows that a portfolio comprised of 10 shares has a standard deviation of about 20%. Explain why these two figures are not equal.

Q6-11 Look at **Figure 6.15**. Suppose you had to invest all of your money in just one of these shares (excluding Intel). Which one seems most attractive, and why? Which share seems least attractive?

Q6-12 Classify each of the following events as a source of systematic or unsystematic risk.

- a Jerome Hayden Powell retires as Chairman of the Federal Reserve and Arnold Schwarzenegger is appointed to take his place.
- b Martha Stewart is convicted of insider trading and is sentenced to prison.
- c An OPEC embargo raises the world market price of oil.
- d A major consumer products company loses a product liability case.
- e The US Supreme Court rules that no employer can lay off an employee without first giving 30 days' notice.

PROBLEMS

UNDERSTANDING RETURNS

- P6-1** You purchase 1,000 shares of Spears Grinders for \$50 per share. A year later, the shares pay a dividend of \$1.20 each and sell for \$59.
- Calculate your total dollar return.
 - Calculate your total percentage return.
 - Do the answers to parts (a) and (b) depend on whether you sell or continue to hold the shares after one year?
- P6-2** A financial adviser claims that a particular share earned a total return of 10% last year. During the year, the share price rose from \$30 to \$32.50. What dividend did the share pay?
- P6-3** D.S. Trucking Company shares pay a \$1.50 dividend every year without fail. A year ago, the shares sold for \$25 each, and their total return during the past year was 20%. What do the shares sell for today?
- P6-4** Nano-Motors has shares outstanding, which sell for \$10 per share. Macro-Motors shares cost \$50 each. Neither company pays dividends at present.
- An investor buys 100 shares of Nano-Motors. A year later, each share sells for \$15. Calculate the total return in dollar terms and in percentage terms.
 - Another investor buys 100 shares of Macro-Motors. A year later, the share price has risen to \$56. Calculate the total return in dollar terms and in percentage terms.
 - Why is it difficult to say which investor had a better year?
- P6-5** David Rawlings pays \$1,000 to buy a five-year Treasury bond that pays a 5% coupon rate. (For simplicity, assume annual coupon payments.) One year later, the market's required return on this bond has increased from 5% to 7%. What is Rawlings' total return (in dollar and percentage terms) on the bond?
- P6-6** G Welch purchases a corporate bond that was originally issued for \$1,000 several years ago. The bond has four years remaining until it matures, the market price now is \$1,054.45 and the yield to maturity (YTM) is 4%. The bond pays an annual coupon of \$55, with the next payment due in one year.
- What is the bond's coupon rate? What is its coupon yield?
 - Suppose Welch holds this bond for one year and the YTM does not change. What is the total percentage return on the bond? Show that on a percentage basis, the total return is the sum of the interest and capital gain/loss components.
 - If the YTM decreases during the first year from 4% to 3.5%, what is the total percentage return that year?
- P6-7** In this advanced problem, let's look at the behaviour of ordinary Treasury bonds and inflation indexed bonds, or TIPS. We will simplify by assuming annual rather than semiannual interest payments. Suppose that over the next five years investors expect 3% inflation each year. The Treasury issues a five-year ordinary bond that pays \$55 interest each year. The US Treasury issues a five-year TIPS that pays a coupon rate of 2%. With TIPS, the coupon payment is determined by multiplying the coupon rate times the inflation-adjusted principal value. Like ordinary bonds, TIPS begin with a par value or principal value of \$1,000. However, that principal increases over time as

inflation occurs. Assuming that inflation is in fact equal to 3% in each of the next five years, then the cash flows associated with each bond would look like this:

YEAR	T-BOND PAYS	TIPS PAYS	INFLATION-ADJUSTED PRINCIPAL (TIPS)	COUPON PAYMENT CALCULATION
0 (cost)	-1,000.00	-1,000.00	-1,000.00	NA
1	55.00	20.60	1,030.00	1,000.00(1.03) × 2%
2	55.00	21.22	1,060.90	1,030.00(1.03) × 2%
3	55.00	21.85	1,092.73	1,060.90(1.03) × 2%
4	55.00	22.51	1,125.51	1,092.73(1.03) × 2%
5	1,055.00	1,182.46	1,159.27	1,125.51(1.03) × 2%

In the last row of the table, notice the final TIPS payment includes the return of the inflation-adjusted principal (\$1,159.27), plus the final coupon payment.

- a Calculate the YTM of each bond. Why is one higher than the other? Show that the TIPS YTM equals the product of the real interest rate and the inflation rate.
- b What is the *real return* on the T-bond?
- c Suppose the *real return* on the T-bond stays constant, but investors expect 4% inflation rather than 3%. What happens to the required return on the T-bond in nominal terms?
- d Imagine that during the first year, the inflation that actually occurred was 3%, as expected. However, suppose that by the end of the first year, investors had come to expect 4% inflation for the next four years. Fill out the remaining cash flows for each bond in the table below.

YEAR	T-BOND PAYS	TIPS PAYS	INFLATION-ADJUSTED PRINCIPAL (TIPS)	COUPON PAYMENT CALCULATION
0 (cost)	-1,000.00	-1,000.00	-1,000.00	NA
1	55.00	20.60	1,030.00	1,000.00(1.03) × 2%
2				
3				
4				
5				

- e Now calculate the market price of the Treasury bond as of the end of the first year. Remember to discount the bond's remaining cash flows, using the nominal required return that you calculated in part (c). Given this new market price, what is the total return offered by the T-bond in the first year?
- f Next, calculate the market price of the TIPS bond. Remember, at the end of the first year, the YTM on the TIPS will equal the product of one plus the real return (2%) and one plus the inflation rate (4%). What is the total nominal return offered by TIPS the first year?

THE HISTORY OF RETURNS (OR, HOW TO GET RICH SLOWLY)

- P6-8 Refer to **Figure 6.2**. At the end of each line, we show the nominal value in 2018 of a \$1 investment shares, bonds and bills. Calculate the ratio of the 2018 value of \$1 invested in bonds divided by the 2018 value of \$1 invested in bills. Now recalculate this ratio, using the real values in **Figure 6.3**. What do you find?

P6-9 The US stock market hit an all-time high in October 1929 before crashing dramatically. Following the market crash, the US entered a prolonged economic downturn dubbed the Great Depression. Using **Figure 6.2**, estimate how long it took for the stock market to fully rebound from its fall, which began in October 1929. How did bond investors fare over this same period? (Note: A precise answer is hard to obtain from the figure, so just make your best estimate.)

P6-10 Refer again to **Figure 6.2**, which tracks the value of \$1 invested in various assets starting in 1900. At the stock market peak in 1929, look at the gap that exists between equities and bonds. At the end of 1929, the \$1 investment in shares was worth about five times more than the \$1 investment in bonds. About how long did investors in shares have to wait before they would regain that same performance edge? Again, getting a precise answer from the figure is difficult, so make an estimate.

P6-11 The *nominal return* on a particular investment is 12% and the inflation rate is 3%. What is the *real return*?

P6-12 A bond offers a *real return* of 6%. If investors expect 2.5% inflation, what is the *nominal rate of return* on the bond?

P6-13 If an investment promises a nominal return of 6% and the inflation rate is 3%, what is the real return?

P6-14 The following data show the rate of return on shares and bonds for several years. Calculate the risk premium on equities versus bonds each year, then calculate the average risk premium. Do you think that, at the beginning of 2007, investors expected the outcomes we observe in this table?

YEAR	2007	2008	2009	2010
Return on shares (%)	5.6	-37.2	28.5	17.1
Return on bonds (%)	9.9	25.9	14.5	6.4
Risk premium (%)				

P6-15 The table below shows the average return on US shares and bonds for 25-year periods ending in 1925, 1950, 1975 and 2000. Calculate the *equity risk premium* for each quarter of a century. What lesson emerges from your calculations?

AVE. RETURN	1925	1950	1975	2000
Shares	9.7%	10.2%	11.4%	16.2%
Bonds	3.5%	4.1%	2.4%	10.6%
Risk premium				

Source: Dimson, Elroy, *Triumph of the Optimists*. © 2002 Elroy Dimson, Paul Marsh and Mike Staunton. Published by Princeton University Press. Reprinted by permission of Princeton University Press.

P6-16 The current YTM on a one-year Treasury bill is 4%. You believe that the expected risk premium on shares versus bills equals 7.7%.

- Estimate the expected return on the share market next year.
- Explain why the estimate in part (a) may be better than simply assuming that next year's share market return will equal the long-term average return.

VOLATILITY AND RISK

P6-17 Using **Figure 6.8**, how would you estimate the probability that the return on the share market will exceed 30% in any given year?

- P6-18** In this problem, use [Figure 6.8](#) to estimate the expected return on the share market. To estimate the expected return, create a list of possible returns and assign a probability to each outcome. To find the expected return, multiply each possible return by the probability that it will occur, and then add up across outcomes. Notice that [Figure 6.8](#) divides the range of possible returns into intervals of 10% (except for very low or very high outcomes). Create a list of potential future equity returns by taking the midpoint of the various ranges as follows:

POSSIBLE EQUITY RETURNS (%)										
-35	-25	-15	-5	5	15	25	35	45	55	
$\frac{3}{111}$	$\frac{4}{111}$							$\frac{3}{111}$	$\frac{2}{111}$	

$$\text{Expected return} = \left(\frac{3}{111}\right)(-35) + \left(\frac{4}{111}\right)(-25) + \dots + \left(\frac{3}{111}\right)(45) + \frac{2}{111}(55) = ?$$

[Figure 6.8](#) shows that four years out of 111 had returns of between -20% and -30%. Let us capture this fact by assuming that, if returns do occur inside that interval, the typical return would be -25% (in the middle of the interval). The probability associated with this outcome is 4/111, or about 3.6%. Fill in the missing values in the table, then fill in the missing parts of the equation to calculate the expected return.

- P6-19** Below are the nominal returns on shares, bonds and bills for the 1920s and 1930s. For each decade, calculate the standard deviation of returns for each asset class. How do those figures compare with the more recent numbers for shares presented in [Figure 6.9](#) and the long-run figures for all three asset types in [Figure 6.10](#)?

NOMINAL RETURNS (%) ON SHARES, BONDS AND BILLS								
1920s				1930s				
	SHARES	BONDS	BILLS		SHARES	BONDS	BILLS	
1920	-17.9	5.8	7.6	1930	-28.3	4.7	2.4	
1921	11.6	12.7	7.0	1931	-43.9	-5.3	1.1	
1922	30.6	3.5	4.7	1932	-9.8	16.8	1.0	
1923	3.0	5.7	5.2	1933	57.6	-0.1	0.3	
1924	27.0	6.4	4.1	1934	4.4	10.0	0.2	
1925	28.3	5.7	4.1	1935	44.0	5.0	0.2	
1926	9.5	7.8	3.3	1936	32.3	7.5	0.2	
1927	33.1	8.9	3.1	1937	-34.6	0.2	0.3	
1928	38.7	0.1	3.6	1938	-8.2	5.5	0.0	
1929	-14.5	3.4	4.7	1939	2.9	5.5	0.0	

Source: "Triumph of the Optimists," by Elroy Dimson, Paul Marsh, and Mike Staunton, in Global Investment Returns Yearbook 2010. Published by ABN AMRO, London. Updates provided by Dimson, et al. through 2009. Author's estimates for 2010. Reprinted with permission.

P6-20 Use the data below to calculate the standard deviation of nominal and real Treasury bill returns from 1972–82. Do you think that when they purchased T-bills, investors expected to earn negative real returns as often as they did during this period? If not, what happened that took investors by surprise?

YEAR	NOMINAL RETURN (%)	REAL RETURN (%)
1972	3.8	0.4
1973	6.9	-1.7
1974	8.0	-3.7
1975	5.8	-1.1
1976	5.1	0.3
1977	5.1	-1.5
1978	7.2	-1.7
1979	10.4	-2.6
1980	11.2	-1.0
1981	14.7	5.3
1982	10.5	6.4

Source: "Triumph of the Optimists," by Elroy Dimson, Paul Marsh, and Mike Staunton, in *Global Investment Returns Yearbook 2010*. Published by ABN AMRO, London. Updates provided by Dimson, et al., through 2009. Author's estimates for 2010. Reprinted with permission.

P6-21 Based on [Figure 6.11](#), about what rate of return would a truly risk-free investment (one with a standard deviation of zero) offer investors?

THE POWER OF DIVERSIFICATION

P6-22 Troy McClain wants to form a portfolio of four different shares. Summary data on the four shares follows. First, calculate the average standard deviation across the four shares, then answer this question: if Troy forms a portfolio by investing 25% of his money in each of the shares in the table, is it very likely that the standard deviation of this portfolio's return will be (more than, less than, equal to) 43.5%? Explain your answer.

SHARE	RETURN	STD. DEV.
1	14%	71%
2	10%	46%
3	9%	32%
4	11%	25%

P6-23 The table below shows annual returns on Archer Daniels Midland (ADM) and Walmart. The last column of the table shows the annual return that a portfolio invested 50% in ADM and 50% in Walmart would have earned in 1993. The portfolio's return is simply a weighted average of the returns of ADM and Walmart.

YEAR	ADM	WALMART	50–50 PORTFOLIO
1993	1.5%	-22.7%	$-10.6\% = (0.5 \times 1.5\% + 0.5 \times -22.7\%)$
1994	37.4%	-24.6%	
1995	-11.2%	-5.5%	
1996	31.1%	8.0%	
1997	10.0%	50.7%	
1998	-15.3%	76.8%	
1999	-23.5%	61.2%	
2000	32.9%	9.5%	
2001	1.9%	15.6%	
2002	-12.1%	-18.1%	
2003	25.1%	11.1%	
2004	49.1%	-10.5%	
2005	12.3%	-8.2%	
2006	31.0%	3.3%	
2007	47.2%	0.3%	
2008	-36.9%	15.0%	
2009	10.8%	10.9%	
2010	-1.5%	1.4%	

- a Plot a graph similar to **Figure 6.13** showing the returns on ADM and Walmart each year.
- b Fill in the blanks in the table above by calculating the 50–50 portfolio's return each year from 1994–2010, then plot this on the graph you created for part (a). How does the portfolio return compare to the returns of the individual shares in the portfolio?
- c Calculate the standard deviation of ADM, Walmart and the portfolio, and comment on what you find.

P6-24 The table below shows annual returns for Merck and one of its major competitors, Eli Lilly. The final column shows the annual return on a portfolio invested 50% in Lilly and 50% in Merck. The portfolio's return is simply a weighted average of the returns of the shares in the portfolio, as shown in the example calculation at the top of the table

YEAR	ELI LILLY	MERCK	50–50 PORTFOLIO
Year 1	15.4%	14.9%	$15.1\% = (0.5 \times 15.4\% + 0.5 \times 14.9\%)$
Year 2	77.2%	76.4%	
Year 3	32.6%	24.0%	
Year 4	93.6%	35.5%	
Year 5	29.1%	41.2%	
Year 6	-24.3%	-7.4%	
Year 7	41.9%	41.7%	
Year 8	-14.4%	-35.9%	
Year 9	-17.6%	-1.1%	
Year 10	13.1%	-11.2%	
Std. dev.			

- a Plot a graph similar to [Figure 6.13](#) showing the returns on Lilly and Merck each year.
- b Fill in the blanks in the table above by calculating the 50-50 portfolio's return each year from year 2 to year 10, then plot this on the graph you created for part (a). How does the portfolio return compare to the returns of the individual shares in the portfolio?
- c Calculate the standard deviation of Lilly, Merck and the portfolio, and comment on what you find.

P6-25 In this problem, you will generate a graph similar to [Figure 6.14](#). The table below shows the standard deviation for various portfolios of shares listed in [Figure 6.12](#). Plot the relationship between the number of shares in the portfolio and the portfolio's standard deviation. Comment on how the resulting graph is similar to and different from [Figure 6.14](#).

SHARES IN THE PORTFOLIO	STD. DEVIATION (%)
Exxon	16.6
Exxon + P&G	15.2
Exxon + P&G + Coke	15.4
Exxon + P&G + Coke + ADM	14.7
Exxon + P&G + Coke + ADM + Walmart	12.5
Exxon + P&G + Coke + ADM + Walmart + Wendy's	14.5

CASE STUDY

THE TRADE-OFF BETWEEN RISK AND RETURN

Use the following information to compare the performance of the S&P 500 Index, the Nasdaq Index and the Treasury Bill Index from 1983–2003. Each of these index numbers is calculated in a way that assumes that investors reinvest any income they receive, so the total return equals the percentage change in the index value each year. The last column shows the level of the Consumer Price Index (CPI) at the end of each year, so the percentage change in the index indicates the rate of inflation for a particular year. Note that, because the data start on 31 December 1983, it is not possible to calculate returns or an inflation rate in 1983.

ASSIGNMENT

- 1 For the S&P 500, the Nasdaq and the T-bill series, calculate: (a) the cumulative return over 20 years; (b) the average annual return in nominal terms; (c) the average annual return in real terms; and (d) the standard deviation of the nominal return. Based on these calculations, discuss the risk/return relationship between these indexes. Which asset class earned the highest average return? For which asset class were returns most volatile? Plot your results on a graph with the standard deviation of each asset class on the horizontal axis and the average return on the vertical axis.
- 2 Update this data using a more recent time period. Conduct a similar analysis and compare the results to the results obtained above. Hint: historical time series data for the T-Bill Index can be obtained from S&P (<https://finance.yahoo.com/quote/%5EIRX/history?p=%5EIRX>), as can data for the S&P 500. Data for the S&P 500 (<https://finance.yahoo.com/quote/%5EGSPC/history?p=%5EGSPC>) and Nasdaq indices can also be obtained from Yahoo! Finance (<http://au.finance.yahoo.com>). US CPI data can be obtained from the US Bureau of Labor Statistics (<http://www.bls.gov/cpi/>).
- 3 Conduct a similar analysis for the Australian share market using the ASX All Ordinaries and S&P/ASX 200 Share Price Indices and the Consumer Price Index

(CPI). Compare these results with those for the US market. Hint: Long, dated historical time series data for Australian CPI can be sourced from the Australian Bureau of Statistics website (<http://www.abs.gov.au>). More recent data on the S&P/ASX 200 and CPI are available from the Reserve Bank of Australia website (<http://www.rba.gov.au>). Historical share price indices data are available from the Australian Stock Exchange website (<http://www.asx.com.au>) and Yahoo! Finance (<http://au.finance.yahoo.com>).

DATE	S&P 500	NASDAQ	T-BILLS	CPI
31-12-1983	164.93	278.60	681.44	101.3
31-12-1984	167.24	247.35	748.88	105.3
31-12-1985	211.28	324.39	806.62	109.3
31-12-1986	242.17	348.81	855.73	110.5
31-12-1987	247.08	330.47	906.02	115.4
31-12-1988	277.72	381.38	968.89	120.5
31-12-1989	353.40	454.82	1,050.63	126.1
31-12-1990	330.22	373.84	1,131.42	133.8
31-12-1991	417.09	586.34	1,192.83	137.9
31-12-1992	435.71	676.95	1,234.36	141.9
31-12-1993	466.45	776.80	1,271.78	145.8
31-12-1994	459.27	751.96	1,327.55	149.7
31-12-1995	615.93	1,052.13	1,401.97	153.5
31-12-1996	740.74	1,291.03	1,473.98	158.6
31-12-1997	970.43	1,570.35	1,550.49	161.3
31-12-1998	1,229.23	2,192.68	1,625.77	163.9
31-12-1999	1,469.25	4,069.31	1,703.84	168.3
31-12-2000	1,320.28	2,470.52	1,805.75	174.0
31-12-2001	1,148.08	1,950.40	1,865.85	176.7
31-12-2002	879.82	1,335.51	1,895.83	180.9
31-12-2003	1,111.92	2,003.37	1,915.29	184.3

7

RISK, RETURN AND THE CAPITAL ASSET PRICING MODEL

WHAT COMPANIES DO

THE HIGH-BETA RALLY

'The notion that a share's beta is an important measure of risk and is linked to an investment's return is fundamental to one of the most important theories in all of finance: the capital asset pricing model (CAPM). The CAPM gives investors a way to judge the risks and rewards of almost any investment, and managers rely on the model when they analyse capital investment projects for their companies. We can see this in practice by assessing the behaviour of shares with high betas. The CAPM implies that if a company's share price has a high beta associated with it, the company's shares are considered to be more risky or volatile, suggesting that the share price is going to move up and down more dramatically than the share prices of companies that the market perceives as less risky. Thus, when a major market upswing occurs, this can be driven by a rise in the price of high-beta shares.'

Traders refer to this as a "*high-beta rally*". An example occurred in the final day of trading in 2012 and the first day of trading in 2013 in the US. Following the euphoria of escaping the so-called "fiscal cliff", the US market displayed a massive two-day surge in value, with 31 December 2012 producing the largest final-day gain since 1974. However, this surge was mainly due to a massive rise in the value of high-beta shares. The S&P 500 High Beta Index (listed as the *SPHB*) consists of the 100 shares from the S&P 500 Index with the highest sensitivity to market movements, or beta, over the past 12 months as determined by Standard & Poor's. The following chart shows how it performed compared to the S&P 500 Index (*SP500*) over the last quarter of 2012 and beginning of 2013. The chart demonstrates how this two-day surge in value was driven by high beta shares.'

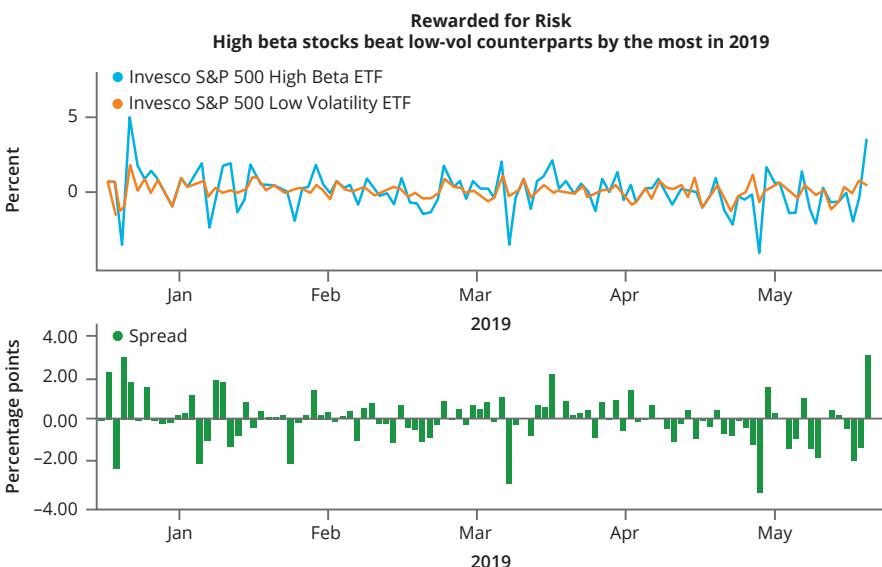




Source: 'Crossing Wall Street', CWS Market Review, 4 January 2013

Although less dramatic, high-beta US stocks displayed a similar phenomenon on 6 June 2019, when they outperformed low volatility stocks by the highest amount since

the start of the year. The following chart shows the relative changes in price of the Invesco S&P 500 High Beta ETF compared to the Invesco S&P 500 Low Volatility ETF.



Source: K. Kawa, 'Risk-on Is Back as Rally-Hungry Bulls Set Aside Trade Fears', Bloomberg, 6 June 2019, <https://www.bloomberg.com/news/articles/2019-06-05/hope-may-not-be-a-plan-but-rally-hungry-bulls-give-it-a-shot>. Accessed 10 February 2020.

LEARNING OBJECTIVES

After studying this chapter, you will be able to:

- LO7.1 illustrate three different approaches for estimating an asset's expected return
- LO7.2 calculate a portfolio's expected return, standard deviation and its beta
- LO7.3 explain how the capital asset pricing model (CAPM) links an asset's beta to its expected return

LO7.4 describe the concept of market efficiency and its important lessons for investors.

In this chapter, we continue our study of the relationship between risk and return. We will see that a share's beta, a measure of how much a share's return varies in response to variations in overall market returns, is an important determinant of its expected return. This is the central insight of the capital asset pricing model (CAPM), one of the most important ideas in modern finance. The scholars who developed the model earned a Nobel Prize in Economics in 1990 for their research. The CAPM is useful not only for investors in financial markets but also for managers who need to understand what returns shareholders expect on the money they contribute to corporate ventures.

LO7.1 7.1 EXPECTED RETURNS

expected return

A forecast of the return that an asset will earn over some future period of time

Ultimately, people want to know what return they should expect from an investment. Investors and corporate managers decide upon investments based on their best judgements about what the future will hold. In finance, when we use the term **expected return**, we have in mind a 'best-guess' estimate of how an investment will perform. For example, in Chapter 6 we saw ample evidence that investors should expect higher returns on shares than on bonds. Intuitively, that makes sense because shares are riskier than bonds, and investors should expect a reward for bearing risk. However, the claim that expected returns should be higher for shares than for bonds does not imply that shares will actually outperform bonds every year. Rather, it means that it is more likely that shares will outperform bonds than vice-versa.

In this chapter, we want to establish a link between risk and expected returns. To establish that link, we must deal with a major challenge: *expected returns are inherently unobservable*. Analysts have many techniques at their disposal to form estimates of expected returns, but it is important to remember that the numbers produced by these models are just estimates. As a starting point, let's see how analysts might use historical data to make educated guesses about the future.

7.1a THE HISTORICAL APPROACH

Analysts employ at least three different methods to estimate an asset's expected return. The first method relies on historical data and assumes that the future and the past share much in common. Chapter 6 reported an average risk premium on US shares relative to Treasury bills of 7.5% over the 111 years to 2010. A 2012 report by NERA Economic Consulting suggested that a premium of 7.0% would be appropriate for Australia.¹ More recent reports suggest that this may have fallen to approximately 6%.^{2,3}

In Australia, the equivalent of a Treasury bill is a short-dated instrument called a Treasury note. If a Treasury note currently offers investors a 2% yield to maturity (YTM), then the sum of the note yield and the historical equity risk premium ($2.0\% + 6.0\% = 8.0\%$) provides one measure of the expected return on shares.

Can we apply that logic to an individual share to estimate its expected return? Consider the case of Oroton Group Limited. Oroton shares have been listed on the ASX since 1987, so we can calculate its long-run average return, just as we did for the US share market. Suppose that over many decades, Oroton's return has averaged 15.0%. Suppose also that over the same time period, the average return on Treasury notes was 4.0%. Thus, Oroton shareholders have enjoyed a historical risk premium of 11.0%. Therefore, we might estimate Oroton's expected return as follows:

1 *The Black CAPM, Report for APA Group, Envestra, Multinet & SPAusNet*, NERA Consulting Group, March 2012.

2 *Australian Valuation Practices Survey 2015*, KPMG, 2015.

3 P. Fernández, 'Market Risk Premium Used in 71 Countries in 2016: A Survey with 6,932 Answers', *Journal of International Business Research and Marketing*, Vol. 2, No. 6, 2017, pp 23–31.

$$\begin{aligned}\text{Oroton expected return} &= \text{Current Treasury note rate} + \text{Oroton historical risk premium} \\ \text{Oroton expected return} &= 2\% + 11\% = 13\%\end{aligned}$$

Although simple and intuitively appealing, this approach suffers from several drawbacks. First, over its long history, Oroton has experienced many changes, including executive turnover, technological breakthroughs in manufacturing and increased competition from domestic and foreign rivals. This suggests that the risks of investing in Oroton have changed dramatically over time, so the risk premium on Oroton shares has fluctuated too. Calculating Oroton's historical risk premium over many years blends all these changes into a single number, and that number may or may not reflect Oroton's current status. Thus, the historical approach yields merely a naïve estimate of the expected return. Investors need to know whether Oroton's shares today are more risky, less risky or just as risky as the long-term premium indicates.

A second flaw in applying this approach broadly is that most shares in the market do not have as long a history as Oroton's do to forecast the expected return. In the six months to the end of 2019, around 80 new companies listed their shares on the Australian Securities Exchange (ASX).⁴ Over the same time frame, more than 70 companies were delisted from the ASX, where fewer than half the companies that were delisted had been listed for more than 10 years. These companies have no long-run track record to learn from – only a few years of rather volatile recent history.⁵

7.1b THE PROBABILISTIC APPROACH

A second method for estimating expected returns uses statistical concepts. When statisticians want to estimate the expected value of some unknown quantity, they first list all *possible* values that the variable of interest might take, as well as the probability that each outcome will occur. In principle, analysts can use the same approach to calculate the expected return on shares and other financial assets. A potential advantage of this approach is that it does not require an analyst to assume that the future will look just like the past. Professional judgement plays a larger role here.

OrotonGroup Limited falls into a category of shares that traders call *cyclicals* because these shares' fortunes rise and fall dramatically with the business cycle. To project the expected return on Oroton shares, an analyst can estimate the probabilities associated with different states of the overall economy. The table below illustrates how this can work. The analyst assumes that the economy will be in one of three possible states next year: boom, expansion or recession. The current climate presents a 20% chance that the economy will experience a recession, and the probabilities of a normal expansion or a boom are 70% and 10%, respectively. Next, the analyst projects that if the economy slips into recession, Oroton shareholders will experience a 30% loss. If the economy continues to expand normally, then Oroton's share return will be 15%. If the economy booms, Oroton shares will do very well, earning a total return of 55%.

OUTCOME	PROBABILITY	OROTON RETURN
Recession	20%	-30%
Expansion	70%	15%
Boom	10%	55%

To calculate the expected return on Oroton shares, multiply each possible return times the probability that it will occur and then add up the returns across all three possible outcomes:

$$\text{Oroton expected return} = 0.20(-30\%) + 0.70(15\%) + 0.10(55\%) = 10\%^6$$

⁴ MorningStar DataAnalysis, <http://datanalysis.morningstar.com.au/af/dathome?xtm-licensee=dat>. Subscription database.

⁵ Ibid.

⁶ It is easy to generalise this equation. Rather than assuming that there are just three possible outcomes for Oroton shares, suppose that there are n distinct states, where n can be any number. Each state occurs with a particular probability ($P_1 + P_2 + \dots + P_n = 1.0$) and results in a specific return on Oroton shares (r_1, r_2, r_3, \dots). In this case, the expected return equals:

$$E(r) = P_1 r_1 + P_2 r_2 + P_3 r_3 + \dots + P_n r_n$$

With an estimate of the expected return in place, the analyst can estimate the variance and standard deviation of Orono shares. To do so, subtract the 10% expected return from the actual return on Orono shares in each state of the economy. Then, square that difference and multiply it by the probability of recession, expansion or boom. The accompanying table illustrates the calculation.

OUTCOME	PROBABILITY	ORONO RETURN	RETURN – 10%	(RETURN – 10%) ²
Recession	20%	-30%	-40%	1,600% ²
Expansion	70%	15%	5%	25% ²
Boom	10%	55%	45%	2,025% ²

$$\text{Variance} = (0.20)(1,600\%)^2 + (0.70)(25\%)^2 + (0.10)(2,025\%)^2 = 540\%^2$$

$$\text{Standard deviation} = \sqrt{540\%^2} = 23.2\%$$

The analyst can apply the same model to any share with returns tied to the business cycle. For example, purchases of Coca-Cola do not vary over the business cycle as much as car purchases do, so Coca-Cola Amatil shares should be less sensitive to economic conditions than are Orono's shares. Perhaps when the economy is booming, Coca-Cola Amatil shareholders earn 36%. Under normal economic conditions, Coca-Cola Amatil shares earn 12%, but during an economic slump, the return on Coca-Cola Amatil shares equals -15%. Maintaining the same assumptions about the probabilities of recession, expansion and boom, estimates of Coca-Cola Amatil's expected return, variance and standard deviation can be constructed as follows:

OUTCOME	PROBABILITY	COCA-COLA AMATIL RETURN	RETURN – 9%	(RETURN – 9%) ²
Recession	20%	-15%	-24%	576% ²
Expansion	70%	12%	3%	9% ²
Boom	10%	36%	27%	729% ²

$$\text{Expected return} = (0.20)(-15\%) + (0.70)(12\%) + (0.10)(36\%) = 9\%$$

$$\text{Variance} = (0.20)(576\%)^2 + (0.70)(9\%)^2 + (0.10)(729\%)^2 = 194.4\%^2$$

$$\text{Standard deviation} = \sqrt{194.4\%^2} = 13.9\%$$

But the probabilistic approach has its own drawbacks. To calculate expected returns for Orono and Coca-Cola Amatil, we started with a simplifying assumption that only three possible outcomes or scenarios were possible. Clearly, the range of potential outcomes is much broader than this. Similarly, we assumed that we knew the probability of each scenario in advance. Where did those probabilities come from? Analysts can draw from historical experience, for example, by estimating the probability of a recession by studying past recession frequencies. If history shows that recessions occur in roughly one year out of every five, then 20% might be a reasonable estimate of the probability of a future recession; then again, it might be well off the mark. In any case, the probabilistic approach involves a high degree of subjectivity. It requires analysts to specify possible future outcomes for share returns and to attach a probability to each outcome. Once again, these assumptions about possible states of the economy can be somewhat naïve if the assumptions are based on historical data.

7.1c THE RISK-BASED APPROACH

A third approach to estimate an asset's expected return is more theoretically sound, and is used in practice by most corporate finance professionals. It requires an analyst to first measure the risk of the asset, then translate that risk measure into an expected return estimate. This approach involves a two-step process. The first step is to define what we mean by risk and to measure it, and the second step is to quantify how much return we should expect on an asset with a given amount of risk.

Measuring the Risk of a Single Asset

Recall that Chapter 6 introduced the notions of systematic and unsystematic risk. Remember these concepts:

- Systematic risks simultaneously affect many different securities, whereas unsystematic risks affect just a few securities at a time. Systematic risk refers to events, such as unexpected changes in the overall health of the economy, interest rate movements or changes in inflation. Events that we classify as examples of unsystematic risk include the failure of a company's new product to gain market share, a scandal involving top management at a particular company or the loss of a key employee.⁷
- Investors *can eliminate unsystematic risk by diversifying*, but diversification cannot eradicate systematic (or market) risk. Because it is easy for investors to shed one type of risk but not the other, the *market pays investors for bearing systematic risk*. That is, assets with more exposure to systematic risk generally offer investors higher returns than assets with less exposure to systematic risk. We see evidence of that proposition in the historical record, such as the higher long-term average return on shares compared to Treasury bonds or Treasury notes.
- The standard deviation of an asset's returns measures how much returns fluctuate around the average. The standard deviation calculation makes no distinction between a movement in returns caused by systematic factors, such as an increase in oil prices, and movements associated with unsystematic factors, such as the outcome of a product liability lawsuit filed against one company. In other words, *the standard deviation measures an asset's total risk, equal to the sum of its systematic and unsystematic components*. Because only the systematic component of risk influences an asset's expected return, an asset's standard deviation is an unreliable guide to its expected return.

If systematic risk means risk that affects the entire market, then for an individual share, we need to know the extent to which the share moves when the market moves. We need a measure that captures *only* the systematic component of a share's volatility because *only* that component should be related to the asset's expected return. When an event having a positive (or negative) effect on the overall market also has a pronounced positive (or negative) effect on a particular share, then that share has a high degree of systematic risk and should also have a high expected return.

A key aspect of this approach is assessing the behaviour of the entire market. Since we cannot observe the entire market (remember that many assets are not listed, making price information difficult to obtain), we need to use a proxy to estimate its behaviour. We can do this by using a market index. We use the S&P/ASX 200 Index as a proxy for the Australian market.

The S&P/ASX 200 Index covers 200 of the largest listed Australian shares, by market capitalisation. **Figure 7.1** shows the characteristics of this index. It shows how the market is heavily skewed towards financial and resources (materials) shares. **Figure 7.2** provides more details around the characteristics of this index.

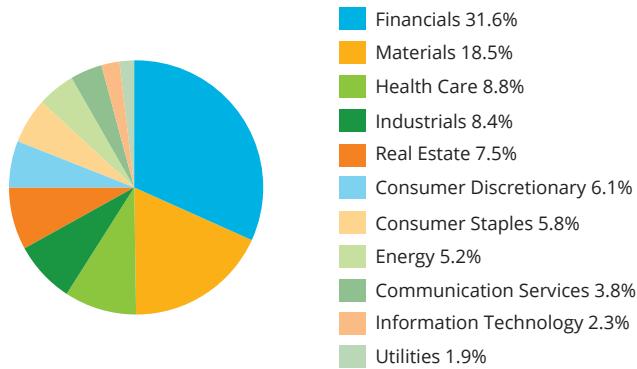
When calculating equity returns, it is important to calculate total returns. This means we need to adjust raw price data for share splits and dividend payments.

The S&P 500 Index is a market index consisting of 500 large US shares. It is one of the most widely watched barometers of the overall US share market, and is usually used as a proxy for the US market. It is also often used as a proxy for the entire global market. The MSCI World Index is a more representative global proxy, which is also used as a proxy for the global market.

For a visual explanation of this idea, examine **Figures 7.3a** and **7.3b**. The figures show scatter plots of monthly share returns for two companies, Orotongroup Limited (retailer and wholesaler of luxury goods) and utility company AGL Energy Limited, versus the monthly return on the S&P/ASX 200 Index. For example,

⁷ Notice that all these examples are negative events, in the sense that we expect them to cause the company's share price to fall. Of course, risk means that outcomes can be surprisingly good, just as they can be surprisingly bad.

FIGURE 7.1 S&P/ASX 200 SECTOR BREAKDOWN



Based on GICS® sectors

The weightings for each sector of the index are rounded to the nearest tenth of a percent; therefore, the aggregate weights for the index may not equal 100%.

As of Jul 31, 2019

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FIGURE 7.2 THE S&P/ASX 200 INDEX AS A PROXY FOR THE AUSTRALIAN MARKET INDEX CHARACTERISTICS (AS OF 31 JULY 2019)

Number of Constituents	200
Launch Date	Apr 3, 2000
Constituent Total Market Cap [AUD Millions]	
Max Market Cap	144,835.08
Min Market Cap	431.88
Mean Market Cap	9,664.70
Median Market Cap	3,341.84

As of Jul 31, 2019

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each dot in **Figure 7.3A** shows the return on OrlonGroup shares and the return on the S&P/ASX 200 in a particular month. Through each scatter plot we have drawn a trend line, estimated by using the method of linear regression. This trend line shows the average tendency for each share to move with the market. However, clearly OrlonGroup shares do not track the market perfectly, which is evidence that there are unsystematic risks that affect OrlonGroup share returns.

These two shares respond differently, on average, to market movements. The OrlonGroup's trend line slope equals 1.4. Thus, *on average*, if the market's return one month moves by 1%, then the return on OrlonGroup shares moves in the same direction by 1.4%. AGL Energy shares behave quite differently, displaying a much lower tendency to move in conjunction with the market. With a gradient of 0.4, AGL Energy's trend line tells us that if the market return moves up or down 1%, *on average*, AGL Energy's return moves just 0.4% in response. These differences in responsiveness lead to an important conclusion. Because returns on OrlonGroup are more sensitive to overall market movements, OrlonGroup ordinary shares

FIGURE 7.3A SCATTER PLOT OF MONTHLY RETURNS FOR OROTONGROUP LIMITED AGAINST THE ASX 200 INDEX

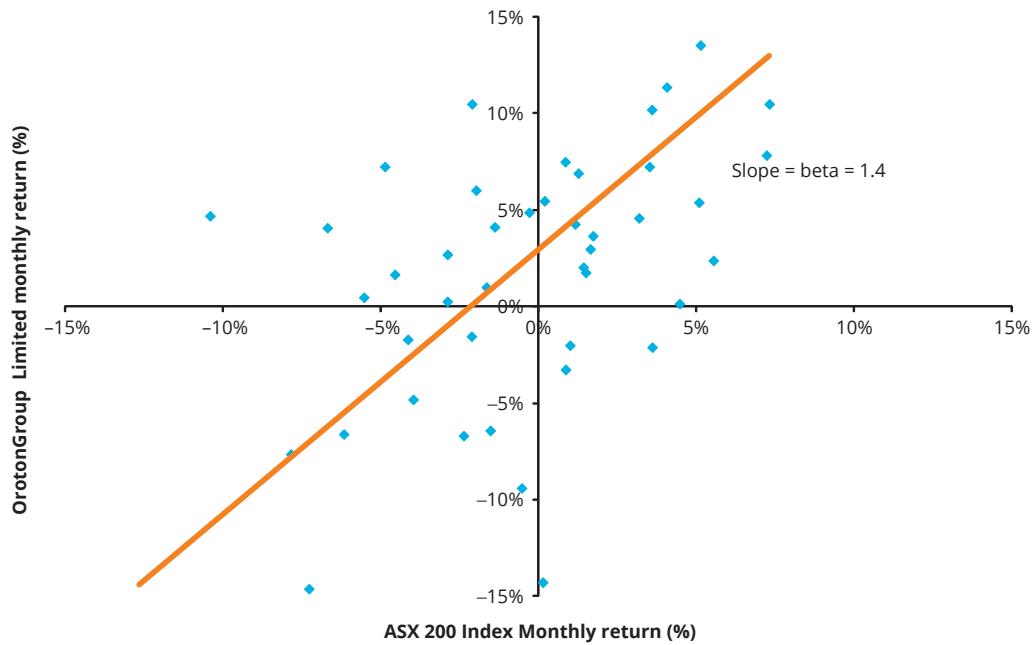
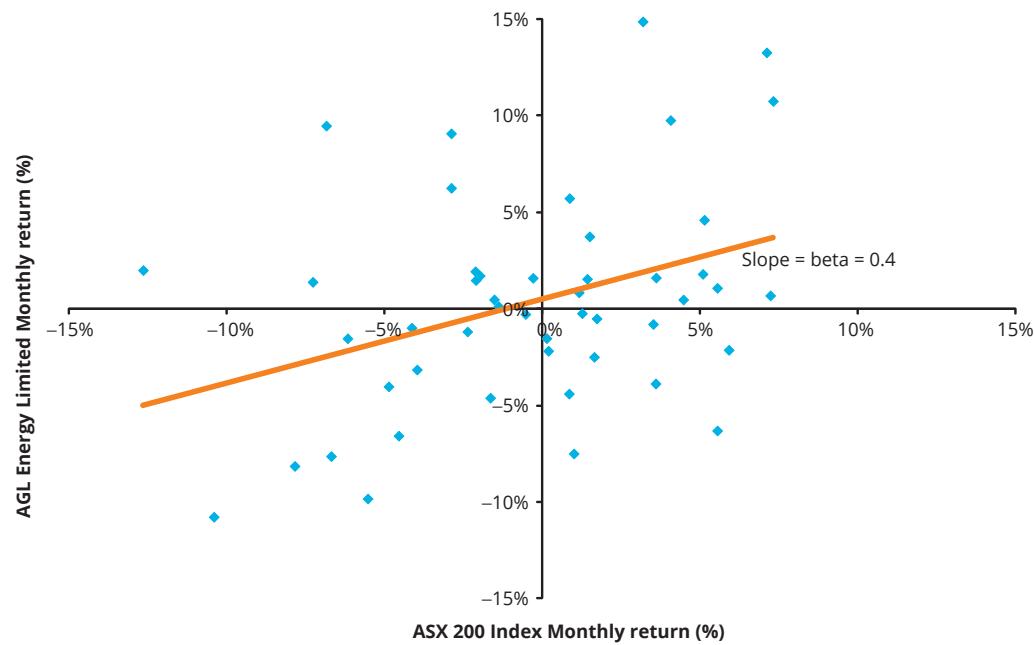


FIGURE 7.3B SCATTER PLOT OF MONTHLY RETURNS FOR AGL ENERGY LIMITED AGAINST THE ASX 200 INDEX



have more systematic risk than AGL Energy shares. In other words, when a macroeconomic event, such as an unexpected shift in interest rates, moves the entire market, Orotongroup shares typically respond more sharply than do AGL Energy shares. These results make sense when we consider the businesses each company is engaged in. AGL Energy provides energy to consumers. The demand for this is quite inelastic – energy is required whether or not the market is doing well. In contrast, the demand for luxury goods is likely to be very elastic; when consumers feel wealthier – for example, if their equity investments are performing well in a bull market – they are more likely to choose to purchase luxury items than if they are feeling less wealthy.

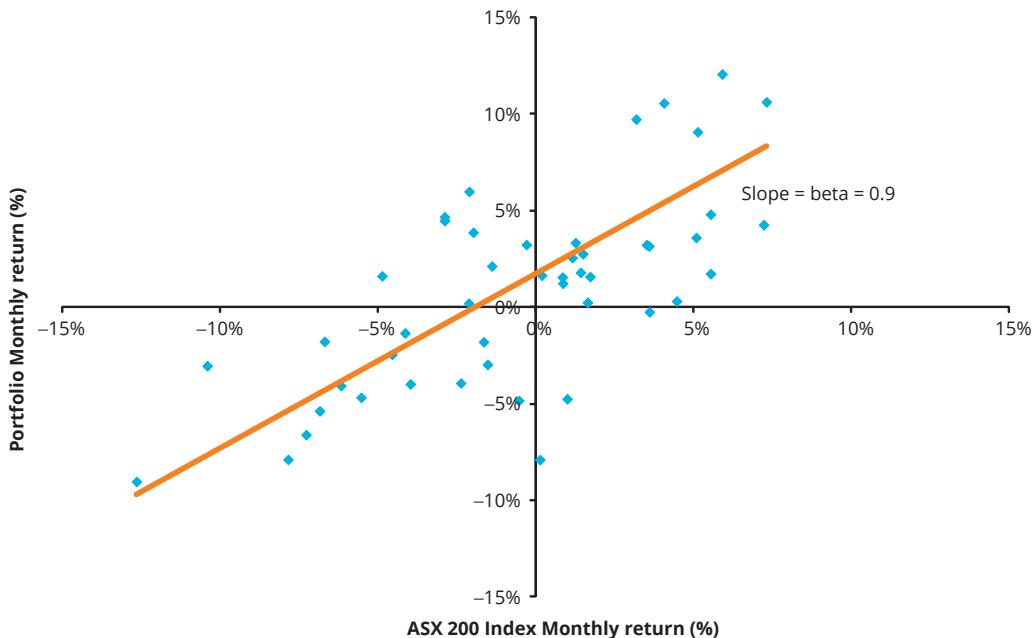
beta

A standardised measure of the risk of an individual asset that captures only the systematic component of its volatility; it measures the sensitivity of the asset's return to movements in the overall market

The slopes of the trend lines in **Figures 7.3a** and **7.3b** have a special designation in finance, known as **beta**. A share's beta measures the sensitivity of its return to movements in the overall market return. Thus, beta is a measure of systematic risk. The return on a high-beta share like Orotongroup typically experiences dramatic up-and-down swings when the market return moves. Because Orotongroup's beta equals 1.4, we can say that the return on Orotongroup's shares moves, on average, 1.4 times as much as does the market return. In contrast, with a beta of just 0.4, the return on AGL Energy shares moves much less on average when the overall share market fluctuates. *This is not the same thing as saying that AGL Energy is not a volatile share.* The individual dots in **Figure 7.3b** show that monthly returns on AGL Energy usually fall in a range between positive and negative 15%. Clearly, a share that can gain or lose 15% in a month is volatile, but AGL Energy's return does not move sharply in the same direction as the overall market return. Hence, the systematic risk of AGL Energy is relatively low.

Finally, look at **Figure 7.3c**, which plots monthly returns produced by a portfolio invested equally in Orotongroup and AGL Energy. Two important points emerge from this figure. First, notice that the slope of the line, which is the beta of the portfolio, is 0.9. That is actually equal to the average of the betas of Orotongroup (1.4) and AGL Energy (0.4). In other words, *the beta of a portfolio is a weighted average of the betas of the shares in the portfolio*. Second, observe how in **Figure 7.3c** the dots cluster a little closer to the trend line than they do

FIGURE 7.3C SCATTER PLOT OF MONTHLY RETURNS FOR A PORTFOLIO INVESTED EQUALLY IN OROTONGROUP AND AGL ENERGY AGAINST THE ASX 200 INDEX



Note: The figures show scatter plots of monthly returns on Orotongroup shares (Figure 7.3a), AGL Energy shares (Figure 7.3b) and an equally weighted portfolio of those two shares (Figure 7.3c) versus the monthly return on the ASX 200 share index. The returns were calculated from share price and index data sourced from <http://au.finance.yahoo.com>.

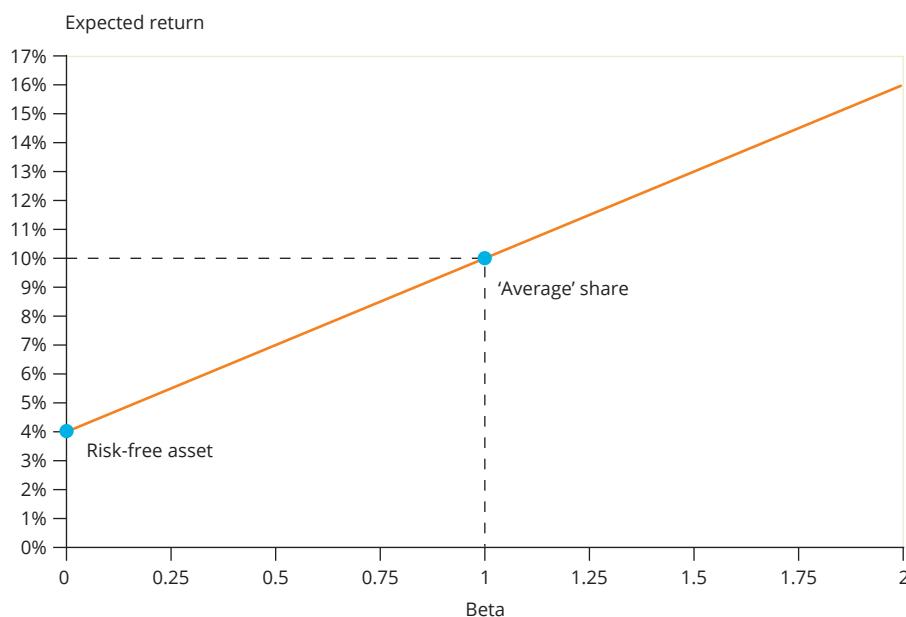
in **Figures 7.3a** and **7.3b**. This occurs because, in the portfolio, some of the unsystematic risk of the individual shares has been diversified away.

Risk and Expected Returns

The risk-based approach to calculating expected returns involves two steps. The first step is to develop a measure of a particular asset's systematic risk. In *beta* we have such a measure. The second step involves translating the asset's beta into an estimate of expected return. To see how that process works, examine **Figure 7.4**.⁸

FIGURE 7.4 BETA AND EXPECTED RETURNS

An investor willing to accept an average level of systematic risk, by holding a share with a beta of 1.0, expects a return of 10%. By holding only the risk-free asset, an investor can earn 4% without having to accept any systematic risk at all.



In **Figure 7.4**, we plot the beta against the expected return for two important assets. First, suppose an asset is available that pays a given return with certainty; in this case, 4%. We designate this as the risk-free asset. Its return is not subject to systematic risk (therefore its beta equals zero) or default risk. In reality, no asset can promise a completely risk-free return, but a US Treasury bill comes very close. In 2011, at least one rating agency downgraded the US government's credit rating due to persistent budget deficits. Australian treasury instruments have been awarded the highest credit ratings by Fitch, Standard & Poor's and Moody's since 2011, 2003 and 2002, respectively. (Details are contained in the article: <http://www.abc.net.au/news/2011-11-29/fitch-rating-australia/3701752>.) Thus, we can think of an Australian Treasury note as a proxy for a risk-free asset. In **Figure 7.4**, the risk-free rate is 4%.

The second asset plotted in **Figure 7.4** is an average share. The term *average share* means that this security's sensitivity to market movements is neither especially high, like OrlonGroup, nor especially low, like AGL Energy. By definition, *the beta of the average share equals 1.0*. On average, its return goes up or down

⁸ Notice that Figure 7.4 is conceptually different from Figures 7.3a and 7.3b. The earlier figures compared actual returns on particular shares to actual returns on a market index. In Figure 7.4 we are establishing a connection between risk, as measured by beta, and expected returns.

by 1% when the market return goes up or down by 1%. Assume for a moment that the expected return on this share equals 10%.

FINANCE IN THE REAL WORLD



HOW DO AUSTRALIAN COMPANIES ESTIMATE THE RISK-FREE RATE?

The risk-free rate can never be known with certainty. However, we can use the yields on observable instruments that are expected to behave in a similar fashion to risk-free assets because they themselves are very low-risk assets. This is the logic behind using triple A-rated Treasury bonds and notes issued by the Australian government as proxies for risk-free assets.

Companies typically make long-term investment decisions, and so often use the 10-year government bond as a default proxy for a risk-free asset. However, to be more accurate, we should match the duration of our risk-free asset to the expected duration of our

investment. Thus, for short-term investments, it might be more appropriate to use the yield on short-dated instruments such as Treasury notes as our proxy for the risk-free rate.

Another issue to consider is that investors investing in a triple A-rated coupon-paying Treasury bond will bear more risk than those investing in zero-coupon triple A-rated Treasury bonds. This is because the coupons will be exposed to reinvestment risk; the rate at which they can be invested could be different from the yield on the zero-coupon bonds. Thus, zero-coupon Treasury instruments will be better proxies for risk-free assets.

By drawing a straight line connecting the two points in **Figure 7.4**, we gain some insight into the relationship between beta and expected returns. An investor who is unwilling to accept any systematic risk at all can hold the risk-free asset and earn 4%. An investor who is willing to bear an average degree of systematic risk, by investing in a share with a beta equal to 1.0, expects to earn 10%. In general, investors may expect higher or lower returns based on the betas of the shares they hold, as the following example illustrates.



Algebraic Model for Figure 7.4

We can derive an algebraic expression for the line in **Figure 7.4**. Recognise that the vertical (y -) axis in the figure is measuring the expected return of some investment, which we will denote as $E(r)$. The horizontal (x -) axis is measuring the investment's beta (β). The y -intercept is the risk-free rate, which we assume to be 4%. Because we have plotted two points on the line, we can use the 'rise over run' formula to calculate the line's slope.

$$\text{Slope} = \frac{\text{Rise}}{\text{Run}} = \frac{(10\% - 4\%)}{(1.0 - 0.0)} = 6\%$$

Because we now know both the intercept (4%) and the slope (6%) of the line, we can express the

relation between an investment's expected return and its beta as follows:

$$E(r) = 4\% + (6\% \times \beta)$$

Now consider an investor who wants to take an intermediate level of risk by holding a share with a beta of 0.5. The expected return on this share is 7%:

$$E(r) = 4\% + (6\% \times 0.5) = 7\%$$

On the other hand, an investor who is willing to take a lot of risk by holding a share with a beta of 1.5 can expect a much higher return:

$$E(r) = 4\% + (6\% \times 1.5) = 13\%$$

The line in **Figure 7.4** plays a very important role in finance, and we will return to it later in this chapter. For now, the important lesson is that *beta measures an asset's systematic risk, a risk that has a direct relationship with expected returns.*

LO7.1

CONCEPT REVIEW QUESTIONS

- 1 What is the difference between an asset's expected return and its actual return? Why are expected returns so important to investors and managers?
- 2 Contrast the historical approach to estimating expected returns with the probabilistic approach.
- 3 Why should share betas and expected returns be related, while no such relationship exists between share standard deviations and expected returns?
- 4 Why is the risk-based approach the best method for estimating a share's expected return?

THINKING CAP QUESTION

- 1 How would you estimate the share beta for a particular company?

LO7.2

7.2 RISK AND RETURN FOR PORTFOLIOS

In Chapter 6, we saw that investors can reduce risk dramatically by holding diversified portfolios rather than individual shares. An investor who chooses to diversify will be more concerned with how her portfolio performs than with the performance of each individual security in the portfolio. Therefore, we need a way to measure risk and return for portfolios.

7.2a PORTFOLIO EXPECTED RETURN

Suppose an individual has \$10,000 to invest, and she decides to divide that money between two different assets. Asset 1 has an expected return of 8%, and Asset 2 has an expected return of 12%. Our investor puts \$4,000 in Asset 1 and \$6,000 in Asset 2. What is the expected return on the portfolio?

To begin, we must calculate the fraction of the individual's wealth invested in each asset, known as the **portfolio weights**. The fraction invested in Asset 1 equals 0.40 (\$4,000/\$10,000), and the fraction invested in Asset 2 equals 0.60 (\$6,000/\$10,000). Notice that the portfolio weights add up to 1.0.

The portfolio's expected return equals the weighted average of the expected returns of the securities in the portfolio. In this case, the expected return equals:

$$\text{Expected return} = (0.40)(8\%) + (0.60)(12\%) = 10.4\%$$

We can write a more general expression describing a portfolio's expected return. Suppose a portfolio contains different securities. The expected returns on these securities are $E(r_1)$, $E(r_2)$, ..., $E(r_n)$. The *portfolio weights* are w_1 , w_2 , ... w_n . The portfolio expected return $E(r_p)$ is given by this equation:

(Eq. 7.1)

$$E(r_p) = w_1 E(r_1) + w_2 E(r_2) + \dots + w_n E(r_n)$$

$$w_1 + w_2 + \dots + w_n = 1$$

portfolio weights

The percentage invested in each of several securities in a portfolio. Portfolio weights must sum to 1.0 (or 100%).


EXAMPLE

Calculating Expected Returns for Portfolios

Calculate the expected return on the portfolio described in the following table.

SHARE	E(R)	\$ INVESTED
Telstra	10%	\$ 2,500
Billabong	12%	5,000
Woolworths	8%	2,500
Cochlear	14%	10,000

First, calculate the portfolio weights. The total dollar value of the portfolio is \$20,000. The weights for the investments in Telstra and Woolworths are 0.125 (\$2,500/\$20,000). The fraction invested in Billabong is 0.25, and the weight associated with Cochlear is 0.50. Now multiply those weights times the expected return for each share and add up:

$$E(r_p) = (0.125)(10\%) + (0.25)(12\%) + (0.125)(8\%) + (0.5)(14\%) = 12.25\%$$

Short Selling

We noted that the portfolio weights must add up to 1. It is natural to assume that these weights also fall in a range between zero and 1, meaning that an investor can invest nothing or everything in any particular asset. However, a more exotic arrangement is possible, one that results in a negative portfolio weight for a particular asset. A negative portfolio weight means that, rather than investing in the given asset, an individual is borrowing that asset, selling it and using the proceeds to invest more in something else. When investors borrow a security and sell it, they are **selling short**. In some markets, or in periods of substantial financial market instability, short selling is banned. In these cases, an extra restriction is imposed on the portfolio weights; each individual weight must be greater than or equal to zero, and less than or equal to one. Here's how shorting works.

Consider two assets in the market, Rocket.com and BricksNMortar Inc. Both shares currently sell for \$10 and pay no dividends. You are optimistic about Rocket's prospects, and you expect its return next year to be 25%. In contrast, you believe that BricksNMortar will earn just 5%. You have \$1,000 to invest, but you would like to invest more than that in Rocket.com. To do this, you phone a friend who owns 50 shares of BricksNMortar and persuade him to let you borrow the shares by promising that you'll return them in one year. Once you receive the shares, you sell them in the market, immediately raising \$500 (50 shares × \$10 per share). Next, you combine those funds with your own money and purchase \$1,500 (150 shares) of Rocket.com. Your portfolio expected return looks like this:

$$E(r_p) = (-0.5)(5\%) + (1.5)(25\%) = 35\%$$

In this equation, the weight invested in Rocket.com equals 1.5 (\$1,500 ÷ \$1,000), or 150% of your total wealth. You can invest more than 100% of your wealth (that is, more than \$1,000) because you borrowed from someone else. The weight invested in BricksNMortar equals -0.5 because you took out a \$500 loan equivalent to half your wealth. If you are right and BricksNMortar shares go up from \$10 to \$10.50 during the year (an increase of 5%), then you will effectively pay your friend 5% interest when you repurchase the BricksNMortar shares and return them next year. This loan will be very profitable if Rocket.com shares increase as rapidly as you expect. For example, in one year's time, if BricksNMortar sells for \$10.50 (up 5%) and Rocket.com sells for \$12.50 (up 25%), your position will look like this:

SELLING SHORT

Borrowing a security and selling it for cash at the current market price. A short seller hopes that either: (1) the price of the security sold short will fall; or (2) the return on the security sold short will be lower than the return on the asset in which the proceeds from the short sale were invested

BEGINNING OF YEAR		
Initial investment	\$1,000	
Borrowed funds	500	(50 shares @ \$10)
Rocket shares	\$1,500	(150 shares @ \$10)
END OF YEAR		
Sell Rocket.com shares	\$1,875	(150 shares @ \$12.50)
Return borrowed shares	-525	(50 shares @ \$10.50)
Net cash earned	\$1,350	
Rate of return = $(\$1,350 - \$1,000) / \$1,000 = 0.35 = 35\%$		

Notice that the expected return on this portfolio exceeds the expected return of either share in the portfolio. When investors take a short position in one asset to invest more in another asset, they are using *financial leverage*. As is noted in Chapter 13, leverage magnifies expected returns, but it also increases risk. This is one of the reasons why short selling is viewed as risky by some market regulators. For example, many markets that usually allow short selling restricted it during the global credit crisis that began in 2008. These markets included the UK, US and Australia. In Australia, restrictions were more stringent, with a ban on all short selling for a period of time. The restrictions made it very difficult for many hedge funds to survive, since many relied on short selling to make profits. The global attrition in the number of viable hedge funds in 2009 is commonly attributed to these restrictions.



If Prices Do Not Go As Predicted ...

Suppose you are wrong about these two shares, and Rocket.com goes down by 10% during the year (to \$9), while BricksNMortar increases by 10% (to \$11). At the end of the year, your situation is as follows:

Sell Rocket.com shares	\$1,350	(150 shares @ \$9.00)
Return borrowed shares	\$ 550	(50 shares @ \$11.00)
Net cash earned	\$ 800	
Rate of return = $(\$800 - \$1,000) / \$1,000 = -0.20 = -20\%$		

The 150 shares of Rocket are worth just \$1,350, and you must return 50 BricksNMortar shares, which are now worth \$550, to the lender. That leaves you with just \$800 of your original \$1,000 investment, a loss of 20%.

FINANCE IN THE REAL WORLD



WHY PORTFOLIO WEIGHTS SHIFT

In Chapter 6 we looked at how your decision to allocate funds between shares and bonds would affect the amount of money you saved for retirement. No matter how you allocate your savings initially between shares and bonds, over time the portfolio weights will shift towards the asset earning the highest returns.



Repeating the example from p. 194 of Chapter 6, suppose you invest \$4,000 each year for 35 years, and you invest half of each contribution in bonds and half in shares. Assume that bonds earn 5.6% per year and shares earn 11.4%. The table below shows how your portfolio weights tilt towards ordinary shares, even though you divide your contributions equally between shares and bonds. Because shares earn a higher return than bonds, the share portfolio grows faster each year, increasing the portfolio weight invested in shares as time goes by.

	TOTAL AMOUNT INVESTED		
YEAR	BOND PORTFOLIO	SHARE PORTFOLIO	% INVESTED IN SHARES
1	\$ 2,000	\$ 2,000	50.0%
2	4,112	4,228	50.7%
5	11,184	12,555	52.9%
10	25,872	34,095	56.9%
15	45,158	71,050	61.1%
30	147,416	429,841	74.5%

7.2b PORTFOLIO RISK

Based on the calculation of a portfolio's expected return, you may expect that a portfolio's risk is equal to a weighted average of the risks of the assets that comprise the portfolio. That statement is partly right and partly wrong. When we shift our focus from expected return to risk, we must be very careful about the measure of risk that we use in our calculations.

For instance, in [Figure 6.12](#) in the previous chapter, we estimated the standard deviation of returns for Archer Daniels Midland (ADM) to be 24.8%. The same table reported a standard deviation for American Airlines (AMR) of 47.0%. Suppose we form a portfolio invested equally in ADM and AMR shares. With portfolio weights of 0.50, you might guess that the standard deviation of this portfolio equals:

$$\text{Portfolio standard deviation} = (0.50)(24.8\%) + (0.50)(47.0\%) = 35.9\%$$

As reasonable as that guess seems, it is wrong. It turns out that a portfolio invested in equal proportions of ADM and AMR has a standard deviation of just 28%!

As a general rule, *the standard deviation of a portfolio is almost always less than the weighted average of the standard deviations of the shares in the portfolio*. This is diversification at work. Combining securities together eliminates some of their unsystematic risk, so the portfolio is less volatile than the average share in the portfolio.⁹

The standard deviation of a portfolio takes account of how the expected returns of the securities in the portfolio co-vary with each other. This term is the product of the **correlation coefficient** of the expected returns of the constituent securities with each other ($\rho_{1,2}$), and their respective standard deviations (σ_1) and (σ_2). For a portfolio with two securities (or more generally, two assets) the *standard deviation of a portfolio* ($\sigma_{\text{Portfolio}}$) is given by:

correlation coefficient
A statistical measure of the degree of interdependence between two variables, indicating how they vary together. The correlation coefficient can range from -1 to +1. A value of +1 indicates the variables are perfectly correlated, while a value of -1 indicates they are perfectly negatively correlated. A value of zero indicates that the variables have zero interdependence. In the context of portfolio management, the risk of the returns of a portfolio of two assets is reduced when it contains assets whose returns are negatively correlated with each other.

⁹ You can also see this effect of diversification in Figure 6.11. The average standard deviation of the 10 shares listed in that table is 31.4%, but the standard deviation of a portfolio containing all 10 shares is just 19.1%.

(Eq. 7.2)

$$\sigma_{\text{portfolio}} = \sqrt{w_1^2 \sigma_1^2 + w_2^2 \sigma_2^2 + 2w_1 w_2 \rho_{1,2} \sigma_1 \sigma_2}$$

where:

w_1 = Proportion of the portfolio invested in Asset 1

w_2 = Proportion of the portfolio invested in Asset 2

σ_1 = Asset 1 standard deviation of returns

σ_2 = Asset 2 standard deviation of returns

$\rho_{1,2}$ = Correlation coefficient between the returns of Asset 1 and Asset 2

In this example, the correlation coefficient of the two assets is 0.13382. Thus, the portfolio standard deviation can be calculated as follows:

$$\text{Portfolio standard deviation} = [(0.50)^2(24.8\%)^2 + (0.50)^2(47.0\%)^2 + 2(0.5)(0.5)(0.13382)(24.8\%)(47.0\%)]^{0.5} = 28\%$$

We can write a more general expression to calculate portfolio standard deviation for a portfolio containing n assets. As described previously, the expected returns on these assets are $E(r_1), E(r_2), \dots, E(r_n)$. The portfolio weights are w_1, w_2, \dots, w_n . The portfolio standard deviation ($\sigma_{\text{portfolio}}$) is given by this equation:

(Eq. 7.3)

$$\sigma_{\text{portfolio}} = \sqrt{\sum_{a=1}^n w_a^2 \sigma_a^2 + 2 \sum_{a_1=1}^n \sum_{a_2=1}^n w_{a_1} w_{a_2} \sigma_{a_1} \sigma_{a_2}}$$

$$w_{a_1} + w_{a_2} + \dots + w_{an} = 1$$

which can also be represented as:

$$\sum_{a=1}^n w_a = 1$$

However, diversification does not eliminate systematic risk. Therefore, if we redefine portfolio risk and focus on systematic risk only, not on the standard deviation – which includes both systematic and unsystematic risk – then the simple weighted average formula works. For example, suppose an ADM share has a beta of 0.8 and AMR's beta equals 1.4. The beta of a portfolio with equal investments in each share is:

$$\text{Portfolio beta} = \beta_p = (0.50)(0.8) + (0.50)(1.4) = 1.1$$

We can write a more general expression describing a portfolio's beta. Suppose a portfolio contains different assets. The betas of these assets are $\beta_1, \beta_2, \dots, \beta_n$. The portfolio weights are w_1, w_2, \dots, w_n . The portfolio beta (β_p) is given by this equation:

(Eq. 7.4)

$$\beta_p = w_1 \beta_1 + w_2 \beta_2 + \dots + w_n \beta_n$$

$$\text{where } w_1 + w_2 + \dots + w_n = 1$$

The chapter-opening ‘What Companies Do’ box illustrates why distinguishing between systematic and unsystematic risk is important, not just for investors who buy shares and bonds, but also for global corporations that build factories, invest in distribution networks and make other kinds of investments in physical assets.



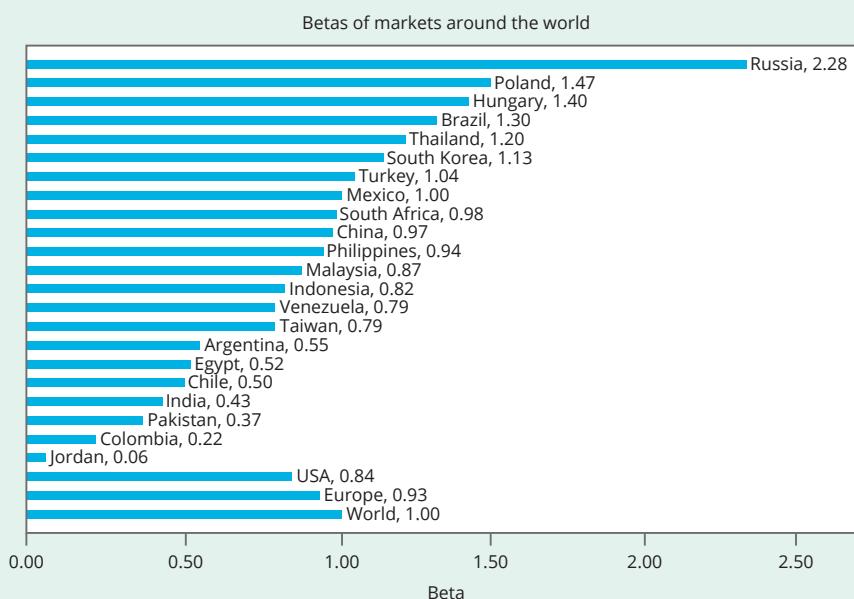
HOW RISKY ARE EMERGING MARKETS?

In recent decades, many developing countries adopted market-oriented reforms and opened their economies to foreign capital. Despite the success these countries have enjoyed in attracting new investors, a report by McKinsey & Company argues that most multinational corporations overestimate the risk of investing in emerging markets. According to McKinsey, companies routinely assign a risk premium to projects in emerging markets that is more than double the risk premium that they assign to similar projects in the United States and Europe. By overstating the risks, multinational companies underestimate the value of investments in emerging markets. McKinsey & Company believes that this leads companies to pass up profitable investment opportunities in these countries.

If it is true that companies overstate the risks of investing in emerging markets, what is the cause of that error? McKinsey proposes that companies do not take the proper portfolio view of the businesses they engage in around the world. Rather than looking at each

business unit's contribution to overall company risk – the contribution of each unit to the company's portfolio of businesses – companies place too much emphasis on the unsystematic risks associated with individual countries.

To demonstrate that point, McKinsey calculates a beta for each emerging market relative to a world market index. By definition, the world market's beta equals 1.0. Especially risky countries should have betas much greater than 1.0, while supposedly 'safe' countries like the US should have betas below 1.0. The bar chart below shows betas for the US, Europe and 22 emerging markets. Ten emerging markets have a beta below that of the US market, and in only one country, Russia, does the market beta justify a risk premium double that of the US. Investments that seem to be very risky when considered in isolation look much less risky as part of a portfolio. That's a lesson that applies to individual investors as well as to multinational corporations.



Source: Marc H. Goedhart and Peter Haden, 'Are Emerging Markets as Risky as You Think?' *McKinsey on Finance*, Spring 2003.

EXAMPLE

Calculating a Portfolio Beta

Calculate the beta of the portfolio described in the following table.

SHARE	BETA	\$ INVESTED
Telstra	1.00	\$ 2,500
Billabong	1.33	\$ 5,000
Woolworths	0.67	\$ 2,500
Cochlear	1.67	\$10,000

The portfolio weights here are the same as in the example 'Calculating Expected Returns for Portfolios', so the portfolio beta equals:

$$\beta_p = (0.125)(1.00) + (0.25)(1.33) + (0.125)(0.67) + (0.50)(1.67) = 1.38$$

LO7.2

CONCEPT REVIEW QUESTIONS

- 5 How can the weight given to a particular share in a portfolio exceed 100%?
- 6 Why is the standard deviation of a portfolio typically less than the weighted average of the standard deviations of the assets in the portfolio, while a portfolio's beta equals the weighted average of the betas of the shares in the portfolio?

THINKING CAP QUESTION

- 2 Do companies use the same methods to assess the risk of foreign and domestic investments?

LO7.3

7.3 PULLING IT ALL TOGETHER: THE CAPM

Now we are ready to tie together the concepts of risk and return for portfolios as well as for individual securities. Once again, we will begin by considering a portfolio consisting of just two assets. One asset pays a risk-free return equal to r_f . We already know that the beta of the risk-free asset equals zero. The other asset is a broadly diversified portfolio. Imagine a portfolio that is so diversified that it invests in every available risky asset in the economy. Because such a portfolio represents the overall market, we refer to it as the **market portfolio**. Designate the expected return on the market portfolio as $E(r_m)$.

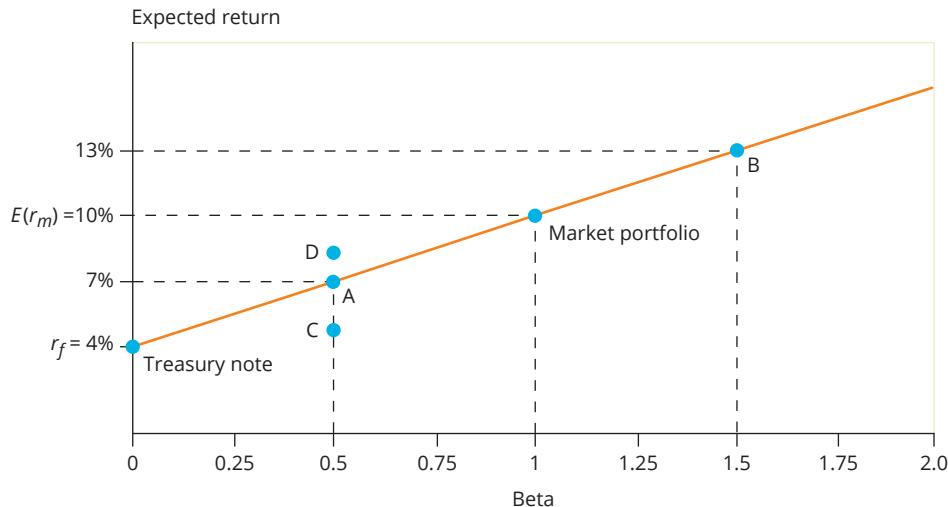
The beta of the market portfolio must equal 1.0. To see why, reconsider the definition of beta. An asset's beta describes how the asset moves in relation to the overall market. The market portfolio will mimic the overall market perfectly. Because the portfolio's return moves exactly in sync with the market, its beta must be 1.0. **Figure 7.5** plots the beta and the expected return of the risk-free asset and the market portfolio.

Suppose we combine the risk-free asset – let's call it a Treasury note – and the market portfolio to create a new portfolio. We know that the expected return on this new portfolio must be a weighted average of the expected returns of the assets in the portfolio. Similarly, we know that the beta of the portfolio must be a weighted average of the betas of a Treasury note and the market. This implies that the new portfolio we've created must lie along the line connecting the risk-free asset and the market portfolio in **Figure 7.5**. What are the properties of this line?

market portfolio
A portfolio that invests in every asset in the economy

FIGURE 7.5 THE SECURITY MARKET LINE

The security market line plots the relationship between an asset's beta and its expected return. The line shows how an investor can construct a portfolio of Treasury notes and the market portfolio to achieve the desired level of risk and return. One investor might choose a relatively conservative portfolio, mixing Treasury notes and the market portfolio in equal proportions (see point A). Another investor could construct a very risky portfolio by investing his own money and borrowing more to invest in the market (see point B).



With two points identified on the line, the Treasury note and the market portfolio, we can calculate the line's slope by taking the rise over the run, just as we did in the example 'Algebraic Model for Figure 7.4':

$$\text{Slope} = \frac{E(r_m) - r_f}{1 - 0} = \frac{E(r_m) - r_f}{1}$$

market risk premium
The additional return earned (or expected) on the market portfolio over and above the risk-free rate

The difference in returns between a portfolio of risky securities and a risk-free asset is the **market risk premium**. The market risk premium indicates the reward that investors receive if they hold the market portfolio.¹⁰

The intercept of the line in **Figure 7.5** equals r_f . From elementary algebra we know that the equation for a straight line is $y = b + mx$ where b is the intercept and m is the slope. In **Figure 7.5**, the variable we measure on the y -axis is the expected return on some portfolio of Treasury notes and the market portfolio. The variable we measure on the x -axis is the beta of this portfolio. Therefore, the equation of the line plotted in this figure is

$$E(r_p) = r_f + \beta_p [E(r_m) - r_f]$$

The equation says that the expected return on any portfolio consisting of Treasury notes and the market portfolio depends on three things: the risk-free rate, the portfolio beta and the market risk premium. It's easy to verify that this equation works with a numerical illustration.

What if an investor is willing to hold a position that is even more risky than the market portfolio? One option is to borrow money. When investors buy Treasury notes, they are essentially lending money to the government. Suppose investors also borrow money at the risk-free rate. To be more precise, suppose a certain investor has \$10,000 to invest, but raises an additional \$5,000 by borrowing. The investor then puts all \$15,000 in the market portfolio. The portfolio weight on Treasury notes becomes -0.50 , and the weight

¹⁰ Conceptually, the market portfolio invests in every risky asset available in the market. No such portfolio exists in practice, so to estimate the market risk premium, analysts typically use the risk premium on a well-diversified share portfolio.

invested in the market portfolio increases to 1.50. The investor now holds a portfolio with a beta greater than 1 and an expected return greater than 10%, as confirmed in the following calculations:

$$\begin{aligned}\beta_p &= -(0.5)(0) + (1.5)(1.0) = 1.5 \\ E(r_p) &= 4\% + (1.5)[10\% - 4\%] = 13\%\end{aligned}$$

EXAMPLE

Ways to Calculate the Expected Return of a Portfolio

Suppose the risk-free rate is 4% and the expected return on the market portfolio is 10%. This implies that the market risk premium is 6%. What is the expected return on a portfolio invested equally in Treasury notes and shares? There are actually several ways to get the answer. First, we know that the expected return on the portfolio is simply the weighted average of the expected returns of the assets in the portfolio, so we have:

$$E(r_p) = (0.5)(4\%) + (0.5)(10\%) = 7\%$$

Alternatively, we could begin by calculating the beta of this portfolio. The portfolio beta is a

weighted average of the betas of Treasury notes and the market portfolio, so we obtain:

$$\begin{aligned}\beta_p &= (0.5) (\text{Treasury note beta}) + (0.5) (\text{Market beta}) \\ &= (0.5)(0) + (0.5)(1.0) = 0.5\end{aligned}$$

Now, using the equation of the line in **Figure 7.5**, we calculate the portfolio's expected return as follows:

$$E(r_p) = 4\% + (0.5)[10\% - 4\%] = 7\%$$

The position of this portfolio appears as point A in **Figure 7.5**.

In **Figure 7.5**, the investor's portfolio lies up and to the right of the market portfolio at point B.

At this point, we must stop and make a crucial observation. If it is true, as the preceding example shows, that a portfolio with a beta of 0.5 offers an expected return of 7%, then, in equilibrium, it must also be true that any individual security with a beta of 0.5 offers the same return. To understand this claim, examine point C in **Figure 7.5**. This point represents a share with a beta of 0.5 and an expected return of less than 7%. Rational investors who own C will sell it because they can create an equally risky portfolio that offers a higher return by combining Treasury notes and the market portfolio. As investors sell asset C, its price will fall. We know that prices and returns of financial assets move in opposite directions (for example, if a bond's price falls, its yield rises), so as the price of C falls, its expected return rises until it reaches 7%.

Similarly, consider point D in the figure. Point D represents an asset with a beta of 0.5 but an expected return greater than 7%. This asset is a true bargain because it offers investors a higher rate of return than they can earn on a 50–50 portfolio of Treasury notes and shares, without requiring them to take on extra risk. Investors will rush to buy share D, and their buying pressure will drive up the price and push down the return of share D. As soon as the expected return on D reaches 7%, the market once again reaches equilibrium.

Figure 7.5 therefore plots the relationship between betas and expected returns for individual securities as well as for portfolios. This relationship is called the *security market line*, and the equation of this line is the fundamental risk and return relationship predicted by the **capital asset pricing model (CAPM)**. The CAPM says that the expected return on any asset (*i*), denoted by $E(r_i)$, depends on the risk-free rate (r_f), the asset's beta (β_i) and the market risk premium (given by the excess expected return of the market ($E(r_m)$) compared to the risk-free rate.¹¹

(Eq. 7.5)

$$E(r_i) = r_f + \beta_i(E(r_m) - r_f)$$

capital asset pricing model (CAPM)
States that the expected return on a specific asset equals the risk-free rate plus a premium that depends on the asset's beta and the expected risk premium on the market portfolio

¹¹ 'i' is standard notation to suggest any asset, rather than a specific asset. ' r_i ' refers to the return of this asset *i*. ' $E(r_i)$ ' refers to the expected return of the asset *i*.

FINANCE IN THE REAL WORLD



CFO FORECASTS OF THE MARKET RISK PREMIUM

The expected risk premium on the market is an important component of the CAPM, but how does one know what the expected market risk premium is? One way to estimate that premium is to ask CFOs what return they expect shares to earn relative to safe assets such as Treasury notes or, in the US, Treasury bonds or bills. The chart below shows the market risk premium that American CFOs said they expected (looking 10 years into the

future) when they responded to the quarterly Duke University CFO Survey. From 2001 to 2011 (first quarter), CFOs' estimates of the market risk premium averaged about 3.5%, but their forecasts fluctuated over time, ranging from a low of about 2.4% to a high of 4.75%. In general, these forecasts suggest that CFOs expect a lower market risk premium than the long-run historical average of 7.5% presented in Chapter 6.



FINANCE IN THE REAL WORLD



GLOBAL ESTIMATES OF THE EQUITY RISK PREMIUM

Aswath Damodaran provides data and a model for estimating equity risk premium by country. The following table shows the results for a number of countries. It shows that in general, companies in emerging markets tend to use a relatively higher equity risk premium than those in more developed markets. This reflects the perception that the developed

markets are less risky. It is interesting to note that despite having the highest Moody's credit rating (Aaa), New Zealand and Australia do have slightly higher equity risk premiums than other countries with the same rating. Singapore has the lowest equity risk premium in the Asia-Pacific region.



FIGURE 7.6 GLOBAL ESTIMATES OF EQUITY RISK PREMIUMS BY COUNTRY

COUNTRY	REGION	MOODY'S RATING	RATING-BASED DEFAULT SPREAD	TOTAL EQUITY RISK PREMIUM
Canada	North America	Aaa	0.00%	5.96%
Denmark	Western Europe	Aaa	0.00%	5.96%
Germany	Western Europe	Aaa	0.00%	5.96%
Liechtenstein	Western Europe	Aaa	0.00%	5.96%
Luxembourg	Western Europe	Aaa	0.00%	5.96%
Netherlands	Western Europe	Aaa	0.00%	5.96%
Norway	Western Europe	Aaa	0.00%	5.96%
Singapore	Asia	Aaa	0.00%	5.96%
Sweden	Western Europe	Aaa	0.00%	5.96%
Switzerland	Western Europe	Aaa	0.00%	5.96%
United States	North America	Aaa	0.00%	5.96%
New Zealand	Australia & New Zealand	Aaa	0.00%	6.07%
Australia	Australia & New Zealand	Aaa	0.00%	6.11%
Austria	Western Europe	Aa1	0.45%	6.51%
Finland	Western Europe	Aa1	0.45%	6.51%
France	Western Europe	Aa2	0.56%	6.65%
Hong Kong	Asia	Aa2	0.56%	6.65%
Isle of Man	Western Europe	Aa2	0.56%	6.65%
Korea	Asia	Aa2	0.56%	6.65%
United Arab Emirates	Middle East	Aa2	0.56%	6.65%
United Kingdom	Western Europe	Aa2	0.56%	6.65%
Belgium	Western Europe	Aa3	0.68%	6.80%
Guernsey (States of)	Western Europe	Aa3	0.68%	6.80%
Jersey (States of)	Western Europe	Aa3	0.68%	6.80%
Macao	Asia	Aa3	0.68%	6.80%
Qatar	Middle East	Aa3	0.68%	6.80%
Taiwan	Asia	Aa3	0.68%	6.80%
Cayman Islands	Caribbean	Aa3	0.68%	6.83%
Czech Republic	Eastern Europe & Russia	A1	0.79%	6.94%
Estonia	Eastern Europe & Russia	A1	0.79%	6.94%
Japan	Asia	A1	0.79%	6.94%
Chile	Central and South America	A1	0.79%	6.96%
Israel	Middle East	A1	0.79%	6.96%
Abu Dhabi	Middle East	Aa2	0.56%	6.97%
China	Asia	A1	0.79%	6.99%
Kuwait	Middle East	Aa2	0.56%	7.03%
Bermuda	Caribbean	A2	0.96%	7.14%
Botswana	Africa	A2	0.96%	7.14%





COUNTRY	REGION	MOODY'S RATING	RATING-BASED DEFAULT SPREAD	TOTAL EQUITY RISK PREMIUM
Ireland	Western Europe	A2	0.96%	7.14%
Poland	Eastern Europe & Russia	A2	0.96%	7.14%
Slovakia	Eastern Europe & Russia	A2	0.96%	7.14%
Ras Al Khaimah (Emirate of)	Middle East	A2	0.96%	7.34%
Saudi Arabia	Middle East	A1	0.79%	7.44%
Curacao	Caribbean	A3	1.35%	7.63%
Iceland	Western Europe	A3	1.35%	7.63%
Latvia	Eastern Europe & Russia	A3	1.35%	7.63%
Lithuania	Eastern Europe & Russia	A3	1.35%	7.63%
Malta	Western Europe	A3	1.35%	7.63%
Peru	Central and South America	A3	1.35%	7.63%
Sharjah	Middle East	A3	1.35%	7.63%
Malaysia	Asia	A3	1.35%	7.77%
Aruba	Caribbean	Baa1	1.80%	8.18%
Mauritius	Asia	Baa1	1.80%	8.18%
Slovenia	Eastern Europe & Russia	Baa1	1.80%	8.18%
Spain	Western Europe	Baa1	1.80%	8.18%
Thailand	Asia	Baa1	1.80%	8.18%
Turks and Caicos Islands	Caribbean	Baa1	1.80%	8.18%
Mexico	Central and South America	A3	1.35%	8.48%
Andorra (Principality of)	Western Europe	Baa2	2.15%	8.60%
Bulgaria	Eastern Europe & Russia	Baa2	2.15%	8.60%
Colombia	Central and South America	Baa2	2.15%	8.60%
India	Asia	Baa2	2.15%	8.60%
Indonesia	Asia	Baa2	2.15%	8.60%
Panama	Central and South America	Baa2	2.15%	8.60%
Philippines	Asia	Baa2	2.15%	8.60%
St. Maarten	Caribbean	Baa2	2.15%	8.60%
Uruguay	Central and South America	Baa2	2.15%	8.60%
Bahamas	Caribbean	Baa3	2.48%	9.02%
Hungary	Eastern Europe & Russia	Baa3	2.48%	9.02%
Italy	Western Europe	Baa3	2.48%	9.02%
Kazakhstan	Eastern Europe & Russia	Baa3	2.48%	9.02%
Montserrat	Caribbean	Baa3	2.48%	9.02%
Oman	Middle East	Baa3	2.48%	9.02%
Portugal	Western Europe	Baa3	2.48%	9.02%
Romania	Eastern Europe & Russia	Baa3	2.48%	9.02%
South Africa	Africa	Baa3	2.48%	9.18%
Guatemala	Central and South America	Ba1	2.82%	9.43%





COUNTRY	REGION	MOODY'S RATING	RATING-BASED DEFAULT SPREAD	TOTAL EQUITY RISK PREMIUM
Morocco	Africa	Ba1	2.82%	9.43%
Namibia	Africa	Ba1	2.82%	9.43%
Paraguay	Central and South America	Ba1	2.82%	9.43%
Russia	Eastern Europe & Russia	Ba1	2.82%	9.43%
Trinidad and Tobago	Caribbean	Ba1	2.82%	9.43%
Azerbaijan	Eastern Europe & Russia	Ba2	3.39%	10.13%
Brazil	Central and South America	Ba2	3.39%	10.13%
Croatia	Eastern Europe & Russia	Ba2	3.39%	10.13%
Cyprus	Western Europe	Ba2	3.39%	10.13%
Georgia	Eastern Europe & Russia	Ba2	3.39%	10.13%
Bangladesh	Asia	Ba3	4.06%	10.96%
Bolivia	Central and South America	Ba3	4.06%	10.96%
Côte d'Ivoire	Africa	Ba3	4.06%	10.96%
Dominican Republic	Caribbean	Ba3	4.06%	10.96%
Fiji	Asia	Ba3	4.06%	10.96%
Macedonia	Eastern Europe & Russia	Ba3	4.06%	10.96%
Serbia	Eastern Europe & Russia	Ba3	4.06%	10.96%
Turkey	Western Europe	Ba3	4.06%	10.96%
Vietnam	Asia	Ba3	4.06%	10.96%
Senegal	Africa	Ba3	4.06%	11.02%
Albania	Eastern Europe & Russia	B1	5.08%	12.21%
Armenia	Eastern Europe & Russia	B1	5.08%	12.21%
Benin	Africa	B1	5.08%	12.21%
Cook Islands	Australia & New Zealand	B1	5.08%	12.21%
Costa Rica	Central and South America	B1	5.08%	12.21%
Ethiopia	Africa	B1	5.08%	12.21%
Honduras	Central and South America	B1	5.08%	12.21%
Jordan	Middle East	B1	5.08%	12.21%
Montenegro	Eastern Europe & Russia	B1	5.08%	12.21%
Sri Lanka	Asia	B1	5.08%	12.21%
Tanzania	Africa	B1	5.08%	12.21%
Bahrain	Middle East	B2	6.21%	13.60%
Burkina Faso	Africa	B2	6.21%	13.60%
Cambodia	Asia	B2	6.21%	13.60%
Cameroon	Africa	B2	6.21%	13.60%
Cape Verde	Africa	B2	6.21%	13.60%
Kenya	Africa	B2	6.21%	13.60%
Kyrgyzstan	Eastern Europe & Russia	B2	6.21%	13.60%
Maldives	Asia	B2	6.21%	13.60%





COUNTRY	REGION	MOODY'S RATING	RATING-BASED DEFAULT SPREAD	TOTAL EQUITY RISK PREMIUM
Nicaragua	Central and South America	B2	6.21%	13.60%
Nigeria	Africa	B2	6.21%	13.60%
Papua New Guinea	Asia	B2	6.21%	13.60%
Rwanda	Africa	B2	6.21%	13.60%
Suriname	Central and South America	B2	6.21%	13.60%
Swaziland	Africa	B2	6.21%	13.60%
Tunisia	Africa	B2	6.21%	13.60%
Uganda	Africa	B2	6.21%	13.60%
Angola	Africa	B3	7.34%	14.99%
Belarus	Eastern Europe & Russia	B3	7.34%	14.99%
Belize	Central and South America	B3	7.34%	14.99%
Bosnia and Herzegovina	Eastern Europe & Russia	B3	7.34%	14.99%
Congo (Democratic Republic of)	Africa	B3	7.34%	14.99%
Ecuador	Central and South America	B3	7.34%	14.99%
Egypt	Africa	B3	7.34%	14.99%
Ghana	Africa	B3	7.34%	14.99%
Greece	Western Europe	B3	7.34%	14.99%
Jamaica	Caribbean	B3	7.34%	14.99%
Moldova	Eastern Europe & Russia	B3	7.34%	14.99%
Mongolia	Asia	B3	7.34%	14.99%
Pakistan	Asia	B3	7.34%	14.99%
Solomon Islands	Asia	B3	7.34%	14.99%
St. Vincent & the Grenadines	Caribbean	B3	7.34%	14.99%
Tajikistan	Eastern Europe & Russia	B3	7.34%	14.99%
Lebanon	Middle East	B3	7.34%	15.33%
Argentina	Central and South America	B2	6.21%	15.68%
El Salvador	Central and South America	Caa1	8.46%	16.37%
Gabon	Africa	Caa1	8.46%	16.37%
Iraq	Middle East	Caa1	8.46%	16.37%
Ukraine	Eastern Europe & Russia	Caa1	8.46%	16.37%
Zambia	Africa	Caa1	8.46%	16.37%
Congo (Republic of)	Africa	Caa2	10.16%	18.46%
Cuba	Caribbean	Caa2	10.16%	18.46%
Barbados	Caribbean	Caa3	11.28%	19.83%
Mozambique	Africa	Caa3	11.28%	19.83%
Venezuela	Central and South America	C	18.00%	28.10%

Note: Updated 1 January 2019.

Source: Adapted from data provided by Aswath Damodaran, http://pages.stern.nyu.edu/~adamodar/New_Home_Page/datafile/ctryprem.html.

The CAPM stands as one of the most important ideas in all of finance. Financial managers in nearly all large corporations know the model's key predictions, and they use the CAPM to estimate the rate of return that shareholders require on the company's shares. Managers use the required return on their company's shares (along with other information) to calculate the company's *weighted average cost of capital* (WACC). The WACC is important because most companies only make new investments when they believe those investments will earn returns that exceed the WACC.

As useful as it is, however, the CAPM is not a crystal ball. It gives us some insights about expected returns, but that is not the same thing as predicting how the future will unfold. In the next section, we explore the extent to which actual share returns, rather than expected returns, may be predictable.

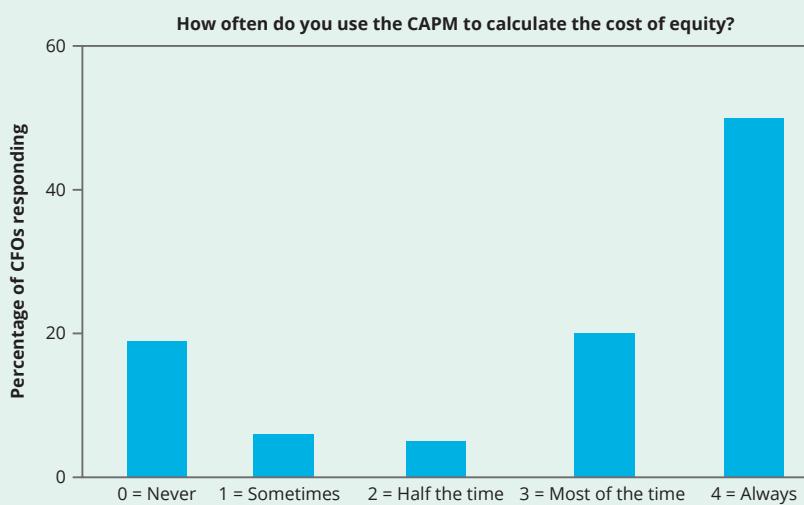
FINANCE IN THE REAL WORLD



DO COMPANIES USE THE CAPM?

Graham and Harvey (2001) asked nearly 400 CFOs about the method they used to determine the cost of equity for their companies. As the accompanying chart indicates, nearly three-quarters of respondents said that their companies almost always or always (responses 3 and 4 in the survey) used the CAPM to determine the return that the market required on their shares. The second-most common method for estimating the cost of equity – using the historical average return – was used by roughly half as many CFOs.

The survey results suggested that the use of CAPM was widespread in companies around the world, although the model's popularity was not as strong outside the US. In the UK and France, roughly 45% of CFOs said their companies used the CAPM, whereas closer to one-third of German CFOs reported doing so. However, this pattern is changing over time. The percentage of companies using the CAPM has been rising for years in the United States, and that trend seems likely to continue abroad. The market in Australia seems to mirror the United States. A survey of listed company CFOs, conducted in Australia in 2004 by Truong, Partington and Peat,¹² found that 72% of respondents used the CAPM to estimate their cost of capital.



¹² See Giang Truong, Graham Partington and Maurice Peat, 'Cost-of-Capital Estimation and Capital-Budgeting Practice in Australia', *Australian Journal of Management*, June 2008, Vol. 33, No 1; ABI/INFORM Global, p. 95.

LO7.3

CONCEPT REVIEW QUESTIONS

7 List the three factors that influence a share's expected return according to the CAPM.

8 If a particular share had no systematic risk, but only unsystematic risk, what would be its expected return?

LO7.4

7.4 ARE SHARE RETURNS PREDICTABLE?

Microsoft Corp. debuted as a public US company with its initial public offering (IPO) on 13 March 1986. On that day, one Microsoft share sold for US\$21. In the 24 years that followed, share splits turned a single share purchased at the IPO into 288 shares, worth an amazing US\$7,200 by August 2011. That represents a compound annual return of roughly 26% per year! The purpose of this section is to investigate whether such a spectacular outcome could have been anticipated by smart investors.

Suppose that, upon graduating from university, you decide to open your own business. The question is, what kind of business should you start? A friend suggests opening a pizza restaurant. Having learned a few valuable lessons in your degree, you respond that the pizza business is a terrible place to start. Most communities are already saturated with pizza restaurants, and most offer similar varieties of pizza with a similar ambience, or lack thereof. You want to find a niche that is less competitive. You reason that getting rich selling pizzas is nearly impossible.

As competitive as the pizza business is, it hardly compares with the competitive environment of modern financial markets. The sheer size and transparency of financial markets make them more competitive than most markets for goods and services. Financial asset prices are set in arenas that are typically governed by rules designed to make the process as fair and open as possible. Each day, thousands of professional financial analysts (to say nothing of the tens of thousands of amateurs) worldwide scrutinise all available information about high-profile shares such as Microsoft, hoping to find any bit of information overlooked by the crowd that might lead to an advantage in determining the fair value of those shares. The rapid growth of electronic media, especially the internet, during the past two decades has caused an explosion in the total volume of financial information available to investors and accelerated the speed with which that information arrives. All of this means that being a better-than-average share prognosticator is probably more difficult than building a better pizza.

In finance, the idea that competition in financial markets creates an equilibrium in which it is exceedingly difficult to identify undervalued or overvalued shares is called the **efficient markets hypothesis (EMH)**. The EMH says that financial asset prices rapidly and fully incorporate new information. An interesting implication of this prediction is that asset prices move almost randomly over time. We must use the qualifier 'almost' in the previous sentence because there is a kind of baseline predictability to asset returns that is related to risk. For example, over time, we expect shares to earn higher returns than bonds because shares are riskier. Indeed, the historical record confirms this prediction. But in any given year, shares may do very well or very poorly relative to bonds. The efficient markets hypothesis says that it is nearly impossible to predict exactly when shares will do well relative to bonds or when the opposite outcome will occur.

The seemingly random changes in share prices occur because prices respond only to new information, and new information is almost by definition unpredictable. Numerous trading strategies have been devised and tested in an attempt to earn above-average returns in the share market. Some strategies suggest buying companies with the highest market share in their industry. Other strategies propose buying shares of new companies with new technologies that could revolutionise an industry. Still others suggest buying or selling shares based on patterns in share charts that allegedly repeat over time.

efficient markets hypothesis (EMH)

Asserts that financial asset prices rapidly and fully incorporate new information

Of course, there is no end to the number of trading strategies like these that can be tested using the historical data. In the vast majority of cases, these trading strategies do not generate significantly higher returns than a simple buy-and-hold approach. This suggests that share prices are indeed nearly unpredictable.

The most compelling evidence that markets are efficient is a comparison of **passively managed** versus **actively managed** mutual funds. A mutual fund that adopts a passive management style is called an **index fund**. Index fund managers make no attempt to analyse shares to determine which ones will perform well and which ones will do poorly. Instead, these managers try to mimic the performance of a market index, such as the ASX 200, by buying the shares that make up the index. In contrast, fund managers adopting an active management style do extensive analysis to identify mispriced shares. Active managers trade more frequently than do passive managers, and in the process generate higher expenses for their shareholders. Though there are notable exceptions (such as legendary managers Peter Lynch, Warren Buffett and Bill Gross), most research indicates that active funds earn lower returns (after expenses such as transaction costs and taxes) than passive funds are able to achieve. Buy-and-hold wins again.

If this section concludes with the statement that share returns are essentially unpredictable, then it is fair to ask why we place so much emphasis on the CAPM. After all, the CAPM's purpose is to provide an estimate of how a share will perform in the future. If share returns move essentially at random, then does the CAPM have any place in the practice of corporate finance?

It is true that the CAPM provides only an estimate of a share's expected return and that actual outcomes deviate considerably (and unpredictably) from that estimate in any given year. Even so, the CAPM gives analysts a tool for measuring the systematic risk of any particular asset. Because assets with high systematic risk should, on average, earn a higher return than assets with low systematic risk, the CAPM offers a framework for making educated guesses about the risk and return of investment alternatives. Though it is hardly infallible, this framework enjoys widespread use in corporate finance, as we will see in subsequent chapters.

passively managed
A strategy in which an investor makes no attempt to identify overvalued or undervalued shares, but instead holds a diversified portfolio

actively managed
A strategy in which an investor does research in an attempt to identify undervalued and overvalued shares

index fund
A passively managed fund that tries to mimic the performance of a market index, such as the ASX 200

LO7.4 CONCEPT REVIEW QUESTIONS

- 9 If the share market is efficient, what makes it efficient?
- 10 If prices move almost at random, then why should we place any value on the CAPM, which makes predictions about expected asset returns?

STUDY TOOLS

SUMMARY

LO7.1

- Investors and managers make decisions based on expected returns.
 - Estimates of expected returns may be obtained from historical data, from probabilistic calculations or from a risk-based approach.
- LO7.2**
- An asset's beta measures its systematic risk, and it is this risk that should be linked to expected returns.

- The expected return of a portfolio equals a weighted average of the expected returns of the assets in the portfolio. The same can be said of the portfolio's beta.
- The standard deviation of a portfolio usually does not equal the weighted average of the standard deviation of the shares in the portfolio. This is because some of the unsystematic fluctuations of individual shares cancel each other out in a portfolio. A fully diversified portfolio contains only systematic risk.
- A portfolio's expected return, standard deviation and beta can be calculated using **Equations 7.1, 7.2, 7.3** and **7.4**, respectively, in the 'Table of important equations' below.

LO7.3

- The CAPM predicts that the expected return on a share depends on the share's beta, the risk-free rate and the market risk premium.
- Equation 7.5** in the 'Table of important equations' shows how the capital asset pricing model (CAPM) links an asset's beta to its expected return.

LO7.4

- According to the efficient markets hypothesis (EMH), competition in financial markets creates an equilibrium in which it is very difficult to identify overvalued or undervalued assets because all financial asset prices rapidly and fully incorporate all new information.
- In an efficient market, competition for information makes asset prices nearly unpredictable.

IMPORTANT EQUATIONS

TABLE OF IMPORTANT EQUATIONS

7.1 $E(r_p) = w_1 E(r_1) + w_2 E(r_2) + \dots + w_n E(r_n)$
where $w_1 + w_2 + \dots + w_n = 1$

7.2 $\sigma_{\text{portfolio}} = \sqrt{w_1^2 \sigma_1^2 + w_2^2 \sigma_2^2 + 2w_1 w_2 \rho_{1,2} \sigma_1 \sigma_2}$

7.3 $\sigma_{\text{portfolio}} = \sqrt{\sum_{a=1}^n w_a^2 \sigma_a^2 + 2 \sum_{a_1=1}^n \sum_{a_2=1}^n w_{a_1} w_{a_2} \sigma_{a_1 a_2} \sigma_{a_1} \sigma_{a_2}}$

7.4 $\beta_p = w_1 \beta_1 + w_2 \beta_2 + \dots + w_n \beta_n$
where $w_1 + w_2 + \dots + w_n = 1$

7.5 $E(r) = r_f + b(E(r_m) - r_f)$

SELF-TEST PROBLEMS

Answers to these 'Self-test problems' and the 'Concept review' questions throughout the chapter appear on the Student Companion Website (<http://login.cengagebrain.com>) or via your instructor.

ST7-1 Calculate the mean, variance and standard deviations for a share with the probability distribution outlined in the following table:

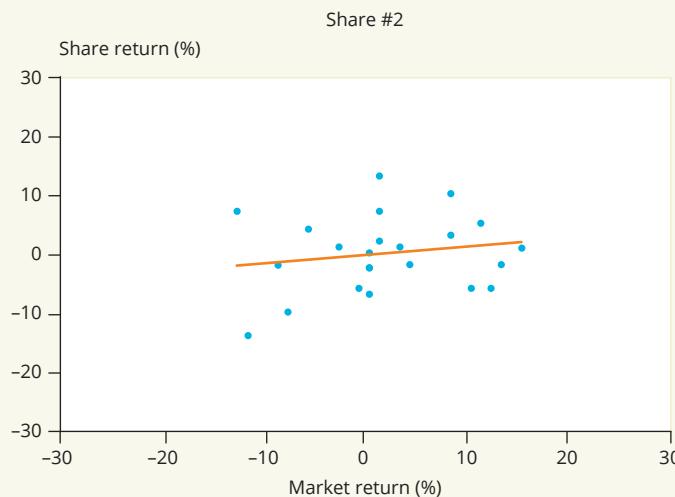
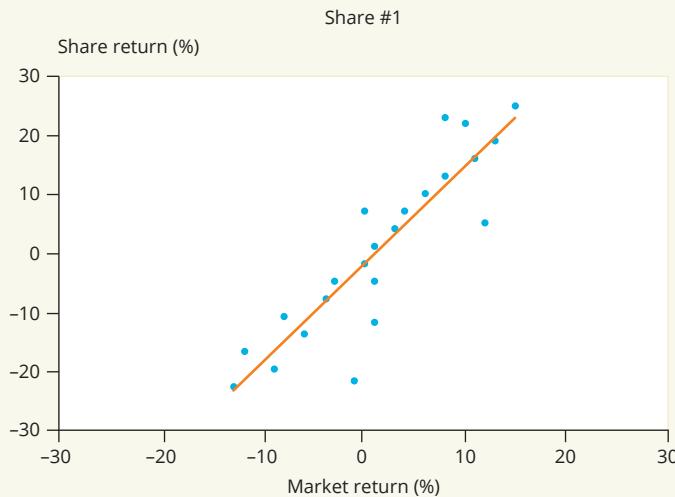
OUTCOME	PROBABILITY	SHARE RETURN
Recession	20%	-40%
Expansion	50%	20%
Boom	30%	50%

ST7-2 You invest \$25,000 in Treasury notes and \$50,000 in the market portfolio. If the risk-free rate equals 2% and the expected market risk premium is 6%, what is the expected return on your portfolio?

ST7-3 The risk-free rate equals 4%, and the expected return on the market is 10%. If a share's expected return is 13%, what is the share's beta?

QUESTIONS

- Q7-1** Based on the charts below, which share has more systematic risk, and which share has more unsystematic risk?



- Q7-2** The table below shows the expected return and standard deviation for two shares. Is the pattern shown in the table possible? Explain your answer.

SHARE	BETA	STD. DEV.
1	1.5	22%
2	0.9	35%

- Q7-3** Which type of company do you think will have a higher beta: a fast-food chain or a cruise-ship company? Why?

Q7-4 Is the data in the following table believable? Explain your answer.

SHARE	STD. DEV.
1	40%
2	60%
50–50 portfolio	50%

Q7-5 How can investors hold a portfolio with a weight of more than 100% in a particular asset?

Q7-6 According to the CAPM, is the following data possible? Explain your answer.

ASSET	RETURN	STD. DEV.
1	4%	0%
2	2%	20%

Q7-7 Share A has a beta of 1.5, and Share B has a beta of 1.0. Determine whether each statement below is true or false.

- a Share A must have a higher standard deviation than Share B.
- b Share A has a higher expected return than Share B.
- c The expected return on Share A is 50% higher than the expected return on B.

Q7-8 If an asset lies above the security market line, is it overpriced or underpriced? Explain why.

Q7-9 A share has a beta equal to 1.0. Is the standard deviation of the share equal to the standard deviation of the market? Explain your answer.

Q7-10 If share prices move unpredictably, does this mean that investing in shares is just gambling? Why or why not?

Q7-11 Explain why the efficient markets hypothesis implies that a well-run company is not necessarily a good investment.

PROBLEMS

EXPECTED RETURNS

P7-1 a Suppose that, over the long run, the risk premium on shares relative to Treasury notes has been 7.6% in Australia. Suppose also that the current Treasury note yield is 1.5%, but the historical average return on Treasury notes is 4.1%. Estimate the expected return on shares and explain how and why you arrived at your answer.

b Suppose that, over the long run, the risk premium on shares relative to Treasury bonds has been 6.5%. The current Treasury bond yield is 4.5%, but the historical return on Treasury bonds is 5.2%. Estimate the expected return on shares and explain how and why you arrived at your answer.

c Compare your answers above and explain any differences.

P7-2 The table below shows the historical difference in returns between US shares and US Treasury bills and the difference between US shares and US Treasury bonds at 10-year intervals.

YEARS	SHARES VS. TREASURY BONDS	SHARES VS. TREASURY BILLS
1964–73	3.7%	8.3%
1974–83	0.2%	8.6%
1984–93	7.5%	5.4%
1994–2003	4.8%	2.1%

- a At the end of 1973, the yield on Treasury bonds was 6.6% and the yield on Treasury bills was 7.2%. Using these figures and the historical data from 1964–73, construct two estimates of the expected return on equities as of December 1973.
- b At the end of 1983, the yield on Treasury bonds was 6.6% and the yield on Treasury bills was 7.2%. Using these figures and the historical data from 1974–83, construct two estimates of the expected return on equities as of December 1983.
- c At the end of 1993, the yield on Treasury bonds was 6.6% and the yield on Treasury bills was 2.8%. Using these figures and the historical data from 1984–93, construct two estimates of the expected return on equities as of December 1993.
- d At the end of 2003, the yield on Treasury bonds was 5.0% and the yield on Treasury bills was 1.0%. Using these figures and the historical data from 1994–2003, construct two estimates of the expected return on equities as of December 2003.
- e What lessons do you learn from this exercise? How much do your estimates of the expected return on equities vary over time, and why do they vary?

P7-3 Use the information below to estimate the expected return on the shares of Bieber Corporation.

- Long-run average share return = 12%
- Long-run average Treasury note return = 3%
- Current Treasury note return = 1%.

P7-4 Calculate the expected return, variance and standard deviation for the shares in the table below.

PRODUCT DEMAND	PROBABILITY	SHARE RETURNS IN EACH SCENARIO		
		SHARE 1	SHARE 2	SHARE 3
High	10%	30%	20%	15%
Medium	60%	12%	14%	10%
Low	30%	-10%	-5%	-2%

P7-5 Calculate the expected return, variance and standard deviation for the shares listed below.

STATE OF THE ECONOMY	PROBABILITY	SHARE RETURNS IN EACH STATE		
		SHARE A	SHARE B	SHARE C
Recession	25%	-20%	-10%	-5%
Normal growth	45%	18%	13%	10%
Boom	30%	40%	28%	20%

P7-6 Refer to [Figure 7.3](#) on page 227 and answer the following questions.

- a What return would you expect on a share with a beta of 2.0?
- b What return would you expect on a share with a beta of 0.66?
- c What determines the slope of the line in [Figure 7.3](#)?

RISK AND RETURN FOR PORTFOLIOS

P7-7 Calculate the portfolio weights implied by the dollar investments in each of the asset classes below.

ASSET	\$ INVESTED
Shares	\$10,000
Bonds	\$10,000
Treasury notes	\$ 5,000

- P7-8** Wendi Deng recently inherited \$1 million and has decided to invest it. Her portfolio consists of the following positions in several shares. Calculate the portfolio weights to fill in the bottom row of the table.

	INTEL	GENERAL MOTORS	PROCTER & GAMBLE	EXXON MOBIL
Shares	7,280	5,700	5,300	6,000
Price per share	\$25	\$45	\$55	\$45
Portfolio weights				

- P7-9** Victoria Goldman is a financial adviser who manages money for high-net-worth individuals. For a particular client, Victoria recommends the following portfolio of shares.

	GLOBAL RECORDING ARTISTS (GRA)	SOCER INTL. (SI)	LIQUID OXYGEN CORP. (LO)	VIVA MFG. (VM)	WANNABE TRAVEL (WT)
Shares	8,000	9,000	7,000	10,500	4,000
Price per share	\$40	\$36	\$45	\$30	\$60
Portfolio weights					

- a Calculate the portfolio weights implied by Ms Goldman's recommendations. What fraction of the portfolio is invested in GRA and SI combined?
- b Suppose that the client purchases the shares suggested by Ms Goldman, and a year later the prices of the five shares are as follows: GRA (\$60), SI (\$50), LO (\$38), VM (\$20), WT (\$50). Calculate the portfolio weights at the end of the year. Now what fraction of the portfolio is held in GRA and SI combined?

- P7-10** Calculate the expected return, variance and standard deviation for the shares in the table below. Next, form an equally weighted portfolio of all three shares and calculate its mean, variance and standard deviation.

STATE OF THE ECONOMY	PROBABILITY	RETURNS IN EACH STATE OF THE ECONOMY		
		CYCLI-CAL INC.	HOME GROWN CORP.	PHARMA-CEL
Boom	20%	40%	20%	20%
Expansion	50%	10%	10%	40%
Recession	30%	-20%	-10%	-30%

- P7-11** You analyse the prospects of several companies and come to the following conclusions about the expected return on each:

SHARE	EXPECTED RETURN
Bega Cheese	8%
Woolworths	10%
Carsales.com	5%
Fisher & Paykel	10%

You decide to invest \$4,000 in Bega Cheese, \$6,000 in Woolworths, \$12,000 in Carsales.com and \$3,000 in Fisher & Paykel. What is the expected return on your portfolio?

- P7-12** Calculate the expected return of the portfolio described in the accompanying table.

SHARE	\$ INVESTED	EXPECTED RETURN
A	\$40,000	10%
B	20,000	7%
C	25,000	12%

P7-13 Calculate the portfolio weights based on the dollar investments in the table below. Interpret the negative sign on one investment. What is the size of the initial investment on which an investor's rate of return calculation should be based?

SHARE	\$ INVESTED
1	\$10,000
2	5,000
3	-5,000

P7-14 Pete Pablo has \$20,000 to invest. He is very optimistic about the prospects of two companies, 919 Brands Inc. and Diaries.com. However, Pete has a very pessimistic view of one company, a financial institution known as Star Bank. The current market price of each share and Pete's assessment of the expected return for each share appear below.

SHARE	PRICE	EXPECTED RETURN
919 Brands	\$60	10%
Diaries.com	80	14%
Star Bank	70	5%

- a Pete decides to purchase 210 shares of 919 Brands and 180 shares of Diaries.com. What is the expected return on this portfolio? Can Pete construct this portfolio with the amount of money he has to invest?
- b If Pete sells short 100 shares of Star Bank, how much additional money will he have to invest in the other two shares?
- c If Pete buys 210 shares of 919 Brands and 180 shares of Diaries.com, and he simultaneously sells short 100 shares of Star Bank, what are the resulting portfolio weights in each share? (Hint: The weights must sum to 1, but they need not all be positive.)
- d What is the expected return on the portfolio described in part (c)?

P7-15 Shares in Springfield Nuclear Power Corp. (SNP) currently sell for \$25. You believe that the shares will be worth \$30 in one year, and this implies that the return you expect on these shares is 20% (the company pays no dividends).

- a If you invest \$10,000 by purchasing 400 shares, what is the expected value of your holdings next year?
- b Now suppose that you buy 400 shares of SNP, but you finance this purchase with \$5,000 of your own funds and \$5,000 that you raise by selling short 100 shares of Nader Insurance Inc. Nader Insurance shares currently sell for \$50, but next year you expect them to be worth \$52. This implies an expected return of 4%. If both shares perform as you expect, how much money will you have at the end of the year after you repurchase 100 Nader shares at the market price and return them to your broker? What rate of return on your \$5,000 investment does this represent?
- c Suppose you buy 400 shares of SNP and finance them as described in part (b). However, at the end of the year SNP shares are worth \$31. What was the percentage increase in SNP shares? What is the rate of return on your portfolio (again, after you repurchase Nader shares and return them to your broker)?
- d Finally, assume that at the end of one year, SNP shares have fallen to \$24. What was the rate of return on SNP shares for the year? What is the rate of return on your portfolio?
- e What is the general lesson illustrated here? What is the impact of short selling on the expected return and risk of your portfolio?

P7-16 You are given the following data on several shares:

STATE OF THE ECONOMY	PROBABILITY	RETURNS IN EACH STATE OF ECONOMY		
		GERE MINING	REUBENFELD FILMS	DELOREAN AUTOMOTIVE
Boom	25%	40%	24%	-20%
Expansion	50%	12%	10%	12%
Recession	25%	-20%	-12%	-40%

- a Calculate the expected return and standard deviation for each share.
- b Calculate the expected return and standard deviation for a portfolio invested equally in Gere Mining and Reubenfeld Films. How does the standard deviation of this portfolio compare to a simple 50–50 weighted average of the standard deviations of the two shares?
- c Calculate the expected return and standard deviation for a portfolio invested equally in Gere Mining and DeLorean Automotive. How does the standard deviation of this portfolio compare to a simple 50–50 weighted average of the standard deviations of the two shares?
- d Explain why your answers regarding the portfolio standard deviations are so different in parts (b) and (c).

P7-17 In an odd twist of fate, the return on the share market has been exactly 1% in each of the last eight months. The return on Simon Entertainment shares in the past eight months has been as follows: 8%, 4%, 16%, -10%, 26%, 22%, 1%, -55%. From this information, estimate the beta of Simon shares.

P7-18 Petro-Chem Pty Ltd's share has a beta equal to 0.9. Digi-Media Corp.'s share beta is 2.0. What is the beta of a portfolio invested equally in these two shares?

PUTTING IT ALL TOGETHER: THE CAPM

P7-19 The risk-free rate is currently 3%, and the expected risk premium on the market portfolio is 6%. What is the expected return on a share with a beta of 1.1?

P7-20 The expected return on the market portfolio equals 12%. The current risk-free rate is 6%. What is the expected return on a share with a beta of 0.66?

P7-21 The expected return on a particular share is 14%. The share's beta is 1.5. What is the risk-free rate if the expected return on the market portfolio equals 10%?

P7-22 If the risk-free rate equals 4% and a share with a beta of 0.75 has an expected return of 10%, what is the expected return on the market portfolio?

P7-23 You believe that a particular share has an expected return of 15%. The share's beta is 1.2, the risk-free rate is 3%, and the expected market risk premium is 6%. Based on this, is it your view that the share is overvalued or undervalued?

P7-24 A particular share sells for \$30. The share's beta is 1.25, the risk-free rate is 4%, and the expected return on the market portfolio is 10%. If you forecast that the share will be worth \$33 next year (assume no dividends), should you buy the share or not?

P7-25 Currently, the risk-free rate equals 5% and the expected return on the market portfolio equals 11%. An investment analyst provides you with the following information:

SHARE	BETA	EXPECTED RETURN
A	1.33	12%
B	0.70	10%
C	1.50	14%
D	0.66	9%

- a Indicate whether each share is overpriced, underpriced or correctly priced.
- b For each share, subtract the risk-free rate from the share's expected return and divide the result by the share's beta. For example, for asset A this calculation is $(12\% - 5\%) \div 1.33$. Provide an interpretation for these ratios. Which share has the highest ratio and which has the lowest?
- c Show how a smart investor could construct a portfolio of shares C and D that would outperform share A.
- d Construct a portfolio consisting of some combination of the market portfolio and the risk-free asset such that the portfolio's expected return equals 9%. What is the beta of this portfolio? What does this say about share D?
- e Divide the risk premium on share C by the risk premium on share D. Next, divide the beta of share C by the beta of share D. Comment on what you find.

CASE STUDY

RISK, RETURN AND THE CAPITAL ASSET PRICING MODEL (CAPM)

On your first day as an intern at Tri-Star Management Pty Ltd, the CEO asks you to analyse the following information pertaining to two ordinary share investments, Tech.com and Sam's Grocery. You are told that a one-year Treasury note will have a rate of return of 5% over the next year. Also, information from an investment advisory service lists the current beta for Tech.com as 1.68 and for Sam's Grocery as 0.52. You are provided a series of questions to guide your analysis.

ECONOMY	PROBABILITY	ESTIMATED RATE OF RETURN		
		TECH.COM	SAM'S GROCERY	ASX 200
Recession	30%	-20%	5%	-4%
Average	20%	15%	6%	11%
Expansion	35%	30%	8%	17%
Boom	15%	50%	10%	27%

ASSIGNMENT

- 1 Using the probabilistic approach, calculate the expected rate of return for Tech.com, Sam's Grocery and the ASX 200 Index.
- 2 Calculate the standard deviations of the estimated rates of return for Tech.com, Sam's Grocery and the ASX 200 Index.
- 3 Which is a better measure of risk for the ordinary shares of Tech.com and Sam's Grocery – the standard deviation you calculated in Question 2 or the beta?
- 4 Based on the beta provided, what is the expected rate of return for Tech.com and Sam's Grocery for the next year?
- 5 If you form a two-share portfolio by investing \$30,000 in Tech.com and \$70,000 in Sam's Grocery, what is the portfolio beta and expected rate of return?
- 6 If you form a two-share portfolio by investing \$70,000 in Tech.com and \$30,000 in Sam's Grocery, what is the portfolio beta and expected rate of return?
- 7 Which of these two-share portfolios do you prefer? Why?

8

OPTIONS

WHAT COMPANIES DO

INCREASING YOUR (INVESTMENT) OPTIONS

In its product disclosure statement of March 2017, CitiFirst, part of the CitiGroup in Australia, promoted 'CitiFirst MINIs' for investors. These are financial products, warrants, traded on the Australian Securities Exchange (ASX) in the same way that shares are traded.

According to CitiFirst's statement, a warrant 'is a derivative, and as such, derives its value from an underlying instrument. The underlying instrument can be a security or securities, an index, a commodity or a currency'. The underlying instrument is usually referred to as the Underlying Parcel. CitiFirst MINIs are structured as either 'call warrants' or 'put warrants'.

The warrants are listed as being available over a large number of Australian companies, including Australia and New Zealand

Banking Group Limited, BHP Billiton Limited, Commonwealth Bank of Australia, Navitas, Macquarie Group Limited, National Australia Bank Limited, Newcrest Mining Limited, Orica Ltd, QBE Insurance Group Limited, Rio Tinto Limited, Seek Limited, Wesfarmers Limited and Westpac Banking Corporation.

There are some potential benefits for investors who buy and hold CitiFirst MINIs:

- being exposed to the price movements of the underlying asset, such as a share at a fraction of the cost of buying the underlying asset itself
- having the ability to buy and sell the CitiFirst MINIs on ASX at any time prior to the date when the warrants expire
- being able to capture greater returns per dollar of investment than if the investor bought and held the underlying asset itself, because the warrant effectively 'leverages' the investment
- having the ability to fix the price at which the underlying asset such as shares could be bought – this is a prime advantage of an option to buy
- being able to take advantage of both rising and falling markets.

CitiGroup does warn investors to note that they are not entitled to any dividends, distributions or other rights that may be payable to genuine full holders of the underlying asset; a warrant is not quite the



same as actually possessing the underlying asset. And the CitiGroup document also notes on its cover 'Investment product: not a deposit | not insured | no bank guarantee | may lose value'.

Source: Adapted from CitiFirst Trading warrants, *Product Disclosure Statement, Equity Call and Put Warrants*, 2 November 2012. Issued by Citigroup Global Markets Australia Pty Limited. Used with permissions. Updated using ASX. <https://www.asx.com.au/PDF/17-037CTW.pdf>. Accessed 6 July 2019.

LEARNING OBJECTIVES

After reading this chapter, you should be able to:

- LO8.1 describe the basic features of call and put options
- LO8.2 construct payoff diagrams for individual options as well as portfolios of options and other securities
- LO8.3 explain qualitatively what factors are important in determining option prices
- LO8.4 calculate the price of an option, using the binomial model
- LO8.5 list several corporate finance applications of option pricing theory.

A bit of folk wisdom says, 'Always keep your options open.' This implies that choices, both now and in the future, have value; and that having the right to do something is better than being obliged to do it. This chapter shows how to apply that intuition in corporate finance in two related ways. One application, which is perhaps the more obvious one, is to allow us to place values on specific financial instruments called options. Options allow investors to buy or to sell an asset at a fixed price, for a given period of time. Having the right to buy or sell shares at a fixed price can be valuable – as long as there is a chance that the share price can move in the right direction.

The other application is more general and perhaps more subtle in use. When we explained the key valuation method of corporate finance (present value of investments) in Chapter 3 and the examples of its use in the following chapters, we did not talk about choices that may arise for corporations during the life of the investments. We took the view that once an investment was underway, with cash flows occurring in and out of the company, we did not make any further decisions with respect to the investment. This is not realistic: corporations should, and do, spend resources and time evaluating investments as they roll out into the future, and changes may be undertaken during the life of investments. For example, a company may pilot test a new product with limited volume in a market to see if the product may be a success, then consider an expansion of production and sales if the product sells well; but if the product does not sell well, the company may stop production and sales. Having this choice during the life of an investment is a (real) option.

Another example would be simply to delay the start of an investment: not every investment must begin in period 0 (now) because there could be market learning opportunities for the company from delaying the start of the investment. This can apply as much to governmental decision making as to corporates: in many countries the local laws specify the maximum time allowed between elections, but also give the government the opportunity to 'go early', holding the election at a time earlier than the maximum period allowed. Choosing that time is exercising a real option for the government.

You may note we used the word 'opportunity' several times in the discussion above. This is what an option provides, a chance or opportunity to make a decision during an investment which was not previously available or desirable in the original investment, perhaps due to a lack of information or an absence of alternatives for implementation. Because this approach to decision making by evaluating options is very important, we want you to gain an early understanding of how we may calculate a

financial value for the options to incorporate them into the overall present value analysis of investments. This chapter provides the basis for calculating option values, using what is quite recently developed analysis. We shall then be able to show how the option valuation methods can be incorporated in the general corporate finance process as we move on to the following chapters of the book. Here are some further samples of option use:

- As part of the compensation package for managers, options provide incentives for managers to take actions that increase their companies' share prices, thereby increasing the wealth of shareholders. Some point out that abuses may occur when organisations award excessive option grants, or employees take improper actions to inflate share prices and option values. However, we see this as a corporate governance problem, not a problem with options per se.
- A wide variety of options exist to allow holders the right to buy and to sell many different types of assets, not just ordinary shares. Sometimes, trading the option is more cost effective than trading the underlying asset. For example, trading a share index option, which grants the right to buy or to sell a portfolio of shares such as the ASX 200, enables investors to benefit from market movements while avoiding paying all of the transaction costs that would result from trading 200 individual shares.
- Companies use options to reduce their exposure to certain types of risk. Companies regularly buy and sell options to shelter their cash flows from movements in exchange rates, interest rates and commodity prices. In that function, options resemble insurance much more than they resemble gambling.
- Options facilitate the creation of innovative trading strategies. For instance, suppose that an investor is following a pharmaceutical company that has a genetically engineered cancer drug in clinical trials. The company has invested vast resources in this project, so much so that its future depends entirely on the outcome of these trials. If the tests are successful, the company's share price will skyrocket. If not, the company may go bankrupt. An investor with choices limited to buying or selling the company's shares must guess whether the clinical trials will succeed or fail. As we will see, an investor who can buy and sell options can construct a trading strategy to profit from a large movement in the company's share price, regardless of whether that movement is up or down.

We begin this chapter with a brief description of the most common types of share options and their essential characteristics. Next, we turn our attention to portfolios of options, illustrating how options can be used to construct unique trading strategies and gaining insight into how prices of different kinds of options are linked together in the market. The rest of the chapter examines factors that influence option prices, and we introduce a simple, yet powerful, tool for pricing many different kinds of options.

LO8.1

8.1 OPTIONS VOCABULARY

derivative security

A security that derives its value from another asset

underlying asset

The asset from which an option or other derivative security derives its value

call option

An option that grants the right to buy an underlying asset at a fixed price

An option is one example of a **derivative security**, a security that derives its value from another asset. An option fits this description because its value depends on the price of the underlying shares that the option holder can buy or sell. The asset from which a derivative security obtains its value is called the **underlying asset**. A **call option** grants the right to purchase a share at a fixed price, on or before a certain date. The price at which a call option allows an investor to purchase the underlying share is called the **strike price** or the **exercise price**. Because the option holder can buy the underlying share at a fixed price, the more the market price of the share increases, the greater the value of the call option.



FINANCE IN THE REAL WORLD

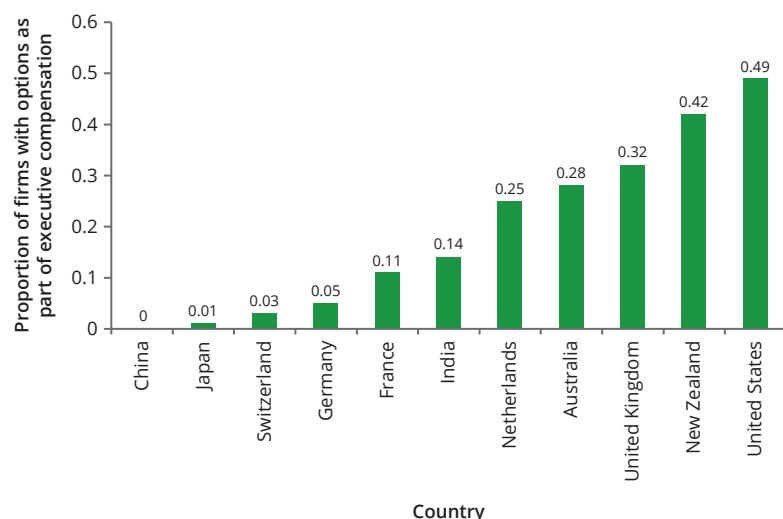
CFO SURVEY EVIDENCE: OPTIONS, COMPENSATION AND HEDGING PRACTICES

The role of share options in executive pay varies widely across countries. The following chart shows that some companies are much more likely to include share options as a significant portion of the pay package given to senior executives than companies in other countries. Bryan, Nash and Patel (2009) investigated differences in executive compensation practices across companies in different countries and found that share options were more prevalent in countries that had greater institutional protections for shareholder rights and better enforcement of those protections. The study found that characteristics of companies were important, too, with equity-linked compensation such as options playing a bigger role in companies with more growth potential and in larger companies with less free cash flow.

In another study from 2007, Cohen and Yagil asked CFOs from the largest 300 companies in the United States, the United

Kingdom, Canada, Germany and Japan how often they used options to hedge financial risks. Executives in Japan reported that they were roughly 50% more likely to use options to hedge risk than their US and Canadian counterparts, whereas German and British CFOs fell in the middle. CFOs from all five countries reported that they were more likely to use forward contracts (discussed in Chapter 16) than options when hedging.

A survey by Murphy (2012) reveals that over the period 1990–2011, the importance of share options in executive compensation for organisations in countries such as the US, Canada and Australia, as well as in western Europe, grew rapidly, then diminished somewhat. The impacts of the global financial crisis seemed to discourage the use of share options in executive compensation packages, but they are still a sizeable part of the overall remuneration to CEOs and their senior staff in corporate entities.



strike price
The price at which an option holder can buy or sell the underlying asset

exercise price
The price at which an option holder can buy or sell the underlying asset

expiration date
The date on which the right to buy or to sell the underlying asset expires

American call option
An option that grants the right to buy an underlying asset on or before the expiration date

European call option
An option that grants the right to buy the underlying asset *only* on the expiration date

put option
An option that grants the right to sell an underlying asset at a fixed price

long position
To own an option or another security

exercise the option
Pay (receive) the strike price and buy (sell) the underlying asset

short position
To sell an option or another security

option premium
The market price of the option

Call options grant investors the right to purchase a share for a fairly short time period, usually just a few months.¹ The point at which this right expires is called the option's **expiration date**. An **American call option** gives holders the right to purchase shares at a fixed price, on or before its expiration date, whereas a **European call option** grants that right *only* on the expiration date. If we compare the prices of two options that are identical in every respect, except that one is American and one is European, the price of the American option should be at least as high as the European option because of the American option's greater flexibility.

A **put option** grants the right to sell a share at a fixed price on or before a certain date. The right to sell shares at a fixed price becomes more and more valuable as the price of the underlying share price decreases. Thus, we have the most basic distinction between put and call options: put options rise in value as the underlying price goes down, whereas call options increase in value as the underlying share price goes up. Just like call options, put options specify both an exercise price at which investors can sell the underlying shares and an expiration date at which the right to sell vanishes. Also, put options come in American and in European varieties, as do call options.

The most distinctive feature of options, both puts and calls, can be deduced from the term *option*. Investors who own calls and puts have the right to buy or sell shares, but they are not obligated to do so. This feature creates an asymmetry in option payoffs, and that asymmetry is central to understanding how to use options effectively and how to price them, as we will soon see.

8.1a OPTION TRADING

An important feature distinguishing calls and puts from other securities we've studied, such as shares and bonds, is that options are not necessarily issued by companies.² Rather, an option is a contract between two parties, neither of whom need have any connection to the company whose shares serve as the underlying asset for the contract. For example, suppose Tony and Oscar, neither of whom works for BHP Billiton, decide to enter into an option contract. Tony agrees to pay Oscar \$3 for the right to purchase one ordinary share in BHP Billiton for \$20 at any time during the next month. As the option buyer, Tony has a **long position** in a call option. He can decide at any point whether or not he wants to **exercise the option**. If he chooses to exercise his option, he will pay Oscar \$20, and Oscar will deliver one share in BHP Billiton to Tony. Naturally, Tony will choose to exercise the option only if BHP Billiton shares are worth more than \$20 each. If BHP Billiton shares are worth less than \$20, Tony will let the option expire worthless and will lose his \$3 investment.

On the other side of this transaction, Oscar, as the seller of the option, has a **short position** in a call option.³ If Tony decides to exercise his option, Oscar's *obligation* is to follow through on his promise to deliver one share of BHP Billiton for \$20. If Oscar does not already own a share of BHP Billiton, he can buy one in the market. Why would Oscar agree to this arrangement? Because he receives the **option premium**, the \$3 payment that Tony made at the beginning of their agreement. If BHP Billiton's share price rises above \$20, Oscar will lose part or all of the option premium because he must sell Tony an asset for less than what it is worth. On the other hand, if BHP Billiton's share price does not rise above \$20, then Tony will not attempt to buy the asset, and Oscar can keep the \$3 option premium.

1 Employee share options, which typically give workers the right to buy shares at a fixed price for up to 10 years, are an important exception to this rule. Some publicly traded options have long expiration dates, too, such as the long-term equity anticipation securities (LEAPS) introduced by the American Stock Exchange in 1990.

2 This is not to say that companies cannot issue options if they want to. Companies do issue options to employees and may also sell options, as part of their risk management activities, or bundle options with other securities, such as bonds and preferred shares, that they sell to raise capital. Options issued by companies on their own shares are called warrants, and these are discussed later in this chapter.

3 We may also say that Oscar writes an option when he sells the option to Tony.

Options trades do not usually occur in face-to-face transactions between two parties. Instead, options trade either on an exchange such as the Australian Securities Exchange or the Singapore Stock Exchange, or on the over-the-counter (OTC) market. The exchanges list options on a limited number of shares, with a limited set of exercise prices and expiration dates. By restricting the number and the variety of listed options, the exchanges expect greater liquidity in the option contracts that are available for trading. Furthermore, an options exchange may serve as a guarantor, fulfilling the terms of an option contract if one party defaults. In contrast, OTC options come in seemingly infinite varieties. They are less liquid than exchange-traded options. A trader of OTC options faces **counterparty risk**, the risk that their counterparty on a specific trade will default on their obligation. While there is a counterparty risk for those trading with an exchange, the risk is greatly lowered because of the typically greater resources held by the exchange, and the fact that it manages as its business a diversified portfolio of many different options compared with a single individual.

Most investors who trade options never exercise them. An investor who holds an option and wants to convert that holding into cash can do so in several ways. First, one investor can simply sell the option to another investor, as long as there is some time remaining before expiration. Second, an investor can receive a **cash settlement** for the option. To understand how cash settlement works, go back to Tony's call option to buy BHP Billiton shares for \$20 each. Suppose that the price of BHP Billiton is \$30 per share when the option expires. Rather than have Tony pay Oscar \$20 in exchange for one share of BHP Billiton, Oscar might agree to pay Tony \$10, the difference between the market price of BHP Billiton and the option's strike price. Settling in cash avoids the potential need for Oscar to buy one share of BHP Billiton to give to Tony and the need for Tony to sell that share if he wants to convert his profit into cash. Avoiding these unnecessary trades saves transaction costs.

counterparty risk
The risk that the counterparty in an options transaction will default on its obligation

8.1b OPTION PRICES

Figure 8.1 shows a set of option-price quotations for St Kilda Optics. The first column indicates that the quoted options are on St Kilda Optics ordinary shares. On the day that these option prices were obtained, the closing price of St Kilda Optics was \$30.00. The second column illustrates the range of expiration dates available for St Kilda Optics options. The prices we've chosen to illustrate in the table are for options expiring either in April, May or July. The third column shows the range of option strike prices available, from \$27.50 to \$35. The fourth and fifth columns give the most recent trading prices for calls and puts.⁴ For instance, an investor who wanted to buy a call option on St Kilda Optics shares, with a strike price of \$27.50 and an expiration date in May, would pay \$3.91. For a May put with the same strike price, an investor would pay just \$1.23. Remember, we also refer to the price of an option as the option's premium.

Options traders say that a call option is **in the money** if the option's strike price is less than the current share price. For puts, an option is in the money if the strike price exceeds the share price. Using these definitions, we can say that the call options in the upper three rows of **Figure 8.1** are in the money, whereas the put options in the lower six rows are in the money. Similarly, options traders say that a call option is **at the money** when the share price and the strike price are equal. In **Figure 8.1**, the St Kilda Optics options, with a strike price of \$30, are at the money because the share price is \$30.00.

Take one more look at the May call option, with a strike price of \$27.50. If an investor who owned this option exercised it, she could buy St Kilda Optics shares for \$27.50 and resell them at the market price of \$30.00, a difference of \$2.50. But the current price of this option is \$3.91, or \$1.41 more than the value the

cash settlement
An agreement between two parties, in which one party pays the other party the cash value of its option position, rather than forcing it to exercise the option by buying or selling the underlying asset

in the money
A call (put) option is in the money when the share price is greater (less) than the strike price

at the money
An option is at the money when the share price equals the strike price

4 A minor institutional detail is worth mentioning here. In most option exchanges, an option contract grants the right to buy or to sell a specified number of the underlying shares even though the price quotes in the table are on a 'per-share' or 'per-option' basis. That is, the call price of \$3.91 for the May option, with a \$27.50 strike, means that for \$391, an investor can purchase the right to buy 100 shares of St Kilda Optics at \$27.50 per share. All the examples in this chapter are constructed as if an investor can trade one option to buy or to sell one share. We make that assumption to keep the numbers simple, but it does not affect any of the main lessons of the chapter.

FIGURE 8.1 OPTION PRICE QUOTES FOR ST KILDA OPTICS

The table lists prices for call and put options that expire in April, May and July, with strike prices of \$27.50, \$30.00, \$32.50 and \$35.00.

COMPANY	EXPIRATION	STRIKE	CALLS	PUTS	
30.00	April	27.50	3.26	0.67	Out-of-the-money puts, in-the-money calls
30.00	May	27.50	3.91	1.23	
30.00	July	27.50	4.91	2.04	
30.00	April	30.00	1.77	1.67	At-the-money puts and calls
30.00	May	30.00	2.53	2.33	
30.00	July	30.00	3.62	3.23	
30.00	April	32.50	0.85	3.24	In-the-money puts, out-of-the-money calls
30.00	May	32.50	1.55	3.83	
30.00	July	32.50	2.62	4.69	
30.00	April	35.00	0.36	5.24	
30.00	May	35.00	0.90	5.67	
30.00	July	35.00	1.86	6.40	

intrinsic value

The profit that an investor makes from exercising an option, ignoring transactions costs and the option premium

out of the money

A call (put) option is out of the money when the share price is less (greater) than the strike price

time value

The difference between an option's market price and its intrinsic value

investor would obtain by exercising it. In this example, \$2.50 is the option's **intrinsic value**.⁵ You can think of intrinsic value as the profit an investor makes from exercising the option (ignoring transactions costs as well as the option premium). If an option is **out of the money**, its intrinsic value is zero. Therefore, a call option's intrinsic value equals the share price minus the strike price ($S - X$) or zero, whichever is greater. For a put option, the intrinsic value equals either zero or the option's strike price minus the share price ($X - S$), whichever is greater. The difference between an option's intrinsic value and its market price (\$1.41 for the May call) is called the option's **time value**. At the expiration date, the time value equals zero.

Suppose you purchase the May call for St Kilda Optics, with a \$30 strike price, for \$2.53. On the option's expiration date, the price of the company's shares has grown from \$30 to \$35, an increase of \$5, or 16.7%. What would the option be worth at that time? Because the option holder can buy a share at \$30 and then immediately resell it for \$35, the option should be worth \$5. If the option sells for \$5, that's an increase of \$2.47, or a percentage increase of almost 98% from the \$2.53 purchase price! Similarly, if St Kilda Optics' share price is just \$25 when the option expires, then the option will be worthless. If you purchased the call for \$2.53, your return on that investment would be -100%, even though St Kilda Optics' shares fell just \$5, or -16.7%, from the date of your purchase.

This example illustrates what may be the most important fact to know about options. When the price of the shares moves, the dollar change of the shares is generally more than the dollar change of the option price, but the percentage change in the option price is greater than the percentage change in the share price. We have heard students argue that buying a call option is less risky than buying the underlying share because the maximum dollar loss that an investor can experience is much less on the option. That's only true when we compare the \$30 investment required to buy one share of St Kilda Optics with the \$2.53 required to buy one May call. It is accurate to say that the call investor can lose, at most, \$2.53, whereas an investor in St Kilda Optics shares may lose \$30. But there are two problems with this comparison. First, the likelihood that St Kilda Optics will go bankrupt and that its shares will fall to \$0 in a short time frame is negligible. The likelihood that the shares could dip below \$30, resulting in a \$0 value for the call option, is much greater.

5. The intrinsic value of each of the three call options, with a strike price of \$30, is \$0. For put options, the intrinsic value equals either $X - S$ or \$0, whichever is greater. For example, the intrinsic value of each of the three put options, with a strike price of \$35, is \$5 (\$35 - \$30).

FINANCE IN THE REAL WORLD



'WE'RE IN THE MONEY'

Suppose that during your final year of university, you obtain a job offer from a mining company in Malaysia. Rather than offering you a cash signing bonus, they offer 400 call options with an exercise price set at the current market price of the company's shares, M\$40. These options 'vest' in five years, meaning that you have to wait five years before you can exercise them. How valuable might these options become?

Figure 8.2 illustrates how the payoff on your options depends on the company's share price, assuming that you plan to exercise them as soon as they vest if they are in the money.

What happens if the share price is M\$40 or less in five years? As long as the options have not expired, you would continue to hold them in the hope that the share price will go up. This means that although you cannot obtain any cash payoff from the options when they vest, they still have some value because you might obtain a cash payoff later.

**FIGURE 8.2 DECISIONS AND PAYOFFS FOR
MALAYSIAN MINING OPTIONS
IN FIVE YEARS**

SHARE PRICE IN FIVE YEARS	OPTIONS PAYOFF	CALCULATION
\$30	\$ 0	Out of the money
40	0	Out of the money
45	2,000	$400 \times (45 - 40)$
55	6,000	$400 \times (55 - 40)$

Second, it is better to compare an equal dollar investment in St Kilda Optics shares and calls than to compare one share to one call. An investment of \$30 would purchase almost 12 St Kilda Optics call options. Which position, do you think, is riskier – one share or 12 call options?

LO8.1

CONCEPT REVIEW QUESTIONS

- 1 Explain the difference between the share price, the exercise price and the option premium. Which of these are market prices determined by the forces of supply and demand?
- 2 Explain the difference between a long position and a short position. With respect to call options, what is the maximum gain and loss possible for an investor who holds the long position? What is the maximum gain and loss for the investor on the short side of the transaction?
- 3 Suppose an investor holds a call option on shares in Woolworths and decides to exercise the option. What will happen to the total ordinary shares outstanding for Woolworths?
- 4 Which of the following would increase the value of a put option – an increase in the share price or an increase in the strike price?

THINKING CAP QUESTION

- 1 Which is riskier, a specific share or a call option on that share?

LO8.2

8.2 OPTION PAYOFF DIAGRAMS

So far, our discussion of options has been mostly descriptive. Now we turn to the problem of determining an option's market price. Valuing an option is an extraordinarily difficult problem – so difficult, in fact, that the economists who solved the problem won a Nobel Prize for their efforts. In earlier chapters, when we studied the pricing of shares and bonds, we began by describing their cash flows. We do the same here, focusing initially on the relatively simple problem of outlining options' cash flows on the expiration date. Eventually, that will help us understand the intuition behind complex option pricing models.

8.2a CALL OPTION PAYOFFS

payoff

The value received from exercising an option on the expiration date (or zero), ignoring the initial premium required to purchase the option

payoff diagrams

A diagram that shows how the expiration date payoff from an option or a portfolio varies, as the underlying asset price changes

We define an option's **payoff** as the price an investor would be willing to pay for the option the instant before it expires.⁶ An option's payoff is distinct from its price, or premium, because the payoff only refers to the price of the option at a particular instant in time, the expiration date. Graphs that illustrate an option's payoff as a function of the underlying share price are called **payoff diagrams**. Payoff diagrams are extremely useful tools for understanding how options behave and how they can be combined to form portfolios with fascinating properties.

Suppose an investor purchases a call option with a strike price of \$75 and an expiration date three months in the future. To acquire this option, the investor pays a premium of \$8. When the option expires, what will it be worth? If the underlying share price is less than \$75 on the expiration date, the option will be worthless. No one would pay anything for the right to buy this share for \$75 when they can easily buy it for less in the market. What if the share price equals \$76 on the expiration date? In that case, owning the right to buy the share at \$75 is worth \$1, the difference between the share's market price and the option's exercise price. Ignoring transactions costs, an investor who owns the option can buy the share for \$75 and immediately sell it in the market for \$76, earning a \$1 payoff. In general, the payoff of this option will equal the greater of:

- \$0, if the share price is less than \$75 at expiration; or
- the difference between the share price and \$75, if the share price is more than \$75 at expiration.

net payoff

The difference between the payoff received when the option expires and the premium paid to acquire the option

The green line in **Figure 8.3** shows a payoff diagram for the option buyer, or the long position. This picture is a classic in finance, known informally as a *hockey-stick diagram*. It shows that the option, at worst, will be worth \$0, and at best, the option's value is unlimited. The orange line in the figure represents the investor's **net payoff**. The net payoff line appears \$8 lower than the solid line, reflecting the \$8 premium the investor paid to acquire the option. On a net basis, the holder of the call option makes a profit when the price of the shares exceeds \$83.⁷

Figure 8.3 also shows the call's payoff from the seller's perspective, or the short position. Options are a zero-sum game, meaning that profits on the long position represent losses on the short side, and vice-versa. In this part of the figure, the green line illustrates that the seller's payoff equals \$0 when the share price is below \$75. It decreases as the share price rises above \$75. The incentive for the seller to engage in this transaction is the \$8 premium, as shown by the orange line. If the option expires out of the money, the seller earns an \$8 profit. If the option expires in the money, the seller may realise a net profit or a net loss, depending on how

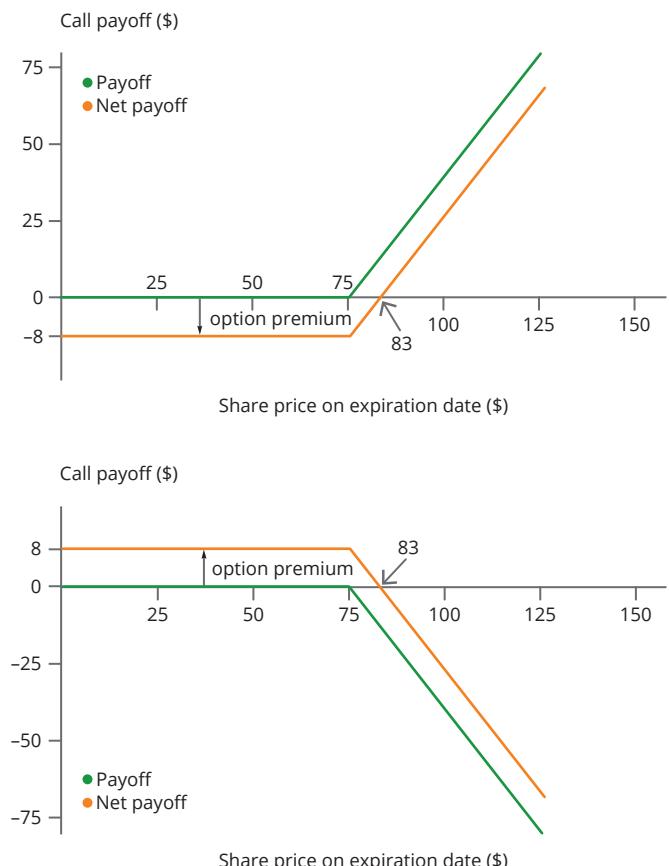
⁶ Alternatively, we could define the payoff as the value an investor would receive, ignoring transactions costs, if he or she exercised the option when it expired. If it did not make sense to exercise the option when it expired, the payoff would be zero.

⁷ Notice that when the share price is above \$75 but below \$83, it still makes sense for the investor to exercise his option, or to sell it, because it reduces the investor's losses. For example, if the share price at expiration equals \$80, the option payoff is \$5, reducing the net loss to -\$3. The careful reader may notice that we are committing a major sin, for finance professors anyway, by comparing the \$8 premium paid up-front to the payoff received three months later. At this point, ignoring the time value of money in the graphs is relatively harmless, but rest assured, we take that into account later when we determine the price of an option.

FIGURE 8.3 PAYOFF OF A CALL OPTION WITH $X = \$75$

The top graph illustrates, from the option buyer's perspective, how a call option's payoff varies as the underlying share price changes. The green line illustrates that the call option's payoff is \$0 if the share price is \$75 or less on the expiration date, but the option's payoff rises dollar for dollar with the share price as the share price rises above \$75. The orange line illustrates the option's net payoff after taking into account the \$8 premium that the buyer paid to acquire the option. The breakeven point occurs when the share price is \$83 ($\$75 + \8). At higher prices, the buyer earns a profit, and at lower prices, the buyer loses money. The buyer's maximum loss is \$8, and the maximum gain is unlimited.

The lower graph illustrates the seller's perspective. The green line illustrates that the call option's payoff is \$0 if the share price is \$75 or less on the expiration date, but the option's payoff falls dollar for dollar with the share price as the share price rises above \$75. The orange line illustrates the option's net payoff after taking into account the \$8 premium that the seller received from the buyer. The breakeven point occurs when the share price is \$83. At lower prices, the seller earns a profit, and at higher prices, the seller loses money. The seller's maximum profit is \$8, and the maximum loss is unlimited.



high the share price is at that time. Whereas the call option buyer enjoys the potential for unlimited gains, the option seller faces exposure to the risk of unlimited losses. Rationally, if \$8 is sufficient to induce someone to sell this option and thereby face the potential of huge losses, it must be the case that the seller perceives the probability of a large loss to be relatively low.

8.2b PUT OPTION PAYOFFS

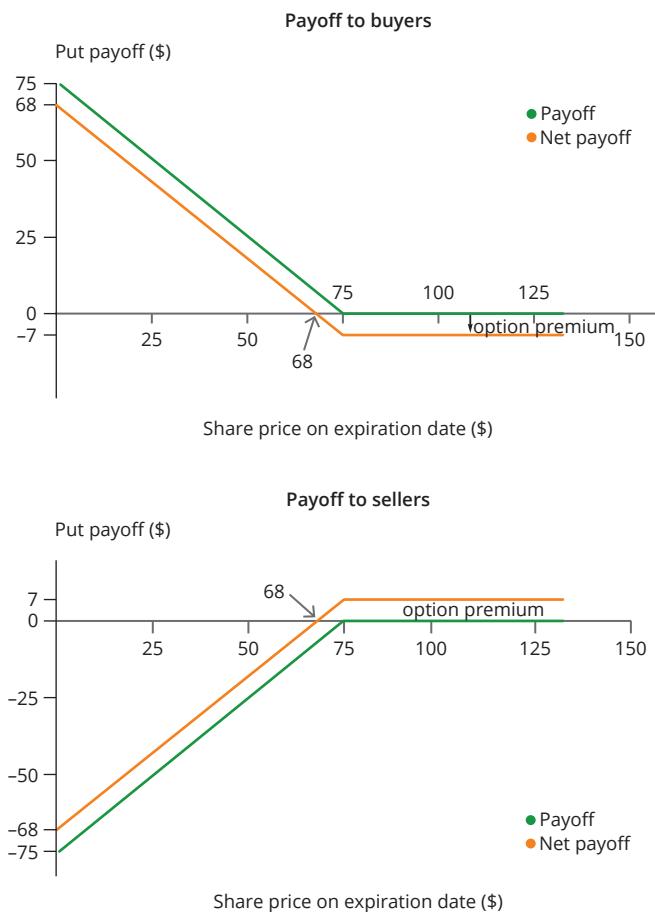
Figure 8.4 shows payoffs for put option buyers (long) and sellers (short). We maintain the assumption that the strike price equals \$75, but, in this figure, the option premium is \$7. For an investor holding a put option, the payoff rises as the share price falls below the option's strike price. However, unlike a call option, a put option's potential gains are limited by a share price that cannot fall below zero (because the law provides limited liability for a company's shareholders). The maximum gain on this particular put equals \$75 (or \$68 on a net basis after subtracting the premium), whereas the maximum loss is the \$7 option premium.

Again, the seller's perspective is just the opposite of the buyer's. The seller earns a maximum net gain of \$7 if the option expires worthless because the share price exceeds \$75 on the expiration date, and the seller faces a maximum net loss of \$68 if the company goes bankrupt and its shares become worthless.

We must now clarify an important point. Thus far, all our discussions about options payoffs have assumed that each option buyer or seller had what traders refer to as a **naked option position**. A naked call option, for example, occurs when an investor buys or sells an option on a share without already owning the underlying

naked option position
To buy or to sell an option, without a simultaneous position in the underlying asset

FIGURE 8.4 PAYOFF OF A PUT OPTION WITH X = \$75



The top graph illustrates, from the option buyer's perspective, how a put option's payoff varies as the underlying share price changes. The green line shows that the put option will be worthless on the expiration date if the share price is \$75 or higher. The buyer's payoff rises dollar for dollar as the share price drops below \$75. The orange line illustrates the put option's net payoff, which takes into account the \$7 premium that the buyer paid to acquire the option. The buyer's breakeven point occurs when the share price is \$68 ($\$75 - \7). At lower share prices, the buyer makes a profit, and at higher prices, the buyer loses money. The buyer's maximum profit is \$68, and the maximum loss is \$7.

The lower graph illustrates the seller's perspective. The green line shows that the put option's payoff is \$0 if the share price is \$75 or higher, but the seller loses money as the share price falls below \$75. The orange line illustrates the net payoff and reflects the \$7 premium that the seller received from the buyer. The seller's breakeven point is \$68. At higher share prices, the seller makes a net profit, and at lower prices the seller loses money. The seller's maximum profit is \$7, and the maximum loss is \$68.

EXAMPLE

Payoffs for Trading Options

Jennifer sells a put option on Albany Lighting Systems (ALS) shares to Murray. The option's strike price is \$65, and it expires in one month. Murray pays Jennifer a premium of \$5 for the option. One month later, ALS sells for \$45 per share. Murray purchases a share of ALS in the open market for \$45 and immediately exercises his option to sell

it to Jennifer for \$65 (or Jennifer and Murray could agree to settle their contract by having Jennifer pay Murray \$20). The payoff on Murray's option is \$20, or \$15 on a net basis. Jennifer loses \$20 on the deal, or just \$15, taking into account the \$5 premium she received up-front.

share. Similarly, when a trader buys or sells a put option without owning the underlying shares, the trader creates a naked put position. Buying or selling naked options is an act of pure speculation. Investors who buy naked calls believe that the share price will rise. Investors who sell naked calls believe the opposite. Similarly, buyers of naked puts expect the share price to fall, and sellers take the opposite view.

But many option trades do not involve this kind of speculation. Investors who own particular shares may purchase put options on those shares, not because they expect share prices to decline, but because they want protection in the event that they do. Executives who own their companies' shares may sell call options, not

because they think that the share's future gains are limited, but because they are willing to give up potential profits on their shares in exchange for current income. To understand this proposition, we need to examine payoff diagrams for portfolios of options and other securities.

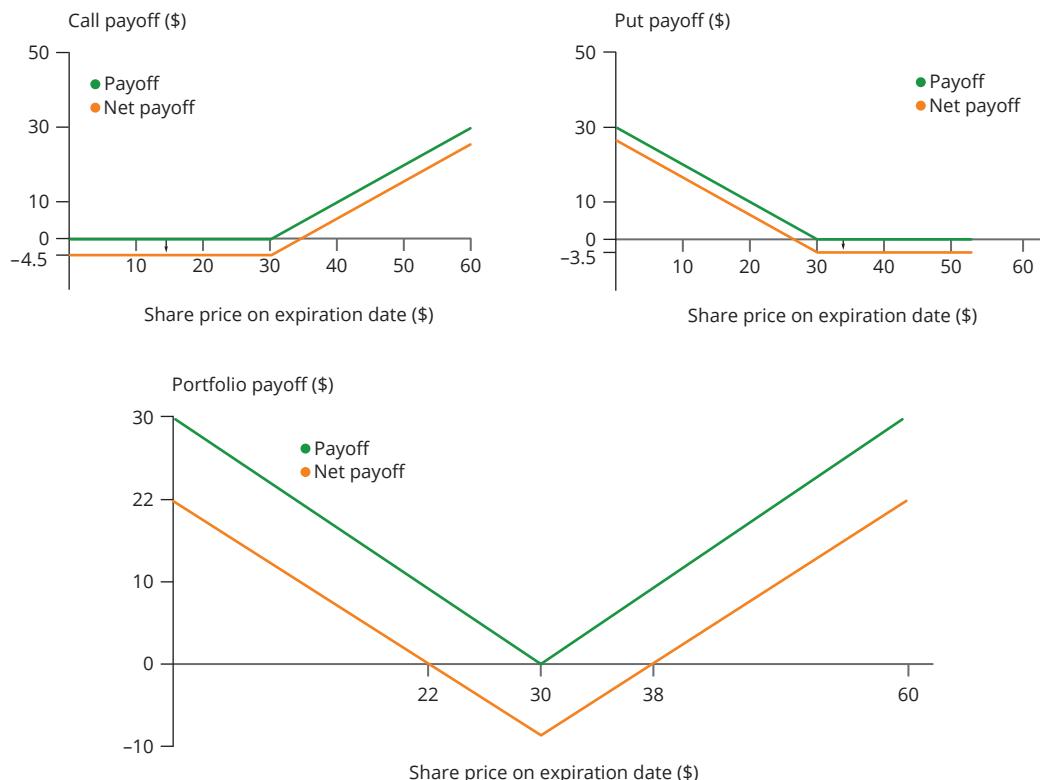
8.2c PAYOFFS FOR PORTFOLIOS OF OPTIONS AND OTHER SECURITIES

Experienced options traders know that by combining different types of options, they can construct a wide range of portfolios with unusual payoff structures. Think about what happens if an investor simultaneously buys a call option and a put option on the same underlying shares and with the same exercise price. We've seen before that the call option pays off handsomely if the share price rises, whereas the put option is most profitable if the share price falls. By combining both into one portfolio, an investor has a position that can make money whether the share price rises or falls.

Suppose that Wendy cannot decide whether the shares of Internet Phones Company (IPC) will rise or fall from their current value of \$30. Suppose Wendy decides to purchase a call option and a put option on IPC shares, both having a strike price of \$30 and an expiration date of 20 April. Wendy pays premiums of \$4.50 for the call and \$3.50 for the put, for a total cost of \$8. **Figure 8.5** illustrates Wendy's position. The payoff of her portfolio equals \$0 if IPC's share price is \$30 on 20 April, and if that occurs, Wendy will experience a net loss

FIGURE 8.5 PAYOFF TO PORTFOLIO CONTAINING ONE CALL AND ONE PUT (X = \$30)

In this situation, the strike price is \$30, the call premium is \$4.50 and the put premium is \$3.50. Combining a put and a call therefore costs \$8. By purchasing a call (upper-left graph) and a put (upper-right graph) option that have the same strike price, an investor can profit from a significant change in the underlying share price in either direction. The orange line in the lower graph shows that the investor makes a net profit if the underlying share price falls below \$22 or rises above \$38.



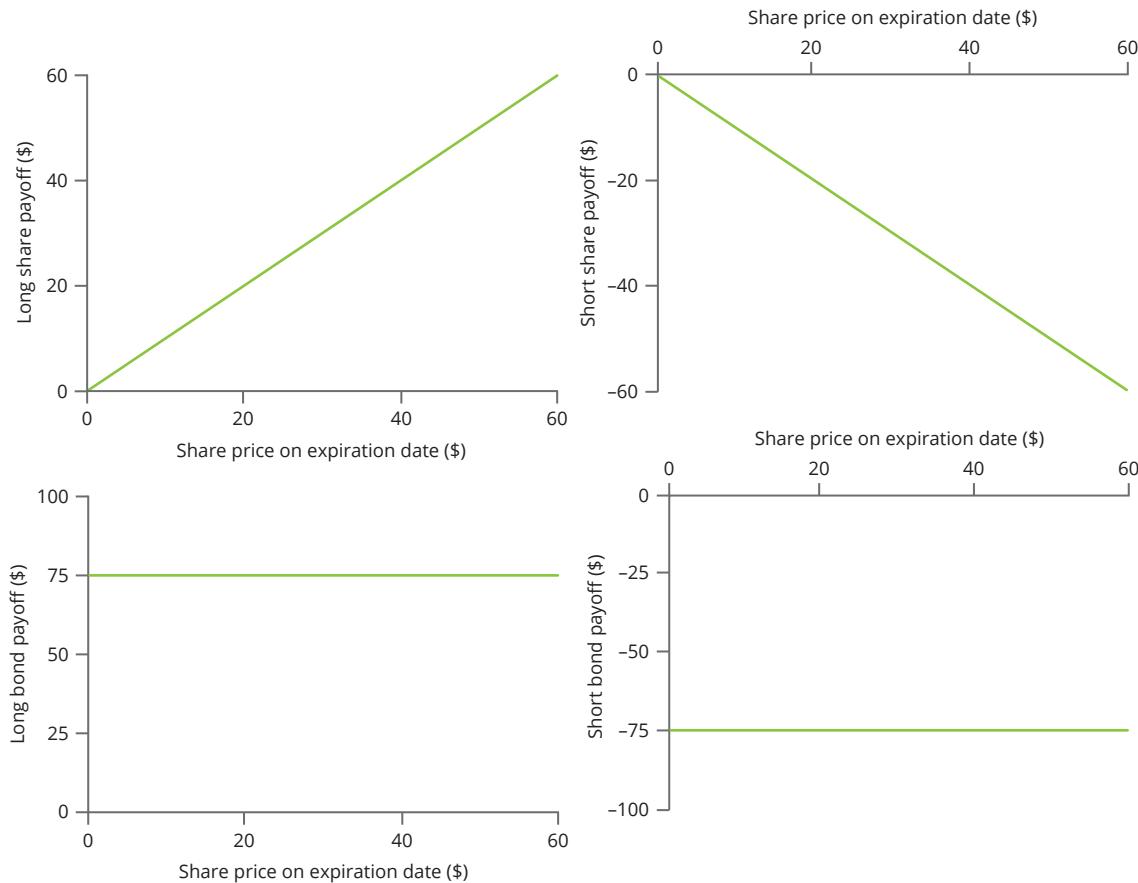
of \$8. But if the share price is higher or lower than \$30 on 20 April, at least one of Wendy's options will be in the money. On a net basis, Wendy makes a profit if the IPC share price either falls below \$22 or rises above \$38, but she does not have to take a view on which outcome is more likely.

In this example, Wendy is speculating, but not on the *direction* of IPC shares. Rather, Wendy's gamble is on the *volatility* of IPC shares. If the shares move a great deal, either up or down, she makes a net profit. If the shares do not move much by 20 April, she experiences a net loss. Options traders refer to this type of position as a *long straddle*, a portfolio consisting of long positions in calls and puts on the same shares with the same strike price and expiration date. Naturally, creating a *short straddle* is possible, too. If Wendy believed that IPC shares would not move far from their current value, she could simultaneously sell a put and a call option on IPC shares, with a strike price of \$30. She would receive \$8 in option premiums from this trade. If IPC shares were priced at \$30 on 20 April, both of the options she sold would expire worthless. On the other hand, if IPC shares moved up or down from \$30, one of the options would be exercised, reducing Wendy's profits from the options sale.

Now let's look at what happens when investors form portfolios by combining options with other securities such as shares and bonds. To begin, examine **Figure 8.6**, which displays payoff diagrams for a long position in

FIGURE 8.6 PAYOFF DIAGRAMS FOR SHARES AND BONDS

The graphs show the payoff for long (upper-left) and short (upper-right) positions in ordinary shares and in risk-free, zero-coupon bonds (lower-left for long bond position, lower-right for short bond position). The payoff diagram for shares is a 45-degree line (upward-sloping for the buyer and downward-sloping for the seller) because the payoff of the shares simply equals the price of the shares. Similarly, the bond payoff lines are horizontal because the bond pays \$75 to the buyer (or requires the seller to pay \$75) with certainty. The bond's payoff is not affected by changes in the share price.



ordinary shares and bonds.⁸ A payoff diagram shows the total value of a security (in this case, one ordinary share or one bond) on a specific future date on the *y*-axis, and the value of a share on that same date on the *x*-axis. In [Figure 8.6](#), the payoff diagram from holding a share is a 45-degree line emanating from the origin because both axes of the graph are plotting the same thing – the value of the share on a future date.⁹

The payoff diagram for the bond requires a little more explanation. The type of bond in this example is very special. It is a risk-free, zero-coupon bond with a face value of \$75. The payoff for an investor who purchases this bond is simply \$75, no matter what the price of the shares underlying the put and call options turns out to be. That's why the diagram shows a horizontal line at \$75 for the long bond's payoff.¹⁰

Next, consider a portfolio consisting of one share and one put option on that share, with a strike price of \$40. If, on the expiration date of the option, the share price is \$40, or more, the put option will be worthless. Therefore, the portfolio's total value will equal the value of one share. What happens if the share price is less than \$40 on the option's expiration date? In that case, the put option has a positive payoff, which ensures that the portfolio's value cannot drop below \$40, even if the share price does. Imagine that the share price falls to \$30. At that point, the put option's payoff is \$10, leaving the combined portfolio value at \$40 (\$30 from the share + \$10 from the put). Simply stated, the put option provides a kind of portfolio insurance, for it guarantees that the share can be sold for at least \$40. However, if the price of the shares rises, the portfolio value will rise right along with it. Though the put option will be worthless, any increase in the share price beyond \$40 increases the portfolio's value as well, as shown in [Figure 8.7](#). This strategy is known as a **protective put**.

Investors can construct portfolios containing options, shares and bonds in ways that generate a wide range of interesting payoffs. We have illustrated how investors could construct a portfolio not only to profit from a share's volatility but also to protect themselves from that volatility, using put options. As we see in the next section, no matter what kind of payoff structure an investor wants to create, there is always more than one way to form a portfolio that generates the desired payoffs.

protective put
A portfolio containing a share and a put option on that share

8.2d PUT-CALL PARITY

In the payoff diagrams we have studied thus far, the vertical axis shows the value of an option at a particular point in time – the expiration date. Knowing what an option is worth when it expires is important, but option traders need to know the value of options at any time, not just on the expiration date. We explore option pricing in greater depth in the next two sections, but we can gain some basic insights into the process of valuing options by examining payoff diagrams.

Suppose an investor forms a portfolio containing one risk-free, zero-coupon bond with a face value of \$75, and one call option with a strike price of \$75. The bond matures in one year, which is also when the call option expires. [Figure 8.8](#) shows that in one year, this portfolio's payoff will be at least \$75. Even if the call option expires out of the money, the bond will pay \$75. In addition, if the price of the underlying shares is high enough, the call option will have a positive payoff, too, and the portfolio's payoff will exceed \$75.

Does this diagram look familiar? Notice that it has the same basic shape as the protective put shown in [Figure 8.7](#). In fact, we could create a new portfolio with exactly the same payoff as the one shown in [Figure 8.8](#), simply by combining one put option, with a strike price of \$75, and one share. Both portfolios provide a minimum payoff in one year of \$75, with additional upside potential if the share price rises above \$75.

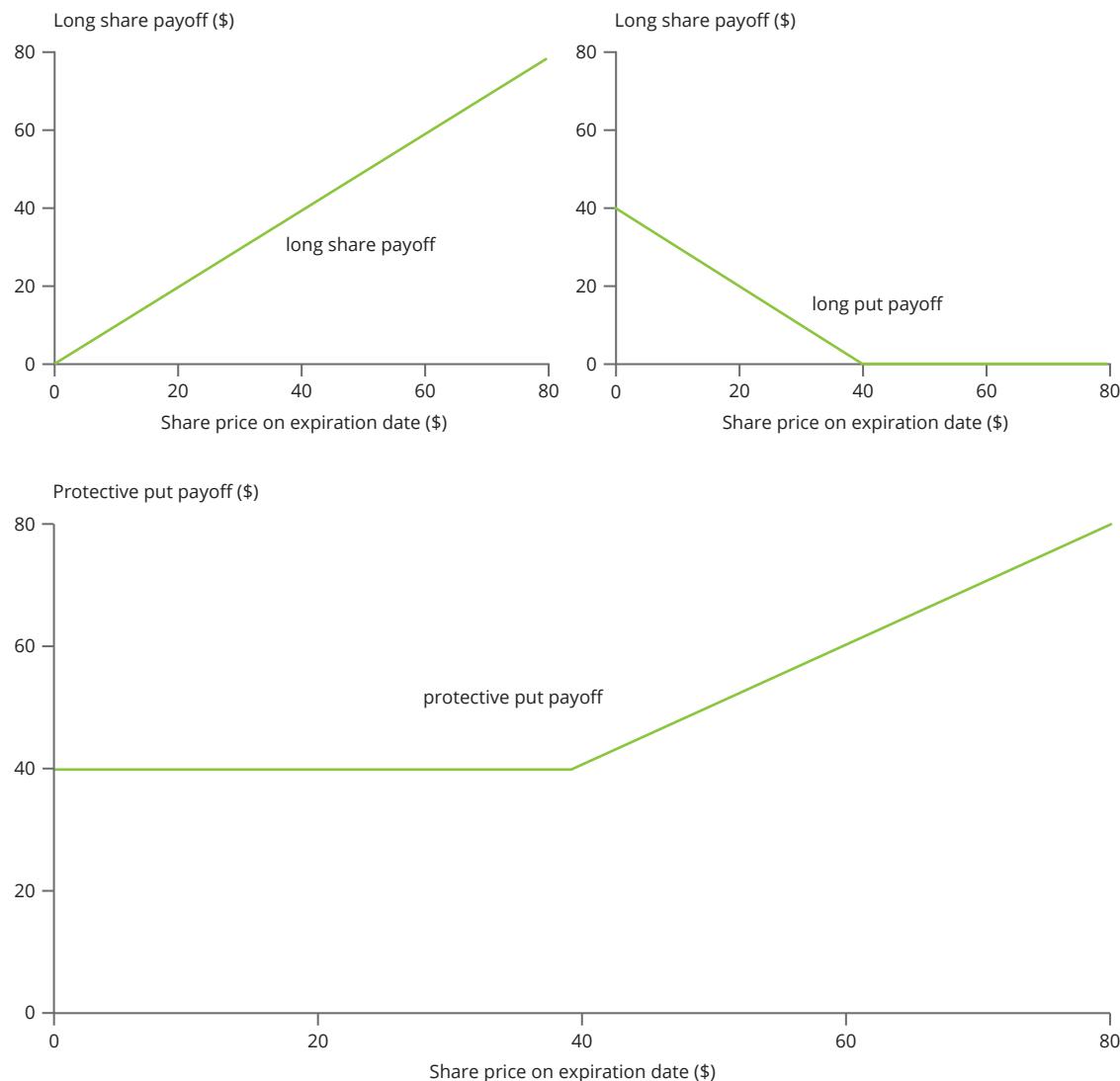
8 In Figure 8.6, we do not plot the net payoff, meaning that the diagram ignores the initial cost of buying shares or bonds, or the revenue obtained from shorting them.

9 Figure 8.6 also shows the payoff diagram for a short position in shares, and as always, it is just the opposite of the long payoff diagram. When investors short sell shares, they borrow shares from other investors, promising to return the shares at a future date. Short selling therefore creates a liability. The magnitude of that liability is just the price of the shares that the short seller must return on a future date.

10 Is it really possible to buy a risk-free bond with a face value of \$75, given the usual face value of (risk-free) government debt is either \$100 or \$1,000? Perhaps not, but an investor could buy 75 Treasury notes, each with a face value of \$1,000, resulting in a risk-free bond portfolio with a face value of \$75,000. The assumption that investors can buy risk-free bonds with any face value is just a simplification to keep the numbers in our examples manageable.

FIGURE 8.7 PAYOFF FROM ONE LONG SHARE AND ONE LONG PUT ($X = \$40$)

The graph shows the payoff on a protective put, a portfolio that combines a long position in the underlying share (upper-left) and a long position in a put option (upper-right) on that share, with a strike price of \$40. If the share price increases above \$40, the investor's portfolio goes up. However, if the share price falls below \$40, the put option gives the investor the right to sell the share at \$40, essentially putting a floor on the portfolio's value.

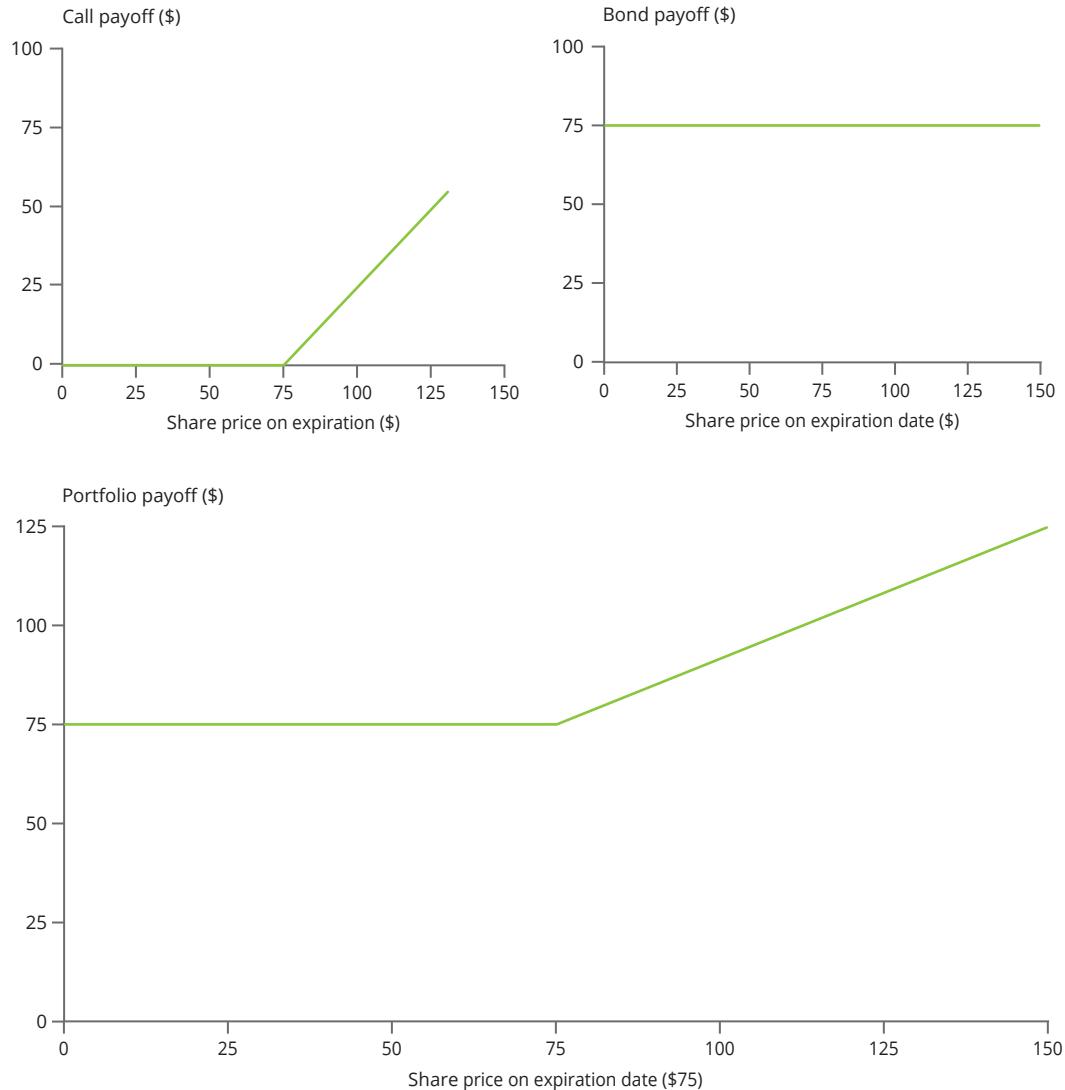


Think carefully about what this means. An investor who wants to construct a position with a minimum payoff of \$75, plus the potential for a higher payoff if the share price rises, has two alternatives. He can either purchase a risk-free bond with a face value of \$75, and a call option with $X = \$75$, or can purchase one share and one put option, with $X = \$75$. No matter what happens to the share price over the next year, these portfolios have equal payoffs on the expiration date. Therefore we can write:

$$\text{Payoff on bond} + \text{Payoff on call} = \text{Payoff on share} + \text{Payoff on put}$$

FIGURE 8.8 PAYOFF ON PORTFOLIO OF ONE BOND (FV = \$75) AND ONE CALL (X = \$75)

The diagram illustrates the payoff of a portfolio containing a call option (upper-left) and a risk-free bond (upper-right). In the bottom graph, we see that the bond ensures that the portfolio's payoff will never be less than \$75. However, if the underlying share price is greater than \$75 on the expiration date, then the portfolio's payoff will be greater than \$75 because both the bond and the call option will have a positive payoff.



This equation applies to payoffs that occur one year in the future, when the put and call options expire and the bond matures. However, an important principle in finance says that if two assets have identical cash flows in the future, then they must sell for the same price today. If that were not true, then investors could earn unlimited risk-free profits by engaging in arbitrage, simultaneously buying the asset with the lower price and selling the asset with the higher price. To prevent arbitrage opportunities, *the price of the portfolio consisting of a bond and a call option must equal the price of the portfolio consisting of one share and one put option.*

In making the previous statement, we took a subtle, but important, step forward in understanding options. Notice that the last sentence of the previous paragraph used the word ‘price’ rather than the word ‘payoff’. Because the future payoffs on these two portfolios will be identical on the expiration date, then the prices of the portfolios must be equal on the expiration date and on any date prior to expiration. We can express this idea algebraically as follows:

(Eq. 8.1)

$$S + P = B + C$$

put-call parity

A relationship that links the market prices of shares, risk-free bonds, call options and put options

In this equation, S stands for the current share price, P and C represent the current market prices (premiums) of the put and call options, respectively, and B equals the current price of the risk-free, zero-coupon bond. **Equation 8.1** describes one of the most fundamental ideas in option pricing, known as **put-call parity**. Put-call parity says that the prices of put and call options on the same underlying share, with the same strike price and the same expiration date, must be related to each other.



Finding the Put Option Price

Sigatoka Pty Ltd shares currently sell for \$28 per share. Put and call options on Sigatoka shares are available, with a strike price of \$30 and an expiration date of one year. The price of the Sigatoka call option is \$6, and the risk-free interest rate equals 5%. What is the appropriate price for the Sigatoka put option? In other words, what price would satisfy put-call parity?

Examine **Equation 8.1**. We know that the share price equals \$28 and the call price is \$6. To find the put price, we also need to know the market price of a risk-free bond. Refer once again to **Figure 8.8**. In that example, the face value of the bond is \$75, equal to the strike price of the option. To apply put-call parity to value the Sigatoka put option, we must recognise that B , in **Equation 8.1**, represents a risk-free bond with a face value of \$30, the same value as the option’s strike price. The face value of the bond must equal the option’s strike price because on

the right-hand side of **Equation 8.1**, it is the bond that provides the ‘floor’ on the portfolio value. On the left-hand side of **Equation 8.1**, the put option creates a floor on the portfolio value, and that floor is equal to the strike price of the put. That is, if the put option’s strike is \$30, then the left-hand side of **Equation 8.1** can never be less than \$30. For the right-hand side of **Equation 8.1** to have the same floor, the bond’s face value must equal \$30.

If a risk-free bond pays \$30 in one year, then the current market price of the bond equals

$$B = \$30 \div (1.05) = \$28.57$$

Plug this and the other known values into **Equation 8.1** to solve for the put price:

$$S + P = B + C$$

$$\$28 + P = \$28.57 + \$6$$

$$P = \$6.57$$

Pause a moment to take an inventory of the information that is required to value the Sigatoka put option. To calculate the put value, we had to know the following facts:

- the strike price of the option, \$30
- the current price of the underlying shares, \$28
- the amount of time remaining before the option expires, one year
- the risk-free interest rate, 5%
- the price of the call option, \$6.

It turns out that each of these items, except for the last one, is required to value an option, whether we use put-call parity or an alternative method to determine the option's price. In the next section, we provide an intuitive, qualitative explanation of how several of these factors influence option prices.

LO8.2

CONCEPT REVIEW QUESTIONS

- 5 What would happen if an investor who owned a share of a particular company also bought a put option with a strike price of \$50, and sold a call option with a strike price of \$50? Try to draw the payoff diagram for this portfolio.
- 6 Is selling a call the same thing as buying a put? Explain why or why not.
- 7 A major corporation is involved in high-profile anti-competitiveness litigation with the government. The company's share price is somewhat depressed due to the uncertainty surrounding the case. If the company wins, investors expect its share price to shoot up. If it loses, its share price will decline even more than it already has. If investors expect a resolution to the case in the near future, what effect do you think that resolution will have on put and call options on the company's shares? (Hint: think about [Figure 8.5](#).)

THINKING CAP QUESTION

- 2 How are the prices of put and call options on the same underlying share related to each other?

LO8.3

8.3 QUALITATIVE ANALYSIS OF OPTION PRICES

Before getting into the rather complex quantitative aspects of pricing options, let's cultivate the intuition needed to understand the factors that influence option prices. We begin by reviewing recent price quotes for options on Charybdis Machine Company shares. [Figure 8.9](#) shows the prices of several Charybdis option contracts in February 2020, the current month of our analysis.

FIGURE 8.9 PRICES OF OPTION CONTRACTS ON CHARYBDIS SHARES, 18 FEBRUARY 2020

The table shows the market prices of various call and put options on Charybdis shares at 18 February 2020. Both call and put prices increase as the expiration date moves from March to June to September.

CHARYBDIS PRICE	EXPIRATION	STRIKE	CALL	PUT
\$83.44	March	\$85	\$2.15	\$4.00
83.44	June	85	5.48	7.60
83.44	September	85	7.24	8.70

8.3a FACTORS THAT INFLUENCE OPTION VALUES

You should notice a striking pattern here. The prices of both calls and puts rise the longer the time before expiration. To understand why, think about the call option that expires in March, roughly one month in the future (from the date that we gathered the option prices). Currently, this option is out of the money because it grants the right to purchase Charybdis' shares for \$85, but investors can buy Charybdis in the open market for \$83.44. Buying the March call option requires an investment of just \$2.15. The option is inexpensive because

there is only a small chance that, before the option expires in one month, Charybdis' share price will increase enough to make exercising the option profitable. If an investor pays \$2.15 for the call option, then Charybdis' share price must reach at least \$87.15 before the investor earns a net profit. That would represent a 4.4% gain on Charybdis shares in just a few weeks, so the low price of the Charybdis call in part reflects that investors doubt the share will move that much in one month.

However, the price of the June call option with a strike price of \$85 is two-and-a-half times greater than the price of the March call. The June option expires in about four months. For an investor who pays \$5.48 to acquire this option, the share price must rise to at least \$90.48 ($\$85 + \5.48) in the next four months so that exercising the option will produce a net profit. That represents an increase of about 8.4% from the current share price. Investors must think that an 8.4% gain in four months is more likely than a 4.4% gain in one month because they are willing to pay more for the June call than the March call. The same pattern holds for puts. The June put option sells for \$3.60 more than the March put option because investors recognise that the chance of a significant drop in Charybdis shares over a one-month period is much lower than the chance of a large decrease over the next four months. In general, *holding other factors constant, call and put option prices increase as the time to expiration increases.*¹¹

Next, let's examine the prices of several Charybdis puts and calls, all of which expire in March. **Figure 8.10** lists the market prices of these options at 18 February 2020. Once again, a clear pattern emerges. Call option prices fall as the strike price increases, and put option prices rise as the strike price increases. This relationship is intuitive. A call option grants the right to buy shares at a fixed price. That right is more valuable the cheaper the price at which the option holder can buy the shares. Conversely, put options grant the right to sell shares at a fixed price. That right is more valuable the higher the price at which investors can sell.

FIGURE 8.10 PRICES OF MARCH OPTION CONTRACTS ON CHARYBDIS SHARES

The table shows the market prices of various call and put options on Charybdis shares at 18 February 2020 and 11 February 2020. The table illustrates that call prices increase and put prices decrease when the difference between the share price and the exercise price ($S - X$) increases.

EXPIRATION	STRIKE	18 FEBRUARY 2020 CHARYBDIS = \$83.44		11 FEBRUARY 2020 CHARYBDIS = \$86.70	
		CALL	PUT	CALL	PUT
March	\$80	\$4.80	\$1.68	\$7.60	\$0.88
March	85	2.15	4.00	4.18	2.48
March	90	0.85	7.85	1.95	5.25
March	95	0.34	12.30	0.78	9.10

We can see a similar relationship by looking at **Figure 8.10**, which shows what happened to the prices of March Charybdis options during the week 11–18 February 2020. During that week, Charybdis shares fell \$3.26. All the call prices in **Figure 8.10** declined during the week, but all the put prices increased. In response to the \$3.26 decline in Charybdis shares, call prices dropped between \$0.44 and \$2.80, and put prices rose between \$0.80 and \$3.20. Combining the lessons of the last few paragraphs, we can say that *call prices increase and put prices decrease when the difference between the underlying share price and the exercise price ($S - X$) increases.*

Finally, to isolate the most important, and the most subtle, influence on option prices, examine **Figure 8.11**, which compares the prices of March options on two different shares, Charybdis and Dubbo

¹¹ There are a few exceptions to this rule. Suppose you hold a European put option on a company that is about to go bankrupt. The company's share price will be nearly zero, and it cannot drop much farther. In this case, you would prefer to exercise your option immediately, rather than having to wait to sell it, so the value of the option will decline as the time to expiration lengthens.

FIGURE 8.11 PRICES OF OPTION CONTRACTS ON TWO COMPANIES, 18 FEBRUARY 2020

On 18 February 2020, call options on Dubbo Phosphates were trading for more than Charybdis calls (holding the strike prices and expiration dates equal). Dubbo Phosphates options were more valuable, in part, because Dubbo Phosphates shares were more volatile.

EXPIRATION	STRIKE	DUBBO PHOSPHATES CALL	CHARYBDIS CALL
March	\$85	\$2.71	\$2.15
March	90	1.24	0.85
Dubbo Phosphates share price = \$83.02			
Charybdis share price = \$83.44			

Phosphates, a producer of phosphate and potash crop fertilisers. On 18 February 2020, these two shares traded at nearly the same prices, with Charybdis at \$83.44 compared to Dubbo Phosphates' \$83.02. We might expect options on Charybdis and on Dubbo Phosphates with similar characteristics – the same expiration date and strike price – to trade at nearly identical prices, but [Figure 8.11](#) shows that this was not the case. Looking at March call options with a \$85 strike price, we see that Charybdis' call sold for \$2.15 while Dubbo Phosphates' was worth 26% more at \$2.71 (despite Dubbo Phosphates' share price trading for \$0.42 less than Charybdis'). For contracts with a slightly higher strike price, \$90, Dubbo Phosphates' call was worth 46% more than Charybdis' (\$1.24 versus \$0.85). Why were Dubbo Phosphates' call options worth so much more, even though its share price was trading at a lower price than that for Charybdis' shares?

History offers a clue about what makes Dubbo Phosphates options so valuable. The weekly price movements in the two shares reveal that the fluctuations in the share price for Dubbo Phosphates were often larger than Charybdis' movements. Dubbo Phosphates is a much smaller company than Charybdis, and its cash flows are very sensitive to movements in agricultural commodity prices (which are themselves notoriously volatile). Perhaps, then, it is not too surprising that Dubbo Phosphates' shares are more volatile than Charybdis'. But why should Dubbo Phosphates' higher volatility lead to higher option prices?

The answer lies in the asymmetry of option payoffs. When a call option expires, its payoff is zero, for a wide range of share prices. Whether the share price falls below the option's strike price by \$1, \$10 or \$100, the call payoff is zero. On the other hand, as the share price rises above the strike price, the call option's payoff increases. A similar relationship holds for puts. The value of a put at expiration is zero if the share price is greater than the strike price. Whether the share price is just above or far above the strike price, it does not change the payoff. However, the put option has a larger payoff the lower the share price falls, once it falls below the strike price. In summary, *call and put option prices increase as the volatility of the underlying share price increases*.

Summing up, we now know that option prices usually increase as time to expiration increases. Option values also rise as the volatility of the underlying asset increases. Call option prices increase as the difference between the share price and the strike price ($S - X$) grows larger, whereas put prices increase as this difference decreases. We are finally ready to tie all this together and calculate market price of puts and calls. Fortunately, simple but powerful tools exist for valuing options. We examine two approaches for valuing options, the binomial model and the Black-Scholes model.

 **EXAMPLE****Finding the Put Option Price**

Suppose you are tracking two shares. One exhibits much more volatility than the other. Let's call the more volatile shares Extreme Pty Ltd and the less volatile shares Steady Corporation. At present, shares of both companies sell for about \$40. At-the-money put and call options are available on both shares, with an expiration date in three months. Based on the historical volatility of each share, you estimate a range of prices that you think the shares may attain by the time the options expire. Next to each possible share price, you write down the option payoff that will occur if the shares actually reach that price on the expiration date (the strike price is \$40 for both options). The numbers appear in **Figure 8.12**.

The payoffs of puts and calls for both companies are zero exactly half the time. But when the payoffs are not zero, they are much larger for Extreme Pty Ltd than they are for Steady Corporation. That makes options on

shares in Extreme Pty Ltd much more valuable than options on shares in Steady Corporation.

FIGURE 8.12 POSSIBLE OPTION PAYOFFS FOR EXTREME PTY LTD AND STEADY CORPORATION

SHARES	POTENTIAL PRICES IN THREE MONTHS	CALL PAYOFF	PUT PAYOFF
Extreme Pty Ltd	\$15	\$0	\$25
	35	0	5
	45	5	0
	65	25	0
Steady Corporation	\$30	0	\$10
	38	0	2
	42	2	0
	50	10	0

LO8.3 **CONCEPT REVIEW QUESTIONS**

- 8 Throughout most of this book, we have shown that if an asset's risk increases, its price declines. Why is the opposite true for options?
- 9 Put options increase in value as share prices fall, and call options increase in value as share prices rise. How can the same movement in an underlying variable (for example, an increase either in time before expiration or in volatility) cause both put and call prices to rise at the same time?

LO8.4**8.4 OPTION PRICING MODELS**

Earlier in this chapter, we studied an important relationship linking the prices of puts, calls, shares and risk-free bonds. Put-call parity establishes a direct link between the prices of these assets, a link that must hold to prevent arbitrage opportunities. A similar logic drives the binomial option pricing model. We shall discuss this model in section 8.4a below.

This is not, however, the only option pricing model used by capital market analysts and traders. An option pricing model that is perhaps more famous, but more formidable in its mathematics, is that created by Fischer Black, Myron Scholes and Robert Merton. This model is driven by a recognition that an option that fully

hedges a capital market exposure will thereby reduce the portfolio risk to that of the market risk-free rate; and this insight provides us with the appropriate discount rate to use in what is really a continuous time variant of the present value formula. We examine the Black–Scholes model, as it is conventionally known, in more detail in section 8.4b.

8.4a THE BINOMIAL MODEL

The **binomial option pricing model** recognises that investors can combine options (either calls or puts) with shares of the underlying asset to construct a portfolio with a risk-free payoff. Any asset with a risk-free payoff is relatively easy to value – just discount its future cash flows at the risk-free rate. But if we can value a portfolio containing options and shares, then we can also calculate the value of the options by subtracting the value of the shares from the value of the portfolio.

binomial option pricing model

A model that uses the principle of 'no arbitrage' to calculate call and put values

Let's work through an example that shows how to price an option using the binomial method. The example proceeds in three distinct steps. First, we must find a portfolio of shares and options that generates a risk-free payoff in the future. Second, given that the portfolio offers a risk-free cash payment, we can calculate the present value of that portfolio by discounting its cash flow at the risk-free rate. Third, given the portfolio's present value, we can determine how much of the portfolio's value comes from the shares and how much comes from the option. By subtracting the value of the underlying shares from the value of the portfolio, we obtain the option's market price.

Step 1: Create a Risk-Free Portfolio

Suppose that shares of Financial Engineers Ltd currently sell for \$55. We want to determine the price of a call option on Financial Engineers shares with an exercise price of \$55 and an expiration date in one year. Assume the risk-free rate is 4%.

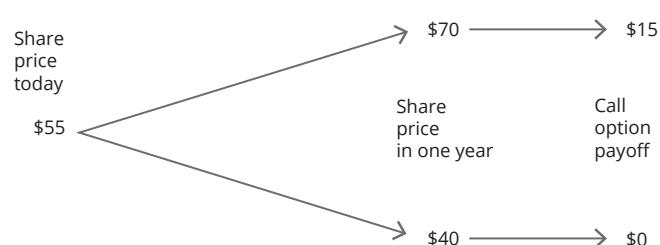
The binomial model begins with an assumption about the volatility of the underlying shares. Specifically, the model assumes that by the time the option expires, the share will have increased or decreased to a particular dollar value. In this problem, we assume that one year from now, Financial Engineers' share price will have risen to \$70 or fallen to \$40. [Figure 8.13](#) provides a simple diagram of this assumption.¹²

The call option we want to price has a strike of \$55. Therefore, if the underlying share reaches \$70 in one year, the call option will be worth \$15. However, if Financial Engineers' price falls to \$40, the call option will be worthless.

Here is the crux of the first step. We want to find some combination of Financial Engineers' shares and the call option which yields the same payoff whether the share goes up or down over the next year. In other words, we want to create a risk-free combination of shares and calls. To begin, suppose we purchase one share

FIGURE 8.13 BINOMIAL OPTION PRICING

The figure shows that in one year, Financial Engineers' shares will each be worth \$70 or \$40. If there is a call option on these shares, with a strike price of \$55, then they will be worth \$15 or \$0 when that option expires in one year.



12. How can we possibly know that the price of Financial Engineers' shares will be either \$70 or \$40? Of course, we cannot know that. Almost any price is possible one year in the future. Soon, we will illustrate that this assumption, which seems completely ridiculous now, isn't really necessary in a more complex version of the binomial model. But let's understand the simple version first.

and h call options. At the moment, we do not know the value of h , but we can solve for it. Because our portfolio objective is to generate the same cash payment one year from now, whether our share rises or falls, we can write down the portfolio's payoffs in each possible scenario and then choose h so that the payoffs are equal.

	CASH FLOWS ONE YEAR FROM TODAY	
	IF THE SHARE PRICE GOES UP TO \$70	IF THE SHARE PRICE DROPS TO \$40
One share is worth	\$70	\$40
h options are worth	\$15 h	\$0 h
Total portfolio is worth	\$70 + \$15 h	\$40 + \$0 h

A portfolio that contains one share and h call options will have the same cash value in one year if we choose the value of h that solves this equation:

$$70 + 15h = 40 + 0h$$

$$h = -2$$

The value of h represents the number of call options in our risk-free portfolio. Because h equals -2 , we must *sell two call options* and combine that position with our single share to create a risk-free portfolio. Why do we sell options to achieve this objective? Remember that the value of a call option rises as the share price rises. If we own a share and a call option (or several call options) on that share, the assets in our portfolio will move together, rising and falling at the same time. To create a portfolio that behaves like a risk-free bond, we need the movements in the shares and the call option to offset each other. If the share price movements exactly cancel out fluctuations in the call, then the portfolio's payout will not move at all, just like a risk-free bond. Therefore, if we buy a share, we must sell call options to create offsetting movements between the assets in our portfolio.

What happens to our portfolio if we buy one share and sell two calls? You can see the answer in two ways. First, just plug the value -2 back into the equation that we used to solve for h . You get:

$$40 = 40$$

This expression says that the portfolio payoff will be \$40 whether the share price increases or decreases. Another way to see this is to lay out the payoffs of each asset in the portfolio in a table like this.

	CASH FLOWS ONE YEAR FROM TODAY	
	IF THE SHARE PRICE GOES UP TO \$70	IF THE SHARE PRICE DROPS TO \$40
One share is worth	\$70	\$40
Two short options are worth	-30	0
Total portfolio is worth	40	40

The first line of the table is self-explanatory. The second line indicates that if we sell two call options and the share price equals \$70 next year, then we will owe the holder of the calls \$15 per option, or \$30 total. On the other hand, if one year from now the share price equals \$40, then the call options we sold will be worthless, and we will have no cash outflow. In either case, the total cash inflow from the portfolio will be \$40.

Because this portfolio pays \$40 in one year, no matter what happens, we call it a perfectly hedged portfolio. The value of h is called the **hedge ratio** because it tells us what combination of shares and calls results in a perfectly hedged position.¹³

hedge ratio
A combination of shares and options that results in a risk-free payoff

¹³ The hedge ratio can be defined as the ratio of calls to shares in a perfectly hedged portfolio (the definition we use here) or as the ratio of shares to calls. In this example, the hedge ratio equals either 22:1 (using our definition) or 21:1 (using the alternative definition). Either way, the hedge ratio defines the mix of options and shares that results in a perfectly hedged portfolio.

Step 2: Calculate the Present Value of the Portfolio

Because the portfolio, which consists of one share and two short call options, pays \$40 for certain next year, we can say that the portfolio behaves like a risk-free bond (in technical terms, the portfolio is a ‘synthetic’ risk-free bond). The second step requires us to calculate the present value of the portfolio. Because we already know that the risk-free rate equals 4%, the present value of the portfolio equals:

$$PV = \frac{\$40}{1.04} = \$38.46$$

It is crucial at this step to understand the following point. Buying one share and selling two calls yields the same future payoff as buying a risk-free, zero-coupon bond with a face value of \$40. Because both investments offer, with certainty, \$40 in one year, they should both sell for the same price today. That is the insight that allows us to determine the option’s price in the next step.

Step 3: Determine the Price of the Option

If a risk-free bond paying \$40 in one year costs \$38.46 today, then the net cost of buying one share of the Financial Engineers enterprise and selling two call options must also be \$38.46. Why? Both investment strategies offer the same future cash flows, so they must both sell for the same price. Therefore, to determine the price of the option, we need to write down an expression for the cost of our hedged portfolio and set that expression equal to \$38.46.

From the information given in the problem, purchasing one share costs \$55. Partially offsetting this cost will be the revenue from selling two call options. Denoting the price of the call option, C , we can calculate the total cost of the portfolio as follows:

$$\text{Total portfolio cost} = \$55 - 2C = \$38.46$$

Solving for C , we obtain a call value of \$8.27.

At this point, it is worth reviewing what we’ve accomplished. We began with an assumption about the future movements of the underlying shares. Next, given the type of option we wanted to value and its characteristics, we calculated the payoffs of the option for each of the two possible future share prices. Given those payoffs, we discovered that, by buying one share and selling two calls, we could generate a certain payoff of \$40 in one year. Because the present value of that payoff is \$38.46, the net cost of buying the share and selling the calls must also equal \$38.46. That implies that we received revenue of \$16.54 from selling two calls, or \$8.27 per call. The following example repeats the process to value an identical put option on the same underlying shares.



Using Binomial Theorem for Option Pricing

We begin this problem with the same set of assumptions from the last problem. Financial Engineers shares each sell for \$55, and may increase to \$70 or decrease to \$40 in one year. The risk-free rate equals 4%. We want to use the binomial model to calculate the value of a one-year put option with a strike price of \$55. We begin by finding the composition of a perfectly hedged portfolio. As before, let’s write down the payoffs of a portfolio that contains one share and h put options.

	CASH FLOWS ONE YEAR FROM TODAY	
	IF THE SHARE PRICE GOES UP TO \$70	IF THE SHARE PRICE DROPS TO \$40
One share is worth	\$70	\$40
h options are worth	\$0h	\$15h
Total portfolio is worth	\$70 + \$0h	\$40 + \$15h



Notice that the put option pays \$15 when the share price falls, and pays nothing when the share price rises. Set the payoffs in each scenario equal to each other and solve for h :

$$70 + 0h = 40 + 15h$$

$$h = 2$$

To create a perfectly hedged portfolio, we must buy one share and two put options. Observe that in this problem we are buying options, not selling them. Put values increase when share values decrease, so it is possible to form a risk-free portfolio containing long positions in both shares and puts because they move in opposite directions. By plugging the value of $h = 2$ back into the equation, we see that an investor who buys one share and two put

options essentially creates a synthetic bond with a face value of \$70:

$$70 + 0(2) = 40 + 15(2)$$

$$70 = 70$$

Given a risk-free rate of 4%, the present value today of \$70 is \$67.31. It would cost \$67.31 to buy a one-year, risk-free bond paying \$70, so it must also cost \$67.31 to buy the synthetic version of that bond, consisting of one share and two puts. Given that the current share price is \$55, and letting P denote the price of the put, we find that the put option is worth \$6.16 (rounding to the nearest cent):

$$\text{Cost of one share} + 2 \text{ puts} = \$67.31 = \$55 + 2P$$

$$\$12.31 = 2P$$

$$\$6.16 = P$$

Take a moment to look over the last two examples of pricing options that use the binomial approach. Make a list of the data needed to price these options:

- the current price of the underlying shares
- the amount of time remaining before the option expires
- the strike price of the option
- the risk-free rate
- the possible values that the underlying shares could take in the future.

On this list, the only unknown is the fifth item. You can easily find the other four necessary values by looking at current market data.

At this point, we want to pause and ask one of our all-time favourite exam questions. Look back at [Figure 8.13](#). What assumption are we making about the probability of an up-and-down move in Financial Engineers' shares? Most people see that the figure shows two possible outcomes and guess that the probabilities must be 50–50. That is not true. At no point in our discussion of the binomial model did we make any assumption about the probabilities of up-and-down movements in the shares. We don't have to know what those probabilities are to value the option, which is convenient because estimating them could be very difficult.

Why are the probabilities of no concern to us? There are two answers to this question. The first is that the market sets the current price of the shares at a level that reflects the probabilities of future up-and-down movements. In other words, the probabilities are embedded in the share price, even though no one can see them directly.

The second answer is that the binomial model prices an option through the principle of 'no arbitrage'. Because it is always possible to combine a share with options (either calls or puts) into a risk-free portfolio, the binomial model says that the value of that portfolio must be the same as the value of a risk-free bond. Otherwise, an arbitrage opportunity would exist because identical assets would be selling at different prices. Hence, because the portfolio containing shares and options offers a risk-free payoff, the probabilities of up-and-down movements in the share price do not enter the calculations. An investor who holds the hedged portfolio doesn't need to worry about movements in the shares because they do not affect the portfolio's payoffs.

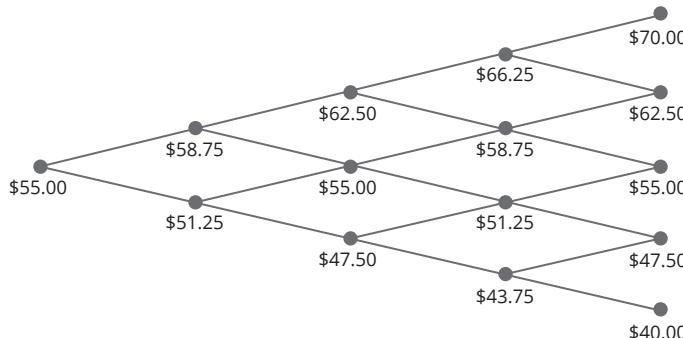
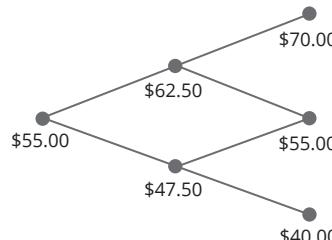
Almost all students object to the binomial model's assumption that the price of a share can take just two values in the future. Fair enough. It is certainly true that one year from today, the price of Financial Engineers may be \$70, \$40 or almost any other value. However, it turns out that more complex versions of the binomial do not require analysts to specify just two final prices for the shares. The binomial model can accommodate a wide range of final prices. To see how this works, consider a slight modification to our original problem.

Rather than presume that Financial Engineers shares will rise or fall by \$15 each over a year's time, suppose they may rise or fall by \$7.50 every six months. That's still a big assumption; but if we make it, we find that the list of potential prices of Financial Engineers shares one year from today has grown from two values to three. [Figure 8.14](#) proves this claim. After one year, the price of the shares may be \$40, \$55 or \$70. Now let's modify the assumption one more time. Suppose the price of the shares can move up or down \$3.75 every three months. [Figure 8.14](#) shows that in this case, the number of possible share prices one year in the future grows to five.

Given a tree with many branches like the one in [Figure 8.14](#), it is possible to solve for the value of a call or put option by applying the same steps we followed to value options using the simple two-step tree. Now imagine a much larger tree, one in which the share price moves up or down every few minutes, or even every few seconds. Each change in the share price is very small, perhaps a cent or two, but as the tree unfolds and time passes, the number of branches rapidly expands, as does the number of possible values of the shares at the option's expiration date. If you imagine what this tree would look like, you can see that when the option

FIGURE 8.14 MULTISTAGE BINOMIAL TREES

The binomial model can be modified to allow for multiple share price movements throughout the life of an option. The more movements we build into the model, the finer the grid of possible share prices when the option expires.



expires in a year, the price of Financial Engineers shares can take any one of hundreds, or even thousands, of different values. Therefore, the complaint about the binomial model's artificial assumption of just two possible share prices no longer applies. Though extremely tedious, solving for the call value involves working all the way through the tree, applying the same steps over and over again.

The binomial model is an incredibly powerful and flexible tool that analysts can use to price all sorts of options, from ordinary puts and calls to complex real options that are embedded in capital investment projects. The genius of the model is in its recognition of the opportunity to use shares and options to mimic the payoffs of risk-free bonds, the easiest of all securities to price. That insight is also central to the second option pricing model that we discuss, the Black–Scholes Model.

8.4b THE BLACK–SCHOLES MODEL

In 1973, Fischer Black and Myron Scholes published what might fairly be called a trillion-dollar research paper. Their research produced, for the first time, a formula that traders could use to calculate the value of call options – a path-breaking discovery that had eluded researchers for decades. Black and Scholes did not have to wait long to see whether their formula would have an effect in financial markets. That same year, options began trading in the United States on the newly formed Chicago Board Options Exchange (CBOE). Traders on the floor of the options exchange used handheld calculators that were programmed with the Black–Scholes formula. From that beginning, trading in options exploded over the next two decades, hence the trillion-dollar moniker given to the original research paper.¹⁴

When you first encounter it, the Black–Scholes option pricing equation looks rather intimidating. As a matter of fact, Black and Scholes' paper was originally rejected by the editor at the prestigious academic journal in which they eventually published their prize-winning formula. The editor felt it was too technical and not of interest to a wide audience. Although it is true that the derivation of the formula requires a rather high level of mathematics, the intuition behind the equation is fairly straightforward. In fact, the logic of the Black–Scholes model mirrors that of the binomial model.

Black and Scholes began their research by asking a question. Suppose investors can buy and sell shares, options on those shares and risk-free bonds. Does a combination of options and shares exist that provides a risk-free payoff? This should sound familiar because it is exactly how you begin when you price an option using the binomial model. However, Black and Scholes' approach to valuing an option differs from the binomial method in several important ways.

First, recall that the binomial model assumes that over a given time period, the share price will move up or down by a known amount. In [Figure 8.14](#), we showed that by shortening the length of the period during which the share price moves, we increase the number of different prices that the shares may reach by the option's expiration date. The Black–Scholes model takes this approach to its logical extreme. It presumes that share prices can move at every instant. If we were to illustrate this assumption by drawing a binomial tree like the ones in [Figure 8.14](#), the tree would have an infinite number of branches, and on the option's expiration date the share price could take on almost any value.

Second, Black and Scholes did not assume that they knew precisely what the up-and-down movements in shares would be at every instant. They recognised that these movements were essentially random, and therefore unpredictable. Instead, they assumed that the volatility, or standard deviation, of a share's movements was known.

With these assumptions in place, Black and Scholes calculated the price of a European call option (on a non-dividend-paying share) with the following equations:

¹⁴ For this achievement, Myron Scholes won the Nobel Memorial Prize in Economic Sciences in 1997, an honour he shared with Robert Merton, another researcher who made seminal contributions to options research. Fischer Black undoubtedly would have been a co-recipient of the Nobel award had he not died in 1995. Indeed, unusually, Black was mentioned in the Prize citation even though under the Nobel rules, he could not be a winner due to his earlier death.

(Eq. 8.2)

$$C = SN(d_1) - Xe^{-rt} N(d_2)$$

(Eq. 8.3)

$$d_1 = \frac{\ln \frac{S}{X} + \left(r + \frac{\sigma^2}{2} \right) t}{\sigma \sqrt{t}}$$
$$d_2 = d_1 - \sigma \sqrt{t}$$

Let's dissect this carefully. We have seen most of the terms in the equation before:

S = current market price of underlying share

X = strike price of option

t = amount of time (in years) before option expires

r = annual risk-free interest rate

σ = annual standard deviation of underlying share's returns

$e = 2.718$ (approximately)

$N(X)$ = the probability of drawing a value less than or equal to X from the **standard normal distribution**.

Does this list of variables look familiar? It should because it is nearly identical to the list of inputs required to use the binomial model. The stock or share price (S), the strike price (X), the time until expiration (t) and the risk-free rate (r) are all variables that the binomial model uses to price options. The new item the Black-Scholes model requires is the standard deviation, σ , of the underlying asset's returns.

What about the term Xe^{-rt} ? Recall from our discussion about continuous compounding, in Chapter 3, that the term e^{-rt} reflects the present value of \$1, discounted at r per cent for t years. Therefore, Xe^{-rt} simply equals the present value of the option's strike price.¹⁵ With this in mind, look again at **Equation 8.2**. The first term equals the share price multiplied by a quantity labelled $N(d_1)$. The second term is the present value of the strike price multiplied by a quantity labelled $N(d_2)$. Therefore, we can say that the call option value equals the 'adjusted' share price minus the present value of the 'adjusted' strike price, where $N(d_1)$ and $N(d_2)$ represent adjustment factors. Earlier in this chapter, we saw that call option values increase as the difference between the share price and the strike price, $S - X$, increases. The same relationship holds here, although we must now factor in the terms $N(d_1)$ and $N(d_2)$.

In the Black-Scholes equation, d_1 and d_2 are simply numerical values (calculated using **Equation 8.3**) that depend on the model's inputs: the share price, the strike price, the interest rate, the time to expiration and volatility. The expressions $N(d_1)$ and $N(d_2)$ convert the numerical values of d_1 and d_2 into probabilities using the standard normal distribution.¹⁶ **Figure 8.15** shows that the value $N(d_1)$ equals the area under the standard normal curve to the left of value d_1 . For example, if we calculate the value of d_1 and find that it equals 0, then $N(d_1)$ equals 0.5, because half of the area under the curve falls to the left of zero. The higher the value of d_1 , the closer $N(d_1)$ gets to 1.0. The lower the value of d_1 , the closer $N(d_1)$ gets to zero. The same relationship holds between d_2 and $N(d_2)$. Given a particular value of d_1 (or d_2), to calculate $N(d_1)$ you need a table showing the cumulative standard normal probabilities, or you can plug d_1 into the Excel function =normsdist(d_1). A common intuitive interpretation of $N(d_1)$ and $N(d_2)$ is that they represent the risk-adjusted probabilities that the call will expire in the money. Therefore, a verbal description of **Equation 8.2** is as follows: the call option price equals the share price, minus the present value of the exercise price, adjusted for the probability that when the option expires, the share price will exceed the strike price (the probability that the option expires in the money).

standard normal distribution

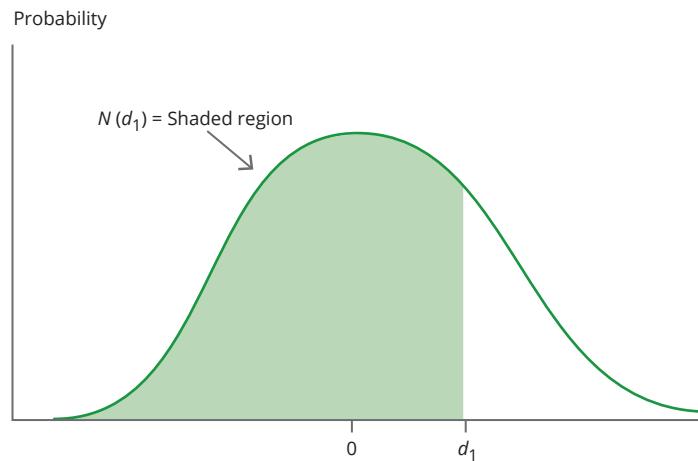
A normal distribution with a mean of zero and a standard deviation of 1

15 Remember, this expression can be written in two ways: $Xe^{-rt} = \frac{X}{e^{rt}}$. Assuming that the continuously compounded risk-free rate of interest equals r and the amount of time before expiration equals t , this is simply the present value of the strike price.

16 Recall from the statistics that the standard normal distribution has a mean equal to zero and a standard deviation equal to 1.

FIGURE 8.15 STANDARD NORMAL DISTRIBUTION

The expression $N(d_1)$ equals the probability of drawing a particular value, d_1 , or a lower value, from the standard normal distribution. In the figure, $N(d_1)$ is represented by the shaded portion under the bell curve. Because the normal distribution is symmetric about the mean, we can write $N(d_1) = 1 - N(-d_1)$.



➤ EXAMPLE

Finding the Put Option Price

Shares of Cloverdale Food Processors currently sell for \$40. A European call option on Cloverdale shares has an expiration date six months in the future and a strike price of \$38. The estimate

of the annual standard deviation of Cloverdale shares is 45%, and the risk-free rate is 6%. What is the call worth? It is worth \$6.58, as shown below.

$$d_1 = \frac{\ln\left(\frac{40}{38}\right) + \left(0.06 + \frac{0.45^2}{2}\right)\frac{1}{2}}{0.45\sqrt{\frac{1}{2}}} = \frac{(0.0513) + (0.0806)}{0.3182} = 0.4146$$

$$d_2 = d_1 - \sigma\sqrt{t} = 0.4146 - 0.45\sqrt{\frac{1}{2}} = 0.0964$$

$$N(0.4146) = 0.6608 \quad N(0.0964) = 0.5384$$

$$C = 40(0.608) - 38(2.718 - (.06)(0.5))(0.5384) = \$6.58$$

By experimenting with **Equations 8.2** and **8.3**, we can study the effect of changes in each of the key input variables on the price of a call option. For example, suppose we recalculate the value of the Cloverdale call option, described earlier, by adjusting just one of the required inputs each time to see the resulting effect on the option's price. After just a few experiments, we could reach the following conclusions:

- The call value increases as the price of Cloverdale shares (S) increases.
- The call value increases as the time to expiration (t) increases.
- The call value increases as the standard deviation of Cloverdale shares (σ) increases.
- The call value increases as the strike price (X) decreases.
- The call value increases as the risk-free interest rate (r) increases.

We have already discussed the first four relationships above. Call values generally increase with increases in the underlying share price, the time to expiration or the volatility of the underlying shares, and calls are more valuable when the strike price is lower. The finding that call values increase when the interest rate increases is new. Here is an intuitive explanation for that relationship. The call option grants the holder the right to buy something and to pay for it at a later date. The right to defer payment is more valuable when the interest rate is high, so call values increase when interest rates do.

Though the Black–Scholes model and the binomial model look very different at first glance, they share the same underlying logical principles. Both models calculate option values based on the notion that combinations of options and underlying shares can mimic the payoffs of risk-free bonds. Both models require essentially the same inputs (S , X , r , t and some assumption about volatility) to calculate option values. And both models produce the same predictions about how changes in the input variables affect option prices.

LO8.4

CONCEPT REVIEW QUESTIONS

- 10 To value options using the binomial method, is it necessary to know the expected return on the shares? Why or why not?
- 11 There is an old saying that nature abhors a vacuum. The financial equivalent is, ‘Markets abhor arbitrage opportunities.’ Explain the central role this principle plays in the binomial model.

THINKING CAP QUESTIONS

- 3 What factors influence the prices of call and put options?
- 4 How does a share’s expected return influence the price of a call option?

LO8.5

8.5 OPTIONS IN CORPORATE FINANCE

Thus far, our emphasis has been on share options that trade in financial markets. The principles we’ve developed to understand those options can be applied more broadly in a wide range of corporate finance problems. We conclude this chapter with a brief overview of the applications of option-pricing techniques to the problems that corporate financial managers encounter on a regular basis.

8.5a EMPLOYEE SHARE OPTIONS

Many companies around the world now use employee share option grants (ESOs) as part of their compensation packages. ESOs are essentially call options that give employees the right to buy shares in the company they work for, at a fixed price. When companies distribute ESOs to their employees, they typically set the strike price equal to the current market price, so ESOs are typically at the money when they are issued. Like the ordinary call options that trade in financial markets, ESOs are most valuable when the price of the underlying shares is well above the strike price. Thus, granting ESOs gives employees an incentive to take actions that increase the company’s share price. Aligning the interests of employees with those of shareholders is one of the primary reasons that companies compensate their people with options. Options do not result in a perfect alignment of interests, however. For example, we know that option values increase if the volatility of the underlying shares increases, so paying managers in options creates at least some incentive for them to take added risk. That added risk may or may not be in the interests of shareholders.

ESOs differ from ordinary call options in several important ways. Whereas the majority of options traded in financial markets expire within a few months, ESOs grant employees the right to buy shares for as long as 10 years. We know that call option values increase as the time towards expiration grows longer, so the long life of ESOs makes them particularly attractive to employees. However, many companies do not allow employees to exercise their options until a ‘vesting’ period has passed. For example, a common requirement is that the employee must work for the company for five years after receiving an ESO grant before the option can be exercised. In a sense, ESOs are a blend of American and European options. Like European options, ESOs cannot be exercised immediately, but like American options, they can be exercised at any time after the vesting period has passed.

Besides using options to give employees an incentive to increase the share price, companies issue options because they require no immediate cash outlay. Small companies, rapidly growing companies and companies that do not have an abundance of cash may elect to pay employees with options as a way of conserving cash.

8.5b WARRANTS AND CONVERTIBLES

warrants

Securities that grant rights similar to a call option, except that when a warrant is exercised, the company must issue a new share, and it receives the strike price as a cash inflow

Warrants are securities that are issued by companies and that grant investors the right to buy shares at a fixed price for a given period of time. Warrants bear a close resemblance to call options, and the same factors that influence call option values (share price, risk-free rate, strike price, expiration date and volatility) affect warrant prices, too. However, there are some important differences between warrants and calls:

- Warrants are issued by companies, whereas call options are contracts between investors who are not necessarily connected to the company whose shares serve as the underlying asset.
- When investors exercise warrants, the number of outstanding shares increases and the issuing company receives the strike price as a capital inflow. When investors exercise call options, no change in outstanding shares occurs, and the company receives no cash.
- Warrants are often issued with expiration dates several years in the future, whereas most options expire in just a few months.
- Although call and put options trade as stand-alone securities, companies frequently attach warrants to public or privately placed bonds, preferred shares and sometimes even ordinary shares. Warrants that are attached to other securities are called **equity kickers**, implying that they give additional upside potential to the security to which they are attached. When companies bundle warrants together with other securities, they may or may not grant investors the right to unbundle them and sell the warrants separately.

Even though warrants and options differ in some important respects, the Black–Scholes model can be used to value warrants – provided an adjustment is made to account for the dilution that occurs when companies issue new shares to warrant holders. A simple example will illustrate how to adjust for dilution.

Assume that a small company has 1,000 shares outstanding worth \$10 each. The company has no debt, so the value of its assets equals the value of its equity: \$10,000. Two years ago, when the company’s share price was just \$8, the company issued 100 ordinary shares to a private investor. Each share had an attached warrant granting a two-year right to purchase one share for \$9. The warrants are about to expire, and the investor intends to exercise them.

What would the investor’s payoff be if she held ordinary call options (sold to her by another private investor) rather than warrants? Because the price of the shares is \$10 and the strike price is \$9, the investor would earn a profit of \$1 per share, or \$100 on the calls. If calls were exercised, then the company would still have 100 shares outstanding worth \$10 each. From the company’s point of view, the call exercise would generate neither a cash inflow nor a cash outflow.

equity kickers

Warrants attached to another security offering (usually a bond offering) that give investors more upside potential

In contrast, if the investor exercises her warrants, then two changes take place. First, the company receives cash equal to the strike price (\$9) times the number of warrants exercised (100), or a total inflow of \$900. This raises the total value of the company's assets to \$10,900. Simultaneously, the company's outstanding shares increase from 1,000 to 1,100, so the new price per share can be calculated as follows:

$$\text{New price per share} = \$10,900 @ 1,100 = \$9.91$$

The investor's payoff on the warrants is just \$0.91, compared to \$1.00 on a comparable call option. Fortunately, it's easy to use the Black–Scholes model to value a call option with characteristics similar to those of a warrant and then multiply the call value times an adjustment factor for dilution. If N_1 represents the number of 'old shares' outstanding and N_2 represents the number of new shares issued as a result of the warrants being exercised, then the price of the warrants equals the price of an identical call option, $\$C$, multiplied by the dilution factor, $N_1/(N_1 + N_2)$:

(Eq. 8.4)

$$\text{Warrant value} = \$C(N_1 / (N_1 + N_2))$$



TARP and Warrant Purchases

Here is a special example of warrant issues being purchased on a very large scale by a single purchaser motivated by a perceived governmental need to help a large financial institution. As part of the Troubled Asset Relief Program (TARP), in 2008 the US government paid Wells Fargo Bank \$25 billion in exchange for preferred shares and warrants. The government received 110.3 million warrants, and Wells Fargo had 3,325 million outstanding shares at the time. We will use the Black–Scholes formula and the adjustment factor in **Equation 8.4** to value the Wells Fargo warrants. To value the warrants, we must know the price of Wells Fargo shares, the expiration date of the warrants, the strike price and the risk-free rate. We also need an estimate of Wells Fargo's volatility. Here are the relevant figures: share price = \$31.22; strike price = \$34.01;

risk-free rate = 2%; expiration = 10 years; standard deviation = 94.7%.

$$d_1 = \frac{\ln\left(\frac{31.22}{34.01}\right) + \left[0.02 + \frac{(0.947)^2}{2}\right]10}{0.947\sqrt{10}}$$

$$= \frac{(-0.086) + (4.684)}{2.995} = 1.535$$

$$d_2 = d_1 - \sigma\sqrt{t} = 1.535 - 2.995 = -1.460$$

$$N(1.535) = 0.938, N(-1.459) = 0.072$$

$$C = 31.22(0.938) - 34.01(2.718)^{-(.02)(10)} = \$27.28$$

$$\text{Warrant} = \frac{3,325}{3,325 + 110.3}(27.28) = \$26.40$$

A *convertible bond* is a bond that grants investors the right to receive payment in the shares of a company rather than in cash.

Usually, the shares, which investors have the right to 'purchase' in exchange for their bonds, are the shares of the company that issued the bonds. In some cases, however, a company that owns a large amount of ordinary shares in a different company will use those shares as the underlying asset for a convertible bond issue. In either case, a convertible bond is essentially an ordinary corporate bond with an attached call option or warrant.

Some years ago, the corporate giant Microsoft announced a sale of four-year, zero-coupon bonds, which were planned to generate proceeds for the company of approximately US\$1.25 billion. Microsoft's bonds offered investors a yield to maturity (YTM) of just 1.85%, similar to the yields on four-year government bonds at the time. How could a technology company borrow money at a rate comparable to that paid by the US government? Investors were willing to buy Microsoft's bonds despite their low yield because the bonds were

convertible into Microsoft ordinary shares. Specifically, each Microsoft bond that had a market value when issued of \$1,000 could be converted into 29.94 ordinary shares of Microsoft.

Convertible bonds offer investors the security of a bond and the upside potential of ordinary shares. If Microsoft's shares increased in value at least six months after the issue date, its convertible bondholders would redeem their bonds for Microsoft shares rather than cash. To see how far Microsoft's shares would have to rise before bondholders would want to convert, we divide the bond price by the conversion ratio.

conversion ratio
The number of shares bondholders receive if they convert their bonds into shares

conversion price
The market price of a convertible bond, divided by the number of shares that bondholders receive if they convert

conversion premium
The percentage increase in the underlying stock that must occur before it is profitable to exercise the option to convert a bond into shares

conversion value
The market price of the shares, multiplied by the number of shares that bondholders receive if they convert

The **conversion ratio** defines how many Microsoft shares bondholders will receive if they convert. In this case, the conversion ratio is 29.94. Therefore, if bondholders choose to convert immediately, they will effectively be paying a **conversion price** for Microsoft of:

$$\text{Conversion price} = \frac{\$1,000}{29.94} = \$33.40$$

At the time Microsoft issued these bonds, its shares were selling for \$25.11 per share. Holding the price of the bond constant at \$1,000, Microsoft's shares would have to rise by 33% before bondholders would want to convert their bonds into ordinary shares. This 33% figure equals the bond's **conversion premium**.

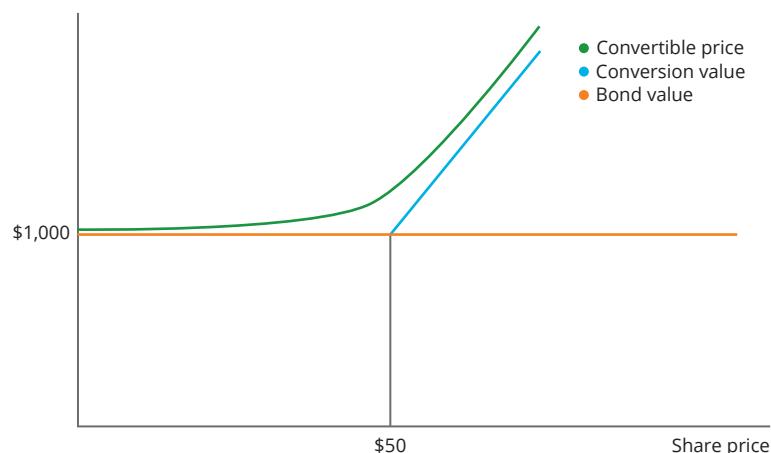
At a share price of \$25.11, it does not make sense for holders of Microsoft's convertible bonds to trade them for shares. Nevertheless, we can still ask: what value will bondholders receive if they do convert? If Microsoft shares sell for \$25.11 and each bond can be exchanged for 29.94 shares, then the **conversion value** of one bond equals \$751.79 ($29.94 \times \25.11).

Conversion value is important because it helps define a lower bound on the market value of a convertible bond. For example, suppose interest rates jump suddenly and the yield on Microsoft's bonds increases; the price of the bonds cannot fall below the conversion value of \$751.79. If it did, investors could exploit an arbitrage opportunity by purchasing one bond and immediately converting it into shares.

In general, we can say that the price of a convertible bond will be, at a minimum, the higher of: (1) the value of an identical bond without conversion rights; or (2) the conversion value. **Figure 8.16** demonstrates this pattern for a generic convertible bond with a par value of \$1,000 and a conversion ratio of 20. The horizontal line represents the present value of the convertible bond's scheduled interest and principal payments, which

FIGURE 8.16 THE VALUE OF A CONVERTIBLE BOND

The convertible bond must sell for at least its value as a straight bond, or its conversion value, whichever is greater. If the bond's value is \$1,000 and the conversion ratio is 20, then the conversion price equals \$50. For each \$1 increase in the share price beyond \$50, the bond's conversion value rises by \$20.



we simplify to be \$1,000. The upward-sloping straight line shows the bond's conversion value at different share prices, and the curved line shows the convertible bond's price. When the share price is very low, so too is the probability that the bonds will ever be worth converting into shares, so the convertible bond sells at a price comparable to an ordinary bond. As the share price rises, the value of the conversion option increases.

Most convertible bonds issued have another feature that slightly complicates matters. When companies issue convertibles, they almost always retain the right to call back the bonds. When companies call their outstanding bonds, bondholders can choose, within 30 days of the call, to receive either the call price in cash or a quantity of shares equal to the conversion ratio. Effectively, the call option that companies retain allows them to shorten the conversion option held by bondholders. If a company calls its bonds, investors will choose cash if the call price exceeds conversion value, and they will choose shares if the opposite is true.

Under what circumstances should a company call its convertible bonds? If managers are acting in the interests of shareholders, they will never call bonds that are worth less than the call price. Doing so would transfer wealth from shareholders to bondholders. Similarly, if the price of a bond rises above the call price because the underlying shares have increased in value, then companies should call the bonds. If companies do not call the bonds and the share price continues to increase, then when investors ultimately choose to convert their bonds into shares, companies will be selling shares at a bargain. Again, the result is a transfer of wealth from shareholders to bondholders. Therefore, the optimal policy is to call the bonds when their market value equals the call price.¹⁷

8.5c OTHER OPTION TYPES

We have focused on financial (especially equity) options in this chapter because these were the first to be analysed successfully, and the growth of formal markets for financial options since 1973 when the Chicago exchange was launched and the Black–Scholes formula was published has been considerable. We have considered financial options for equities and for bonds. Financial options have also been developed for foreign currencies and for insurance products.

Suppose, however, we considered the use of options based on non-financial instruments. Here is an example. Imagine that your company is considering the launch of a new product into the market of your current customers. You undertake a standard NPV (net present value) analysis based on the likely cash flows, the expected horizon for the investment and the appropriate discount rate, all found using the models explained in earlier chapters. As you are about to finalise your calculations, one of your staff members suggests that it may be sensible to run a pilot sales program into the market to check to see how your customers may react to the new product. If, from the pilot, the demand seems strong, then you can launch into the market with much more confidence – and less risk – than tackling the market blind.

Now, a pilot program (or market test) is not a novel idea; but its use tells us something about choices that we now seem to have with the new product launch that were not visible when we thought about the project as a simple, ‘we start it now or we never start it’ venture based on whether the NPV for the project was positive or negative. The use of a pilot first shows us that we do not have to start all projects immediately: we can perhaps wait some time before launching. It also gives us new information about the market that we do not currently possess, which may change our risk evaluation of the project.

¹⁷ Actually, this would be the optimal call policy if companies could force investors to choose cash or shares immediately upon receiving the call. However, because investors in many countries have 30 days to decide whether they want cash or shares, the optimal time to call may be when the market value of the bonds slightly exceeds the call price. The reason is that if companies call the bonds precisely when the market price hits the call price, the share price may fall during the 30-day decision period. A decline in the share price would lower the conversion value, and companies would be forced to redeem the bonds for cash. Allowing the conversion value of the bonds to rise a little beyond the strike price gives companies a little ‘slack’.

Having these choices or options is valuable for the project. They are ‘real options’, in the terminology of Stewart Myers of MIT, who coined the phrase in a publication in 1978. (Real options are discussed in detail in Chapter 11.) In our example, we have an option (choice) on when to begin the project because of the delay induced by running the pilot; and an option on the scale of the project once we have the results of the pilot – we can implement the launch of the new product (full-scale) or not (zero-scale). Each of these options has its own NPV; so we can compare these, as we would any set of project NPVs, and adopt the project with the highest NPV.

In Chapter 11 we will explore in detail the formal framework for real options, but we can conclude our discussion here by listing some types of real options:

- *Waiting-to-invest option*. Should we start a project immediately, or wait for some time?
- *Growth options*. At what scale should we run our project (most projects have several scales, from zero to some maximum level) once we start it?
- *Flexibility options*. Once the project is running, can we change the scale at which we operate?
- *Exit options*. No project really lasts forever, but most projects also do not have a single fixed endpoint; if we learn new information about the likely future cash flows or their risks while running the project, we may recalculate the NPVs of continuing the project and find that we should close it down, or extend it, earlier than thought.

In summary, any project or investment does contain options about its operation that we should account for in the valuation of the project. These real (or embedded) options may be very valuable, and we may undervalue a project in a major way if we ignore them.

LO8.5

CONCEPT REVIEW QUESTIONS

- 12 How are employee share options different from the options that trade on the exchanges and in the over-the-counter market?
- 13 What is the most important reason why companies should be required to show an expense on their income statement for employee share options?
- 14 Suppose a warrant and a call option have the same strike price, the same expiration date and the same underlying asset. Which is more valuable, the warrant or the call? Why?

THINKING CAP QUESTIONS

- 5 Why do you think that companies might offer options on their own shares?
- 6 How does a price of a warrant compare to the price of a call with identical characteristics?

STUDY TOOLS

SUMMARY

- LO8.1**
 - Options are contracts that grant the buyer the right to buy or sell shares at a fixed price.
 - Call options grant the right to purchase shares; put options grant the right to sell shares.
 - Options provide a real economic benefit to society and are not simply a form of legalised gambling.
 - American options allow investors to exercise their options before they expire, but European options do not.
- LO8.2**
 - Payoff diagrams show the value of options or portfolios of options on the expiration date. Payoff diagrams can be used to illustrate how portfolios of options and other securities perform as the underlying share price moves.
- LO8.3**
 - Put-call parity establishes a link between the market prices of calls, puts, shares and bonds.
 - Call option prices rise and put option prices fall as $S - X$ (the share price minus the strike price) increases.
 - Calls increase in value when there is time left before expiration, whereas the effect of a longer expiration period on the value of a put can be positive or negative.
 - An increase in the volatility of the underlying asset increases the values of puts and calls.
- LO8.4**
 - The binomial model uses the principle of 'no arbitrage' to determine the market prices of puts and calls.
- LO8.5**
 - Beyond the pure theory of financial options, option pricing is useful for calculating the worth of executive compensation packages that include share options, and for valuing convertible bonds (which include embedded options). It is also used more generally for evaluating 'real options' (covered in Chapter 11), which are projects with embedded choices for the investor.

IMPORTANT EQUATIONS

TABLE OF IMPORTANT EQUATIONS

$$8.1 \quad S + P = B + C$$

$$8.2 \quad C = SN(d_1) - Xe^{-rt} N(d_2)$$
$$d_1 = \frac{\ln\left(\frac{S}{X}\right) + \left(r + \frac{\sigma^2}{2}\right)t}{\sigma\sqrt{t}}$$

$$8.3 \quad d_2 = d_1 - \sigma\sqrt{t}$$

$$8.4 \quad \text{Warrant value} = \$C(N_1 / (N_1 + N_2))$$

SELF-TEST PROBLEMS

Answers to these 'Self-test problems' and the 'Concept review' questions throughout the chapter appear on the Student Companion Website (<http://login.cengagebrain.com>) or via your instructor.

ST8-1 Several call options on Cuban Cigars Inc. are available for trading. The expiration date, strike price and current premium for each of these options appears below.

STRIKE	EXPIRATION	PREMIUM
\$40	July	\$6.00
\$45	July	\$3.50
\$50	July	\$1.75

An investor decides to purchase one call with a \$40 strike and one with a \$50 strike. At the same time, the investor sells two of the calls with a \$45 strike price. Draw a payoff diagram for this portfolio of options. Your diagram should have two lines, one showing the portfolio's payoff on a gross basis and one showing the payoff net of the cost of forming the portfolio.

- ST8-2** A share currently sells for \$40. In the next six months, the share will either go up to \$45 or fall to \$36. If the risk-free rate is 5% per year, calculate the current market price of a call option on this share with an expiration date in six months and a strike price of \$39.

QUESTIONS

- Q8-1** Explain why an option is a derivative security.
- Q8-2** Is buying an option more or less risky than buying the underlying shares?
- Q8-3** What is the difference between an option's price and its payoff?
- Q8-4** List five factors that influence the prices of calls and puts.
- Q8-5** What are the economic benefits that options provide?
- Q8-6** What is the primary advantage of settling options contracts in cash?
- Q8-7** Suppose you want to invest in a particular company. What are the pros and cons of buying the company's shares versus buying their options?
- Q8-8** Suppose you want to make an investment that will be profitable if a company's share price falls. What are the pros and cons of buying a put option on the company's shares versus short selling the shares?
- Q8-9** Suppose you own an American call option on equity in Woolworths. Woolworths shares have gone up in value considerably since you bought the option, so your investment has been profitable. There is still one month to go before the option expires, but you decide to go ahead and take your profits in cash. Describe two ways that you could accomplish this goal. Which one is likely to leave you with the highest cash payoff?
- Q8-10** Look at the St Kilda Optics call option prices in [Figure 8.1](#). Holding the expiration month constant, call prices increase as the strike price decreases. The strike prices decrease in increments of \$2.50. Do the call option prices increase in constant increments? That is, does the call price increase by the same amount as the strike price drops, from \$35 to \$32.50 to \$30, and so on?

PROBLEMS

OPTIONS VOCABULARY

- P8-1** If the underlying share price is \$37, indicate whether each of the options below is in the money, at the money or out of the money.

STRIKE	CALL	PUT
\$20		
37		
50		

- P8-2** The shares of Spears Entertainment currently sell for \$28 each. A call option on this share has a strike price of \$25, and it sells for \$5.25. A put option on this share has a strike price of \$30, and it sells for \$3.10. What is the intrinsic value of each option? What is the time value of each option?

OPTION PAYOFF DIAGRAMS

P8-3 Draw payoff diagrams for each of the positions below (X = strike price):

- a Buy a call with $X = \$50$
- b Sell a call with $X = \$60$
- c Buy a put with $X = \$60$
- d Sell a put with $X = \$50$

P8-4 Draw payoff diagrams for each of the following portfolios (X = strike price):

- a Buy a call with $X = \$25$, and sell a call with $X = \$30$.
- b Buy a bond with a face value of \$5, short a put with $X = \$30$, and buy a put with $X = \$25$.
- c Buy a share, buy a put option with $X = \$25$, sell a call with $X = \$30$, and short a bond (i.e. borrow) with a face value of \$25.
- d What principle do these diagrams illustrate?

P8-5 Draw a payoff diagram for the following portfolio. Buy two call options, one with $X = \$20$ and one with $X = \$30$, and sell two call options, both with $X = \$25$.

P8-6 Refer to the data in the table below.

STRIKE PRICE	PUT PRICE
\$30	\$1.00
35	\$3.50
40	\$6.50

Suppose an investor purchases one put with $X = \$30$, and one put with $X = \$40$, and sells two puts with $X = \$35$. Draw a payoff diagram for this position. In your diagram, show the gross payoff (ignoring the costs of buying and selling the options) and the net payoff. In what range of share prices does the investor make a net profit? What is the investor's maximum potential dollar profit and maximum potential dollar loss?

P8-7 Suppose that Lisa Emerson owns a share of Brisbane Chemical, which is worth \$10 per share. Lisa purchases a put option on this share, with a strike price of \$9.50, and she sells a call option, with a strike price of \$10.50. Plot the payoff diagram for Lisa's new portfolio.

QUALITATIVE ANALYSIS OF OPTION PRICES

P8-8 Examine the data in the table below. Given that both shares trade for \$50 and both options have a \$45 strike price and a July expiration date, can we say that the option of Company A is overvalued or that the option of Company B is undervalued? Why or why not?

COMPANY	SHARE PRICE	EXPIRATION	STRIKE PRICE	CALL PRICE
A	\$50	July	\$45	\$7.50
B	50	July	45	6.75

P8-9 Suppose an American call option is in the money, so $S > X$. Demonstrate that the market price of this call (C) cannot be less than the difference between the share price and the exercise price. That is, explain why this must be true: $C \geq S - X$. (Hint: consider what would happen if $C < S - X$.)

OPTION PRICING MODELS

P8-10 a A call option expires in three months and has $X = \$20$. The underlying shares are worth \$21 each today. In three months, the shares may increase by \$3.50 or decrease by \$3. The risk-free rate is 2% per year. Use the binomial model to value the call option.

- b** A put option expires in three months and has $X = \$20$. The underlying shares are worth \$21 each today. In three months, the shares may increase by \$3.50 or decrease by \$3. The risk-free rate is 2% per year. Use the binomial model to value the put option.
- c** Given the call and the put prices you calculated in parts (a) and (b), check to see if put-call parity holds.
- P8-11** A share is worth \$20 today, and it may increase or decrease \$5 over the next year. If the risk-free rate of interest is 6%, calculate the market price of the at-the-money put and call options on this share that expire in one year. Which option is more valuable, the put or the call? Is it always the case that a call option is worth more than a put if both are tied to the same underlying shares, have the same expiration date, and are at the money? (Hint: use the put-call parity to prove the statement true or false.)
- P8-12** Darwin Foods shares currently sell for \$48 each. A call option on this equity is available, with a strike price of \$45 and an expiration date six months in the future. The standard deviation of the share's return is 45%, and the risk-free interest rate is 4%. Calculate the value of the call option. Next, use the put-call parity to determine the value of a Darwin Foods put option that also has a \$45 strike price and six months until expiration.

OPTIONS IN CORPORATE FINANCE

- P8-13** A convertible bond has a par value of \$100 and a conversion ratio of 20. If the underlying share currently sells for \$4 and the bond sells at par, what is the conversion premium? The conversion value?

CASE STUDY

OPTIONS

You have recently spent one of your Saturday afternoons at an options seminar presented by Derivatives Traders. Interested in putting some of your new knowledge to work, you start by thinking about possible returns from an investment in the volatile ordinary shares of PurchasePro.com (PPRO). Four options currently trade on PPRO. Two are call options, one with a strike price of \$35 and the other with a strike price of \$45. The other two are put options, which also have strike prices of \$35 and \$45, respectively. To help you decide which options strategies might work, evaluate the following option positions.

ASSIGNMENT

- 1 You believe the price of PPRO will rise, and are therefore considering either: (a) taking a long position in a \$45 call by paying a premium of \$3; or (b) taking a short position in a \$45 put, for which you will receive a premium of \$3. If the share price is \$50 on the expiration date, which position makes you better off?
- 2 You believe the price of PPRO will fall, and are therefore considering either: (a) taking a long position in a \$35 put,



paying a premium of \$2; or (b) taking a short position in a \$35 call, receiving a premium of \$2. If the share price is \$30 on the expiration date, which position makes you better off?

- 3 Assume you can buy or sell either the call or the put options with a strike price of \$35. The call option has a premium of \$3, and the put option has a premium of \$2. Which of these option contracts can be used to form a long straddle? What is the payoff if the share price closes at \$38 on the option expiration date? What is the payoff if the share price closes at \$28 on the option expiration date?
- 4 Assume you can buy or sell either the call or the put options with a strike price of \$35. The call option has a premium of \$3, and the put option has a premium of \$2. Which of these option contracts can be used to form a short straddle? What is the payoff if the share price closes at \$38 on the option expiration date? What is the payoff if the share price closes at \$28 on the option expiration date?

REAL-WORLD CASE STUDY

SHARING THE BUSINESS

This is a short case which brings together several of the financial issues that we have been discussing in Part 2: the role of shares in capital raising for a company; the procedural stages that underpin the process of ‘going to market’ for funds, especially for a company that is going public for the first time; and the sorts of information that the capital markets seek when deciding whether to invest in a (new) company in the hope that the investment will add value to the investors’ portfolios. This is the public launch of a governmental entity (Napier Port in New Zealand), selling 45% of its governmental ownership into private investor hands. We have examined the underpinning corporate finance elements of this sort of investment in Part 2, and the case offers a chance to see them interacting in a real situation.

‘OPINION: The successful NZX listing of 45% of Napier Port is a case study for local authorities struggling to balance the growing requirements for infrastructure investment with limiting demands on ratepayers and retaining control of strategic assets.

The minority listing of Napier Port on August 20 is significant not just because it’s the first substantial new NZX listing in two years, but because it has successfully brought private capital into a public asset while protecting the things that matter most to a local community.

Hawke’s Bay is far from unique. Many of the issues it faces, and which gave rise to the Napier Port IPO, are almost universal across local government: strategic assets requiring intergenerational investment, a lack of appetite from ratepayers to pay for it, a desire from locals to retain control of regional assets and for local authorities to stay within set debt parameters.

Just like Hawke’s Bay, councils now also face the challenges posed by climate change on their infrastructure, lands and assets. There is a bow wave of required major infrastructure investment just around the corner – funding

pressures on local government are storm clouds on the horizon.

In 2018, local government held fixed assets worth \$123 billion, with the provision of physical infrastructure dominating councils’ spending. Debt held by local authorities has increased fivefold, from \$2.7b in 2000 to \$16.2b in 2018. While this level of debt is relatively modest, the trajectory isn’t.

The option of using debt to provide funding to Napier Port was investigated and consulted upon before Hawke’s Bay Regional Council decided on an IPO. This option would have seen debt gearing levels uncomfortably high, have led to direct and significant costs to ratepayers and could have reduced the balance-sheet flexibility to respond to unexpected events, such as natural disasters.

...

Where a minority IPO is the right solution, the Napier Port IPO has set out the conditions by which success should be measured. So what were they?

Let’s start with the balance sheet. At the end of the 2018 financial year, Napier Port was valued at \$291 million on Hawke’s Bay Regional Council’s books. In selling a 45% stake, the council’s new 55% stake was, at the end of the first day of trading, valued at approximately \$330m. Somewhat counter-intuitively, the balance-sheet value of its Napier Port holding increased materially through almost halving its ownership stake.

The main rationale for the IPO was to provide the funding that Napier Port needs to invest in its future – primarily a new wharf at a cost of up to \$190m. In inviting private capital to partner in the port, the regional council was able to provide \$110m to Napier Port. It protected ratepayers from having to foot that bill and realised additional proceeds of over \$100m to invest on behalf of Hawke’s Bay residents.

It has diversified what was an overly concentrated exposure on Napier Port for



income and sensibly reduced its investment and asset risk profile.

The regional council consulted the local community comprehensively on the IPO proposal and put forward a range of options. Perhaps most importantly, it listened to feedback and designed an IPO structure that reflected it. Residents made it clear they did not want to fund the port's expansion but that they valued continued local ownership. A majority of submitters supported a minority IPO.

Approximately 20% of the shares on offer went to groups prioritised through the IPO design: iwi [native Maori groups], port staff, locals and non-resident ratepayers. Almost every permanent employee of Napier Port opted to own shares via an employee share scheme.

Today, Napier Port has the funds it needs to begin to invest in its future. It still has a majority council shareholder representing ratepayers, plus locals, iwi and investment institutions all owning shares. The regional council also retains a healthy level of commercial exposure to the port's financial performance.

This diversification of ownership will provide an opportunity for broader public participation in the port's operations. Having almost every member of staff owning shares can only be positive for the culture and the safe, profitable ongoing operation of Napier Port.

And then there's the capital markets. In harnessing some of the \$6b that flows into KiwiSaver funds every year for regional infrastructure investment, New Zealand can also strengthen and deepen its capital markets.

The Napier Port minority IPO has demonstrated that, when community feedback is incorporated into transaction design, an IPO can meet multiple requirements. It can deliver success for a region and its ratepayers, for local investors and for local authorities facing increasing challenges in the funding of infrastructure investment and environmental management.'

Source: Hill, J. (2019), Napier Port IPO a win-win case study for local government, *The Dominion Post*, 27 August, <https://www.stuff.co.nz/business/115280775/napier-port-ipo-a-winwin-case-study-for-local-government>.

ASSIGNMENT

- 1 Why do you think that the IPO is for a *minority* listing in this case rather than having all the shares placed on the public market?
- 2 What is Napier Port going to do with the funds raised by the IPO?
- 3 The local council's stake of 55% of Napier Port was valued at \$NZ330 million at the end of the first day of trade in August 2019. What has been the history of the valuation using market share prices since the IPO? (*Hint: check the subsequent share price pattern for Napier Port through the internet.*)

SOUND BITES: ETHICS IN CORPORATE FINANCE – PART 2

WRITTEN BY BORIS BIELER

Boris Bieler has over twenty years of risk management experience mainly gained in senior audit leadership roles at foreign corporate and investment banks in Australia. For his full biography, please see p. 114.



JANE WONG'S INTRODUCTORY TRAINING – INSIDER TRADING: AN EXAMPLE OF UNETHICAL BEHAVIOUR

On Jane's first day at work, she joined all new starters for the firm's introductory training, which focused on the company's strategy and values, different business divisions, employees' obligations to comply with all legal and regulatory requirements and the firm's internal governance and ethics framework. In group discussions, Jane learnt about situations of conflicts of interest that she would be likely to face in her new role as a mergers and acquisitions (M&A) analyst – *insider trading* being one of them.

- Insider trading is the buying or selling of stocks, bonds or other financial securities by someone who has material non-public information (MNPI). Specific to Jane's role, she might have access to MNPI about her clients while working on M&A transactions which are yet to be publicly announced. Such information might drive the share price of the companies involved. The conflict is that self-interest by the individual is pursued without regard for others. If Jane or any of her colleagues misused such information about upcoming financial transactions for their personal gain, they would disadvantage other investors who do not have knowledge about such developments.
- As an example of such rules, in Australia insider trading is prohibited by the *Corporations Act 2001*, which is enforced by the Australian Securities and Investments Commission (ASIC). The justification for such

a prohibition is that insider trading damages confidence in market efficiency, fairness and transparency. Leaking information and trading upon material non-public details of corporate transactions has serious consequences, including jail sentences.

- Jane's company has a comprehensive governance and control framework in place to prevent and detect insider trading. Internal procedures define the employee's roles and responsibilities of handling MNPI. Staff members must seek pre-approval for personal trading and are restricted from trading securities if they possess insider information about the company. They are obliged to disclose any conflicts outside their employment which would include directorships and shareholdings, especially in relation to existing or potential clients of their employer. In the end, the employee's awareness and good judgement is the best way to prevent any wrong-doing, and therefore Jane's employer significantly invests in its staff members' continuous education to ensure everyone follows the law and the firm's internal standards.
- Evidencing and trialling cases of insider trading have been made easier over the past few years by enhancing regulators' and companies' data collection and data analytics capabilities. In response to the public's demand for market integrity, regulators have also been empowered



with better access to information, stronger penalty regimes for insider trading and better resourced enforcement teams.

Jane enjoyed the lively discussion in her group. In brief, she learned about how to identify such conflicts, the consequences

different actions might have, and ultimately what 'right' actions she might need to take in managing MNPI. In case of doubt, she was assured her manager and the firm's Compliance department could always provide further advice to her.

ASSIGNMENT

- 1 Imagine that you had been invested for a number of years in a logistics company which consistently underperformed. To cut your losses short, you now decide to sell the shares. One day after you sell, the share price skyrockets. Curious about what may have happened, you go through all publicly available sources and do not find any indication for that sudden jump in the share price. Two days later, you read in the media that this company may be acquired by an overseas pension fund and that ASIC is currently investigating the recent movements in the company share price. What has just happened? Can you explain the reason for ASIC's interest? And how do you feel about selling off your shares just two days before the share price doubled?
- 2 How do you assess the consequences and penalties imposed on individuals sentenced for insider trading? Do you think they provide sufficient deterrence for offenders? To support your response, please do some research online on insider cases which resulted in jail time.
- 3 Imagine a situation where you overhear a conversation about a potential merger of two well-known companies. Assuming you are a student and not bound by any company's rules, is it acceptable, in your view, to distribute and trade upon the information?
- 4 You might have heard about the big headlines in the media about banks' manipulation of interest rate benchmarks and foreign exchange currency rates. Based upon your online research, please describe some examples:
 - a What happened?
 - b Apparent impacts on the public and other market participants.
 - c The regulatory and court consequences for the companies and individuals involved.
- 5 ASIC provides a semi-annual enforcement update which includes a status report on recent insider trading cases (<http://www.asic.gov.au>). Please read recent publications and provide a trend assessment on the number of insider trading cases being investigated; any patterns you see in the way information was leaked; and which internal controls may have failed in preventing and detecting the crime.



Corporate finance is the art of measuring and managing value over time and with uncertainty

Cash is the physical measure of value, which is embedded in the flow of **Time** and affected by **Uncertainty**. Exchange of value occurs through **Market interaction**.

PART 3

Capital Budgeting

- 9 Capital Budgeting Process and Decision Criteria**
- 10 Cash Flow and Capital Budgeting**
- 11 Risk and Capital Budgeting**

The long-run success or failure of most businesses critically depends on the quality of their investment decisions. For many companies, the most important investment decisions are those that involve the acquisition of fixed assets such as manufacturing plants and equipment. In finance, we refer to the process of making these investment decisions as *capital budgeting*. This part of the text focuses exclusively on capital budgeting.

Chapter 9 describes some of the methods that companies use to evaluate investment opportunities. The preferred approach is the net present value (or NPV) method. In an NPV analysis, a financial manager derives the incremental cash flows associated with a particular investment and discounts those cash flows at a rate that reflects the investment's risk. If the present value of the discounted cash flows exceeds the cost of the project, the project has a positive NPV. The investment rule is to invest when the NPV is positive.

Chapter 10 goes deeper into NPV analysis by showing how analysts derive the cash flow estimates necessary to calculate a project's NPV. Experienced analysts know

that certain types of cash flows occur in almost any investment project, so Chapter 9 lists several categories of cash flows and explains how to treat them properly in an NPV calculation.

Chapter 11 focuses on the second step in calculating NPVs: choosing the rate at which the investment's cash flows will be discounted. Conceptually, the discount rate should reflect the risk of the investment being analysed. Analysts should use higher discount rates when they evaluate riskier investment projects. Furthermore, managers should 'look to the market' to estimate what rate of return investors expect the company to achieve. The market rates on debt and equity can be combined to determine the underlying required return on a company's assets, which is the weighted average cost of capital (or WACC) for their company. The WACC establishes an important 'hurdle rate' for companies. On average, if the company purchases assets that generate returns greater than the company's WACC, then the company's investors earn a positive risk-adjusted return, which creates wealth for shareholders.

9

CAPITAL BUDGETING PROCESS AND DECISION CRITERIA

WHAT COMPANIES DO

INVESTMENT IN GHANA PROVIDES AN IMPRESSIVE RETURN FOR PMI GOLD

A January 2012 pre-feasibility study reported good news for PMI Gold Corporation (PMI), an Australian resource company jointly listed on the Australian Securities Exchange, Toronto Stock Exchange and Frankfurt Stock Exchange. The study estimated that PMI's flagship 100%-owned Obotan Gold Project in Ghana, West Africa, could produce an average annual yield of 205,600 oz. of gold over an initial expected mine life of 11.2 years.

The financial implications of that production were substantial. PMI Gold's investment in the Ghanaian project had an estimated net present value (NPV) of US\$680.5 million and post-tax NPV of US\$416.4 million, assuming a US\$1,300/oz. gold price and 5% discount rate. It was expected to produce a pre-tax internal rate of return (IRR) of more than 42% (equivalent to a post-tax IRR of 31%), with a 2.9-year payback period after gold production begins. The company announced that it expects initial capital costs of US\$183.5 million in addition to pre-strip mining costs of US\$68.3 million,

and forecast the total cash cost over the life of the mine to be US\$690.2/oz. (including royalties, refining costs and pre-strip mining costs). Canadian investors reacted positively to the report. PMI Gold's Canadian closing share price rose 2.4% in the second full day of trading following the announcement, while its closing share price on the Frankfurt Stock Exchange rose by 3.1%. Its Australian closing share price remained unchanged over the same period. PMI was subsequently acquired by Asanko Gold Inc. (listed on the New York Stock Exchange (NYSE) and the Toronto Stock Exchange) in February 2014, after protracted negotiations that had commenced as an attempted merger-of-equals deal in December 2012.¹

Sources: Adapted from PMI Gold Corporation news release, January 2012; *QuoteMedia*, http://tmx.quotemedia.com/pricehistory.php?qm_page=64353&qm_symbol=PMV; ASX Limited, <http://www.asx.com.au/asx/research/companyInfo.do?by=asxCode&asxCode=PVM>; and Bloomberg, <http://www.bloomberg.com/quote/PN3N:GR>. Accessed 9 December 2015.

¹ Mergers of equals are discussed in Chapter 17.

LEARNING OBJECTIVES

After studying this chapter, you should be able to:

- LO9.1 understand capital budgeting procedures and the ideal characteristics of a capital budgeting technique
- LO9.2 discuss the logic, calculation, and pros and cons of the net present value (NPV) method, as well as a variant of this, the economic value added (EVA) method
- LO9.3 describe the logic, calculation, advantages and problems associated with the internal rate of return (IRR) technique, and differentiate between the NPV and IRR techniques by focusing on the scale and timing problems
- LO9.4 discuss the profitability index and findings with regard to the actual use of NPV and IRR in business practice
- LO9.5 understand the use of the payback period and the discounted payback to evaluate capital expenditures
- LO9.6 understand the use of the accounting rate of return to evaluate capital expenditures
- LO9.7 see how an empirical example can be used to illustrate the various capital budgeting techniques discussed in the chapter.

Many decisions that managers make have a long-term impact on the company, and can be very difficult to unwind once initiated. Major investments in plant and equipment fit this description, as does spending on advertising designed to build brand awareness and loyalty among consumers. The terms **capital investment** and **capital spending** refer to investments in these kinds of long-lived assets, and **capital budgeting** refers to the process of determining which of these investment projects a company should undertake.

The capital budgeting process involves these basic steps:

- 1 Identify potential investments.
- 2 Estimate the incremental inflows and outflows of cash associated with each investment.
- 3 Estimate a fair rate of return on each investment given its risk.
- 4 Analyse and prioritise the investments utilising various decision criteria.
- 5 Implement and monitor the performance of accepted projects.

Rarely is there a shortage of ideas for how a company should invest its capital. Compelling proposals to modernise production equipment, expand research and development programs, upgrade information technology or launch new advertising campaigns pour in from all of the company's functional areas. The financial analyst's job is to analyse these investment opportunities, weighing their risks and returns to determine which projects create the most value for shareholders.

In this chapter, we describe the different decision criteria that companies use to make capital investment decisions, highlighting the strengths and weaknesses of alternative methods. In the end, the preferred technique for evaluating most capital investments is called net present value (NPV).

capital budgeting
The process of determining which long-lived investment projects a company should undertake

9.1 INTRODUCTION TO CAPITAL BUDGETING

This section provides an understanding of capital budgeting procedures and the ideal characteristics of a capital budgeting technique. We start by assessing the traits of ideal investment criteria, and then introduce a capital budgeting problem that we can use to apply different decision-making techniques.

9.1a TRAITS OF IDEAL INVESTMENT CRITERIA

Companies use a variety of techniques to evaluate capital investments. Some techniques involve very simple calculations and are intuitively easy to grasp. Financial managers prefer: (1) an easily applied technique that (2) considers cash flow; (3) recognises the time value of money; (4) fully accounts for expected risk and return; and (5) when applied, leads to higher firm value for any company (and higher share prices in public companies). Easy application accounts for the popularity of some simple capital budgeting methods such as the *payback period* and *accounting rate of return* (both defined later).

Unfortunately, when comparing simple capital budgeting methods with more complex ones, other things are decidedly not equal. More complex methods, such as *net present value (NPV)*, *internal rate of return (IRR)* or the *profitability index (PI)*, generally lead to better decision-making because they take into account issues 1–5 cited above, factors that are neglected or ignored by simpler methods. Moreover, we will learn that the *NPV* approach provides a direct estimate of the change in share value resulting from a particular investment. Managers who seek to maximise share value must understand not only how to use various techniques but also the logic that explains why some methods are better than others. As challenging as that sounds, there is no reason to worry. We have already used these tools to value bonds and shares, and now we will apply the discounted cash flow apparatus to real assets such as plant and equipment.

FINANCE IN THE REAL WORLD

CFO SURVEY EVIDENCE (I)

Figure 9.1 lists several of the capital budgeting methods covered in this chapter and indicates how widely they are used, according to a survey of US CFOs. We argue in this chapter that the net present value (NPV) and internal rate of return (IRR) are theoretically preferable to methods such as payback, discounted payback or accounting rate of return. Apparently, CFOs agree, because most of them say that the IRR and NPV methods are their preferred tools for evaluating investment opportunities. The payback approach is also widely used. It is interesting that the popularity of NPV and IRR is particularly high among large companies and companies with CFOs who have MBA training, whereas the payback approach sees wider use in smaller companies. The payback approach, as the name suggests, focuses on how quickly an investment produces sufficient cash flow to recover its up-front costs. Smaller companies probably have less access to capital than larger companies, which may explain why smaller companies rely so heavily on the payback method.

FIGURE 9.1 POPULARITY OF CAPITAL BUDGETING TECHNIQUES

TECHNIQUE	PERCENTAGE OF CFOS ROUTINELY USING TECHNIQUE ^a
Internal rate of return	76%
Net present value	75%
Payback	57%
Discounted payback	29%
Accounting rate of return	20%
Profitability index	12%

a Note that these rounded percentages are drawn from the responses of a large number of CFOs and that many respondents use more than one technique.

Source: Reprinted from J.R. Graham and C.R. Harvey, 'The Theory and Practice of Corporate Finance: Evidence from the Field,' *Journal of Financial Economics*, 60, pp. 187–243, Copyright 2001, with permission from Elsevier.

9.1b A CAPITAL BUDGETING PROBLEM

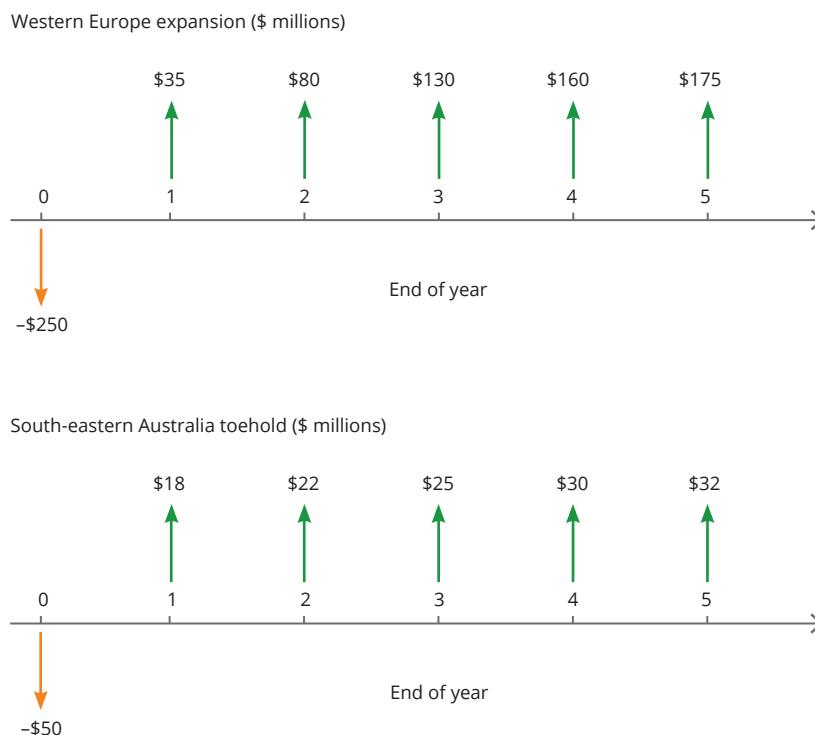
We apply each of the decision-making techniques in this chapter to a single, simplified business problem currently facing Global Untethered, a (fictitious) Australia-based worldwide provider of wireless telephony services. Mobile carriers are scrambling to attract and retain customers in this highly competitive market. According to customer surveys, the number one reason for selecting a given carrier (or for switching to a new one) is the quality of service. For instance, customers who lose calls as they commute to work or travel from one business location to another are apt to switch if another carrier offers fewer service interruptions.

Initial outlay	-\$250 million
Year 1 inflow	\$35 million
Year 2 inflow	\$80 million
Year 3 inflow	\$130 million
Year 4 inflow	\$160 million
Year 5 inflow	\$175 million

Against this backdrop, Global Untethered is contemplating a major expansion of its wireless network in two different regions. **Figure 9.2** depicts the projected cash inflows and outflows of each project over the next five years. By investing \$250 million, Global Untethered could add up to 100 new mobile sites to its existing base in western Europe, giving it the most comprehensive service area in that region. Company analysts project that this investment could generate year-end net after-tax cash inflows that could grow over the next five years, as outlined below.

FIGURE 9.2 GLOBAL UNTETHERED INVESTMENT PROPOSALS

The time lines depict the cash flows for Global Untethered's proposed expansion projects, the western Europe expansion and the south-eastern Australian toehold.



Alternatively, Global Untethered could make a much smaller investment to establish a toehold in a new market in south-eastern Australia. For an initial investment of \$50 million, Global Untethered believes it can create a south-eastern network, with its hub centred in Sydney. The projected end-of-year cash flows associated with this project are as follows:

Initial outlay	-\$50 million
Year 1 inflow	\$18 million
Year 2 inflow	\$22 million
Year 3 inflow	\$25 million
Year 4 inflow	\$30 million
Year 5 inflow	\$32 million

Which investment should Global Untethered make? If the company can undertake both investments, should it do so? If it can make only one investment, which one is better for shareholders? We will see how different capital budgeting techniques lead to different investment choices, starting with the payback method.

LO9.1

CONCEPT REVIEW QUESTION

- What characteristics does management desire in a capital budgeting technique?

THINKING CAP QUESTION

- What methods do companies use to analyse the financial merits of investment opportunities?

LO9.2

9.2 NET PRESENT VALUE AND ECONOMIC VALUE ADDED

net present value (NPV)

The sum of the present values of all a project's cash flows, both inflows and outflows, discounted at a rate consistent with the project's risk. NPV is also the preferred method for valuing capital investments

economic value added (EVA)

A method of analysing capital investments which determines whether an investment produces net cash flow sufficient to cover the company's cost of capital

The **net present value (NPV)** of a project is the sum of the present values of all its cash flows, both inflows and outflows. In this section we discuss the logic, calculation, and pros and cons of the NPV method, as well as a variant of this, the **economic value added (EVA)** method.

9.2a NET PRESENT VALUE CALCULATIONS

The NPV of a project is the sum of the present values of all its cash flows, both inflows and outflows. The rate used to discount the cash flows must be consistent with the project's risk. Calculating an investment project's NPV is relatively straightforward. First, write down the net cash flows that the investment will generate over its life. Second, discount these cash flows at a rate that reflects the degree of risk inherent in the project. (Note: the choice of discount rate is discussed in Chapter 11.) Third, add up the discounted cash flows to obtain the NPV, and invest in the project only when that value exceeds zero.

(Eq. 9.1)
$$NPV = CF_0 + \frac{CF_1}{(1+r)^1} + \frac{CF_2}{(1+r)^2} + \frac{CF_3}{(1+r)^3} + \dots + \frac{CF_n}{(1+r)^n}$$

In this expression, CF_t represents net cash flow in year t , r is the discount rate and n represents the project's life. Each year's cash flows could be positive or negative, although typically projects generate cash outflows initially and cash inflows later on. For example, suppose that the initial cash flow, CF_0 , is a negative number representing the outlay necessary to get the project started, and suppose that all subsequent cash flows are positive. In this case, the NPV can be defined as the *present value of future cash inflows minus the initial outlay*. The NPV decision rule says that companies should invest when the sum of the present values of future cash inflows exceeds the initial project outlay. That is, $NPV > \$0$ when the following occurs:

$$-CF_0 < \frac{CF_1}{(1+r)^1} + \frac{CF_2}{(1+r)^2} + \frac{CF_3}{(1+r)^3} + \dots + \frac{CF_n}{(1+r)^n}$$

Simply stated, the NPV decision rule is:

NPV > \$0	invest
NPV < \$0	do not invest

Notice that for a project to have a positive NPV, the present value of its cash inflows must exceed the present value of its cash outflows. Therefore, any project that meets the discounted payback criterion will generally have a positive NPV (unless it suffers from massive negative cash flows after the payback period). But is the opposite true? Some projects with positive NPVs have large cash flows beyond the payback cut-off period. So we can say that a company using the discounted payback method will never accept a project with a negative NPV, and it may reject some projects with positive NPVs. Another way to say this is that the discounted payback approach is overly conservative, relative to the NPV method.

Why Does the NPV Rule Generally Lead to Good Investment Decisions?

Remember that the company's goal in choosing investment projects is to maximise shareholder wealth. Conceptually, the discount rate, r , in the NPV equation represents an opportunity cost, the highest return that investors can obtain in the marketplace on an investment with risk equal to the risk of the project under consideration. When the NPV equals zero, the investment provides a rate of return equal to shareholders' required return; all investors should be satisfied by a project with a zero NPV, but no extra 'economic profit' is earned. Therefore, a project with a positive NPV earns a return that exceeds shareholders' expectations.

A company that consistently finds positive NPV investments expects to surpass shareholders' requirements and enjoy a rising share price. Clearly, the acceptance of positive NPV projects is consistent with the company's value-creation goal. Conversely, if the company makes an investment with a negative NPV, the investment will reduce value and shareholder wealth. A company that regularly makes negative NPV investments will see its share price lag as it generates lower-than-required returns for shareholders.

Drawing on what we already know about valuing bonds, we can develop an analogy to drive home the point about the relationship between share prices and the NPV rule. Suppose that, at a given moment in time, investors require a 5% return on five-year Treasury bonds. Of course, this means that if the Australian

government issues five-year, \$1,000 par value bonds paying an annual coupon of \$50, the market price of these bonds will be \$1,000, equal to par value.²

$$\$1,000 = \frac{\$50}{1.05^1} + \frac{\$50}{1.05^2} + \dots + \frac{\$1,050}{1.05^5}$$

Now apply NPV logic. If an investor purchases one of these bonds for \$1,000, the NPV equals zero because the bond's cash flows precisely satisfy the investor's expectation of a 5% return:

$$NPV = \$0 = -\$1,000 = \frac{\$50}{1.05^1} + \frac{\$50}{1.05^2} + \dots + \frac{\$1,050}{1.05^5}$$

Next, imagine that, in a fit of election-year largesse, the Australian government decrees that the coupon payments on all government bonds will double, so this bond now pays \$100 in interest per year. If the bond's price remains fixed at \$1,000, this investment's NPV will suddenly switch from zero to positive. At a price of \$1,000, the bond is underpriced if the Australian government raises the bond's coupon to \$100:

$$NPV = \$216.47 = -\$1,000 = \frac{\$100}{1.05^1} + \frac{\$100}{1.05^2} + \dots + \frac{\$1,100}{1.05^5}$$

Of course, the bond's price will not remain at \$1,000. Investors will quickly recognise that – with a price of \$1,000 and a coupon of \$100 – the return offered by these bonds substantially exceeds the required rate of 5%. Investors will flock to buy the bonds, rapidly driving up bond values until prices reach the point at which buying bonds becomes a zero NPV investment once again.³ In the new equilibrium, the bond's price will rise by \$216.47, exactly the amount of the *NPV* that was created when the Commonwealth Government doubled the coupon payments:

$$NPV = \$0 = -\$216.47 = -\$1,000 = \frac{\$100}{1.05^1} + \frac{\$100}{1.05^2} + \dots + \frac{\$1,100}{1.05^5}$$

NPV and Share Price

The same forces that drove up the bond's price in the previous section will drive up a company's share price when it makes a positive NPV investment, as shown in [Figure 9.3](#). The figure depicts a company that investors believe will pay an annual dividend of \$4 in perpetuity. If investors require a 10% return on this company's shares, the price will be \$40.⁴ What happens if the company makes a new investment that is as risky as the shares just described? If the return on this investment is greater than 10%, then it will have a positive NPV. Investors will recognise that the company has made an investment that exceeds their expectations and so will raise their forecast of future dividends, perhaps to \$4.10 per year. At that level, the new share price will be \$41. The same thing happens in reverse if the company makes an investment that earns a return below 10%. At this rate, the project has a negative NPV. Shareholders recognise that this investment's cash flows fall below their expectations, so they lower their estimates of future dividends to \$3.90 per year. As a consequence, the share price falls to \$39.

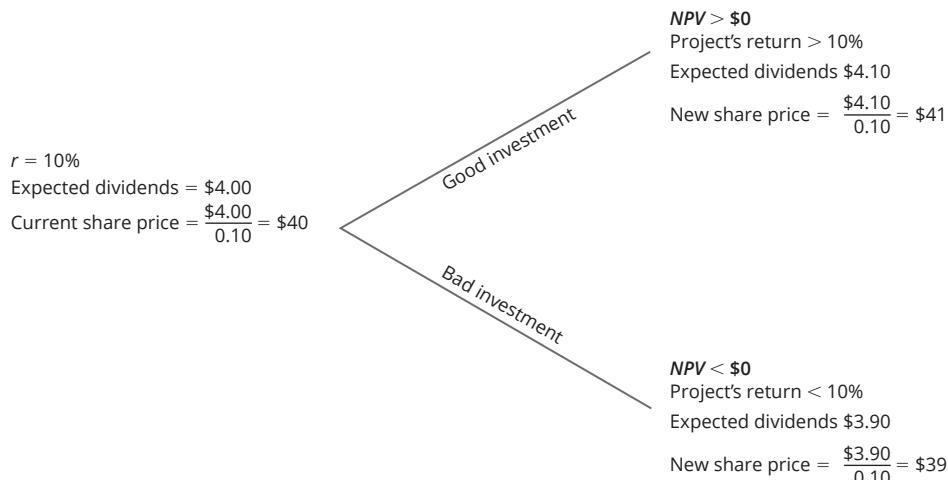
² Though Treasury bonds pay interest semiannually, here we assume annual interest payments to keep the example simple.

³ Recall that in Chapter 7, we said that an underpriced stock would lie above the security market line. The same thing is happening here. At a price of \$1,000, the bond is underpriced if the Australian government raises the bond's coupon to \$100. Recognising the underpricing, investors will buy the bonds, causing their price to rise and the expected return to fall.

⁴ Remember that the price of a share that pays a constant dividend in perpetuity equals the annual dividend divided by the required rate of return – in this case, $\$4 \div 0.10 = \40 .

FIGURE 9.3 THE NPV RULE AND SHAREHOLDER WEALTH

If a company invests in a project that earns more than its required return, its expected dividends and share price are expected to rise. If the project earns less than the required return, the expected dividends and share price are expected to fall.



Now apply this thought process to Global Untethered. Suppose that its shareholders demand an 18% return on their shares. According to the principles we discussed in Chapter 5, the price of Global Untethered shares will reflect the value of all future cash distributions that investors expect from the company, discounted at a rate of 18%. But what if Global Untethered discovers that it can make an investment that offers a return substantially above 18%? By definition, such an investment has a positive NPV; by undertaking it, Global Untethered will increase its share price (just as PMI Gold; see the 'What Companies Do' box at the beginning of the chapter) as investors realise that the investment will enable the company to distribute higher-than-expected cash flows as a result of the investment. How far will the price of each share rise? Simply divide the project's NPV (which represents the wealth the project is expected to create) by the number of outstanding shares. The result is the amount by which Global Untethered's share price should increase.

EXAMPLE

Calculating Global Untethered's NPV

What are the NPVs of each of the investment opportunities now facing Global Untethered? Time lines depicting the NPV calculations for

Global Untethered's projects appear in **Figure 9.4**. Discounting each project's cash flows at 18% yields the following results:

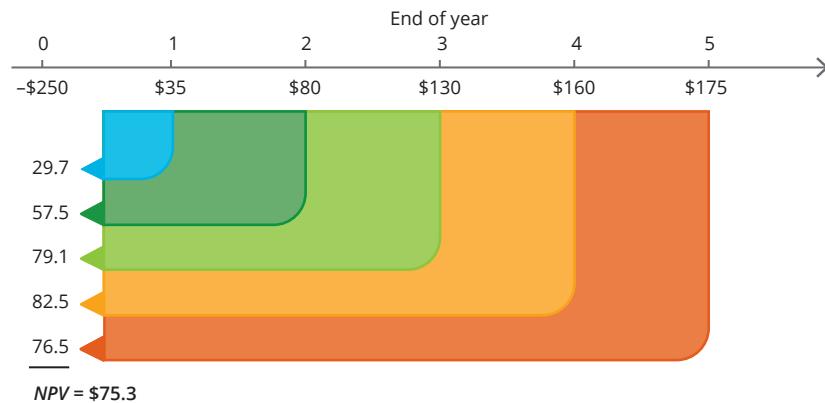
$$NPV_{Western\ Europe} = -\$250 + \frac{\$35}{(1.18)^1} + \frac{\$80}{(1.18)^2} + \frac{\$130}{(1.18)^3} + \frac{\$160}{(1.18)^4} + \frac{\$175}{(1.18)^5} = \$75.3$$

$$NPV_{South-eastern\ Australia} = -\$50 + \frac{\$18}{(1.18)^1} + \frac{\$22}{(1.18)^2} + \frac{\$25}{(1.18)^3} + \frac{\$30}{(1.18)^4} + \frac{\$32}{(1.18)^5} = \$25.7$$



FIGURE 9.4A NPV OF GLOBAL UNTETHERED'S PROJECTS AT 18% (\$ MILLIONS): WESTERN EUROPE PROJECT

The net present value (NPV) of Global Untethered's western Europe project is \$75.3 million, which means that it is acceptable ($NPV > \$0$) and therefore creates wealth for shareholders.



Spreadsheet

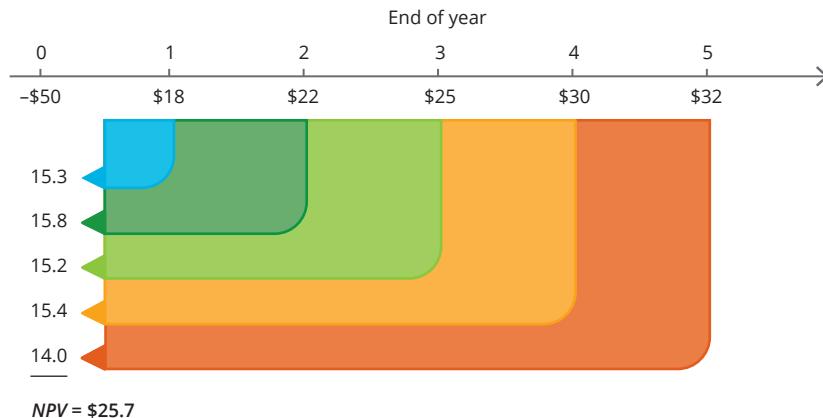
Row	Column	A	B
1	Cash flow 0		-250
2	Cash flow 1		35
3	Cash flow 2		80
4	Cash flow 3		130
5	Cash flow 4		160
6	Cash flow 5		175
7	Interest		18%
8	Net present value		\$75.3
9	<i>Formula B8: -250 + NPV(B7,B2,B3,B4,B5,B6)</i>		





FIGURE 9.4B NPV OF GLOBAL UNTETHERED'S PROJECTS AT 18% (\$ MILLIONS): SOUTH-EASTERN AUSTRALIA PROJECT

The net present value (NPV) of Global Untethered's south-eastern Australia project is \$25.7 million, which means that it is acceptable ($NPV > \$0$) and therefore creates value for shareholders.



Both projects increase shareholder wealth, so both are worth undertaking. One could say that both projects outperform the company's 18% required return, and are therefore acceptable. However, if the company can make only one investment, it should choose to expand its presence in western Europe. That investment increases shareholder wealth by \$75.3 million, whereas the south-eastern

Australian investment increases wealth by only about one-third as much. If Global Untethered has 100 million ordinary shares outstanding, then accepting the western Europe project should increase the share price by about \$0.75 ($\$75.3 \text{ million} \div 100 \text{ million shares}$). Accepting the south-eastern Australian investment would increase the share price by almost \$0.26 ($\$25.7 \text{ million} \div 100 \text{ million shares}$).

9.2b PROS AND CONS OF NPV

The NPV method solves all the problems we will identify later in the chapter with the payback and discounted payback rules, as well as the problems associated with decision rules that are based on the accounting rate of return:

- The NPV rule focuses on cash flow, not accounting earnings.
- When properly applied, the NPV method makes appropriate adjustments for the time value of money.
- The decision rule to invest when NPVs are positive and to refrain from investing when NPVs are negative reflects the company's need to compete for funds in the marketplace and have its projects outperform projects of similar risk.
- The NPV approach offers a relatively straightforward way to control for differences in risk among alternative investments. Cash flows on riskier investments should be discounted at higher rates.
- The NPV method incorporates all the cash flows that a project generates over its life, not just those that occur in the project's early years.
- The NPV gives a direct estimate of the change in shareholder wealth resulting from a given investment.

We are enthusiastic supporters of the NPV approach, especially when compared with the other decision-making methods examined in this chapter. However, there is one subtle drawback to the NPV rule, and it results from our inability to incorporate the value of managerial flexibility when calculating a project's NPV. What we mean by *managerial flexibility* are options that managers can exploit to increase the value of an investment. For example, if a company makes an investment that turns out better than expected, managers have the option to expand that investment, making it even more valuable. Conversely, if a company invests in a project that does not generate as much positive cash flow as anticipated, then managers have the option to scale back the investment and redeploy resources to more productive uses. The NPV method (like the other methods studied in this chapter) does a poor job of capturing the value of managerial flexibility. Incorporating the value of these options into the analysis requires a highly sophisticated approach that relies on the use of decision trees and the principles of option pricing. We offer a brief introduction to valuing investment with option-like characteristics in Chapter 11.

The NPV method enjoys widespread use in large corporations, but there are two other popular capital budgeting tools that are closely related to NPV. One of these alternative approaches, called *economic value added*, essentially calculates an investment's NPV on a year-by-year basis. The other approach, known as the *internal rate of return (IRR)*, summarises the economic merits of an investment in a single number, which represents the compound annual rate of return that an investment earns over its life. In most cases (but not all) these techniques lead to the same investment decisions that NPV analysis does, although there are some important, subtle differences between the three approaches.

9.2c ECONOMIC VALUE ADDED

economic profit

A profit that exceeds a normal, competitive rate of return in an industry or line of business

Net present value analysis is appealing for making capital budgeting decisions because it is both theoretically sound and easy to implement. In recent years, a variant of NPV analysis called economic value added (EVA), or, more generically, shareholder value added (SVA), has become popular with many companies. A registered trademark of Stern Stewart & Co., EVA is based on the century-old idea of **economic profit**. In accounting, we say that a company earns a profit if its revenues are greater than its costs. But when economists use the term *economic profit* they refer to how much profit a company earns relative to a competitive rate of return. If a company earns zero economic profit, then its accounting profits are positive and just sufficient to satisfy the returns required by the company's investors. If a company's economic profits are positive, then its share price will rise because it is out-earning its cost of capital and investor expectations. Similarly, a company may be earning a positive *accounting profit*, but if that profit does not cover the company's cost of capital, then *economic profits* are negative.

For managers, EVA establishes a benchmark that measures an investment's performance in each period based on whether it earns an economic profit. The EVA metric subtracts 'normal profit' from an investment's cash flow to determine whether the investment is adding value for shareholders. As we have already explained, NPV also provides a measure of value added, so it should not be surprising that these methods are quite similar.

To illustrate how the EVA method works, consider an investment that requires \$5 million of capital funding. For simplicity, assume that the invested capital never depreciates, and generates annual cash flows of \$600,000 in perpetuity. Finally, assume that the company making this investment has a 12% cost of capital. The formula used to calculate EVA for a particular year is:

$$EVA = \text{Cash flow} - (\text{Cost of capital}) \times (\text{Invested capital})$$

$$= \$600,000 - 0.12 \times (\$5,000,000) = \$0$$

An EVA of zero means that the project earns exactly its cost of capital. That is, the project covers all costs, including the cost of funds – but does not earn any economic profit above and beyond that amount.

To determine whether the project should be undertaken, an analyst would calculate the EVA in every year and then discount the future EVAs back to the present at the cost of capital; if the resulting value is positive, then the investment is worthwhile. In this case, because EVA every year is zero (and the present value of all future EVAs is also zero), we conclude that this investment provides a break-even return for shareholders. What would the NPV method say? Using the perpetuity shortcut to value the investment's inflows, we find that the NPV is also zero,

$$NPV = -\$5,000,000 + \frac{\$600,000}{0.12} = \$0$$

so the two methods yield the same conclusion.

EVA uses the same basic cash flows as NPV, and evaluates the economics of an investment ‘one year at a time’, whereas NPV compares the incremental net cash inflows over the investment’s life (discounted to the present at the company’s cost of capital) to the net cash outflows required by the investment. Technically, discounting the time series of annual EVAs at the company’s cost of capital should result in the project’s NPV. Thus, NPV and EVA are fully compatible, and yield the same capital budgeting decisions. The appeal of EVA is its integration of NPV analytical techniques into day-to-day managerial decision making.

LO9.2

CONCEPT REVIEW QUESTIONS

- 2 What does it mean if a project has an NPV of \$1 million?
- 3 Why might the discount rates used to calculate the NPVs of two competing projects differ?
- 4 What do NPV and EVA have in common, and how do they differ?

LO9.3

9.3 INTERNAL RATE OF RETURN

As methods used for evaluating investment projects, payback, discounted payback and accounting-based methods suffer from common problems – the complete or partial failure to make adjustments for the time value of money and for risk – that we will discuss later in this chapter. Alternative methods, such as *NPV*, correct these shortcomings.

Perhaps the most popular and intuitive of these alternatives is the **internal rate of return** method. An investment’s internal rate of return is analogous to a bond’s *yield-to-maturity* (YTM), a concept we introduced in Chapter 4. Recall that a bond’s YTM is the discount rate that equates the present value of its future cash flows to its market price. The YTM measures the compound annual return that an investor earns by purchasing a bond and holding it until maturity (provided that all payments are made as promised and that interest payments can be reinvested at the same rate). Likewise, an investment project’s IRR is the compound annual rate of return on the project, given its up-front costs and subsequent cash flows.

internal rate of return (IRR)

The compound annual rate of return on a project, given its up-front costs and subsequent cash flows

9.3a FINDING A PROJECT’S IRR

In mathematical terms, the IRR is the discount rate, r , that makes the net present value of all project cash flows equal to zero:

$$(Eq. 9.2) \quad NPV = \$0 = CF_0 + \frac{CF_1}{(1+r)^1} + \frac{CF_2}{(1+r)^2} + \frac{CF_3}{(1+r)^3} + \dots + \frac{CF_n}{(1+r)^n}; r = IRR$$

To find a project's IRR, we must begin by specifying the project's cash flows. Next, using a financial calculator, a spreadsheet or even trial and error, we find the discount rate that equates the present value of cash flows to zero. Once we have calculated the *IRR*, we compare it with a pre-specified hurdle rate established by the company. The **hurdle rate** represents the company's minimum acceptable return for a given project, so the IRR decision rule is *to invest only if the project's IRR exceeds the hurdle rate; otherwise, reject the project.*

hurdle rate
The minimum rate of return that must be achieved

But where does the hurdle rate come from? How do companies decide whether to require projects to exceed a 10% hurdle or a 20% hurdle? The answer provides insight into another advantage of IRR over relying on a project's payback period or accounting rate of return. A company should set the hurdle rate equal to market returns on similar investments. For example, if the project at hand involves expanding a fast-food restaurant chain, then the hurdle rate should reflect the returns that fast-food businesses of similar risk offer investors. Therefore, the IRR method, like the NPV method, establishes a hurdle rate or a decision criterion that is *market based*, unlike the payback and accounting-based approaches, which establish arbitrary thresholds for investment approval. In fact, *for a given project, the hurdle rate used in IRR analysis should be the discount rate used in NPV analysis.*

FINANCE IN THE REAL WORLD



THE IRR OF A MASTER'S DEGREE

A decision that many people face is whether to invest the time and money necessary to earn a post-graduate degree. Suppose that you are trying to evaluate the financial merits of staying at university for one more year to earn a master's degree. You decide that you will undertake this investment if it earns a return greater than 10% (so 10% is your hurdle rate). You determine that the costs of obtaining the degree, which include tuition, books and lost wages you would have earned from working during the next year, add up to about \$50,000 in present value terms. This represents your initial outlay. However, once you have the degree in hand, you estimate that your starting salary will be \$5,000 higher than it otherwise would have been, and that the difference between your earnings with the degree and what you would have earned without the degree will grow at 5% per year over the next 30 years. That is, the cash flows associated with this decision are as follows:

Today	-\$50,000
Year 1	\$5,000
Year 2	\$5,250
Year 3	\$5,512
.....	
Year 29	\$19,601
Year 30	\$20,581

Plugging these values into **Equation 9.2** and solving for the discount rate that results in a zero present value, we find that the IRR associated with the master's degree program is 14.2%. Given that this return exceeds the 10% hurdle rate, you decide to enrol in the master's program.

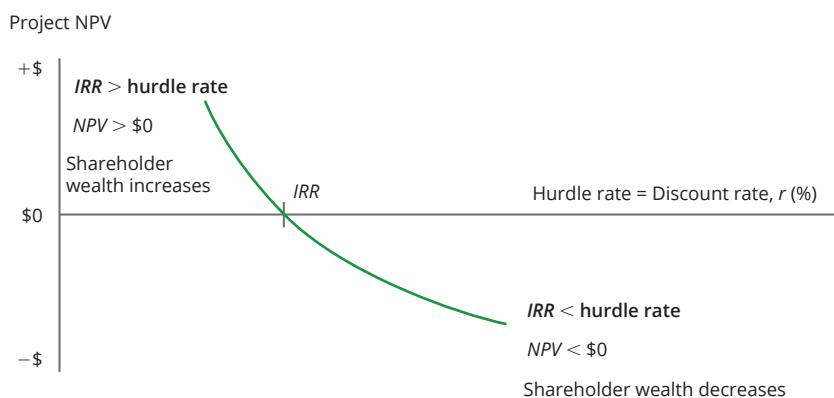
Figure 9.5 is a **net present value (NPV) profile**, which plots a project's NPV (on the *y*-axis) against various discount rates (on the *x*-axis). The NPV profile illustrates the relationship between a typical project's NPV and its IRR. By 'typical', we mean a project with initial cash outflows followed by cash inflows. In this case, the NPV declines as the discount rate used to calculate the NPV increases. Not all projects have this feature, as we will soon see. The green line in **Figure 9.5** shows that when the discount rate is relatively low, the project has a positive NPV. When the discount rate is high, the project has a negative NPV. *At a particular discount rate, the NPV equals zero, and that rate is the project's IRR.*

net present value (NPV) profile

A plot of a project's NPV (on the *y*-axis) against various discount rates (on the *x*-axis). It is used to illustrate the relationship between the NPV and the IRR for the typical project

FIGURE 9.5 NPV PROFILE

The NPV is positive when the IRR is greater than the hurdle (discount) rate, and the NPV is negative when the IRR is less than the hurdle rate.



EXAMPLE

Calculating Global Untethered's IRRs

Suppose that Global Untethered requires its analysts to calculate the IRR of all proposed investments. The company agrees to undertake only those investments which offer an IRR exceeding 18%, a rate that Global Untethered

believes to be an industry standard. **Figures 9.6a** and **9.6b** present time lines depicting the IRR calculations for Global Untethered's two projects. To obtain the IRR for each project under consideration, just solve these two equations:

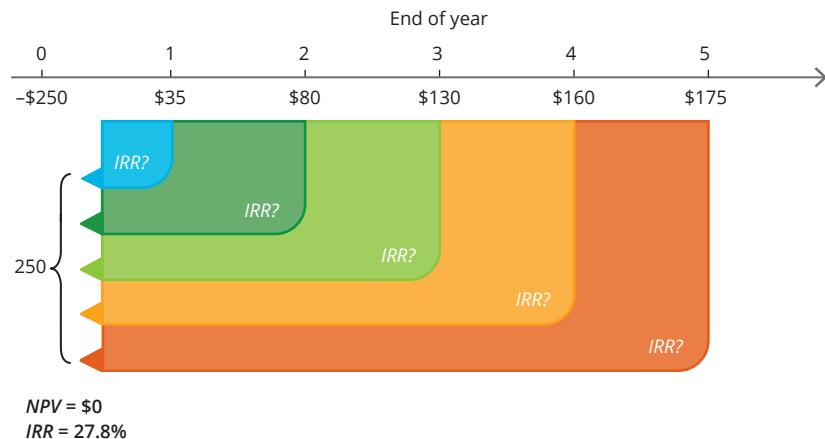
$$\$0 = -\$250 + \frac{\$35}{(1+r_{WE})^1} + \frac{\$80}{(1+r_{WE})^2} + \frac{\$130}{(1+r_{WE})^3} + \frac{\$160}{(1+r_{WE})^4} + \frac{\$175}{(1+r_{WE})^5}$$

$$\$0 = -\$50 + \frac{\$18}{(1+r_{SE})^1} + \frac{\$22}{(1+r_{SE})^2} + \frac{\$25}{(1+r_{SE})^3} + \frac{\$30}{(1+r_{SE})^4} + \frac{\$32}{(1+r_{SE})^5}$$



FIGURE 9.6A IRR OF GLOBAL UNTETHERED'S PROJECTS (\$ MILLIONS): WESTERN EUROPE PROJECT

The internal rate of return (IRR) for Global Untethered's western Europe project is 27.8%, which is the discount rate that causes the project's cash flows to have an NPV of \$0. The project is acceptable because its NPV is greater than the company's 18% hurdle rate.



Spreadsheet

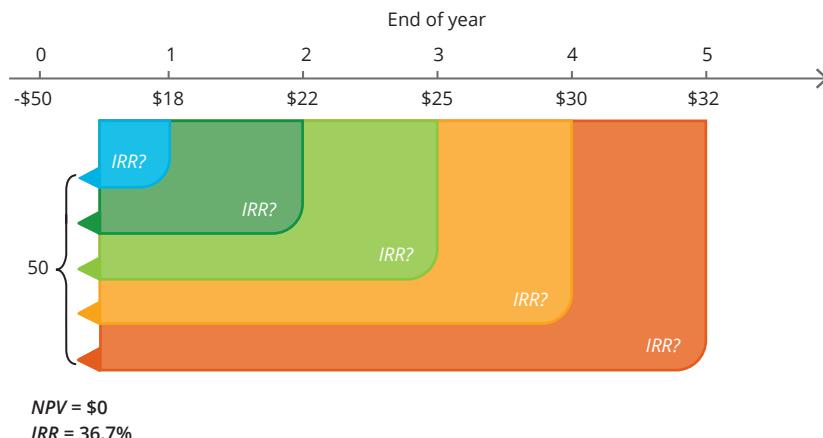
Column	A	B
Row		
1	Cash flow 0	-250
2	Cash flow 1	35
3	Cash flow 2	80
4	Cash flow 3	130
5	Cash flow 4	160
6	Cash flow 5	175
7	IRR	27.8%
8	Formula B7:=IRR(B1:B6)	





FIGURE 9.6B IRR OF GLOBAL UNTETHERED'S PROJECTS (\$ MILLIONS): SOUTH-EASTERN AUSTRALIA PROJECT

The internal rate of return (IRR) for Global Untethered's south-eastern Australia project is 36.7%, which is the discount rate that causes the project's cash flow to have an NPV of \$0.



Here, r_{WE} is the IRR for the western Europe project, and r_{SE} is the IRR for the south-eastern

Australia project. Solving these expressions yields the following:⁵

$$r_{WE} = 27.8\%$$

$$r_{SE} = 36.7\%$$

Because both investments exceed the hurdle rate of 18%, Global Untethered would like to undertake both projects. But what if it can invest in only one project or the other? Should the company invest in the south-eastern Australia

project because it offers the higher IRR, or should it invest in the western Europe project because it has a higher NPV? In this case, the NPV and IRR methods provide conflicting project rankings.

9.3b ADVANTAGES OF THE IRR METHOD

The question of how to rank investments that offer different IRRs points to an important potential weakness of this method. However, before considering the problems associated with IRR analysis, let us discuss the advantages that make it one of the most widely used methods for evaluating capital investments.

- The IRR makes an appropriate adjustment for the time value of money. The value of a dollar received in the first year is greater than the value of a dollar received in the second year. Even cash flows that arrive several years in the future receive some weight in the analysis (unlike payback, which totally ignores distant cash flows).
- The hurdle rate is based on market returns obtainable on similar investments. This takes away some of the subjectivity that creeps into other analytical methods, like the arbitrary threshold decisions that must be made when using payback or accounting rate of return, and it allows managers to make explicit, quantitative adjustments for differences in risk across projects.
- The ‘answer’ that comes out of an IRR analysis is a rate of return, which is easy for both financial and non-financial managers to grasp intuitively. As we will see, however, the intuitive appeal of the IRR approach has its drawbacks, particularly when ranking investments with different IRRs.
- The IRR technique focuses on cash flow rather than on accounting measures of income.

⁵ Of course, you can make this calculation using Excel, as shown in the time lines in Figure 9.6a.

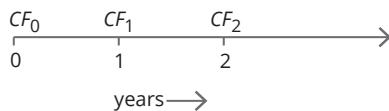
mutually exclusive projects

Two or more projects for which accepting one project implies that the others cannot be undertaken

Despite its advantages, the IRR technique has some quirks and problems that in certain situations should concern analysts. Some of these problems arise from the mathematics of the IRR calculation, but other difficulties come into play only when companies must rank **mutually exclusive projects**. Two or more projects are mutually exclusive if accepting one project implies that the others cannot be undertaken. If the IRRs of several projects exceed the hurdle rate, but only a subset of those projects can be undertaken, how does the company choose? It turns out that the intuitive approach, selecting those projects with the highest IRRs, sometimes leads to bad decisions.

9.3c PROBLEMS WITH THE INTERNAL RATE OF RETURN

There are two classes of problems that analysts encounter when evaluating investments using the IRR technique. The first class can be described as *mathematical problems*, which are difficulties in interpreting the numbers that one obtains from solving an IRR equation. These problems occur infrequently in practice, but you should be aware of them. For example, consider a simple project with cash flows at three different points in time:



CF_0 is the immediate cash flow when the project begins, and CF_1 and CF_2 are cash flows that occur at the end of years 1 and 2, respectively. Note that conceptually the values of CF_0 , CF_1 and CF_2 could be either positive or negative. Solving for this project's IRR means setting the net present value of all these cash flows equal to zero:

$$NPV = \$0 = CF_0 + \frac{CF_1}{(1+r)^1} + \frac{CF_2}{(1+r)^2}$$

Notice that this equation involves terms such as $[1 \div (1+r)]^1$ and $[1 \div (1+r)]^2$. In other words, this is a quadratic equation. Solving a quadratic equation can result in outcomes including: (1) a unique solution; (2) multiple solutions; and (3) no real solution. The following examples illustrate the problems with multiple IRRs and no real solution.

Lending Versus Borrowing

A company establishes a hurdle rate of 20% for new investments. Consider two projects with cash flows occurring at just two dates: now and one year from now.

PROJECT	CASH FLOW NOW	CASH FLOW IN ONE YEAR	IRR	NPV (@20%)
1	-\$100	+\$150	50%	+\$25
2	+\$100	-\$150	50%	-\$25

The first project displays the familiar pattern of an initial cash outflow followed by a cash inflow. Most investment projects probably fit this profile. But the second project begins with a cash inflow followed by a cash outflow. What kinds of projects in the real world follow this pattern? Think of a company that is cutting timber. The timber is cut and sold immediately at a profit, but when harvesting is complete, the company must replant the forest at considerable expense. Similarly, consider an optional warranty sold with a new car. The warranty seller receives payment up-front, but may have to pay claims later on.

Both projects described in the table have a 50% IRR, but are the two projects equally desirable? It should be intuitive to you that project 1 is superior because it generates net cash inflows over time, whereas project 2 generates net cash outflows. Indeed, the NPVs bear this out: project 1 generates a positive \$25 NPV, and project 2 yields a negative -\$25 NPV.

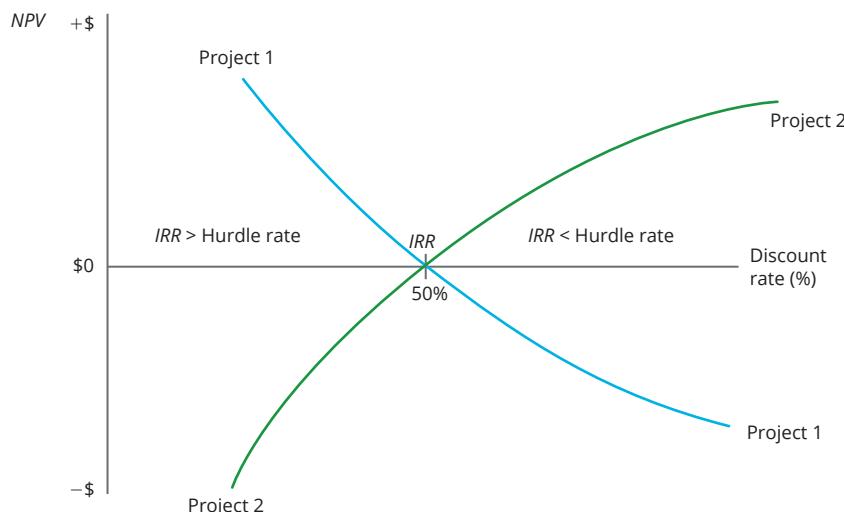
The problem we are confronting here is known as the *lending-versus-borrowing problem*. We can think of project 1 as analogous to a loan. Cash flows out today in exchange for a larger amount of cash in one year. When we lend money, a higher interest rate (or a higher internal rate of return) is preferable, other things held constant. In contrast, project 2 is analogous to borrowing money. We receive cash up-front, but have to pay back a larger amount later. When borrowing money, a lower interest rate (or a lower IRR) is preferred, other factors held constant. Therefore, we can modify the internal rate of return decision rule as follows:

- 1 When projects have initial cash outflows and subsequent cash inflows, invest when the project IRR exceeds the hurdle rate.
- 2 When projects have initial cash inflows and subsequent cash outflows, invest when the project IRR falls below the hurdle rate.

Figure 9.7 illustrates this situation. The NPV of project 1 falls when the discount rate rises, as we would expect. This means that, if the IRR exceeds the hurdle rate, the project's NPV is positive, but if the IRR falls below the hurdle rate, the NPV is negative. So in this case it makes sense to follow the usual rule of accepting projects when the IRR exceeds the hurdle rate. In contrast, the NPV of project 2 actually rises as the discount rate rises. This counterintuitive relationship holds because the company is essentially borrowing money in project 2. The higher the rate at which the company discounts the amount it will have to repay, the lower the present value of that payment and the higher the NPV of the project. In this case, it makes sense to accept projects only when the IRR falls short of the company's hurdle rate.

FIGURE 9.7 LENDING VERSUS BORROWING

The blue line is the NPV profile for project 1, which is a loan made by the company; it shows that as the IRR exceeds the hurdle rate, the loan's NPV is positive. The green line is the NPV profile for project 2, which involves the company borrowing money; it shows that the higher the rate at which the loan payments are discounted, the higher the NPV.



Multiple IRRs

A second difficulty with the IRR method can occur when a project's cash flows alternate between negative and positive values – that is, when the project generates an alternating series of net cash inflows and outflows. In that case, there may be more than one solution to the IRR equation.

As an example, consider a project with the following stream of cash flows:

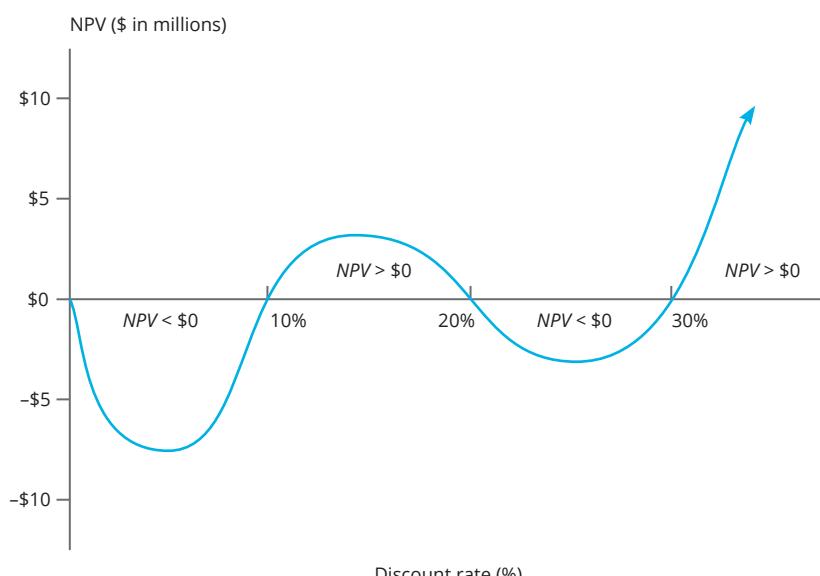
YEAR	CF (\$ IN MILLIONS)
0	+100
1	-460
2	+791
3	-602.6
4	+171.6

Admittedly, this project has a rather strange sequence of alternating net cash inflows and outflows, but it is not hard to think of real-world investments that generate cash flow streams that flip back and forth like this. Consider, for example, high-technology products. A new product costs money to develop. It generates plenty of cash for a year or two, but it quickly becomes obsolete. Obsolescence necessitates more spending to develop an upgraded version of the product, which then generates cash again. The cycle continues indefinitely. The iPhone provides an example of this – each time Apple launches a new model, previous models earn much lower marginal revenues. Notice that Apple launches intermediate product releases that involve software upgrades, rather than full hardware upgrades. (For these intermediate releases, development costs are lower, compared to the full upgrades.)

Figure 9.8 presents the NPV profile for a project with the cash flows just described at various discount rates. Notice that there are four points on the graph at which the project's NPV equals zero. In other words, there are several IRRs for this project, including 0%, 10%, 20% and 30%. How does one apply the IRR decision rule in a situation such as this? Suppose that the hurdle rate for this project is 15%. Two of the four IRRs on this project exceed the hurdle rate, and two fall below the hurdle rate. Should the company invest or not? The only way to know for sure is to check the NPV. On the graph, we see that at a discount rate of 15%, the project's NPV is positive, so the company should invest.

FIGURE 9.8 NPV PROFILE FOR A PROJECT WITH MULTIPLE IRRS

This project with alternating cash inflows and outflows has an NPV profile that reflects multiple IRRs. At each discount rate for which the $NPV = \$0$, there is an IRR. In this case, IRRs occur at 0%, 10%, 20% and 30%.



The general rule of thumb is that the maximum number of IRRs that a project can have equals the number of sign changes in the cash flow stream. Therefore, in the typical project with one negative cash flow up-front and only positive cash flows later on, there is just one sign change and there will be at most one IRR. In the previous example, there are four sign changes in the cash flow stream and four different IRRs. *In the event that you have to evaluate a project with more than one sign change in the cash flows, beware of the multiple IRR problem.* In this situation, the NPV profile must be analysed because use of the IRR typically does not result in the correct decision.

No Real Solution

After entering the cash flows from a particular investment into a calculator or a spreadsheet, you may receive an error message indicating that there is no solution to the problem. For some cash flow patterns, it is possible that there is no real discount rate that equates the project's NPV to zero. In these cases, the only solution to the IRR equation involves imaginary numbers, hardly something that we can compare with a company's hurdle rate.



When IRR Cannot be Calculated

When we first looked at the Global Untethered western Europe expansion project, we examined cash flows over a five-year project life. Let's modify the example a little. Suppose that the project life is six years rather than five, and that in the sixth year the company must incur a large negative cash outflow. The modified cash flow projections look like this:

YEAR	WESTERN EUROPE PROJECT (\$ IN MILLIONS)
0	-250
1	35
2	80
3	130
4	160
5	175
6	-355

When we attempt to calculate the IRR for this stream of cash flows, we find that our Excel (or our financial calculator) returns an error code. The problem is that for this stream of cash flows there is no real solution to the IRR equation. That is, there is no (real) interest rate at which the present value of cash flows equals zero. If we cannot determine the IRR of this project, how can we determine whether the project meets the company's hurdle rate of 18%?

The last three examples illustrate problems that analysts may encounter when using the IRR decision rule. In practice, these problems arise infrequently because most investments generate cash outflows up-front and cash inflows later on. Hence, most investments have a unique IRR. However, two additional problems may arise when analysts use the IRR method to prioritise projects or to choose between mutually exclusive projects. We examine these problems in the next section.

9.3d IRR, NPV AND MUTUALLY EXCLUSIVE PROJECTS

In this section, we differentiate between the NPV and IRR techniques by focusing on the scale and timing problems associated with mutually exclusive capital budgeting projects.

The Scale Problem

Suppose a friend promises to pay you \$2 tomorrow if you lend him \$1 today. If you make the loan and your friend fulfils his end of the bargain, then you will have made an investment with a 100% IRR.⁶ Now consider a different case. Your friend asks you to lend him \$100 today in exchange for \$150 tomorrow. The IRR on that investment is 50%, exactly half the IRR of the first example. Both of these loans offer very high rates of return. Assuming that you trust the friend to repay you in either case, which investment would you choose if you could choose only one? The first investment increases your wealth by \$1, and the second increases your wealth by \$50. Even though the rate of return is lower on the second investment, most people would prefer to lend the larger amount because of its substantially greater monetary payoff.

The point of these examples is to illustrate the *scale problem* inherent in IRR analysis. When choosing between mutually exclusive investments, we cannot conclude that the one offering the highest IRR will necessarily create the most wealth. When several alternative investments offer IRRs that exceed a company's hurdle rate, choosing the investment that maximises shareholder wealth involves more than picking the highest IRR. For example, take another look at the investment opportunities faced by Global Untethered, opportunities that vary dramatically in scale.



NPV Supports Better Decisions than IRR

Here again are the NPV and IRR figures for the two investment alternatives:

PROJECT	IRR	NPV (@18%)
Western Europe	27.8%	\$75.3 million
South-eastern Australia	36.7	25.7 million

If we had to choose just one project on the basis of IRR, then we would (erroneously) choose to invest in the south-eastern Australia project. But we have also seen that the western Europe project generates a much higher NPV, meaning

that it creates more wealth for Global Untethered shareholders. Hence, the NPV criterion tells us to expand in western Europe rather than in south-eastern Australia. Why the conflict? It is because the scale of the western Europe expansion is roughly five times that of the south-eastern Australia project. Even though the south-eastern Australia project provides a higher rate of return, the opportunity to make the much larger western Europe investment (which also offers a return well above the company's hurdle rate) is more attractive.

The Timing Problem

Managers of public corporations often receive criticism for neglecting long-term investment opportunities for the sake of meeting short-term financial performance goals. We refrain from commenting on whether corporate managers, as a rule, put too much emphasis on short-term performance. However, we do agree with the proposition that a naïve reliance on the IRR method can lead to investment decisions that unduly favour investments with short-term payoffs over those that offer returns over a longer horizon. The following example illustrates the problem we have in mind.

⁶ The IRR is 100% per day in this example, which is not a bad return if you annualise it.

EXAMPLE

NPV and IRR May Give Different Decisions

A company wants to evaluate two investment proposals. The first involves a major effort in new product development. The initial cost is \$1 billion, and the company expects the project to generate relatively meagre cash flows in the first four years, followed by a big payoff in year 5. The second investment is a significant marketing campaign to attract new customers. It too has an initial outlay of \$1 billion, but it generates significant cash flows almost immediately and lower levels of cash in the later years. A financial analyst prepares cash flow projections and calculates each project's IRR and NPV as shown in the following table (the company uses 10% as its hurdle rate):

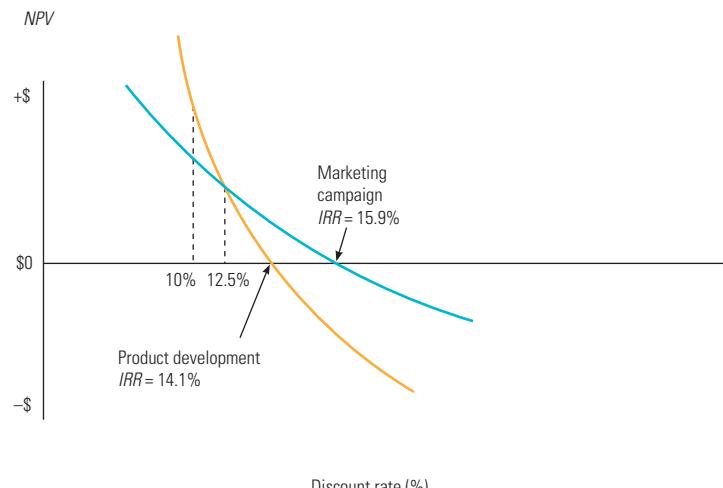
CASH FLOW	PRODUCT DEVELOPMENT (\$ IN MILLIONS)	MARKETING CAMPAIGN (\$ IN MILLIONS)
Initial outlay	-1,000	-1,000
Year 1	0	450
Year 2	50	350
Year 3	100	300
Year 4	200	200
Year 5	1,500	100
Technique		
IRR	14.1%	15.9%
NPV (@10%)	\$ 184.44	\$ 122.44

The analyst observes that the first project generates a higher NPV, whereas the second offers a higher IRR. Bewildered, he wonders which project to recommend to senior management.

Even though both projects require the same initial investment and both last for five years, the marketing campaign generates more cash flow in the early years than the product development proposal. Therefore, in a relative sense, the payoff from product development occurs later than the payoff from marketing. We know from our discussion of interest-rate risk in Chapter 4 that when interest rates change, long-term bond prices move more than do short-term bond prices. The same phenomenon is at work here. **Figure 9.9** plots the NPV profiles for the two projects on the same set of axes. Notice the line plotting NPVs for the product development idea is much steeper than the other. In simple terms, this means the NPV of that investment is much more sensitive to the discount rate than is the NPV of the marketing campaign.

FIGURE 9.9 NPV PROFILES DEMONSTRATING THE TIMING PROBLEM

The timing problem can lead to NPVs and IRRs that yield different investment recommendations. At any discount rate below 12.5%, product development is preferred because of its higher NPV, although the marketing campaign has a higher IRR.



Each investment's IRR appears in **Figure 9.9** where the NPV lines cross the *x*-axis. **Figure 9.9** shows that both IRRs exceed the hurdle rate of 10% and that the marketing campaign has the higher IRR. The two lines intersect at a discount rate of 12.5%. At that discount rate, the NPVs of the projects are equal. At discount rates below 12.5%, product development, which has a longer-term payoff, has the higher NPV. At discount rates above 12.5%, the investment in the marketing campaign offers a larger NPV. Given that the required rate of return on investments for this particular company is 10%, the company should choose to spend the \$1 billion on product development. However, if the company bases its investment decision solely on achieving the highest IRR, it will choose the marketing campaign instead.

In summary, when the timing of cash flows is very different from one project to another, the project with the highest IRR may or may not have the highest NPV. As in the case of the scale problem, the timing problem can lead companies to reject investments that they should accept. We want to emphasise that this problem (and the scale problem) occurs only when companies must choose between mutually exclusive projects. In the previous example, if the company can invest in both projects, then the analyst should recommend that it does so. If the company must choose between two acceptable projects, it should rely on NPV analysis to identify the better project.

LO9.3

CONCEPT REVIEW QUESTIONS

- 5 Describe how the IRR and NPV approaches are related.
- 6 If the IRR for a given project exceeds a company's hurdle rate, does that mean that the project necessarily has a positive NPV? Explain.
- 7 Describe the scale problem and the timing problem. Explain the potential effects of these problems on using IRR versus NPV to choose among mutually exclusive projects.

THINKING CAP QUESTIONS

- 2 What's the relationship between a project's NPV and its IRR?
- 3 A company's hurdle rate is 10%, and most of its investments earn at least a 20% IRR. If it accepts a project with a 15% IRR, won't this lower its average return and disappoint the company's investors?
- 4 Does the IRR method always rank projects the same as the NPV method?

LO9.4

9.4 PROFITABILITY INDEX

profitability index (PI)
A capital budgeting tool defined as the present value of a project's cash inflows divided by the absolute value of its initial cash outflow

Another capital budgeting tool to discuss is the **profitability index (PI)**. Like the IRR, the PI is a close cousin of the NPV approach.

9.4a CALCULATING THE PROFITABILITY INDEX

For simple projects that have an initial cash outflow (CF_0) followed by a series of inflows (CF_1, CF_2, \dots, CF_n), the *PI* is expressed mathematically as the present value of a project's cash inflows divided by the absolute value of its initial cash outflow.⁷

7. Because the initial cash flow is usually negative, we divide by the absolute value of that cash flow in Equation 9.3.

(Eq. 9.3)

$$PI = \frac{\frac{CF_1}{(1+r)^1} + \frac{CF_2}{(1+r)^2} + \frac{CF_3}{(1+r)^3} + \dots + \frac{CF_n}{(1+r)^n}}{|CF_0|}$$

The decision rule to follow when evaluating investment projects using the PI is to invest when the PI is greater than 1.0 (that is, when the present value of cash inflows exceeds the initial cash outflow) and to refrain from investing when the PI is less than 1.0. Note that if the PI is above 1.0, then the NPV is greater than \$0. This means that the NPV and PI decision rules will always yield the same investment recommendation when we are simply trying to decide whether to accept or reject a single project.

► EXAMPLE

Calculating the Profitability Index

To calculate the PI for each of Global Untethered's investment projects, calculate the present value of its cash inflows from years 1–5, then divide by the absolute value of the initial cash outflow to obtain the following result:

Both projects have a PI greater than 1.0, so both are worthwhile. However, if we rank projects based on the PI, then the south-eastern Australia project looks better.

PROJECT	PV OF CF (1-5) (\$ IN MILLIONS)	INITIAL OUTLAY (\$ IN MILLIONS)	PI
Western Europe	325.3	250	1.3
South-eastern Australia	75.7	50	1.5

Because the NPV, IRR and PI methods are so closely related, they share many of the same advantages relative to payback or accounting rate of return analysis, and there is no need to reiterate those advantages here. However, it is worth pointing out that the PI and the IRR share an important flaw. Both suffer from the scale problem described earlier. Recall that our NPV calculations suggested that the western Europe project created more value for shareholders than the south-eastern Australian endeavour, whereas the IRR and PI comparisons suggest just the opposite project ranking. The latter two analyses identify the south-eastern Australia project as the superior investment because the differences in scale between the two projects are ignored. For the south-eastern Australian project, the PI indicates that project cash inflows exceed the initial cash outflow by 50% on a present-value basis. The present value of cash inflows for the western Europe investment exceeds the initial cash outflow by just 30%. But the western Europe project is much larger, and as our NPV figures reveal, it generates considerably more wealth for Global Untethered shareholders.⁸

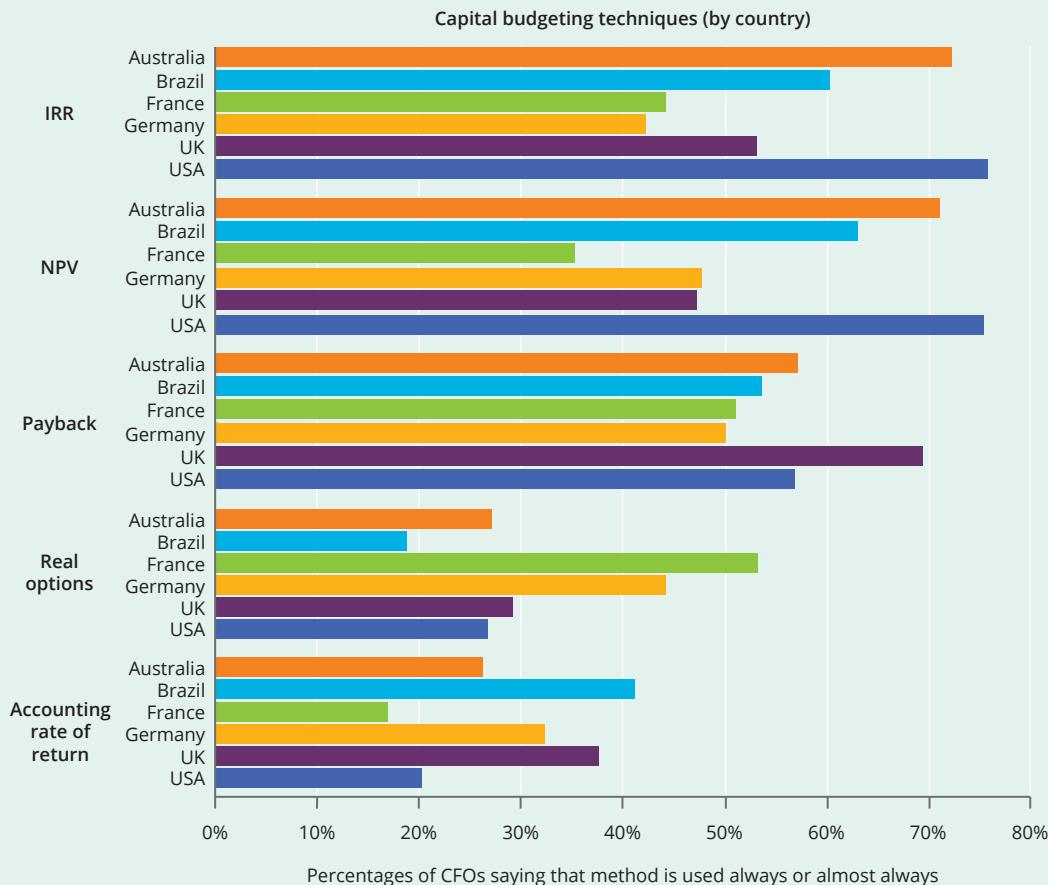
⁸ The use of the profitability index in *capital rationing*, which occurs when the firm has more acceptable projects than it can fund from its current budget, is discussed in Chapter 10.

FINANCE IN THE REAL WORLD



CFO SURVEY EVIDENCE (II)

Surveys of corporate financial managers around the world reveal both major similarities and significant differences in the use of various capital budgeting techniques. The graph below documents how frequently managers in Australia, the United States, the United Kingdom, Germany, France and Brazil use internal rate of return, net present value, payback period, real option analysis and accounting rate of return. IRR and NPV are used by over 70% of managers of Australian and US companies and by a majority, or near-majority, of Brazilian and British managers; but the propensity to use either of these theoretically preferred methods of capital budgeting decision making is below 50% in all other countries. The payback method is one of the most frequently employed decision-making tools in other countries.



Sources: John R. Graham and Campbell R. Harvey, 'The Theory and Practice of Corporate Finance: Evidence from the Field', *Journal of Financial Economics*, 60 (2001), pp. 187–243; Dirk Brounen, Abe de Jong and Kees Koedijk, 'Corporate Finance in Europe: Confronting Theory with Practice', *Financial Management*, 33 (Winter 2004), pp. 71–101; Les Coleman, Krishnan Maheswaran and Sean Pinder, 'Narratives in Managers' Corporate Finance Decisions', Working Paper, University of Melbourne, 2008.

LO9.4

CONCEPT REVIEW QUESTIONS

- 8 How are the NPV, IRR and PI approaches related?
- 9 What important flaw do both the IRR and PI share?

LO9.5

9.5 PAYBACK METHODS

In this section we evaluate the use of the payback period and the discounted payback methods by assessing their pros and cons. Both methods are typically used to assess the impact of capital expenditures.

9.5a THE PAYBACK DECISION RULE

The payback method is the simplest of all capital budgeting decision-making tools; it enjoys widespread use, particularly in small companies. The **payback period** is the time it takes for a project's cumulative net cash inflows to recoup the initial investment. Companies using the payback approach define a maximum acceptable payback period and accept only those projects that have payback periods *less than the maximum*; all other projects are rejected. If a company decides that it wants to avoid any investment that does not 'pay for itself' within three years, then the payback decision rule is to accept projects with a payback period of three years or less and reject all other investments. If several projects satisfy this condition, then companies may prioritise investments based on which ones achieve payback more rapidly. The decision to use three years as the cut-off point is somewhat arbitrary, and there are no hard-and-fast guidelines that establish what the 'optimal' payback period should be. Nevertheless, suppose that Global Untethered uses three years as its cut-off when applying payback analysis. What investment decision would it make?

payback period
The amount of time it takes for a project's cumulative net cash inflows to recoup the initial investment



Calculating the Payback Period for Global Untethered

The investment to expand the mobile network in western Europe requires an initial outlay of \$250 million. According to the company's cash flow projections, this project will bring \$245 million in its first three years (\$35 million in year 1 + \$80 million in year 2 + \$130 million in year 3) and \$405 million after four years (\$245 million in the first three years + \$160 million in year 4). So the company will fully recover its \$250 million initial outlay sometime during year 4. Because the company only needs to recover \$5 million (\$250 million initial outlay – \$245 million recovered in the first three years) in year 4, assuming cash flow occurs at a constant rate throughout the year, we can estimate the fraction of year 4 as 0.03, by dividing the \$5 million that needs to be recovered in year 4 by the \$160 million expected to be recovered in that year. The payback

period for western Europe is therefore 3.03 years; so Global Untethered would reject the investment because this payback period is longer than the company's maximum three-year payback period.

The toehold investment in the south-eastern Australia project requires just \$50 million. In its first two years, this investment generates \$40 million in cash flow (\$18 million in year 1 + \$22 million in year 2). By the end of year 3, it produces a cumulative cash flow of \$65 million (\$40 million in the first two years + \$25 million in year 3). Thus, the project earns back the initial \$50 million at some point during year 3. It needs to recover \$10 million (\$50 million initial outlay – \$40 million recovered in the first two years) in year 3. We can estimate the fraction of year 3 as 0.40, by dividing the \$10 million that needs to be



recovered in year 3 by the \$25 million expected to be recovered that year. The payback for the south-eastern Australian project is therefore 2.40 years. Global Untethered would undertake

the investment because this payback period is shorter than the company's maximum three-year payback period.

9.5b PROS AND CONS OF THE PAYBACK METHOD

Arguments in Favour of the Payback Method

Simplicity is payback's main virtue. Once a company estimates a project's cash flows, it is simply a matter of addition to determine when the cumulative net cash inflows will equal the initial outlay. The intuitive appeal of the payback method is strong. It sounds reasonable to expect a good investment to pay for itself in a fairly short time. Indeed, the time value of money suggests that, other things being equal, a project that brings in cash flow faster ought to be more valuable than one with more distant cash flows. Small companies, which typically operate with limited financing, tend to favour payback because it is simple and because receiving more cash flow sooner allows them more financial flexibility. Some managers say that establishing a short payback period is one way to account for a project's risk exposure. They argue that projects that take longer to pay off are intrinsically riskier than those that recoup the initial investment more quickly, partly because forecast errors tend to increase with the length of the payback time period. The payback period is a popular decision-making technique in highly uncertain situations, where it is frequently used as the primary technique. It is used frequently for international investments made in unstable economic and political environments and in risky domestic investments, such as oil drilling, and new business ventures.

Another justification given for using the payback method is that some companies face financing constraints. Advocates of the payback method argue that it makes sense for cash-strapped companies to use payback because it indicates how quickly the company can generate cash flow to repay debt or to pursue other investment opportunities. Career concerns may also lead managers to prefer the payback rule. Particularly in large companies, managers rotate quite often from one job to another. To obtain promotions and to enhance their reputations, managers want to make investments that will enable them to point to success stories at each stage of their careers. A manager who expects to stay in a particular position in a company for just two or three years may prefer to undertake investments that recover costs quickly, rather than projects that have payoffs far into the future.

Arguments Against the Payback Method

Although the payback method has apparent virtues, it also suffers from some serious problems. The payback cut-off period is simply a judgement with no direct connection to share value maximisation. How can we be sure that accepting projects that pay back within three years will maximise shareholder wealth? What if a project has an enormous payoff in year 4 or year 5? Payback ignores cash flows beyond the cut-off point.

The way that the payback method accounts for the time value of money is crude. The payback method assigns a 0% discount rate to cash flows that occur before the cut-off point. That is, if the payback period is three years, then cash flows that occur in years 1, 2 and 3 receive equal weight in the payback calculation. Beyond the cut-off point, the payback method ignores all cash flows. In other words, cash flows in year 4 and beyond receive zero weight (or have zero present value), as if the discount rate were infinite.

What happens if the project has an early payoff followed by negative cash flows after the payback period? The payback method does not adjust for these situations.

The career concerns of managers, which may lead them to prefer the payback rule, could also be an argument against the payback method. Managers might simply choose investments with rapid payback periods in order to gain early recognition of their successes and progress their careers; but these options may

not be in the best long-term interests of shareholders. This is a classic principal–agent problem, where the interests of the agents looking after the company (i.e. the managers) are not completely aligned with the interests of the principals (i.e. the shareholders who have appointed the managers to act on their behalf).

9.5c DISCOUNTED PAYBACK

The **discounted payback period** is the same as the payback period, except that in calculating the former, managers discount cash flows first. In other words, the discounted payback method calculates how long it takes for a project's discounted cash flows to recover the initial investment. This represents a minor improvement over the simple payback method, in that it does a better job of accounting for the time value of cash flows that occur within the payback cut-off period. As with the ordinary payback rule, discounted payback totally ignores cash flows that occur beyond the cut-off point, and the chosen cut-off is often arbitrary. Thus, this method also suffers from many of the problems associated with the payback method.

discounted payback period

The amount of time it takes for a project's discounted cash flows to recover the initial investment



Calculating Discounted Payback

Suppose that Global Untethered uses the discounted payback method, with a discount rate of 18% and a cut-off period of three years. The following schedules show the present value (PV) of each project's cash flows during the first three years.⁹ For example, \$29.7 million is the present value of the \$35 million that the western Europe investment is expected to earn in its first year, \$57.5 million is the present value of the \$80 million that the project is expected to earn in its second year, and so on.

Recall that the initial outlay for the western Europe expansion project is \$250 million, but only \$50 million for the south-eastern Australia toehold project. After three years, neither project's cumulative PV of cash flows exceeds its initial outlay. Neither investment satisfies the condition that the discounted cash flows recoup the initial investment within three years. Therefore, Global Untethered would reject both projects.

YEAR	WESTERN EUROPE PROJECT (\$ MILLIONS)		SOUTH-EASTERN AUSTRALIA PROJECT (\$ MILLIONS)	
	PV OF CASH FLOW	CUMULATIVE PV	PV OF CASH FLOW	CUMULATIVE PV
1	29.7	29.7	15.3	15.3
2	57.5	87.2	15.8	31.1
3	79.1	166.3	15.2	46.3

In the next section, we present a simple method often used to evaluate projects from an accounting perspective.

LO9.5

CONCEPT REVIEW QUESTIONS

- 10 What factors account for the popularity of the payback method? In what situations is it often used as the primary decision-making technique? Why?
- 11 What are the major flaws of the payback period and discounted payback period approaches?

⁹ We are assuming here that the first year's cash flows occur one year after the initial investment (end of year 1), the second year's cash flows occur two years after the initial investment (end of year 2), and so on.

LO9.6

9.6 ACCOUNTING-BASED METHODS

accounting rate of return

Return on investment calculated by dividing net income by the book value of assets

In this section we evaluate the use of the **accounting rate of return** as an alternative method of assessing the impact of capital expenditures.

9.6a ACCOUNTING RATE OF RETURN

For better or worse, managers in many companies focus as much on how a given project will influence reported earnings as on how it will affect cash flows. Managers justify this focus by pointing to the positive (or negative) share-price response that occurs when their companies beat (or fail to meet) earnings forecasts made by equity analysts. Managers may also overemphasise a project's accounting-based earnings because their compensation is based on meeting accounting-based performance measures such as earnings-per-share or return-on-total-assets targets. Consequently, some companies base their investment decisions on accounting-based rate of return measures.

Companies have many different ways of defining a hurdle rate for their investments in terms of accounting rates of return. Almost all these metrics involve two steps: (1) identifying the project's net income each year; and (2) measuring the project's invested capital requirements, as shown on the balance sheet, each year. Given these two figures, a company may calculate an accounting rate of return by dividing net income by the book value of assets, either on a year-by-year basis or by taking an average over the project's life. Note that this measure is comparable to *return on total assets (ROA)*, also called *return on investment (ROI)* – which was introduced in Chapter 2 – for measuring a company's overall effectiveness in generating returns with its available assets. Companies will usually establish some minimum accounting rate of return, the hurdle rate, which projects must earn before they can be funded. When more than one project exceeds the minimum standard, companies prioritise projects based on their accounting rates of return and invest in projects with higher returns first.

FINANCE IN THE REAL WORLD



CFO SURVEY EVIDENCE (III)

In a survey of CFOs, Graham, Harvey and Rajgopal asked CFOs to identify the most important financial measures that they reported to outside investors. The accompanying pie chart shows that the overwhelming response was earnings. The study also reported that CFOs believed that reporting earnings in the current quarter that are higher than earnings in the same quarter in the prior year was the most important earnings benchmark for companies to achieve – even more important than beating equity analysts' earnings forecasts. This focus on earnings stands in contrast to our recommendation that managers focus on cash flows.



Source: John R. Graham, Campbell R. Harvey and Shiva Rajgopal, 'The Economic Implications of Corporate Financial Reporting', *Journal of Accounting and Economics*, 40, 2005, pp. 3–73.



EXAMPLE

Calculating Accounting Rates of Return

Suppose that the practice at Global Untethered is to calculate a project's accounting rate of return by taking the project's average contribution to net income and dividing by its average book value. Global Untethered ranks projects based on this measure, and accepts those that offer an accounting rate of return of at least 25%. So far, we have been given the cash flows from each of the two projects that Global Untethered is evaluating. Chapter 10 discusses in greater depth the differences between cash flow and net income; but for now, the net income figures for each project appear below. We will assume that the company depreciates fixed assets on a straight-line basis over five years.

	NET INCOME (\$ IN MILLIONS)	
YEAR	WESTERN EUROPE PROJECT	SOUTH-EASTERN AUSTRALIA PROJECT
1	-15	8
2	30	12
3	80	15
4	110	20
5	125	22

Therefore, the western Europe project will have an annual depreciation charge of \$50 million (one-fifth of \$250 million), and the south-eastern Australia project will have an annual depreciation charge of \$10 million (one-fifth of \$50 million). The western Europe project begins with a book value of \$250 million. After five years of depreciation it has a book value of \$0. Therefore, the average book value of that project is \$125 million ($[\$250 - \$0] \div 2$). The project's average net income equals \$66 million ($[-\$15 + \$30 + \$80 + \$110 + \$125] \div 5$), so its average accounting rate of return is an impressive 52.8% ($\$66 \div \125). The same steps applied to the south-eastern Australia project yield an average book value of \$25 million ($[\$50 - \$0] \div 2$), an average net income of \$15.4 million ($[\$8 + \$12 + \$15 + \$20 + \$22] \div 5$), and an accounting rate of return of 61.6% ($\$15.4 \div \25). Because both projects earn more than the required 25% minimum return, Global Untethered should be willing to invest in either project, and it would rank the south-eastern Australia investment above the western Europe expansion.

9.6b PROS AND CONS OF THE ACCOUNTING RATE OF RETURN

Because of their convenience, ease of calculation and ease of interpretation, accounting-based measures are used by many companies to evaluate capital investments. However, these techniques have serious flaws:

- As the preceding example demonstrates, the decision about what depreciation method to use has a large effect on both the numerator and the denominator of the accounting rate of return formula.
- This method makes no adjustment for the time value of money or project risk.
- Investors should be more concerned with the market value than the book value of the assets that a company holds. After five years, the book value of Global Untethered's investment (in either project) is zero, but the market value will almost certainly be positive, and may be even greater than the initial amount invested.
- As explained in Chapter 2, finance theory teaches that investors should focus on a company's ability to generate cash flow rather than on its net income.
- The choice of the 25% accounting return hurdle rate is essentially arbitrary. This rate is not based on rates available on similar investments in the market, but reflects a purely subjective judgement on the part of management.

By now you may have noticed some common themes in our discussion of the pros and cons of different approaches to capital budgeting. Neither the payback method nor the accounting rate of return method considers all of a project's cash flows in the decision-making process. Both of these methods fail to properly account for the time value of money, and none of them deal adequately with risk. Most importantly, neither method is consistent with the goal of shareholder wealth maximisation. As we saw at the beginning of the chapter, the NPV method, along with EVA, solves all these difficulties and therefore enjoys widespread support from both academics and business practitioners.

LO9.6

CONCEPT REVIEW QUESTIONS

- 12 Why do managers focus on the effect that an investment will have on reported earnings rather than on the investment's cash flow consequences?
- 13 What factors determine whether the annual accounting rate of return on a given project will be high or low in the early years of the investment's life? In the latter years?

LO9.7

9.7 CAPITAL BUDGETING IN PRACTICE

We conclude with an investment problem that illustrates many of the issues that we introduced earlier in this chapter.

The Ana-Lab Corporation conducts chemical analysis of water, soil and industrial wastes as mandated by the Environmental Protection Agency (EPA). Ana-Lab's customers include local governmental bodies, which are responsible for ensuring that local water supplies are safe for drinking, and manufacturing companies, which must verify that the wastes that they release into water or landfills comply with strict regulatory standards.

A new regulation recently imposed by the EPA sets limits on the amount of a certain chemical that can be released in industrial wastewater. In the next few years, Ana-Lab expects many of its customers to ask for new tests that monitor the presence of this chemical. However, over time Ana-Lab's clients will change their production processes to reduce the quantity of this harmful chemical, and the demand for testing will eventually decline.

Ana-Lab does not currently have the technology to run the necessary tests, so it will have to buy several new machines called gas chromatographs. Two different types of gas chromatograph are available, both of which have a useful operating life of about six years. One type, Type A, is less expensive and cheaper to operate than the other. The other type, Type B, costs a great deal more, but in principle it can be used to perform many additional kinds of chemical tests. Ana-Lab's CEO, Mr Whitehead, believes that over time he could find new customers who would pay for the additional types of tests that the Type B chromatographs can perform. At the end of its life, the Type B machines must be removed from Ana-Lab's facility at great cost, a cost large enough that in the final year of operating the Type B machines, the net cash flow is negative. The estimated cash flows associated with each type of machine appear below:

YEAR	TYPE A CHROMATOGRAPH	TYPE B CHROMATOGRAPH
0	-\$1,000,000	-\$3,200,000
1	450,000	500,000
2	350,000	550,000
3	250,000	1,000,000
4	200,000	1,500,000
5	150,000	2,000,000
6	125,000	-600,000

Mr Whitehead asks you to provide analysis to help him determine which chromatograph to purchase. He is particularly interested in knowing how quickly each machine will pay back its initial cost and the rate of return that each machine offers. He tells you that if he does not spend money on new gas chromatographs, he will probably replace some existing equipment in the lab, and he would expect to earn a return of about 10% on that type of investment. As you sit down to begin your analysis, a number of questions come to mind.

- What is the payback period of each machine?
- What are the pros and cons of focusing on payback as a decision criterion in this particular case?
- What is the internal rate of return provided by each machine?
- What problems could arise if Mr Whitehead chooses the machine with the highest IRR?
- What hurdle rate ought to be applied to an investment like this?

9.7a PAYBACK PERIOD

The Type A machine produces cash flow of \$800,000 in its first two years and \$250,000 in its third year. Therefore, it pays back the initial \$1,000,000 cost about four-fifths of the way through year 3 ($\$200,000 \div \$250,000 = 0.8$). Its payback period is 2.8 years. The Type B machine generates cash flow of \$2,050,000 during its first three years and \$1,500,000 in its fourth year. Therefore, it earns back the initial \$3,200,000 cost in 3.77 years ($\$1,150,000 \div \$1,500,000 = 0.77$). Based on payback analysis, the Type A chromatograph seems more attractive.

You recall that the payback approach fails to account for the time value of money and completely ignores cash flows beyond the payback period. The Type A machine produces most of its cash flows early in its life, while the Type B machine generates larger cash flows in the later years (but it also has a significant negative cash flow in year 6). Because the timing of the cash flows generated by each machine is so different, you worry that a simple payback analysis might lead to a decision that is not best for the company in the long run.

9.7b INTERNAL RATE OF RETURN

Next, you calculate the rate of return earned by each machine by solving for the *IRR* as follows:

Type A:

$$-\$1,000,000 + \frac{\$450,000}{(1+r)} + \frac{\$350,000}{(1+r)^2} + \frac{\$250,000}{(1+r)^3} + \frac{\$200,000}{(1+r)^4} + \frac{\$150,000}{(1+r)^5} + \frac{\$125,000}{(1+r)^6} = 0$$

$$r = IRR = 0.18 = 18\%$$

Type B:

$$-\$3,200,000 + \frac{\$500,000}{(1+r)} + \frac{\$550,000}{(1+r)^2} + \frac{\$1,000,000}{(1+r)^3} + \frac{\$1,500,000}{(1+r)^4} + \frac{\$2,000,000}{(1+r)^5} + \frac{-\$600,000}{(1+r)^6} = 0$$

$$r = IRR = 0.139 = 13.9\%$$

The Type A machine seems to be the best choice because it offers an 18% return compared to 13.9% for the Type B machine. You feel somewhat relieved that the IRR analysis favours the Type A machine, consistent with the conclusion from your payback period analysis. You also feel reassured that *both* machines earn a return well in excess of the 10% return that Mr Whitehead said he could earn by replacing existing equipment. However, you wonder if an investment in gas chromatographs should earn more than 10%. Perhaps the demand for the tests that the chromatograph can perform is very sensitive to economic conditions, and if so, the investment may have higher systematic risk than Ana-Lab's existing business.

9.7c ADDITIONAL ANALYSIS

Before reporting back to Mr Whitehead, you decide to calculate the NPV for each machine using the 10% hurdle rate that he suggested, as well as a higher rate, 13%, to adjust for the higher risk of these new machines. Given that IRRs of both machines exceed even the higher of these two hurdle rates, you expect to find that both machines create value – have a positive NPV – for Ana-Lab. Your calculations are summarised below:

	TYPE A CHROMATOGRAPH	TYPE B CHROMATOGRAPH
NPV at 10%	\$ 186,476	\$388,084
NPV at 13%	\$1,097,012	\$ 83,566

What previously seemed to be an easy decision to invest in the Type A machine now appears to be less clear cut. When you discount the cash flows at the 10% rate suggested by Mr Whitehead, the NPV of the Type B machine is more than twice as large as the alternative. But at a 13% discount rate, the Type A machine looks like the better choice. You wonder, what accounts for the conflicting rankings?

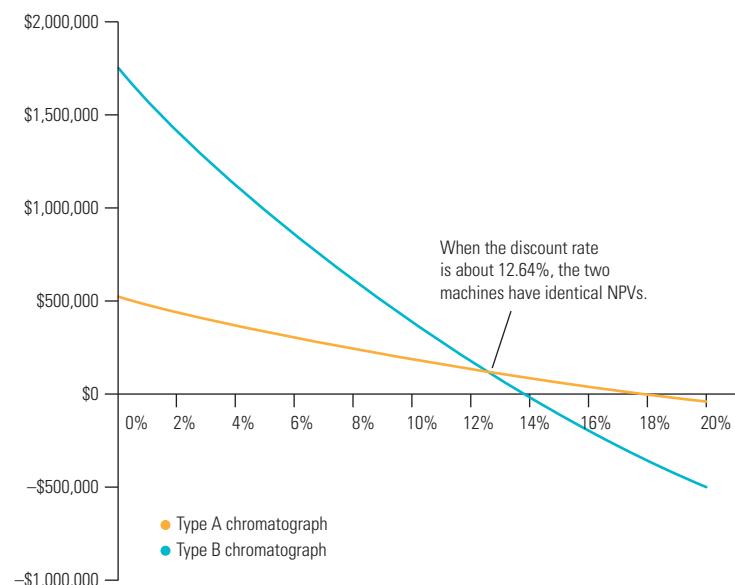
9.7d CONCLUSION

Notice that the cash flows associated with each machine differ in three important ways. First, Ana-Lab must invest a lot more money to purchase the Type B machine. Second, the Type A machine produces most of its cash flow in the early years, while the Type B machine produces higher cash flows later in its life. Third, the Type B machine has net cash outflows up-front and in year 6, but the Type A machine only has an outflow in the initial year.

With respect to the differences in the up-front investments required to purchase each machine, recall that the NPV and IRR rankings may conflict because it is sometimes better to accept a lower return on a larger investment compared to a higher return on a smaller investment. The IRR of the Type A machine is 18%, but Ana-Lab earns that return on an investment of just \$1 million. It is possible that the company could make more money if it earned a lower rate of return on a much larger investment. That is precisely what the NPV analysis is telling you, at least when the discount rate is 10%. If 10% is the proper hurdle rate to apply to this investment decision, then buying the Type B machine creates \$388,084 in additional wealth for the company, even though the rate of return is higher on the other machine.

But if Type B is the right choice at 10%, why is it not correct based on a 13% discount rate? Because the Type B machine produces so much of its cash flows in years 4 and 5, its NPV is very sensitive to the discount rate. [Figure 9.10](#) demonstrates this. At relatively low discount rates, the Type B chromatograph produces a higher NPV compared to the Type A machine, but for higher rates, the NPV of the Type A machine is higher. The two curves in [Figure 9.10](#) intersect at a discount rate of roughly 12.64%, meaning that the NPVs of the two machines are equal at that point. Therefore, your advice to Mr Whitehead should be to purchase the Type B machine if the appropriate hurdle rate is 12.64% or lower, and purchase the Type A machine if the appropriate hurdle rate is greater than 12.64% but less than 18%. This suggests that the company should spend the necessary time to carefully calculate the correct discount rate for this project.

FIGURE 9.10 NET PRESENT VALUES OF TWO GAS CHROMATOGRAPHS



A final consideration is the impact of multiple sign changes in the cash flows associated with the Type B machine. Recall that when the cash flows change sign more than once, it is possible that an investment can have more than one IRR. In that case it is helpful to plot the investment's NPV for a range of discount rates. In [Figure 9.10](#), you can see that the NPV for the Type B chromatograph is positive for any discount rate between 0% and 13.9%, and at higher rates (at least up to 20%) the NPV is negative. Thus, over a range of discount rates that represent plausible hurdle rates for this investment, there is only one IRR. Still, when cash flows change signs more than once, as they do for the Type B machine, you should check to see if the investment has more than one IRR by plotting a graph like [Figure 9.10](#).¹⁰

¹⁰ The Type B machine does in fact have another IRR. The second IRR is approximately -75.38%.

STUDY TOOLS

SUMMARY

- LO9.1**
 - The capital budgeting process involves generating, reviewing, analysing, selecting and implementing long-term investment proposals that are consistent with the company's strategic goals.
 - Other things being equal, managers would prefer an easily applied capital budgeting technique that considers cash flow, recognises the time value of money, fully accounts for expected risk and return and, when applied, leads to higher share prices.
 - Though simplicity is a virtue, the simplest approaches to capital budgeting do not always lead companies to make the best investment decisions.
- LO9.2**
 - Sophisticated techniques include *net present value* (NPV), *internal rate of return* (IRR) and *profitability index* (PI). These methods often give the same accept-reject decisions, but do not necessarily rank projects the same. They all focus on cash flows, rather than accounting earnings, and make appropriate adjustments for time.
 - The NPV gives a direct estimate of the change in shareholder wealth resulting from a given investment and provides a straightforward way to control differences in risk among alternatives. However, it does not provide a means for incorporating the value of managerial flexibility during the life of a project.
 - The NPV is calculated as the sum of the discounted cash flows, as shown in important **Equation 9.1**.
 - The EVA is a variant of NPV analysis, which essentially calculates an investment's NPV on a year-by-year basis. It uses the economic profit, rather than just focusing on accounting profit, and thus allows for the cost of capital. The EVA is equal to the cash flow less the product of the cost of capital and invested capital.
- LO9.3**
 - The IRR is the rate of return which sets the NPV (or sum of the discounted cash flows) to zero, as shown in important **Equation 9.2**.
 - The IRR approach makes an appropriate adjustment for the time value of money and allows managers to make explicit, quantitative adjustments for differences in risk across different projects. However, using the IRR approach can occasionally lead to poor investment decisions when projects have cash flow streams alternating between negative and positive values. The IRR technique may provide sub-optimal project rankings when different investments have very different scales or when the timing of cash flows varies dramatically from one project to another.
 - Although the NPV and IRR techniques give the same accept or reject decisions, these techniques do not necessarily agree in ranking mutually exclusive projects. IRR techniques weight earlier cash flows higher (since they are discounted less), and this can result in differences between rankings using each technique. Because of its lack of mathematical, scale and timing problems, the most straightforward and, theoretically, the best decision technique is net present value (NPV).
- LO9.4**
 - The profitability index is a close cousin of the NPV approach, but it suffers from the same scale problem as the IRR approach. The PI is calculated as shown in important **Equation 9.3**. It is the sum of the discounted cash flows from Period 1 onwards, indexed by the modulus of the cash flow at time zero.
- LO9.5, LO9.6**
 - Capital budgeting techniques include the payback period, discounted payback period and accounting rate of return, which are less sophisticated techniques, because they do not explicitly deal with the time value of money and are not tied to the company's wealth-maximisation goal.
- LO9.7**
 - A single complete example can illustrate how the different measures of value can be calculated, and how investment decisions that add value to an enterprise can be identified.

IMPORTANT EQUATIONS

TABLE OF IMPORTANT EQUATIONS

$$9.1 \quad NPV = CF_0 + \frac{CF_1}{(1+r)^1} + \frac{CF_2}{(1+r)^2} + \frac{CF_3}{(1+r)^3} + \dots + \frac{CF_n}{(1+r)^n}$$

$$9.2 \quad IRR = r, \text{ where } NPV = \$0 = CF_0 + \frac{CF_1}{(1+r)^1} + \frac{CF_2}{(1+r)^2} + \frac{CF_3}{(1+r)^3} + \dots + \frac{CF_n}{(1+r)^n}; \quad r = IRR$$

$$9.3 \quad PI = \frac{\frac{CF_1}{(1+r)^1} + \frac{CF_2}{(1+r)^2} + \frac{CF_3}{(1+r)^3} + \dots + \frac{CF_n}{(1+r)^n}}{|CF_0|}$$

SELF-TEST PROBLEMS

Answers to these 'Self-test problems' and the 'Concept review' questions throughout the chapter appear on the Student Companion Website (<http://login.cengagebrain.com>) or via your instructor.

ST9-1 JK Products Pty Ltd is considering investing in either of two competing projects that will allow the company to eliminate a production bottleneck and meet the growing demand for its products. The company's engineering department narrowed the alternatives down to two: Status Quo (SQ) and High Tech (HT). Working with the accounting and finance personnel, the company's CFO developed the following estimates of the cash flows for SQ and HT over the relevant six-year time horizon. The company has an 11% required return, and views these projects as equally risky.

YEAR	PROJECT SQ	PROJECT HT
	CASH FLOWS	
0	-\$670,000	-\$940,000
1	\$250,000	\$170,000
2	200,000	180,000
3	170,000	200,000
4	150,000	250,000
5	130,000	300,000
6	130,000	550,000

- a Calculate the *net present value (NPV)* of each project, assess its acceptability and indicate which project is best, using NPV.
- b Calculate the *internal rate of return (IRR)* of each project, assess its acceptability and indicate which project is best, using IRR.
- c Calculate the *profitability index (PI)* of each project, assess its acceptability and indicate which project is best, using PI.
- d Draw the *NPV profile* for project SQ and HT on the same set of axes, and use this diagram to explain why the NPV and the IRR show different preferences for these two mutually exclusive projects. Discuss this difference in terms of both the 'scale problem' and the 'timing problem'.
- e Which of the two mutually exclusive projects would you recommend that JK Products undertake? Why?

ST9-2 Nader International is considering investing in two assets: A and B. The initial outlay, annual cash flows and annual depreciation for each asset appears in the following table for the assets' assumed five-year lives. Nader will use straight-line depreciation over each asset's five-year life. The company requires a 10% return on each of those equally risky assets. Nader's maximum payback period is 2.5 years, its maximum discounted payback period is 3.25 years and its minimum accounting rate of return is 30%.

YEAR	ASSET A		ASSET B	
	CASH FLOW	DEPRECIATION	CASH FLOW	DEPRECIATION
0	-\$200,000	–	-\$180,000	–
1	\$70,000	\$40,000	\$80,000	\$36,000
2	80,000	40,000	90,000	36,000
3	90,000	40,000	30,000	36,000
4	90,000	40,000	40,000	36,000
5	100,000	40,000	40,000	36,000

- a Calculate the *payback period* for each asset, assess its acceptability and indicate which asset is best, using the payback period.
- b Calculate the *discounted payback* for each asset, assess its acceptability and indicate which asset is best, using the discounted payback.
- c Assuming that each year's net income equals cash flow minus depreciation, calculate the *accounting rate of return* from each asset, assess its acceptability and indicate which asset is best, using the accounting rate of return.
- d Compare and contrast your findings in parts (a), (b) and (c). Which asset would you recommend to Nader, assuming that they are mutually exclusive? Why?

QUESTIONS

- Q9-1** For a company that uses the NPV rule to make investment decisions, what consequences result if the company misestimates shareholders' required returns and consistently applies a discount rate that is 'too high'?
- Q9-2** 'Cash flow projections more than a few years out are not worth the paper they're written on. Therefore, using payback analysis, which ignores long-term cash flows, is more reasonable than making wild guesses, as one has to do in the NPV approach.' Respond to this comment.
- Q9-3** 'Smart analysts can massage the numbers in NPV analysis to make any project's NPV look positive. It is better to use a simpler approach, such as payback or accounting rate of return, that gives analysts fewer degrees of freedom to manipulate the numbers.' Respond to this comment.
- Q9-4** In what way is the NPV consistent with the principle of shareholder wealth maximisation? What happens to the value of a company if a positive NPV project is accepted? If a negative NPV project is accepted?
- Q9-5** A particular company's shareholders demand a 10% return on their investment, given the company's risk. However, this company has historically generated returns in excess of shareholder expectations, with an average return on its portfolio of investments of 20%.
- a Looking back, what kind of share-price performance would you expect to see for this company?
 - b A new investment opportunity arises, and the company's financial analysts estimate that the project's return will be 15%. The CEO wants to reject the project because it would lower the company's average return and therefore lower the company's share price. How do you respond?

- Q9-6** What are the potential faults in using the IRR as a capital budgeting technique? Given these faults, why is this technique so popular among corporate managers?
- Q9-7** Why is the NPV considered to be theoretically superior to all other capital budgeting techniques? Reconcile this result with the prevalence of the use of IRR in practice. How would you respond to your CFO if she instructed you to use the IRR technique to make capital budgeting decisions on projects with cash flow streams that alternate between inflows and outflows?
- Q9-8** Outline the differences between NPV, IRR and PI. What are the advantages and disadvantages of each technique? Do they agree with regard to simple accept or reject decisions?
- Q9-9** Under what circumstances will the NPV, IRR and PI techniques provide different capital budgeting decisions? What are the underlying causes of the differences often found in the ranking of mutually exclusive projects using NPV and IRR?
- Q9-10** Can you name some industries where the payback period is unavoidably long?
- Q9-11** In statistics, you learn about Type I and Type II errors. A Type I error occurs when a statistical test rejects a hypothesis when the hypothesis is actually true. A Type II error occurs when a test fails to reject a hypothesis that is actually false. We can apply this type of thinking to capital budgeting. A Type I error occurs when a company rejects an investment project that would actually enhance shareholder wealth. A Type II error occurs when a company accepts a value-decreasing investment, which should have been rejected.
- a** Describe the features of the payback rule that could lead to Type I errors.
 - b** Describe the features of the payback rule that could lead to Type II errors.
 - c** Which error do you think is more likely to occur when companies use payback analysis? Does your answer depend on the length of the cut-off payback period? You can assume a 'typical' project cash flow stream, meaning that most cash outflows occur in the early years of a project.
- Q9-12** Holding the cut-off period fixed, which method has a more severe bias against long-lived projects, payback or discounted payback?

PROBLEMS

NET PRESENT VALUE

- P9-1** Calculate the net present value (NPV) for the following 20-year projects. Comment on the acceptability of each. Assume that the company has an opportunity cost of 14%.
- a** Initial cash outlay is \$15,000; cash inflows are \$13,000 per year.
 - b** Initial cash outlay is \$32,000; cash inflows are \$4,000 per year.
 - c** Initial cash outlay is \$50,000; cash inflows are \$8,500 per year.
- P9-2** Michael's Bakery is evaluating a new electronic oven. The oven requires an initial cash outlay of \$19,000, and will generate after-tax cash inflows of \$4,000 per year for eight years. For each of the costs of capital listed: (1) calculate the NPV; (2) indicate whether to accept or reject the machine; and (3) explain your decision.
- a** The cost of capital is 10%.
 - b** The cost of capital is 12%.
 - c** The cost of capital is 14%.

- P9-3** Using a 15% cost of capital, calculate the NPV for each of the projects shown in the following table and indicate whether or not each is acceptable.

YEAR	PROJECT A	PROJECT B	PROJECT C	PROJECT D	PROJECT E
	CASH FLOWS				
0	-\$20,000	-\$600,000	-\$150,000	-\$760,000	-\$100,000
1	3,000	120,000	18,000	185,000	0
2	3,000	145,000	17,000	185,000	0
3	3,000	170,000	16,000	185,000	0
4	3,000	190,000	15,000	185,000	25,000
5	3,000	220,000	15,000	185,000	36,000
6	3,000	240,000	14,000	185,000	0
7	3,000		13,000	185,000	60,000
8	3,000		12,000	185,000	72,000
9	3,000		11,000		84,000
10	3,000		10,000		

- P9-4** Scotty Manufacturing is considering the replacement of one of its machine tools. Three alternative replacement tools – A, B and C – are under consideration. The cash flows associated with each are shown in the following table. The company's cost of capital is 15%.

YEAR	A	B	C
	CASH FLOWS		
0	-\$95,000	-\$50,000	-\$150,000
1	20,000	10,000	58,000
2	20,000	12,000	35,000
3	20,000	13,000	23,000
4	20,000	15,000	23,000
5	20,000	17,000	23,000
6	20,000	21,000	35,000
7	20,000	–	46,000
8	20,000	–	58,000

- a Calculate the NPV of each alternative tool.
- b Using NPV, evaluate the acceptability of each tool.
- c Rank the tools from best to worst, using NPV.

- P9-5** Erwin Enterprises has 10 million shares outstanding, with a current market price of \$10 per share. There is one investment available to Erwin, and its cash flows are provided below. Erwin has a cost of capital of 10%. Given this information, determine the impact on Erwin's share price and company value if capital markets fully reflect the value of undertaking the project.

YEAR	CASH FLOW
0	-\$10,000,000
1	3,000,000
2	4,000,000
3	5,000,000
4	6,000,000
5	9,800,000

- P9-6** A certain investment requires an initial outlay of \$12 million, and subsequently produces annual cash inflows of \$1.4 million in perpetuity. A company evaluating this investment uses a discount rate of 10%. What is the investment's NPV? What is the EVA each period? What is the present value of the stream of EVAs?

INTERNAL RATE OF RETURN

- P9-7** For each of the projects shown in the following table, calculate the internal rate of return (IRR).

YEAR	PROJECT A	PROJECT B	PROJECT C	PROJECT D
	CASH FLOWS			
0	-\$72,000	-\$440,000	-\$18,000	-\$215,000
1	16,000	135,000	7,000	108,000
2	20,000	135,000	7,000	90,000
3	24,000	135,000	7,000	72,000
4	28,000	135,000	7,000	54,000
5	32,000	-	7,000	-

- P9-8** William Industries is attempting to choose the better of two mutually exclusive projects for expanding the company's production capacity. The relevant cash flows for the projects are shown in the following table. The company's cost of capital is 15%.

YEAR	PROJECT A	PROJECT B
	CASH FLOWS	
0	-\$550,000	-\$358,000
1	110,000	154,000
2	132,000	132,000
3	165,000	105,000
4	209,000	77,000
5	275,000	55,000

- a Calculate the IRR for each of the projects.
- b Assess the acceptability of each project, based on the IRRs found in part (a).
- c Which project is preferred, based on the IRRs found in part (a)?

- P9-9** Contract Manufacturing Ltd is considering two alternative investment proposals. The first proposal calls for a major renovation of the company's manufacturing facility. The second involves replacing just a few obsolete pieces of equipment in the facility. The company will choose one project or the other this year, but it will not do both. The cash flows associated with each project appear below, and the company discounts project cash flows at 15%.

YEAR	RENOVATE	REPLACE
0	-\$9,000,000	-\$1,000,000
1	3,500,000	600,000
2	3,000,000	500,000
3	3,000,000	400,000
4	2,800,000	300,000
5	2,500,000	200,000

- a Rank these investments based on their NPVs.
- b Rank these investments based on their IRRs.
- c Why do these rankings yield mixed signals?

- P9-10** Consider a project with the following cash flows and a company with a 10% cost of capital.

YEAR	CASH FLOW
0	-\$20,000
1	50,000
2	-10,000

- a What are the two IRRs associated with this cash flow stream?
- b If the company's cost of capital falls between the two IRR values calculated in part (a), should it accept or reject the project?

- P9-11** A certain project has the following stream of cash flows:

YEAR	CASH FLOW
0	\$17,500
1	-80,500
2	138,425
3	-105,455
4	30,030

- a Fill in the following table:

COST OF CAPITAL (%)	PROJECT NPV
0	—
5	—
10	—
15	—
20	—
25	—
30	—
35	—
50	—

- b** Use the values developed in part (a) to draw an NPV profile for the project.
- c** What is this project's IRR?
- d** Describe the conditions under which the company should accept this project.

PROFITABILITY INDEX

P9-12 Evaluate the following three projects, using the profitability index. Assume a cost of capital of 10%.

CASH FLOWS	PROJECT		
	LIQUIDATE	RECONDITION	REPLACE
Initial cash outflow	-\$100,000	-\$500,000	-\$1,000,000
Year 1 cash inflow	50,000	100,000	500,000
Year 2 cash inflow	60,000	200,000	500,000
Year 3 cash inflow	75,000	250,000	500,000

- a** Rank these projects by their PIs.
- b** If the projects are independent, which would you accept according to the PI criterion?
- c** If these projects are mutually exclusive, which would you accept according to the PI criterion?
- d** Apply the NPV criterion to the projects, rank them according to their NPVs, and indicate which you would accept if they are independent and mutually exclusive.
- e** Compare and contrast your answer from part (c) with your answer to part (d) for the mutually exclusive case. Explain this result.

P9-13 You have a \$10 million capital budget and must make the decision about which investments your company should accept for the coming year. Use the following information, about three mutually exclusive projects, to determine which investment your company should accept. The company's cost of capital is 12%.

CASH FLOWS	PROJECT 1	PROJECT 2	PROJECT 3
Initial cash outflow	-\$4,000,000	-\$5,000,000	-\$10,000,000
Year 1 cash inflow	1,000,000	2,000,000	4,000,000
Year 2 cash inflow	2,000,000	3,000,000	6,000,000
Year 3 cash inflow	3,000,000	3,000,000	5,000,000

- a** Which project do you accept on the basis of NPV?
- b** Which project do you accept on the basis of PI?
- c** If these are the only investments available, which one do you select?

P9-14 Both Old Line Industries and New Tech Ltd use the IRR to make investment decisions. Both companies are considering investing in a more efficient \$4.5 million mail-order processor. This machine could generate after-tax savings of \$2 million per year over the next three years for both companies. However, because of the risky nature of its business, New Tech has a much higher cost of capital (20%) than does Old Line (10%). Given this information, answer parts (a)–(c).

- a** Should Old Line invest in this processor?
- b** Should New Tech invest in this processor?
- c** Based on your answers in parts (a) and (b), what can you infer about the acceptability of projects across companies with different costs of capital?

P9-15 Butler Products has prepared the following estimates for an investment it is considering. The initial cash outflow is \$20,000, and the project is expected to yield cash inflows of \$4,400 per year for seven years. The company has a 10% cost of capital.

- a Determine the NPV for the project.
- b Determine the IRR for the project.
- c Would you recommend that the company accept or reject the project? Explain your answer.

P9-16 Reynolds Enterprises is attempting to evaluate the feasibility of investing \$85,000 in a machine with a five-year life. The company has estimated the cash inflows associated with the proposal as shown below. The company has a 12% cost of capital.

YEAR	CASH INFLOWS
1	\$18,000
2	22,500
3	27,000
4	31,500
5	36,000

- a Calculate the *payback period* for the proposed investment.
- b Calculate the NPV for the proposed investment.
- c Calculate the IRR for the proposed investment.
- d Evaluate the acceptability of the proposed investment using NPV and IRR. What recommendation would you make relative to implementation of the project? Why?

P9-17 Sharpe Manufacturing is attempting to select the best of three mutually exclusive projects. The initial cash outflow and after-tax cash inflows associated with each project are shown in the following table.

CASH FLOWS	PROJECT X	PROJECT Y	PROJECT Z
Initial cash outflow	\$80,000	\$130,000	\$145,000
Cash inflows years 1–5	27,000	41,000	43,000

- a Calculate the *payback period* for each project.
- b Calculate the NPV of each project, assuming that the company has a cost of capital equal to 13%.
- c Calculate the *IRR* for each project.
- d Summarise the preferences dictated by each measure and indicate which project you would recommend. Explain why.

P9-18 Wilkes Ltd must invest in a pollution-control program in order to meet federal regulations to stay in business. There are two programs available to Wilkes: an all-at-once program that will be immediately funded and implemented, and a gradual program that will be phased in over the next three years. The immediate program costs \$5 million, whereas the phase-in program will cost \$1 million today and \$2 million per year for the following three years. If the cost of capital for Wilkes is 15%, which pollution control program should Wilkes select?

P9-19 A consumer product company finds that its brand of laundry detergent is losing market share, so it decides that it needs to 'freshen' the product. One strategy is to maintain the current detergent formula but to repackage the product. The other strategy involves a complete reformulation of the product in a way that will appeal to environmentally conscious consumers. The company will

pursue one strategy or the other, but not both. Cash flows from each proposal appear below, and the company discounts cash flows at 13%.

YEAR	REPACKAGE	REFORMULATE
0	-\$3,000,000	-\$25,000,000
1	2,000,000	10,000,000
2	1,250,000	9,000,000
3	500,000	7,000,000
4	250,000	4,000,000
5	250,000	3,500,000

- a Rank these investments based on their NPVs.
 - b Rank these investments based on their IRRs.
 - c Rank these investments based on their PIs.
 - d Draw NPV profiles for the two projects on the same set of axes, and discuss these profiles.
 - e Do these investment rankings yield mixed signals?
- P9-20** Lundblad Construction recently acquired 4 hectares of land and is weighing two options for developing the land. The first proposal is to build 10 single-family homes on the site. This project would generate a quick cash payoff as the homes are sold over the next two years. Specifically, Lundblad estimates that it would spend \$2.5 million on construction costs immediately, and it would receive \$1.6 million as cash inflows in each of the next two years. The second proposal is to build a strip shopping mall. This project calls for Lundblad to retain ownership of the property and to lease space to retail businesses that would serve the neighbourhood. Construction costs for the strip mall are also about \$2.5 million, and the company expects to receive \$350,000 annually (for each of 50 years, starting one year from now) in net cash inflows from leasing the property. Lundblad's cost of capital is 10%.
- a Rank these projects based on their NPVs.
 - b Rank these projects based on their IRRs.
 - c Rank these projects based on their PIs. Do these rankings agree with those based on NPV or IRR?
 - d Draw NPV profiles for these projects on the same set of axes. Use this graph to explain why, in this case, the NPV and IRR methods yield mixed signals.
 - e Which project should Lundblad choose?
 - f Which project should Lundblad choose if its cost of capital is 13.5%? 16%? 20%?

PAYBACK METHODS

- P9-21** Suppose that a 30-year Treasury bond offers a 5% coupon rate, paid semiannually. The market price of the bond is \$1,000, equal to its par value.
- a What is the *payback period* for this bond?
 - b With such a long payback period, is the bond a bad investment?
 - c What is the *discounted payback* period for the bond, assuming its 5% coupon rate is the required return? What general principle does this example illustrate regarding a project's life, its discounted payback period and its NPV?

P9-22 The cash flows associated with three different projects are as follows:

CASH FLOWS	ALPHA (\$ IN MILLIONS)	BETA (\$ IN MILLIONS)	GAMMA (\$ IN MILLIONS)
Initial outflow	-1.5	-0.4	-7.5
Year 1	0.3	0.1	2.0
Year 2	0.5	0.2	3.0
Year 3	0.5	0.2	2.0
Year 4	0.4	0.1	1.5
Year 5	0.3	-0.2	5.5

- a Calculate the *payback period* of each investment.
- b Which investments does the company accept if the cut-off payback period is three years? Four years?
- c If the company invests by choosing projects with the shortest payback period, which project would it invest in?
- d If the company uses *discounted payback*, with a 15% discount rate and a four-year cut-off period, which projects will it accept?
- e One of these almost certainly should be rejected, but may be accepted if the company uses payback analysis. Which one?
- f One of these projects almost certainly should be accepted (unless the company's opportunity cost of capital is very high), but may be rejected if the company uses payback analysis. Which one?

ACCOUNTING-BASED METHODS

P9-23 Kenneth Gould is the general manager at a small-town newspaper that is part of a national media chain. He is seeking approval from corporate headquarters (HQ) to spend \$20,000 to buy some Macintosh computers and a laser printer to use in designing the layout of his daily paper. This equipment will be depreciated using the straight-line method over four years. These computers will replace outmoded equipment, which will be kept on hand for emergency use. HQ requires Kenneth to estimate the cash flows associated with the purchase of new equipment over a four-year horizon. The impact of the project on net income is derived by subtracting depreciation from cash flow each year. The project's average accounting rate of return equals the average contribution to net income divided by the average book value of the investment. HQ accepts any project that: (1) has an average accounting rate of return that exceeds the cost of capital of 15%; and (2) returns the initial investment within four years (on a cash flow basis). The following are Kenneth's estimates of cash flows:

	YEAR 1	YEAR 2	YEAR 3	YEAR 4
Cost savings	\$7,500	\$9,100	\$9,100	\$9,100

- a What is the average contribution to net income across all four years?
- b What is the average book value of the investment?
- c What is the average accounting rate of return?
- d What is the payback period of this investment?
- e Critique the company's method for evaluating investment proposals.

CASE STUDY



CAPITAL BUDGETING PROCESS AND TECHNIQUES

Contact Manufacturing Ltd is considering two alternative investment proposals. The first proposal calls for a major renovation of the company's manufacturing facility. The second involves replacing just a few obsolete pieces of equipment in the facility. The company will choose one project or the other this year, but it will not do both. The cash flows associated with each project appear below and the company discounts project cash flows at 15%.

YEAR	RENOVATE	REPLACE
0	-\$9,000,000	-\$2,400,000
1	3,000,000	2,000,000
2	3,000,000	800,000
3	3,000,000	200,000
4	3,000,000	200,000
5	3,000,000	200,000

ASSIGNMENT

- Calculate the *payback period* of each project and, based on this criterion, indicate which project you would recommend for acceptance.

- Calculate the *net present value* (NPV) of each project, and based on this criterion, indicate which project you would recommend for acceptance.
- Calculate the *internal rate of return* (IRR) of each project, and based on this criterion, indicate which project you would recommend for acceptance.
- Calculate the *profitability index* (PI) of each project, and based on this criterion, indicate which project you would recommend for acceptance.
- Overall, you should find conflicting recommendations based on the various criteria. Why is this occurring?
- Chart the *NPV profiles* of these projects. Label the intersection points on the x- and y-axes and the crossover point.
- Based on this NPV profile analysis, and assuming the WACC is 15%, which project would you recommend for acceptance? Why?
- Based on this *NPV profile* analysis, and assuming the WACC is 25%, which project would you recommend for acceptance? Why?
- Discuss the important elements to consider when deciding between these two projects.

10

CASH FLOW AND CAPITAL BUDGETING

WHAT COMPANIES DO

CAN TAX RELIEF STIMULATE INVESTMENT?

Historically, tax law required business to depreciate long-lived assets such as plant and equipment gradually, over several years, rather than deduct the entire cost of these investments from income in the year they were purchased. Since writing off the cost of new equipment reduces the income that is subject to taxation (and thereby decreases businesses' tax bills), businesses generally prefer to deduct those costs as soon as possible.

Based on this, policymakers recognise that changes to depreciation rules can alter the incentives that businesses have to make new investments. All else being equal, allowing companies to write off the cost of new assets more rapidly increases the net present value (NPV) of these investments. This can be used to try to stimulate economic growth – policymakers hope that by allowing businesses to depreciate their assets more rapidly, they can encourage these businesses to invest more and hire more workers to get the economy moving again.

In Australia, federal governments have often used this idea to stimulate investment.

They introduced a 'small business tax break' allowing small businesses to claim a bonus tax deduction of 50% of the cost of eligible capital investments, like computers and vehicles, acquired between 13 December 2008 and 31 December 2009, and installed by 31 December 2010. Larger businesses were also offered tax incentives to encourage investment, but at a smaller rate (30% or 10%). The idea was to stimulate new investment in order to boost economic growth.

In July 2012, the government introduced a number of further incentives to assist small businesses with investing and improving their cash flows. One of the major benefits was the introduction of a \$6,500 'instant asset write-off'. Under this scheme, small businesses were able to deduct the full cost of any individual asset purchased for less than \$6,500 at the time they purchased it, rather than depreciating the asset over time. Thus, the cash flow benefit (which reduces taxable income) would have occurred immediately.

The government has continued to use this stimulus mechanism in various subsequent



years. In FY 2019 and FY 2020, the instant asset write-off threshold was \$30,000, although this was due to revert to \$1,000 in FY 2021.

As we will see in this chapter, the timing of expenses can have a major impact on cash flows, which in turn have an impact on NPVs. (If the same positive cash flow occurs in the future, its NPV will be less than if it occurred today. Similarly, an expense incurred

today will provide a greater tax benefit than the same expense incurred in the future, assuming tax rates remain constant.)

Sources: Adapted from Press Releases by the Hon. Wayne Swan MP, former Deputy Prime Minister and Treasurer, 'Small Business and General Business Tax Break', 3 February 2009, <http://www.treasury.gov.au/DisplayDocs.aspx?doc=pressreleases/2009/013.htm&pageID=003&min=wms&Year=&DocType=0>; and 'Tax Relief for Australia's 2.7 Million Small Businesses', 5 July 2012, <http://www.treasury.gov.au/DisplayDocs.aspx?doc=pressreleases/2012/058.htm&pageID=003&min=wms&Year=&DocType=0>. Accessed 9 December 2015. Updated from <https://www.ato.gov.au/Business/Depreciation-and-capital-expenses-and-allowances/Simpler-depreciation-for-small-business/>.

LEARNING OBJECTIVES

After studying this chapter, you should be able to:

- LO10.1 differentiate between cash flow and accounting profit with regard to incremental cash flow, financing costs, taxes and non-cash expenses
- LO10.2 discuss depreciation, fixed asset expenditures, working capital expenditures and terminal value
- LO10.3 understand relevant cash flows and the effects of sunk costs, opportunity costs and cannibalisation
- LO10.4 demonstrate the procedures for determining the relevant cash flows for a capital budgeting problem
- LO10.5 analyse capital rationing decisions, competing replacement projects with unequal lives and excess capacity utilisation projects; and describe how the human element can affect the capital budgeting process and its outcomes.

Chapter 9 described various capital budgeting techniques that analysts use to evaluate and rank investment proposals. Each of the examples in **Chapter 9** began with a sequence of cash flows, although we did not discuss the origins of those cash flow numbers. This chapter describes how to determine the relevant cash flows. We begin with an overview of the kinds of cash flows that may appear in almost any type of investment. Next, we present an extended capital budgeting example and discuss special problems and situations that frequently arise in the capital budgeting process. The chapter concludes with a brief discussion of the human element in capital budgeting.

LO10.1 10.1 TYPES OF CASH FLOWS

In this section we learn how to differentiate between cash flow and accounting profit by focusing on incremental cash flow – ignoring financing costs, considering taxes and adjusting for non-cash expenses.

10.1a CASH FLOW VERSUS ACCOUNTING PROFIT

When accountants prepare financial statements for external reporting, they have a very different purpose in mind than financial analysts do when they evaluate the merits of an investment. Accountants want to

produce financial statements that fairly and accurately represent the state of a business at any given time, as well as over a period of time. Given this purpose, accountants measure the inflows and outflows of a business's operations on an *accrual basis* rather than on a *cash basis*. For example, accountants typically credit a company for earning revenue once a sale is made, even though customers may not pay cash for their purchases for several weeks or months. Similarly, accountants typically do not record the full cost of an asset as an expense if they expect the asset to confer benefits to the company over several years. If a company spends \$1 billion on an asset that it plans to use over 10 years, accountants may count only one-tenth of the purchase price, or \$100 million, as a current-year depreciation expense.

In contrast, when they analyse an investment's merits, *financial analysts focus on the actual cash inflows and outflows that the investment produces*. In part, this is because no matter what earnings a company may show on an accrual basis, it cannot survive for long unless its investments generate enough cash to pay its bills. Furthermore, the emphasis that sound financial analysis places on cash flow reflects the time value of money. If a company sells a product for \$1,000, the value of that sale is greater if the customer pays immediately rather than 30 or 90 days in the future.

This chapter shows you how to calculate the cash flows needed to estimate an investment's net present value (NPV). The key principles involved are:

- include only the investment's incremental cash flows
- ignore an investment's financing costs
- focus on after-tax cash flows
- adjust for non-cash expenses such as depreciation.

The following sections illustrate these principles.

Focusing on Incremental Cash Flows

incremental cash flows
Cash flows triggered by an investment that would not have otherwise occurred

For capital budgeting purposes, financial analysts and companies focus on *incremental* cash inflows and outflows. Cash flows triggered by a particular investment that would not have otherwise occurred are **incremental cash flows**. The cost of building and operating a new plant and the revenues from selling the products produced at the plant are clear examples of incremental cash flows. However, some incremental cash flows are more subtle, and can be easy to miss. For example, when a company launches a new product line, revenues from older products may decline, and those lost sales represent an incremental cash outflow. We will discuss incremental cash flows in more depth later in this chapter. For now, recognise that identifying the cash flows that directly result from a proposed investment is a key step in the analysis of investment opportunities.

Ignoring Financing Costs

Much of this chapter focuses on which cash flows to include in calculating a project's NPV. We should also mention an important category of cash flows which should be excluded – financing cash flows. When calculating a project's NPV, analysts should ignore the costs of raising the money to finance the project, whether those costs are in the form of interest expense from debt financing or dividend payments to equity investors. It may seem counterintuitive to exclude costs such as interest expense from an investment's cash flow calculations, but it is necessary to do so because these are accounted for in the process of discounting future cash flows. When analysts discount a project's cash flows, the chosen discount rate takes into account the opportunity that investors have to invest in other companies or projects. Therefore, if an analyst deducted cash outflows to investors, such as interest and dividend payments, the analyst would, in effect, double-count the financing costs of the investment.



Avoiding Double-Counting Finance Costs 1

Suppose that a company has an investment project that costs \$1 million to undertake. Half of this money will come from shareholders who require a 14% return, and half will come from bondholders who demand 8%. In Chapter 5 we introduced the concept of a company's weighted average cost of capital (WACC), a rate that blends the cost of equity and the after-tax cost of debt. This is often the rate that companies use to discount cash flows in *NPV* calculations. If the company faces a 30% corporate tax rate, then its

after-tax cost of debt is 5.6% (8% pre-tax \times [1 – 30%]) and its WACC is:

$$\begin{aligned} \text{WACC} &= 50\% \times 14\% + 50\% \times [8\% \times (1 - 30\%)] \\ &= 9.8\% \end{aligned}$$

Suppose that the company's investment project will generate annual sales of \$440,000 in perpetuity, as well as \$300,000 in annual operating expenses. The company must also pay \$40,000 in annual interest expenses ($\$500,000 \times 8\%$).¹ Is this investment worth undertaking?



Avoiding Double-Counting Finance Costs 2

One of the company's financial analysts calculates that the project will generate \$70,000 each year in after-tax cash, but this calculation includes both the investment's operating cash flows and its financing cash flows – interest expense – as shown below:

Sales	\$ 440,000
Operating expenses	-300,000
Interest expense	- 40,000
Pre-tax cash flow	\$ 100,000
Taxes (30%)	- 30,000
After-tax cash flow	\$ 70,000

Now let's see whether the company would accept or reject this project, based on these cash flow numbers. If the project costs \$1 million up-front and generates cash inflows of \$70,000 per year (in perpetuity), its NPV is negative:

$$NPV = -\$1,000,000 + \frac{\$70,000}{0.098} = -\$285,714$$

Is rejecting this investment the right decision? One way to answer this question is to ask whether shareholders and bondholders are satisfied with the payments they receive as a result of

the investment. Each year bondholders receive \$40,000, which represents an 8% return on their investment ($\$40,000 \div \$500,000$). In addition, the investment generates \$70,000 per year for shareholders, and that represents a 14% return on their investment ($\$70,000 \div \$500,000$). It appears that investors receive exactly what they require, so the investment is just worth making, and its NPV should be zero. Why does the calculation above show a negative NPV? By deducting interest expenses from cash flows and discounting cash flows at a rate that also reflects the after-tax cost of debt, the analyst's NPV calculation double counts that financing cost. If we ignore the project's financing cash flows and recalculate the NPV, it becomes apparent that the investment indeed just satisfies investors.

Sales	\$ 440,000
Operating expenses	-300,000
Pre-tax cash flow	\$ 140,000
Taxes (30%)	- 42,000
After-tax cash flow	\$ 98,000

$$NPV = -\$1,000,000 + \$98,000 \div 0.098 = \$0$$

¹ For simplicity, we assume that there is no depreciation expense associated with this investment.

In an operational sense, when using the income statement to develop an investment's relevant cash flows, we ignore financing costs by focusing on earnings before interest rather than earnings after deduction of interest expense. Given the structure of an income statement, earnings before interest also excludes all dividends paid to preferred and/or ordinary shareholders. The deduction of interest expense and dividends would double-charge the company for its financing costs – once in the cash flows and again in the discount rate used to find present value. As we demonstrate later in this chapter, you should ignore both interest and dividends when developing an investment's relevant cash flows.

Considering Taxes

When determining cash flows, it is important to account for taxes paid to the government. Remember, we evaluate a project from the perspective of the shareholder. Taxes reduce the cash flows that companies can pay to their shareholders; therefore, when performing a capital budgeting analysis, all cash flows should be measured on an after-tax basis.

In the previous example, we demonstrated that interest expense and other financing cash flows should be excluded from a project's cash flow projections. Similarly, it is necessary to calculate the taxes that a company must pay on an investment's cash flows as if the company had no debt. In other words, the after-tax cash flows used in capital budgeting are those for an all-equity project. The discount rate used in the NPV calculation captures the effects of the tax break that companies receive when they use debt financing, just as it accounts for the interest payments that companies make to bondholders.

The existence of different tax jurisdictions (local, state, national and international) means that determining taxes paid can be somewhat complicated in practice. To keep you focused on the important issues, in this chapter we use simplified illustrations to emphasise the principles involved in measuring after-tax cash flows. To minimise distraction, throughout the chapter we assume that the corporate income tax rate equals 30% (the current Australian corporate tax rate). However, bear in mind that applicable tax rates can vary; for example, if the company is set up as a sole trader.

Another factor that you may need to consider (which we ignore in this chapter, but discuss in Chapter 13 and Chapter 15) is that Australia operates under an imputation tax system. This means that if a company pays corporate tax, this is transferred through to its dividends as franking credits. Shareholders can then offset these against their taxable income. The rationale behind this is to remove any double taxation of income derived from investing in equities. Depending on individual shareholders' circumstances, franking credits can have significant value, and can therefore impact investment decisions.

Adjusting for Non-Cash Expenses

non-cash expenses

Tax-deductible expenses for which there is no corresponding cash outflow in the current period. They include depreciation and amortisation

Although we have emphasised that managers must focus on the cash flows that an investment generates, they cannot totally ignore **non-cash expenses** (tax-deductible expenses for which there is no corresponding cash outflow in the current period) when projecting cash flows. Non-cash expenses, such as depreciation or amortisation, affect an investment's cash flows because they reduce the taxes that companies pay. Remember, depreciation deductions reflect the accounting profession's reliance on the accrual method to portray a company's financial condition. Therefore, when a company's income statement shows a deduction for depreciation, it does not mean that the company has actually incurred a cash charge for depreciation. Nevertheless, the depreciation expense reduces income subject to government taxation, and therefore it reduces the company's tax bill. In other words, the depreciation deduction itself does not represent a cash outflow, but it does produce a real cash flow by shielding some of the company's cash flows from taxes.

There are two ways to calculate cash flows that take this effect into account. First, we can add non-cash expenses back to *net income before interest and after taxes*. Alternatively, we can ignore non-cash expenses when calculating *net income before interest and after taxes*, and then add back the tax savings created by non-cash deductions.

 **EXAMPLE****Non-Cash Expenses and Cash Flows 1**

Let's examine two ways to treat non-cash expenses to obtain cash flow numbers for a simple project. Suppose a company spends \$30,000 in cash to purchase a fixed asset today that it plans to fully depreciate on a straight-line basis over three years. After acquiring this machine, the company can produce 10,000 units of some product each year. Each unit costs \$1 to make and sells for \$3. Given this information, we can construct an income statement for this project. In each of the next three years, the project income statement would look like this (note that the \$30,000 initial investment does not appear here):

Sales	\$30,000
Less: Cost of goods	10,000
Gross profit	\$20,000
Less: Depreciation	10,000
Pre-tax income	\$10,000
Less: Taxes (30%)	3,000
Net income after taxes	\$ 7,000

After the company spends \$30,000 to make this investment, how much cash flow will it generate in each of the subsequent three years? There are two ways to arrive at the answer.

 **EXAMPLE****Non-Cash Expenses and Cash Flows 2**

First, take net income after taxes and add back depreciation, for which there was no cash outlay:

$$\begin{aligned}\text{Cash flow} &= \text{Net income after taxes} + \text{Depreciation} \\ &= \$7,000 + \$10,000 + \$17,000\end{aligned}$$

Second, calculate net income after taxes, ignoring depreciation expense, then add back the tax savings generated by the depreciation deduction:

Sales	\$30,000	
Less: Cost of goods	10,000	
Pre-tax income	\$20,000	
Less: Taxes (30%)	6,000	
After-tax income	\$14,000	
Plus: Depreciation tax savings	3,000	(30% × \$10,000)
Total cash flow	\$17,000	

10.1b DEPRECIATION

The largest non-cash item for most investment projects is depreciation. Analysts must know the magnitude and timing of depreciation deductions for a given project because these deductions affect the taxes that the company will pay. Treating depreciation properly is complicated because the law allows companies to use several different depreciation methods. For example, in Australia, the United States and the United Kingdom, companies keep separate sets of books, one for tax purposes and one for financial reporting purposes, using different depreciation methods. Their goal is to show low taxable income to the taxing authorities and stable, growing income to investors. As a result, most US and UK companies use accelerated depreciation methods for tax purposes and straight-line depreciation for financial reporting. In contrast, in nations such as Japan, Sweden and Germany, the law requires that the income companies report to the tax authorities be substantially the same as the income they report to investors. Because we are interested in the cash flow consequences of investments, and because depreciation only affects cash flow through taxes, *we consider only the depreciation method that a company uses for tax purposes when determining project cash flows.*

Depreciation is supposed to reflect the effective useful life of an asset. Thus, unless there are specific tax incentives allowing companies to do so, companies cannot claim the full cost of acquiring an asset in the year of acquisition. They effectively incur this cost (in the form of depreciation) in annual increments, which are supposed to match the timing of the taxable income derived from the assets. The useful life of an asset is either predetermined by the company when it is purchased, or the company can use the rates determined by the Australian Commissioner of Taxation. **Figure 10.1** provides some examples of these.

FIGURE 10.1 EXAMPLES OF EFFECTIVE LIVES OF ASSETS FROM JULY 2013

The following table provides examples of effective lives that were determined to be applicable from 1 July 2013 by the Australian Commissioner of Taxation.

DEPRECIATING ASSET	EFFECTIVE LIFE IN YEARS
Carpets:	
in commercial office buildings	8
in 10-pin bowling centres	4
Computers:	
generally	4
laptops	3
Curtains and drapes	6
Fire extinguishers	15
Hot water installations for commercial office buildings (excluding commercial boilers and piping)	15
Lawn mower:	
<i>motor</i>	$6\frac{2}{3}$
<i>self-propelled</i>	5
Library (professional)	10
Motor vehicles:	
cars generally	8
hire and travellers' cars	5
Taxis	4
Motorcycles and scooters	$6\frac{2}{3}$
Office machines and equipment:	
photocopying machines	5

Note: for updated details of effective lives of depreciating assets by industry and by asset, please see: <https://www.ato.gov.au/law/view/document?DocID=TXR%2FTR20195%2FNAT%2FATO%2F0023>

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Australian companies can use either the **prime cost method** or the **diminishing value method** to depreciate assets. Under the prime cost method, companies depreciate assets by an equal amount each year (the annual depreciation charge will be equal to the purchase price of the asset divided by the effective life). This is effectively a straight-line depreciation. Under the diminishing value method, the annual depreciation charge will be a fixed percentage of the remaining value of the asset, making this a reducing balance method. The percentage used in calculating the diminishing value is 200% of the inverse of the effective life of the

prime cost method

A method of depreciating assets, accepted by the Australian Taxation Office, whereby assets are depreciated by a set value every year. It is analogous to the reducing straight-line depreciation used in accounting, and effectively means that the asset will be reduced by the same amount each year until it has zero value. The prime cost rate is calculated by obtaining the inverse of the effective asset life. Thus, prime cost rate = $(1/\text{effective asset life}) \times 100\%$

diminishing value method

A method of depreciating assets, accepted by the Australian Taxation Office, whereby assets are depreciated by a set percentage of their remaining value every year. It is analogous to the reducing balance method used in accounting, and effectively means that, in theory, an asset will never have zero value. The percentage used to calculate the diminishing value is set at twice the prime cost rate. Thus, diminishing value rate = $(1/\text{effective asset life}) \times 200\%$

asset. The diminishing value method allows companies to take larger depreciation deductions in the early years of an asset's life. The cash flow effect of this system is to accelerate the tax benefits associated with depreciation.² **Figure 10.2** provides an example of how a company may depreciate its assets using each method.

FIGURE 10.2 DEPRECIATING AN ASSET USING PRIME COST AND DIMINISHING VALUE

This table shows how an office machine purchased for \$14,000 would be depreciated using both the prime cost and the diminishing value methods. Based on the Australian Commissioner of Taxation's ruling on effective lives, this would have an effective life of five years. Thus, the prime cost rate would be 20%, and the diminishing value rate would be twice that, at 40%. As the table demonstrates, the diminishing value method will provide higher depreciation charges towards the start of the asset's life than will the prime cost method. This will result in an increased tax deduction towards the start of the asset's life. However, even after the five years are over, the book value will not be diminished to zero, using the diminishing value method.

PRIME COST DEPRECIATION (DEPRECIATED AT 20%)		DIMINISHING VALUE DEPRECIATION (DEPRECIATED AT 40%)		
YEAR	DEPRECIATION CHARGE	DEPRECIATED BOOK VALUE OF THE ASSET	DEPRECIATION CHARGE	DEPRECIATED BOOK VALUE OF THE ASSET
0	\$ –	\$14,000	\$ –	\$14,000
1	\$2,800	\$11,200	\$5,600	\$8,400
2	\$2,800	\$8,400	\$3,360	\$5,040
3	\$2,800	\$5,600	\$2,016	\$3,024
4	\$2,800	\$2,800	\$1,210	\$1,814
5	\$2,800	\$ –	\$726	\$1,089

10.1c FIXED ASSET

Many capital budgeting decisions involve the acquisition of a fixed asset. The cost of this investment often appears as the initial cash outflow for a project. Additional factors that influence the cash consequences of asset acquisitions include installation costs and after-tax proceeds from sales of any existing assets that are being replaced.

In many cases, the cost of installing new equipment can be a significant part of a project's initial outlay. For tax purposes, companies combine the asset's purchase price and its installation cost to arrive at the asset's *depreciable basis*, which is often recognised as an immediate cash outflow. In future years, though depreciation itself is not a cash outflow, we have seen that depreciation deductions affect future cash flows by reducing taxes. (This is also referred to as the **depreciation tax shield**.) Depreciation deductions influence taxes through another channel when companies sell old fixed assets. Specifically, when a company sells an old piece of equipment, there is a tax consequence if the selling price differs from the old equipment's *book value*. If the company sells an asset for more than its book value, the company must pay taxes on the gain. If a company sells an asset for less than its book value, then it can treat the loss as a tax-deductible expense.

depreciation tax shield
This is the tax deduction that comes from the depreciation of an asset. When this tax shield is applied, the book value of the asset is reduced by this amount

² That is, the tax benefits accrue faster than would be the case under prime cost (straight-line) depreciation.



EXAMPLE

Capital Losses Can Provide Tax-Deductible Expenses

Electrocom Manufacturing purchased \$100,000 worth of new computers three years ago. Now it is replacing these machines with newer, faster computers. The company has a 30% tax rate. The Tax Commissioner has suggested that computers have a useful life of four years. Using the diminishing value method, the annual percentage depreciation will be 50% (calculated using $200\% \times [1/\text{Effective Asset Life}]$). The company has depreciated 50.0% of the remaining asset

values each year, leaving a book value of \$12,500. Electrocom sells its old computers to another company for \$10,000. This allows Electrocom to report a loss on the sale of \$2,500 (\$12,500 book value – \$10,000 sale price). Assuming that Electrocom's business is otherwise profitable, it can deduct this loss from other pre-tax income, resulting in a tax savings of \$750 ($0.30 \times \$2,500$). In the analysis of the new investment project, this \$750 is treated as a cash inflow.

10.1d NET WORKING CAPITAL

Consider a retail company evaluating the opportunity to open a new store. Part of the cash outflow of this investment involves expenditures on fixed assets such as shelving, cash registers and merchandise displays; but stocking the store with inventory constitutes another important cash outflow. A portion of this cash outflow may be deferred if the company can purchase inventory from suppliers on credit. By the same token, cash inflows from selling the product may be delayed if the company sells to customers on credit.

Just as a company must account for cash flows on fixed assets, it must also weigh the cash inflows and outflows associated with *changes* in net working capital. The definition of *net working capital* is simply the difference between current assets and current liabilities. An *increase in net working capital represents a cash outflow*. Net working capital increases if current assets rise (for example, if the company buys more inventory) or if current liabilities fall (for example, if the company pays down accounts payable). As noted in Chapter 2 (see **Figure 2.6**), any increase (decrease) in a current asset account or any decrease (increase) in a current liability account results in a cash outflow (inflow).³ Net working capital decreases when current assets fall (as when a company sells inventory) or when current liabilities increase (as when the company borrows from suppliers). Therefore, a *decrease in net working capital represents a cash inflow*.



Net Working Capital Calculations

Have you ever noticed the cottage industries that temporarily spring up around certain big events? Think about the booths that open in shopping malls near the end of each year and sell nothing but calendars. Suppose you are evaluating the opportunity to operate one of these booths from November until January. You begin by ordering (on credit) \$15,000 worth of calendars. Your suppliers

require a \$5,000 payment on the first day of each month, starting in December. You anticipate that you will sell (entirely on a cash basis) 30% of your inventory in November, 60% in December and 10% in January. You plan to keep \$500 in the cash register until you close the booth on 1 February. Your balance sheet at the beginning of each month looks like this:



³ Of course, one important current asset account is cash. It may seem counterintuitive to argue that if the balances in the cash account increase, then that should be treated as a cash outflow. However, consider again the example of a new retail store. If the company opens a new store, a small amount of cash will have to be held in that store for transactions purposes. Holding fixed the amount of cash that the company maintains in all of its other stores and in its corporate accounts, opening a new store requires a net increase in the company's cash holdings. If the company did not open the new store, then it could invest the cash that it would have held in reserve in the new store in a different project. Likewise, consider what happens if the company decides to close one of its stores. The cash kept in reserve at that location can be redeployed for another use, so reducing cash at that store represents a cash inflow to the company as a whole. As we will see in Chapter 22, cash management tools have become so sophisticated today that few investments require significant changes in cash holdings. Changes in the other working capital items, such as inventory, receivables and payables, typically have a much greater cash flow impact than changes in cash balances.



	1 OCT.	1 NOV.	1 DEC.	1 JAN.	1 FEB.
Cash	\$0	\$500	\$500	\$500	\$0
Inventory	0	15,000	10,500	1,500	0
Accounts payable	0	15,000	10,000	5,000	0
Net working capital	0	500	1,000	-3,000	0
Monthly net working capital change	NA	+500	+500	-4,000	+3,000

The cash flows associated with changes in net working capital are as follows:

- \$500 cash outflow from October–November
- \$500 cash outflow from November–December
- \$4,000 cash inflow from December–January
- \$3,000 cash outflow from January–February.

Since the table shows the financial position at the start of each month, any cash flows that occur during a month are reflected in the position shown for the following month.

Notice that at the start of November, purchases of inventory are entirely on credit, so the increase in inventory is exactly offset by an increase in accounts payable. The only working capital cash outflow occurs because you must raise \$500 to put in the cash register.

During November, sales reduce your inventory by \$4,500 (inflow), but you pay suppliers \$5,000 (outflow). You still have the same amount in the cash register as before, \$500, so on net you have an outflow of \$500, exactly equal to the increase in net working capital from the prior month.

During the month of December, sales reduce your inventory by \$9,000 (inflow), and you pay \$5,000 to suppliers (outflow). That leaves you with cash inflow of \$4,000, equal to the decrease in net working capital during the month. By 1 February, sales reduce your inventory by the remaining \$1,500 in calendars (inflow), you empty \$500 from the cash register (inflow), and you pay the last \$5,000 to suppliers (outflow). The net effect is a \$3,000 cash outflow during January.⁴

10.1e TERMINAL VALUE

Some investments have a well-defined life span. The life span may be determined by the physical life of a piece of equipment, by the length of time until a patent expires or by the period of time covered by a leasing or licensing agreement. Often, however, investments have an indefinite life. For example, when a company acquires another company as a going concern, as noted in the share valuation discussion in Chapter 5, it generally expects the acquired company's assets to continue to generate cash flow for a very long period of time.

When managers invest in an asset with a long life span, they typically do not construct cash flow forecasts more than five to 10 years into the future. These long-term forecasts can be inaccurate to the point that the fine detail in an item-by-item cash flow projection is not very meaningful. Instead, managers project detailed cash flow estimates for five to 10 years, then calculate a project's **terminal value**, the value of all a project's cash flows beyond a certain date in the future. There are a number of ways to calculate terminal value.

Perhaps the most common approach to calculating the terminal value is to take the final year of cash flow projections and make an assumption that all future cash flows will grow at a constant rate. For example, in valuing a large acquisition, many acquiring companies project the target company's cash flows for five to

terminal value
The value of all a project's cash flows beyond a certain date in the future

⁴ In this section we are looking only at the working capital cash flows associated with this project. We have not considered any fixed asset investment up-front, nor have we included the profits from selling calendars at a mark-up, or the labour costs of operating the booth. These issues would certainly be considered in a complete analysis of the investment.

10 years in the future. After that, they assume that cash flows will grow at a rate equal to the growth rate in gross domestic product (GDP) for the economy.⁵



Terminal Value Calculations 1

Suppose that analysts at Nvigor8 Ltd are analysing the potential acquisition of Tribor Pty Ltd. They project that the acquisition of Tribor Pty Ltd will generate the following new stream of cash flows:

Year 1	\$0.50 billion
Year 2	1.00 billion
Year 3	1.75 billion
Year 4	2.50 billion
Year 5	3.25 billion

In year 6 and beyond, analysts believe that cash flows will continue to grow at 5% per year. What is the terminal value of this investment? Recall that in chapters 3 and 5, we learned that we can determine the present value, at a discount

rate r_t of a stream of cash flows growing at a perpetual rate, g , by using the following formula:

$$PV_t = \frac{CF_{t+1}}{r-g}$$

We know that the year 6 cash flow is 5% more than in year 5, or \$3.4125 billion ($1.05 \times \3.25 billion). Put that number in the numerator of the equation. We also know that $g = 5\%$. Suppose that Nvigor8 Ltd discounted the cash flows of this investment at 10%. Using the formula above, we can determine that the present value, as of year 5, of cash flows in years 6 and beyond equals the following:

$$PV_5 = \frac{\$3.4125}{0.10 - 0.05} = \$68.25$$



Terminal Value Calculations 2

This means that the terminal value, the value of the project at the end of year 5, equals \$68.25 billion. To determine the entire value of the project, discount this figure, along with all the other cash flows, at 10% to obtain a total value of \$48.70 billion:⁶

$$\frac{\$0.5}{1.10^1} + \frac{\$1}{1.10^2} + \frac{\$1.75}{1.10^3} + \frac{\$2.5}{1.10^4} + \frac{\$3.25}{1.10^5} + \frac{\$68.25}{1.10^5} = \$48.70$$

Given this set of assumptions, the most Nvigor8 Ltd should pay to acquire Tribor Pty Ltd is about \$48.70 billion. Notice that the terminal value is enormous relative to the cash flows that occur in years 1 through 5. This highlights the fact that accurately estimating terminal value is very important.

Notice in the preceding example that the terminal value was very large relative to all the other cash flows. If we discount the terminal value for five years at 10%, we find that \$42.38 billion of the project's total \$48.70 billion present value comes from the terminal-value assumptions. Those proportions are not uncommon for long-lived investments, illustrating just how important estimates of terminal value can be in assessing an investment's merit. Analysts must think very carefully about the assumptions they make when calculating terminal value.

5. We emphasise that when companies assume that an investment's cash flows will grow at some rate in perpetuity, the rate of growth in nominal GDP, either in the local economy or the world economy, serves as a maximum potential long-run growth rate. Why? If an investment generates cash flows that grow forever at a rate that exceeds the growth of nominal GDP, then mathematically, that one investment eventually becomes the entire economy.

6. Notice that this is the gross present value, not the NPV, because in this example we are not deducting any up-front costs incurred to acquire Tribor Pty Ltd.

For example, the growth rate used to calculate a project's terminal value does not always equal the long-run growth rate of the economy. A factory with fixed capacity might offer zero growth in cash flows, or growth that just keeps pace with inflation, once the company hits the capacity constraint.

Several other methods maintain widespread application in terminal-value calculations. One method calculates terminal value by multiplying the final year's cash flow estimate by a market multiple such as a *price-to-cash-flow ratio* (price-to-earnings and price-to-sales ratios are also used at times) for publicly traded companies with characteristics similar to those of the investment. For example, the last specific cash flow estimate for the Tribor Pty Ltd acquisition was \$3.25 billion in year 5. Nvigor8 Ltd may observe that the average price-to-cash-flow ratio for companies in this industry is 20. Multiplying \$3.25 billion by 20 results in a terminal value estimate of \$65 billion, quite close to the estimate obtained from the perpetual growth model. One hazard in using this approach is that market multiples fluctuate through time, which means that when year 5 finally arrives, even if Tribor Pty Ltd generates \$3.25 billion in cash flow as anticipated, the market may place a much lower value on that cash flow than it did when the acquisition originally took place.

Other approaches to this problem use an investment's book value or its expected liquidation value to estimate the terminal-value figure. Using *book value* is most common when the investment involves physical plant and equipment with a limited useful life. In such a case, companies may plausibly assume that after a number of years of depreciation deductions, the asset's book value will be zero. Depending on whether the asset has fairly standard characteristics that would enable other companies to use it, its *liquidation value* may be positive or it may be zero.⁷ Finding a liquidation value often involves the inclusion of the tax cash flows that result from selling the asset for a price that differs from its book value at the time of sale. Some assets may even have negative terminal values if disposing of them entails substantial costs. Projects that involve the use of substances hazardous to the environment fit this description. When an investment has a fixed life span, part of the terminal value or terminal cash flow may also include recovery of working capital investments. When a retail store closes, for example, the company realises a cash inflow from liquidating inventory.

LO10.1

CONCEPT REVIEW QUESTIONS

- 1 Why is it important for the financial analyst to: (a) focus on incremental cash flows; (b) ignore financing costs; (c) consider taxes; and (d) adjust for non-cash expenses when estimating a project's relevant cash flows?
- 2 Why do we consider changes in net working capital associated with a project to be cash inflows or outflows rather than consider the absolute level of net working capital?
- 3 For what kinds of investments does terminal value account for a substantial fraction of the total project NPV, and for what kinds of investments is terminal value relatively unimportant?

THINKING CAP QUESTIONS

- 1 If we finance an investment project with debt, how should we handle interest expenses in the NPV calculation?
- 2 When calculating the net present value of a project, we can depreciate the cost of the investment on either a straight-line basis or a reducing balance basis. Which depreciation method should we use?
- 3 How far out into the future do companies take financial projections for major investments?

⁷ Anecdotal evidence suggests that companies can expect to recover no more than 20–50% of the original purchase cost of a new machine, once it has been installed. This finding is applicable even for assets with reasonably active secondary markets.

LO10.2

10.2 INCREMENTAL CASH FLOWS

We have seen that many investment problems have similar types of cash flows that analysts must estimate: initial outlays on fixed assets and working capital, operating cash flow and terminal value. But in a broader sense, there is only one type of cash flow that matters in capital budgeting analysis: *incremental cash flow*. To rephrase the oath that witnesses take in television courtroom dramas, analysts must focus on ‘all incremental cash flow and nothing but incremental cash flow’. Determining which cash flows are incremental and which are not for a given project can become complicated at times.

FINANCE IN THE REAL WORLD



THE VALUE OF AN MBA

You earn \$60,000 per year working as an engineer for a software developer, and you pay taxes at a flat rate of 35%. You expect salary increases each year of about 5%. Lately, you have been thinking about going back to school to earn an MBA. A few months ago, you spent \$1,000 to enrol in a Graduate Management Admission Test (GMAT) study course, and \$2,000 visiting various business schools. From your research on MBA programs, you have learned a great deal about the costs and benefits of the degree. At the beginning of each of the next two years, your out-of-pocket costs for tuition, fees and textbooks will be \$35,000. You expect to spend roughly the same amount on room and board in graduate school that you spend now. At the end of two years, you anticipate that you will get an offer for a job with a salary of \$90,000, and you expect that your pay will increase by 8% per year over your career (spanning roughly the next 30 years). The schedule of incremental cash flows for the next few periods looks like this:

Year 0	-\$35,000
Year 1	- 35,000
Year 2	+15,503
Year 3	+18,032

Observe that we did not include the \$1,000 spent studying for the GMAT and the \$2,000

spent visiting MBA programs in the cash outflow for year 0. Those costs have already been incurred, and they cannot be recovered even if you decide not to get an MBA, so they are not incremental. The cash inflow figures for years 2 and 3 require some explanation. Had you stayed at your current job for the next two years, rather than gone back to school, your pay would have increased to \$66,150 ($\$60,000 \times (1 + 0.05)^2$). Therefore, the difference between that figure and your \$90,000 post-MBA salary represents a net cash inflow of \$23,850. Assuming that you pay about 35% of your earnings in taxes, the after-tax inflow would be \$15,503 ($\$23,850 \times (1.00 - 0.35)$). In year 3, you expect to earn 8% more, or \$97,200, compared with what you would have earned at your old job, \$69,458 ($\$66,150 \times (1 + 0.05)$). The after-tax cash inflow in year 3 equals \$18,032 ($(\$97,200 - \$69,458) \times (1.00 - 0.35)$). If you carry these steps out for 30 years, you will quickly see that the MBA has a substantial positive NPV at almost any reasonable discount rate.

Obviously, these assumptions are simplified, since it is unlikely that your tax rate will remain constant at 35%, or that your annual salary increases will occur at a constant rate.

Review: Are there any other incremental cash flows that you should consider?

For example, suppose you complete your undergraduate degree, work for a few years and then consider quitting your job to return to school to pursue an MBA degree. Many of the incremental outflows associated with going back to school are fairly obvious, such as tuition and fees, the cost of textbooks and, possibly, relocation expenses. What about expenditures on room and board? Whether or not you decide to pursue an MBA, you still have to eat and have a place to sleep at night. Therefore, room and board expenditures are not incremental to your decision to go back to school.⁸

The cash inflows associated with an investment in an MBA degree are more difficult to estimate. You believe that obtaining an MBA degree offers the opportunity to earn higher pay after graduation than you earned before returning to school. Furthermore, you hope that, after obtaining an MBA, your salary will increase at a much faster rate than it otherwise would. The net cash flow equals the difference in the salary that you earn with an MBA versus the salary that you would have earned without an MBA, after taxes, of course.

Incremental cash flows should be calculated relative to what the world would be like if the project were not pursued. For example, one of the largest investments that companies make is acquiring another business. In an acquisition, the bidder evaluates the incremental cash flows from making the acquisition relative to what the bidder's cash flows would be if the target company remained independent or was acquired by another company. Indeed, managers often state that one of their motivations for buying other companies is to keep them out of the hands of competitors. If a bidding company believes that its existing business would be negatively impacted if a competitor purchased the target company, then the reduction in cash flows that a successful acquisition prevents represents a cash inflow from the acquisition. As you can imagine, estimating the consequences of a competitor's actions on a company's existing business is very difficult.

10.2a SUNK COSTS

A **sunk cost** is a cost that has already been paid and is therefore not recoverable; thus, it is irrelevant to the investment decision. For instance, in the 'Finance in the Real World' example, your cash outflows did not include the money you had already spent on the GMAT review and on visits to MBA programs. Clearly, these costs are not recoverable, whether or not you ultimately decide to give up your job and return to school. The money has already been spent, and therefore has no bearing on your investment decision. Simply stated, *sunk costs are irrelevant, and therefore should be ignored when determining an investment's relevant cash flows.*

sunk costs

Costs that have already been paid and are therefore not recoverable

10.2b OPPORTUNITY COSTS

In the 'Finance in the Real World' box, we made a number of simplifying assumptions in our analysis of the decision to pursue an MBA. For instance, we assumed that you received your pay in a lump sum each year and that you faced a flat tax rate. Of course, the incremental salary that you earn arrives monthly, and your higher earnings may be taxed at a higher rate. All these effects are easy to account for, although the calculations become a bit more tedious.

However, there is one major error in our analysis of your investment problem. We ignored a significant opportunity cost. Undertaking one investment frequently means passing on an alternative. In capital budgeting, the **opportunity costs** of an investment are the cash flows that the company (or in this case, you) will not receive from other investments (or actions) as a result of undertaking the proposed investment. If you did not attend school, you would earn \$60,000 (\$39,000 after taxes ($\$60,000 \times (1.00 - 0.35)$)) the first year and \$63,000 (\$40,950 after taxes ($\$63,000 \times (1.00 - 0.35)$))) the second year. This is your *opportunity cost* of getting

opportunity costs

Forgone cash flows on an alternative investment that the company or individual decides not to make

8 Of course, you may spend more on housing and food while you're working than when you're in graduate school. In that case, the difference in spending would be an incremental cash inflow.

an MBA, and it is just as important in the overall calculation as your out-of-pocket expenses for tuition, fees and books. Though it is still true, given the assumptions of our example, that the *NPV* of an MBA is positive, the value of the degree falls substantially once we recognise opportunity costs. As every MBA student knows, opportunity costs are real, not just hypothetical numbers from a textbook. Directors of MBA programs all over the world know that MBA applications are countercyclical. That is, the number of students applying to MBA programs increases during economic downturns and falls during booms. One plausible explanation of this phenomenon is that potential MBA students face higher opportunity costs when the economy is strong.

Probably the most common type of opportunity cost encountered in capital budgeting problems involves the alternative use of an asset owned by a company. Suppose that a company owns raw land that it purchased some years ago in anticipation of an expansion opportunity. Now the company is ready to expand by building new facilities on the raw land. Even though the company may have paid for the land many years ago, using the land for expansion entails an incremental opportunity cost. The opportunity cost is the cash that would be received if the company sold the land or leased it for another purpose today. That cost (the cash inflows given up) should be factored into the *NPV* calculation for the company's expansion plans.

10.2c CANNIBALISATION

cannibalisation

Loss of sales of a company's existing product when a new product is introduced

Incremental cash flows can show up in surprising forms. One type of incremental cash outflow that companies must be careful to measure when launching a new product is called **cannibalisation**. This involves the 'substitution effect' that frequently occurs when a company introduces a new product. Typically, some of the new product's sales come at the expense of the company's existing products. In the food products industry, sales of a low-fat version of a popular product may reduce sales of the original (presumably, high-fat) version. Some consumers may effectively substitute purchases of the new, 'improved' product for purchases of the original product, which has the effect on net of reducing the incremental cash flows of the new project.⁹ Companies carefully consider the incremental cash outflows from existing product sales that are cannibalised by a newer product.¹⁰

In the next section, we work through an extended example of a capital budgeting project, illustrating how to apply the principles from this section to calculate the project's cash flows each year. Before getting into the details, we want to remind you of the overall picture. Cash flows are important because they are necessary to calculate a project's *NPV*. Estimating the *NPV* is important because it provides an estimate of the increase or decrease in shareholder value that will occur if the company invests. Research has demonstrated the connection between capital investment decisions and shareholder value by showing that share prices rise on average when companies publicly announce significant new capital investment programs. This suggests that, on average, companies invest in positive *NPV* projects.

LO10.2

CONCEPT REVIEW QUESTIONS

- 4 What are sunk costs and cannibalisation, and do they affect the process of determining a proposed investment's incremental cash flows?

⁹ But it is even more complicated than that. If this company does not introduce a low-fat product line, a competitor might introduce a low-fat product, which would reduce sales of high-fat products anyway. Thus, this company needs to consider the incremental cash flows from introducing a new, low-fat product line relative to what cash flows would be if this company did not introduce low-fat products, considering that someone else might.

¹⁰ On a capital budgeting exam problem, one of our students mentioned that a company needed to be wary that its new product should not 'cannibalise the existing sales force'. Needless to say, that is not the kind of cannibalisation that we have in mind, although should it occur, it would certainly represent an incremental cash outflow.



- 5 A real-estate development company owns a fully leased 40-storey office building. A tenant recently moved its offices out of two storeys of the building, leaving the space temporarily vacant. If the real-estate company considers moving its own offices into this 40-storey office building, what cost should it assign for the space? Is the cost of the vacant space zero, because the company paid for the building long ago, is it a cost that is sunk or is there an incremental opportunity cost?
- 6 Suppose that an analyst makes a mistake and calculates the NPV of an investment project by discounting the project's contribution to net income each year rather than by discounting its relevant cash flows. Would you expect the NPV based on net income to be higher or lower than the NPV calculated using the relevant cash flows?

THINKING CAP QUESTION

- 4 When company managers are evaluating a new investment proposal, how do they try to quantify potential reactions by competitors and factor those into their financial analysis?

LO10.3

10.3 CASH FLOWS FOR PROTECT IT LTD

Protect IT Ltd is a (fictitious) company that makes protective cases for smartphones such as the iPhone. The company is considering a proposal to expand its product selection to include protective covers for tablet devices such as the iPad, and so far, the company has spent \$10,000 analysing the potential market for such a product. Management believes that many purchasers of mobile phone cases will also buy protective covers for tablets, and so the company has a built-in clientele for the new product line. If the company decides to undertake this project, it will begin selling new products next month, when its new fiscal year begins. The company would therefore make the required investment before the end of the current fiscal year (year 0). The company accepts projects with positive NPVs, and it uses a 15% discount rate to calculate NPV.

Up-front costs include \$50,000 in computer equipment that the company will depreciate for five years on a straight-line basis starting in year 1. Protect IT must also make an immediate investment of \$4,500 in inventory, though \$2,500 of that can be purchased on credit. For transactions purposes, the company plans to increase its cash balance by \$1,000 immediately. Managers expect the average selling price of its new tablet covers to be \$13.50, and they expect that price to remain constant indefinitely. Protect IT expects to finance this investment using the cash flow generated from its existing business.

Managers expect unit sales volume to start at 4,500 and to grow rapidly for a few years. In the long run, they predict that unit sales will increase by 4% per year. Cost of goods sold will equal 72% of sales revenue, with selling, general and administrative expenses at 10% of sales.

As sales grow, Protect IT will hold slightly larger cash balances and make additional investments in inventory and receivables. Each year, accounts receivable will be equivalent to one-month's sales, and inventory balances will be about 12.5% of sales. We assume that after the initial purchase of new computers, no additional fixed asset investments will be necessary. In addition, Protect IT's suppliers will provide trade credit on terms such that the accounts payable balance will equal about 10% of cost of goods sold for each year.

FINANCE IN THE REAL WORLD



CASH FLOWS IN PRACTICE

Advancedtronics Corporation is considering purchasing a new packaging machine to replace a fully depreciated packaging machine that will last five more years. The new machine is expected to have a five-year life and depreciation charges of \$4,000 in year 1; \$6,400 in year 2; \$3,800 in year 3; \$2,400 in both year 4 and year 5; and \$1,000 in year 6. The company's estimates of revenues and expenses (excluding depreciation) for the new and the old packaging machines are shown in the following table. Advancedtronics is subject to a 30% tax rate on ordinary income.

YEAR	NEW PACKAGING MACHINE		OLD PACKAGING MACHINE	
	REVENUE	EXPENSES (EXCLUDING DEPRECIATION)	REVENUE	EXPENSES (EXCLUDING DEPRECIATION)
1	\$50,000	\$40,000	\$45,000	\$35,000
2	51,000	40,000	45,000	35,000
3	52,000	40,000	45,000	35,000
4	53,000	40,000	45,000	35,000
5	54,000	40,000	45,000	35,000

The Chief Financial Officer would like to use this information to:

- calculate the operating cash flows associated with each packaging machine (ensuring the depreciation in year 6 is taken into consideration)
- calculate the incremental operating cash flows resulting from the proposed packaging machine replacement
- depict on a time line the incremental operating cash flows found in part (b).

The following shows the steps that the CFO could take to achieve this:

a

NEW MACHINE	0	1	2	3	4	5	6
Sales		\$50,000	\$51,000	\$52,000	\$53,000	\$54,000	\$ 0
- Expenses		40,000	40,000	40,000	40,000	40,000	0
- Depreciation		4,000	6,400	3,800	2,400	2,400	1,000
Taxable income		\$ 6,000	\$ 4,600	\$ 8,200	\$10,600	\$11,600	\$-1,000
- Taxes (30%)		1,800	1,380	2,460	3,180	3,480	-300
Earnings		\$ 4,200	\$ 3,220	\$ 5,740	\$ 7,420	\$ 8,120	\$ -700
Operating CFs (Earnings +Depreciation)		\$ 8,200	\$ 9,620	\$ 9,540	\$ 9,820	\$10,520	\$ 300

OLD MACHINE	0	1	2	3	4	5	6
Sales		\$45,000	\$45,000	\$45,000	\$45,000	\$45,000	0
- Expenses		35,000	35,000	35,000	35,000	35,000	0
- Depreciation		0	0	0	0	0	0
Taxable income		\$10,000	\$10,000	\$10,000	\$10,000	\$10,000	0
- Taxes (30%)		3,000	3,000	3,000	3,000	3,000	0
Earnings		\$ 7,000	\$ 7,000	\$ 7,000	\$ 7,000	\$ 7,000	0
Operating CFs (Earnings + opt. Depreciation)		\$ 7,000	\$ 7,000	\$ 7,000	\$ 7,000	\$ 7,000	0



b Incremental operating cash flows

YEAR	0	1	2	3	4	5	6
New machine		\$8,200	\$9,620	\$9,540	\$9,820	\$10,520	\$300
- Old machine		<u>7,000</u>	<u>7,000</u>	<u>7,000</u>	<u>7,000</u>	<u>7,000</u>	<u>0</u>
Difference		<u>\$1,200</u>	<u>\$2,620</u>	<u>\$2,540</u>	<u>\$2,820</u>	<u>\$3,520</u>	<u>\$300</u>

c

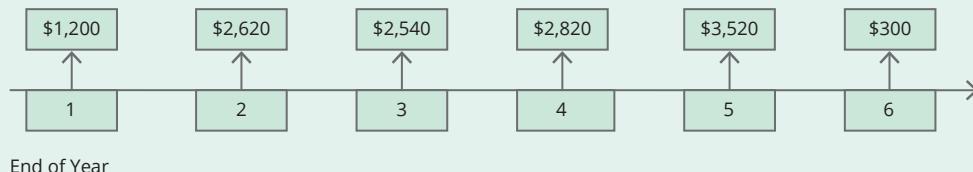


Figure 10.3 shows various projections for the investment project. The top two rows list anticipated selling prices and unit volumes in each of the next six years. Below that appears a series of projected income statements for the next six years. Top-line revenue equals the product of expected selling price and unit volume each year. Next, the table subtracts cost of goods sold, selling, general and administrative (SGA) expenses, and depreciation to arrive at pre-tax profit. Taxes constitute 30% of pre-tax profit.

FIGURE 10.3 PROJECTIONS FOR PROTECT IT'S INVESTMENT PROJECT

YEAR	0	1	2	3	4	5	6
Price per unit	\$ 13.50	\$ 13.50	\$ 13.50	\$ 13.50	\$ 13.50	\$ 13.50	\$ 13.50
Units	0	4,500	10,000	16,000	22,000	24,000	25,000
Abbreviated project income statement							
Revenue	\$ 0	\$60,750	\$135,000	\$216,000	\$297,000	324,000	337,500
Less: Cost of goods sold	\$ 0	\$43,740	\$ 97,200	\$155,520	\$213,840	233,280	243,000
Gross profit	\$ 0	\$17,010	\$ 37,800	\$ 60,480	\$ 83,160	\$ 90,720	\$ 94,500
Less: Selling, general and administrative expense (SG&A expense)	\$ 0	\$ 6,075	\$ 13,500	\$ 21,600	\$ 29,700	\$ 32,400	\$ 33,750
Less: Depreciation	\$ 0	\$10,000	\$ 10,000	\$ 10,000	\$ 10,000	\$ 10,000	\$ 0
Pre-tax profit	\$ 0	\$ 935	\$ 14,300	\$ 28,880	\$ 43,460	\$ 48,320	\$ 60,750
Taxes	\$ 0	\$ 281	\$ 4,290	\$ 8,664	\$ 13,038	\$ 14,496	\$ 18,225
After-tax profit	\$ 0	\$ 655	\$ 10,010	\$ 20,216	\$ 30,422	\$ 33,824	\$ 42,525
Abbreviated project balance sheet							
Cash	\$ 1,000	\$ 2,000	\$ 2,500	\$ 3,000	\$ 3,200	\$ 3,300	\$ 3,500
Accounts receivable	\$ 0	\$ 5,063	\$ 11,250	\$ 18,000	\$ 24,750	\$ 27,000	\$ 28,125
Inventory	\$ 4,500	\$ 7,594	\$ 16,875	\$ 27,000	\$ 37,125	\$ 40,500	\$ 42,188





YEAR	0	1	2	3	4	5	6
Current assets	\$ 5,500	\$14,656	\$ 30,625	\$ 48,000	\$ 65,075	\$ 70,800	\$ 73,813
Gross plant & equipment (P&E)	\$50,000	\$50,000	\$ 50,000	\$ 50,000	\$ 50,000	\$ 50,000	\$ 50,000
Less: Accumulated depreciation	\$ 0	\$10,000	\$ 20,000	\$ 30,000	\$ 40,000	\$ 50,000	\$ 50,000
Net P&E	\$50,000	\$40,000	\$ 30,000	\$ 20,000	\$ 10,000	\$ 0	\$ 0
Total assets	\$55,500	\$54,656	\$ 60,625	\$ 68,000	\$ 75,075	\$ 70,800	\$ 73,813
Accounts payable	\$ 2,500	\$ 4,374	\$ 9,720	\$ 15,552	\$ 21,384	\$ 23,328	\$ 24,300

Beneath the income statement appears a series of abbreviated projected balance sheets. Each shows the project's total asset requirements (including both current and fixed assets) as well as the financing available from suppliers in the form of accounts payable. As mentioned previously, any additional financing the project requires will come from internally generated funds from the already profitable mobile phone cover business.

To determine whether this is an investment opportunity worth taking, we determine the project's cash flows through time and discount them at 15% to calculate the project's NPV. As part of this calculation, we have to estimate the value of the endeavour beyond the sixth year. In other words, we have to estimate the project's terminal value.

10.3a YEAR 0 CASH FLOW

The company will have cash outlays of \$50,000 for computer equipment immediately (year 0). The company will also have a cash outlay of \$3,000 for its net investment in working capital. That consists of outflows of \$1,000 to increase the cash balance and \$4,500 to purchase inventory, and an inflow of \$2,500 from an increase in trade credit. Therefore, the net cash flow for year 0 is:

Increase in fixed assets	-\$50,000
Increase in working capital	-\$ 3,000
Total cash outflow	-\$53,000

Notice that we do not include the \$10,000 that Protect IT spent studying the potential market for covers for tablet devices. That is a sunk cost that cannot be recovered, even if the company decides not to pursue this investment, so it is not an incremental cash flow.

10.3b YEAR 1 CASH FLOW

In year 1, the project earns after-tax income of \$655. To determine cash flows, we add back the non-cash depreciation charge of \$10,000. There is no new investment in fixed assets in year 1, but the net working capital balance rises from \$3,000 to \$10,283. This represents a cash outflow of \$7,283, which consists of the following components:

	YEAR 0	YEAR 1
Cash	\$ 1,000	\$ 2,000
Accounts receivable	0	5,063
Inventory	4,500	7,594
Accounts payable	-2,500	-4,374
Net working capital	\$ 3,000	\$10,283

You can calculate the net cash outflow from new investments in working capital on an item-by-item basis as follows:

OUTFLOWS	
Increase in cash	\$1,000
Increase in accounts receivable	5,063
Increase in inventory	<u>3,094</u>
Total working capital outflows	\$9,157
INFLOWS	
Increase in accounts payable	\$1,874
Net cash flow from working capital = inflows – outflows	=-\$7,283

Summing up, the incremental cash flows for year 1 are as follows:

Net income	\$ 655
Depreciation	10,000
Net working capital	<u>-7,283</u>
Net cash flow	\$ 3,372

10.3c YEAR 2 CASH FLOW

In year 2 we simply repeat the steps we followed to arrive at year 1's cash flow numbers. Net income equals \$10,010. To that, add back the \$10,000 non-cash depreciation deduction. Next, determine the change in working capital. The working capital balance increased from \$10,283 in year 1 to \$20,905 in year 2, so this represents a cash outflow of \$10,622. As in year 1, there are no new investments in fixed assets to consider, so the net cash flow in year 2 equals:

Net income	\$ 10,010
Depreciation	10,000
Increase in working capital	<u>-10,622</u>
Net cash flow	\$ 9,388

Figure 10.4 illustrates the annual net cash flows for the investment project all the way through to the end of the sixth year. Several interesting patterns emerge from this table. First, the project's cash flows grow rapidly for the first five years, primarily because sales volume is growing. However, notice that in year 6, two interesting things happen. First, tax savings from depreciation deductions run out, so an important source of cash inflows stops. Second, the change in working capital in year 6 is relatively small compared to the other years. Remember that the thing driving Protect IT to invest in more working capital each year was sales growth. By year 6, sales growth has slowed to the long-run rate of 4%, so the company doesn't need to increase working capital items as fast as it had in the project's first five years.

FIGURE 10.4 ANNUAL NET CASH FLOW ESTIMATES FOR PROTECT IT'S INVESTMENT PROJECT

	YEAR 0	YEAR 1	YEAR 2	YEAR 3	YEAR 4	YEAR 5	YEAR 6
New fixed assets	\$50,000	\$ 0	\$ 0	\$ 0	\$ 0	\$ 0	\$ 0
Change in working capital	-\$ 3,000 ^a	-\$ 7,282	-\$10,623	-\$11,543	-\$11,243	-\$ 3,781	-\$ 2,041
Net income	\$ 0	\$ 655	\$10,010	\$20,216	\$30,422	\$33,824	\$42,525
Depreciation	\$ 0	\$10,000	\$10,000	\$10,000	\$10,000	\$10,000	\$ 0
Net cash flow	-\$53,000	\$ 3,372	\$ 9,387	\$18,673	\$29,179	\$40,043	\$40,485

a Represents the initial working capital investment.

Because this project starts generating net cash inflows as early as year 1, it is probably not representative of most investment projects that companies undertake. Many projects, especially those that involve launching new ventures or product lines, take several years before they produce positive cash flow. If Protect IT discounts the project's cash flows at 15%, it has a positive NPV of \$23,403, counting only the first six years' cash flows. But that probably understates the investment's true value because Protect IT will surely operate this business beyond year 6. Therefore, to complete the analysis, we need to estimate this venture's terminal value.

10.3d TERMINAL VALUE

We produce two different terminal-value estimates for this project. In the first, we assume that by year 6 the project has reached a steady state, meaning that cash flows will grow at 4% per year indefinitely. In the second, we assume that the company sells its investment at the end of year 6 and receives a cash payment equal to the project's book value.

In year 6, the project generates a net cash inflow of \$40,485. Assuming that cash flows beyond the sixth year grow at 4% per year, and discounting those cash flows at 15%, we can use the equation for a growing perpetuity ([Equation 3.11](#) in Chapter 3) to determine the terminal value of the project *as of the end of year 6*, as follows:

$$\text{Terminal value} = \frac{\$42,104}{0.15 - 0.04} = \$382,764$$

Notice that the numerator of \$42,104 in the expression above is the estimated year 7 cash flow, which is 4% greater than the cash flow in year 6 ($1.04 \times \$40,485 = \$42,104$). Remember (from Chapter 3, [Equation 3.11](#), and Chapter 5, [Equation 5.4](#)), when valuing a stream of cash flows that grows at a perpetual rate, the *value today equals next year's cash flow divided by the difference between the discount rate and the growth rate*. Thus, to determine the terminal value in year 6, we must use the cash flow in year 7 in the numerator.

As a second approach, assume that the terminal value of the project simply equals the book value at the end of year 6. At that time, the company has fully depreciated its investment in computers, so its only assets are cash (\$3,500), receivables (\$28,125) and inventory (\$42,188). Offsetting those assets are \$24,300 in accounts payable, so the book value of the venture is just \$49,513, a far cry from our prior terminal value estimate. The magnitude of that difference should not surprise us too much. In general, as noted in Chapter 5, a profitable, growing business will have a market value that exceeds its book value.

A third way to estimate the project's terminal value is to use a market multiple approach. A Protect IT analyst could multiply the project's expected sales, earnings or cash flow in year 6 times a market multiple based on comparable companies. For example, suppose that at the present time, companies that make

accessories for the iPad sell at a price-to-sales ratio of about 1.5. **Figure 10.3** projects that in six years the line of protective covers will generate \$337,500 in revenue. Multiplying this times 1.5 suggests that the product line could be worth \$506,250 at the end of year 6. Clearly, different methods of calculating a project's terminal value can lead to very different estimates.

10.3e PROTECT IT PROJECT NPV

Putting all this together, we arrive at different estimates of the project's NPV, depending on which estimate of terminal value we use. Assuming that this business will continue to increase profits forever, we arrive at the following NPV:

$$NPV = -\$53,000 + \frac{\$3,372}{1.15^1} + \frac{\$9,387}{1.15^2} + \frac{\$18,673}{1.15^3} + \frac{\$29,179}{1.15^4} + \frac{\$40,043}{1.15^5} + \frac{\$40,485 + \$382,764}{1.15^6} = \$188,882$$

On the other hand, if we assume that the terminal value is only equal to book value after six years, then we arrive at the following NPV:

$$= -\$53,000 + \frac{\$3,372}{1.15^1} + \frac{\$9,387}{1.15^2} + \frac{\$18,673}{1.15^3} + \frac{\$29,179}{1.15^4} + \frac{\$40,043}{1.15^5} + \frac{\$40,485 + \$49,513}{1.15^6} = \$44,808$$

In this example, the project yields a positive NPV, no matter which terminal-value estimate we choose, so investing in the new product line will increase shareholder wealth. However, in many real-world situations, especially those involving long-lived investments, the 'go' or 'no-go' decision will depend critically on terminal-value assumptions. It is not at all uncommon for the perpetual growth and market multiple approaches to yield positive NPVs, while the book value approach shows a negative NPV. In that case, managers have to think more deeply and realistically about the long-run value of their enterprise.

LO10.3

CONCEPT REVIEW QUESTIONS

- 7 We did not discuss the possibility that the new product line might cannibalise sales of existing products. Is that likely to be a problem in this situation? Why or why not?
- 8 What are three ways that Protect IT might estimate the terminal value of this project?
- 9 Suppose Parliament passes legislation that allows Protect IT to depreciate its investment in computers over three years rather than five. In general, what impact would this legislation have on the project's NPV?

THINKING CAP QUESTION

- 5 How would you explain NPV calculations to a non-financial manager?

LO10.4

10.4 SPECIAL PROBLEMS IN CAPITAL BUDGETING

Though our objective in writing this book was to provide as much real-world focus as possible, real business situations are more complex and occur in more varieties than any textbook can reasonably convey. In this section, we examine common business decisions with special characteristics that make them more difficult to analyse than the examples we have covered thus far. We will see that, whereas the analysis may require a little more thinking, the principles involved are the same ones discussed throughout this chapter and Chapter 9.

In Chapter 11, we continue this theme when we discuss the concept of real options and the impact of real options on strategic budgeting.

10.4a CAPITAL RATIONING

In Chapter 9, we asked the following question: if a company must choose between several investment opportunities, all worth taking, how does it prioritise projects? We learned that the IRR and PI methods sometimes rank projects differently than the way NPV does, although properly applied, all three techniques generate the same accept or reject decisions.

A Fundamental Question

There is a fundamental question that we have avoided until now. If the company has many projects with positive NPVs (or investments with acceptable IRRs), why not accept all of them? One possibility is that the company may be constrained by the availability of trained and reliable personnel – especially managers. This prevents the company from growing extremely rapidly, especially because adding a new product or project would require managerial talent of the highest order. Another possibility is that the company simply does not have enough money to finance all its attractive investment opportunities. But why couldn't a large, publicly traded company raise money by issuing new shares to investors and using the proceeds to undertake any and all appealing investments?

If you watch companies closely over time, you notice that most do not often issue new ordinary shares. As Chapter 12 discusses more fully, companies generally prefer to finance investments with internally generated cash flow, and will only infrequently raise money in the external capital markets by issuing new equity. There are several possible reasons for this reluctance to issue new equity. First, when companies announce their plans to raise new equity capital, they may send an unintended negative signal to the market. Perhaps investors may interpret the announcement as a sign that the company's existing investments are not generating acceptable levels of cash flow. Perhaps investors may see the decision to issue new shares as an indication that managers believe the company's shares are overvalued. In either case, investors may react negatively to this announcement, causing the share price to fall. Undoubtedly, managers try to persuade investors that the funds being raised will be invested in profitable projects, but convincing investors that this is the true motive for the issue is an uphill struggle.

A second reason why managers may avoid issuing new equity is that by doing so, they dilute their ownership stake in the company (unless they participate in the offering by purchasing some of the new shares). A smaller ownership stake means that managers control a shrinking block of votes, raising the potential of a corporate takeover or other threat to their control of the company.

In conversations with senior executives, we often hear a third reason why companies do not fund every investment project that looks promising. Behind every idea for a new investment is a person, someone who may have an emotional attachment to the idea or a career-building motivation for proposing the idea in the first place. Upper-level managers are wise to be a little sceptical of the cash flow forecasts they see on projects with favourable NPVs or IRRs. It is a given that every cash flow forecast will prove to be wrong. If the forecasting process is unbiased, forecasts half the time will be too pessimistic, and half the time be too optimistic. Which half is likely to surface on the radar screen of a CFO or CEO in a large corporation? (Answer: the optimistic ones.) Establishing an annual budget constraint on capital expenditures to ration capital is one mechanism by which senior managers impose discipline on the capital budgeting process. By doing so, they hope to weed out some of the investment proposals with an optimistic bias built into the cash flow projections.

Selecting the Best Projects Under Rationing

Regardless of their motivation, managers cannot always invest in every project that offers a positive NPV. In such an environment, **capital rationing** occurs. Given a set of attractive investment opportunities, managers must choose the combination of projects that maximises shareholder wealth, subject to the constraint of limited funds. The following example demonstrates the application of this approach for selecting investments under capital rationing.



Project Choice under Capital Rationing

Assume that a particular company has five projects to choose from, as shown in **Figure 10.5**. Note that all of the projects require an initial cash outflow in year 0 that is followed by four years of cash inflows. All of the projects have positive NPVs, IRRs that exceed the company's 12% required return and PIs greater than 1.0. Notice that the first project has the highest IRR and the highest PI, but project 5 has the largest NPV. This is again the familiar scale problem discussed in Chapter 9. Suppose that this company can invest no more than \$300 million this year. What portfolio of investments maximises shareholder wealth?

Notice that there are several combinations of projects that satisfy the constraint of investing no more than \$300 million. If we begin by accepting

the project with the highest PI, then continue to accept additional projects until we bump into the \$300 million capital constraint, we will invest in projects 1, 2 and 3. With these three projects, we have invested just \$250 million, but that does not leave us with enough capital to fund either project 4 or 5. The total NPV obtainable from the first three projects is \$170.8 (\$59.2 + \$52.0 + \$59.6) million. No other combination of projects that satisfies the capital constraint yields a higher aggregate NPV. For example, investing in projects 3 and 5, thereby using up the full allotment of \$300 million in capital, generates a total NPV of just \$130.6 (\$59.6 + \$71.0) million. Likewise, investing in projects 1, 2 and 4, another combination that utilises all \$300 million in capital, generates an aggregate NPV of \$149.6 (\$59.2 + \$52.0 + \$38.4) million.¹¹

capital rationing
The situation where a company has more positive-NPV projects than its available budget can fund. It should choose the combination of those projects that maximises shareholder wealth

10.4b EQUIPMENT REPLACEMENT AND EQUIVALENT ANNUAL COST

Assume that a company must purchase an electronic control device to monitor its assembly line. Two types of devices are available. Both meet the company's minimum quality standards, but they differ in three dimensions. First, one device is less costly than the other. Second, the cheaper device requires higher maintenance expenditures. Third, the less expensive device (three-year life) does not last as long as the more expensive one (four-year life), so it will have to be replaced sooner. The sequence of expected *cash outflows* (we have omitted the negative signs for convenience) for each device are shown in **Figure 10.5**.

¹¹ Reviewing Figure 10.5, we see that the IRR and PI result in identical project rankings. Therefore, had we used the IRR rather than the PI, we would have selected the same set of projects. These two decision techniques generally result in similar, but not necessarily identical, project rankings.

FIGURE 10.5 CAPITAL RATIONING AND THE PROFITABILITY INDEX (12% REQUIRED RETURN)

	PROJECTS				
YEAR	1	2	3	4	5
0	-\$ 70	-\$ 80	-\$ 100	-\$ 150	-\$ 200
1	30	30	40	50	90
2	40	35	50	55	80
3	50	55	60	60	80
4	55	60	65	90	110
NPV	\$ 59.2	\$ 52.0	\$ 59.6	\$ 38.4	\$ 71.0
IRR	44%	36%	36%	23%	28%
PI	1.8	1.6	1.6	1.3	1.4
END OF YEAR (ALL VALUES ARE OUTFLOWS)					
DEVICE	0	1	2	3	4
A	\$12,000	\$1,500	\$1,500	\$1,500	
B	14,000	1,200	1,200	1,200	\$1,200

Notice that, to keep the example simple, the maintenance costs do not rise over time. Suppose this company uses a discount rate of 7%. Following is the NPV cost of each stream of cash outflows:

DEVICE	NPV COST OF CASH OUTFLOWS
A	\$15,936
B	18,065

Purchasing and operating device A seems to be much cheaper than using device B (remember that we are looking for a lower NPV, because these are *cash outflows*). But this calculation ignores the fact that using device A will necessitate a large replacement expenditure in year 4, one year earlier than device B must be replaced. We need a way to capture the value of replacing device B less frequently than device A.

One way to do this is to look at both machines over a 12-year time horizon. Over the next 12 years, the company will replace device A four times (4×3 years = 12 years) and device B three times (3×4 years = 12 years). At the end of the twelfth year, both machines have to be replaced, and thus begins another 12-year cycle. **Figure 10.6** shows the streams of cash flows over the cycle, assuming that when either control device wears out it can be replaced and maintained at the same costs that initially applied (all future costs remain the same). Notice that in the replacement years, the company must pay both the maintenance cost on the old device (to keep it running through the year) and the purchase price of the new device. The present value cost (using a 7% discount rate) of the cash outflows for the devices over the entire 12-year period follows:

DEVICE	NPV
A	\$48,233
B	42,360

Taking into account the greater longevity of device B, it is the better choice. Remember, *our objective is to find the minimum-cost alternative*, which, in this case, is device B.

FIGURE 10.6 OPERATING AND REPLACEMENT CASH FLOWS FOR TWO DEVICES (ALL VALUES ARE OUTFLOWS)

DEVICE		
YEAR	A	B
0	\$12,000	\$14,000
1	1,500	1,200
2	1,500	1,200
3	13,500	1,200
4	1,500	15,200
5	1,500	1,200
6	13,500	1,200
7	1,500	1,200
8	1,500	15,200
9	13,500	1,200
10	1,500	1,200
11	1,500	1,200
12	1,500	1,200
NPV (@7%)	\$48,233	\$42,360

Note: At the end of 12 years, the company has to replace equipment, regardless of whether it chooses device A or B; thus, a new 12-year cycle begins.

An alternative approach to this problem is called the **equivalent annual cost (EAC) method**. The EAC method begins by calculating the present value of cash flows for each device over its lifetime. We have already seen that the NPV for operating device A for three years is \$15,936, and the NPV for operating device B for four years is \$18,065. Next, the EAC method asks, what annual expenditure over the life of each machine would have the same present value? That is, the EAC solves each expression as follows:

$$\$15,936 = \frac{X}{1.07^1} + \frac{X}{1.07^2} + \frac{X}{1.07^3} \quad X = \$6,072$$

$$\$18,065 = \frac{Y}{1.07^1} + \frac{Y}{1.07^2} + \frac{Y}{1.07^3} + \frac{Y}{1.07^4} \quad Y = \$5,333$$

In the first equation, the variable X represents the annual cash flow from a three-year annuity that has the same present value as the actual purchase and operating costs of device A. If the company purchases device A and keeps replacing it every three years for the indefinite future, the company will incur a sequence of cash flows over time with the same present value as a perpetuity of \$6,072. In other words, \$6,072 is the *equivalent annual cost (EAC)* of device A. Likewise, in the second equation, Y represents the annual cash flow from a four-year annuity with the same present value as the purchase and operating costs of device B. If the company buys device B and replaces it every four years, then it will incur a sequence of cash flows having the same present value as a perpetuity of \$5,333.

The company should choose the alternative with the lower EAC, which is device B.

Our approaches for solving the problem of choosing between equipment with unequal lives both assume that the company will continue to replace worn-out equipment with similar machines for a long period of time. That may not be a bad assumption in some cases, but new technology often makes old equipment obsolete. For example, suppose that the company in our example believes that in three years a new electronic device will be available that is more reliable, less costly to operate and longer-lived. If this new device becomes available in three years, the company will replace whatever device it is using at the time with the newer model. Furthermore, the superior attributes of the new model imply that the salvage value for the old device will be zero. How should the company proceed?

Knowing that it will replace the old device with the improved device in three years, the company can simply discount cash flows for three years:

$$NPV_A = \$12,000 + \frac{\$1,500}{1.07^1} + \frac{\$1,500}{1.07^2} + \frac{\$1,500}{1.07^3} = \$15,936$$

$$NPV_B = \$14,000 + \frac{\$1,200}{1.07^1} + \frac{\$1,200}{1.07^2} + \frac{\$1,200}{1.07^3} = \$17,149$$

In this case, the best device to purchase is A rather than B. Remember that B's primary advantage was its longevity. In an environment in which technological developments make old machines obsolete, longevity is not much of an advantage.

equivalent annual cost (EAC) method

Represents the annual expenditure over the life of each asset that has a present value equal to the present value of the asset's annual cash flows over its lifetime

10.4c EXCESS CAPACITY

Companies often operate at less than full capacity. In such situations, managers encourage alternative uses of the excess capacity because they view it as a free asset. Although it may be true that the marginal cost of using excess capacity is zero in the very short run, using excess capacity today may accelerate the need for more capacity in the future. When that is so, to fully account for incremental cash flow effects, managers should charge the cost of accelerating new capacity development against the current proposal for using excess capacity. This procedure can be demonstrated by the following example.



Building versus Leasing Capacity

Imagine a retail department store chain with a regional distribution centre in south-eastern Australia. At the moment, the distribution centre is not fully utilised. Managers know that in two years, as new stores are built in the region, the company will have to invest \$2 million (cash outflow) to expand the distribution centre's warehouse. A proposal surfaces to lease all the excess space in the warehouse for the next two years at a price that would generate beginning-of-year cash inflow of \$125,000 per year. If the company accepts this proposal, it will have no excess capacity. In order to hold inventory for new stores coming on line in the next few months, the company will have to begin expansion immediately. The incremental investment in this expansion is the difference between investing \$2 million now versus investing \$2 million two years from today. The incremental cash inflow is, of course, the \$125,000 lease cash flows that are received today and one year from today. Should the company accept this offer? Assuming a 10% discount rate, the NPV of the project is shown as follows:

$$NPV = \$125,000 - \$2,000,000 + \frac{\$125,000}{1.1} + \frac{\$2,000,000}{1.1^2} = -\$108,471$$

Notice that we treat the \$2 million investment in the second year as a cash inflow in this expression. By building the warehouse today, the company avoids having to spend the money two years later. Even so, the NPV of leasing excess capacity is negative. However, a clever analyst could propose a counter-offer derived from the following equation:

$$NPV = X - \$2,000,000 + \frac{X}{1.1} + \frac{\$2,000,000}{1.1^2} = \$0$$

The value of X represents the amount of the lease cash inflow (one received today and the other received in one year) that would make the company indifferent to the proposal. Solving the equation, we see that if the lease cash inflows are \$181,818, the project NPV equals zero. Therefore, if the company can lease its capacity for a price above \$181,818, it should do so.

LO10.4

CONCEPT REVIEW QUESTIONS

- 10 When a company is faced with capital rationing, how can the profitability index (PI) be used to select the best projects? Why does choosing the projects with the highest PI not always lead to the best decision?
- 11 Under what circumstance is the use of the equivalent annual cost (EAC) method to compare substitutable projects with different lives clearly more efficient computationally than using multiple investments over a common period where both projects terminate in the same year?



12 In almost every example so far, companies must decide to invest in a project immediately or not at all. But suppose that a company could either invest in a project today or wait one year before investing. How could you use NPV analysis to decide whether to invest now or later?

13 Can you articulate circumstances under which the cost of excess capacity is zero? Think about why the cost of excess capacity normally is not zero.

THINKING CAP QUESTIONS

- 6 How does the approval process for new investment ideas work at various companies?
- 7 When assessing a particular company, consider how the overall budget for capital investments is established.
- 8 How would you decide between two machines: one that costs more and lasts longer versus another one that is less expensive but must be replaced more often?

LO10.5

10.5 THE HUMAN FACE OF CAPITAL BUDGETING

This chapter illustrates which cash flows analysts should discount and which cash flows they should ignore when valuing real investment projects. There are relatively simple rules of thumb that guide managers in this task; however, executing these rules appropriately in practice is an obvious challenge. Deciding which costs are incremental and which are not, incorporating the myriad tax factors that influence cash flows, and measuring opportunity costs properly are much more complex manoeuvres than we or anyone else can convey in a textbook. The nuances of capital budgeting are best learned through practice.

There is another factor that makes real-world capital budgeting more complicated than textbook examples: the *human element*. Neither the ideas for capital investments nor the financial analysis used to evaluate them occur in a vacuum. Almost every investment proposal important enough to warrant a thorough financial analysis has a champion behind it, an individual who believes that the project is a good idea and that it perhaps will advance their own career. When companies allocate investment capital across projects or divisions, they must recognise the potential for an optimistic bias to creep into the numbers. This bias can arise through intentional manipulation of the cash flows to make an investment look more attractive, or it may simply arise if the analyst calculating the NPV is also the cheerleader advocating the project in the first place.

One way that companies attempt to control this bias is by putting responsibility for analysing an investment proposal under an authority independent from the individual or group proposing the investment. For example, it is common in large companies for a particular group to have the responsibility of conducting the financial analysis required to value any potential acquisition targets. In this role, financial analysts play a gatekeeper role, protecting shareholders' interests by steering the company away from large, negative NPV investments. Naturally, these independent analysts face intense pressure from the advocates of each project to portray the investment proposal in its best possible light. Consequently, financial experts need to know more than just which cash flows count in the NPV calculation. They also need to have a sense of what is reasonable when forecasting a project's profit margin and its growth potential. Analysts must also prepare to defend their assumptions, explaining why their (often more conservative) projections do not line up with those offered by the managers advocating a given investment.

Many experienced managers say that they have never seen an investment with a negative NPV. They do not mean that all investments are good investments, but rather that all analysts know enough about NPV

analysis to recognise how to make any investment look attractive. In this environment, another skill comes into play in determining which project receives funding. We refer to this skill as *storytelling*, as opposed to number-crunching. Most good investments have a compelling story behind them – a reason, based on sound economic logic, that the *investment's NPV should be positive*. The best financial analysts not only provide the numbers to highlight the value of a good investment but also explain why the investment makes sense. We return to this storytelling element of capital budgeting in Chapter 11.

LO10.5

CONCEPT REVIEW QUESTION

- 14 What role does the human element play in the capital budgeting decision process? Could it cause a negative NPV project to be accepted?

FINANCE IN THE REAL WORLD



CFO SURVEY EVIDENCE

Throughout this chapter we have stressed that managers should focus on cash flows rather than accounting earnings, both in intra-company financial analysis (including capital budgeting assessments) and in the financial data they report to external stakeholders. Do practising managers actually follow this advice? Unfortunately, survey evidence clearly suggests that financial managers place far greater emphasis on accounting earnings, especially earnings per share (EPS), than they do on any other financial metric. The following graph describes how 401 financial executives ranked the importance of company metrics provided to outsiders. Over half (51%) of the respondents listed earnings as the most important metric they report, with pro forma earnings and revenues the two next most important measures reported. Cash flows from operations and free cash flows, two of the metrics we stress in this chapter, were selected by only 12% and 10% of respondents, respectively.

The researchers conducting this survey also reported the disquieting fact that 78% of responding managers admitted a willingness

to sacrifice company value to smooth reported earnings. In response to the question, 'How large a sacrifice in value would your company make to avoid a bumpy earnings path?', 52% of managers reported a willingness to make a small sacrifice, 24% said they would make a moderate sacrifice and 2% said they would make a large sacrifice to smooth reported profits. This clearly suggests that many managers will forgo positive-NPV investment opportunities so as not to disrupt reported earnings per share.

The most important financial measures reported by managers to outsiders



Source: Reprinted from John R. Graham, Campbell R. Harvey and Shiva Rajgopal, 'The Economic Implications of Corporate Financial Reporting', *Journal of Accounting and Economics*, 40 (2005), pp. 3–73, Figure 2 and Table 9, with permission from Elsevier.

STUDY TOOLS

SUMMARY

LO10.1

- To estimate an investment's relevant cash flows, the analyst focuses on incremental cash flows, ignores financing costs, considers taxes and adjusts for any non-cash expenses, such as depreciation.
- The costs of financing an investment, such as interest paid to lenders and dividends paid to shareholders, should not be counted as part of a project's cash outflows. In contrast, these are included in the calculation of accounting profit.
- The discount rate captures the financing costs, so deducting interest expense and dividends from a project's cash flows would be double counting.

LO10.2

- Certain types of cash flow are common to many different kinds of investments. These include fixed asset cash flow, working capital cash flow, operating cash flow and terminal cash flow.
- Depreciation and amortisation are non-cash items, so they should be excluded from the calculation of cash flow. However, they have an impact on taxes, which are calculated on profits that do take into consideration depreciation and amortisation. Tax payments are included in cash flow calculations, which should be measured on an after-tax basis for capital budgeting purposes.

LO10.3

- Only the incremental cash flows associated with a project should be included in NPV analysis. The analyst should avoid including sunk costs in estimates of incremental cash flows.
- Opportunity costs and any cannibalisation should be reflected in an investment's cash flow projections.

LO10.4

- To find working capital cash flow, calculate the change in net working capital from one period to the next. Increases in net working capital represent cash outflows, whereas decreases in net working capital represent cash inflows.
- To find operating cash flow, calculate after-tax net income (as if the company had no debt) and add back any non-cash expenses.
- To find terminal value, or terminal cash flow, employ one of several methods, including the perpetual growth model and the use of book value, or market multiples.

LO10.5

- When capital rationing exists, managers should analyse all combinations of projects that satisfy the budget constraint and choose the combination that has the highest overall NPV.
- When evaluating alternative equipment purchases with unequal lives, determine the equivalent annual cost (EAC) of each type of equipment and choose the one that is least expensive.
- When confronted with proposals to use excess capacity, think carefully about the true cost of that capacity. It is rarely zero.
- When analysing capital budgeting projects, it is important to consider human factors and make sure that the project, in addition to having a positive NPV, makes sense.

SELF-TEST PROBLEMS

Answers to these 'Self-test problems' and the 'Concept review' questions throughout the chapter appear on the Student Companion Website (<http://login.cengagebrain.com>) or via your instructor.

ST10-1 Claross Ltd wants to determine the relevant operating cash flows associated with the proposed purchase of a new piece of equipment that has an installed cost of \$100 million, an expected

life of five years and is to be depreciated using the diminishing value method. The company's financial analyst estimated that the relevant time horizon for analysis is six years. She expects the revenues attributable to the equipment to be \$158 million in the first year and to increase at 5% per year through year 6. Similarly, she estimates all expenses, other than depreciation attributable to the equipment, to total \$122 million in the first year and to increase by 4% per year until year 6. She plans to ignore any cash flows after year 6. The company has a marginal tax rate of 30% and its required return on the equipment investment is 13%. (Note: round all cash flow calculations to the nearest \$0.01 million.)

- a** Find the relevant incremental cash flows for years 0 to 6.
- b** Using the cash flows found in part (a), determine the NPV and IRR for the proposed equipment purchase.
- c** Based on your findings in part (b), would you recommend that Claross Ltd purchase the equipment? Why?

ST10-2 Tektek Industries wants to determine whether it would be advisable for it to replace an existing, fully depreciated machine with a new one. The new machine will have an after-tax installed cost of \$300,000 and will be depreciated under a three-year diminishing value schedule. The old machine can be sold today for \$80,000, after taxes. The company is in the 30% tax bracket and requires a minimum return on the replacement decision of 15%. The company's estimates of its revenues and expenses (excluding depreciation) for both the new and the old machine (in \$ thousands) over the next four years are given below.

YEAR	NEW MACHINE		OLD MACHINE	
	REVENUE	EXPENSES (EXCLUDING DEPRECIATION)	REVENUE	EXPENSES (EXCLUDING DEPRECIATION)
1	\$925	\$740	\$625	\$580
2	990	780	645	595
3	1,000	825	670	610
4	1,100	875	695	630

Tektek also estimates the values of various current accounts that could be impacted by the proposed replacement. They are shown below for both the new and the old machine over the next four years. Currently (at time 0), the company's net investment in these current accounts is assumed to be \$110,000 with the new machine and \$75,000 with the old machine.

	NEW MACHINE YEAR			
	1	2	3	4
Cash	\$20,000	\$25,000	\$ 30,000	\$ 36,000
Accounts receivable	90,000	95,000	110,000	120,000
Inventory	80,000	90,000	100,000	105,000
Accounts payable	60,000	65,000	70,000	72,000
OLD MACHINE YEAR				
	1	2	3	4
Cash	\$15,000	\$15,000	\$15,000	\$15,000
Accounts receivable	60,000	64,000	68,000	70,000
Inventory	45,000	48,000	52,000	55,000
Accounts payable	33,000	35,000	38,000	40,000

Tektek indicates that after four years of detailed cash flow development, it will assume that the year 4 incremental cash flows of the new machine over the old machine will grow at a compound annual rate of 2% from the end of year 4 to infinity.

- a Find the incremental *operating cash flows* (including any working capital investment) for years 1 to 4 for Tektek's proposed machine-replacement decision.
- b Calculate the *terminal value* of Tektek's proposed machine replacement at the end of year 4.
- c Show the *cash flows* (initial outlay, operating cash flows and terminal cash flow) for years 1 to 4 for Tektek's proposed machine replacement.
- d Using the cash flows from part (c), find the NPV and IRR for Tektek's proposed machine replacement.
- e Based on your findings in part (d), what recommendation would you make to Tektek regarding its proposed machine replacement?

- ST10-3** Performance100 Ltd is faced with choosing between two mutually exclusive projects with differing lives. It requires a return of 12% on these projects. Project A requires an initial outlay at time 0 of \$5,000,000 and is expected to require annual maintenance cash outflows of \$3,100,000 per year over its two-year life. Project B requires an initial outlay at time 0 of \$6,000,000 and is expected to require annual maintenance cash outflows of \$2,600,000 per year over its three-year life. Both projects are acceptable investments and provide equal quality service. The company assumes that the replacement and maintenance costs for both projects will remain unchanged over time.
- a Find the NPV of each project over its life.
 - b Which project would you recommend, based on your finding in part (a)? What is wrong with choosing the best project, based on its NPV?
 - c Use the *equivalent annual cost (EAC) method* to compare the two projects.
 - d Which project would you recommend, based on your finding in part (c)? Compare and contrast this recommendation with the one you gave in part (b).

QUESTIONS

- Q10-1** In capital budgeting analysis, why do we focus on cash flow rather than accounting profit?
- Q10-2** To finance a certain project, a company must borrow money at 10% interest. How should it treat interest payments when it analyses the project's cash flows?
- Q10-3** Does depreciation affect cash flow in a positive or negative manner? From a net present value (NPV) perspective, why is accelerated depreciation preferable? Is it acceptable to utilise one depreciation method for tax purposes and another for financial reporting purposes? Which method is relevant for determining project cash flows?
- Q10-4** In what sense does an increase in accounts payable represent a cash inflow?
- Q10-5** List several ways to estimate a project's terminal value.
- Q10-6** What are the tax consequences of selling an investment asset for more than its book value? Does this have an effect on project cash flows that must be accounted for? What is the effect if the asset is sold for less than its book value?
- Q10-7** Why must *incremental, after-tax, cash flows*, rather than total cash flows, be evaluated in project analysis?
- Q10-8** Differentiate between *sunk costs* and *opportunity costs*. Which of these costs should be included in incremental cash flows and which should be excluded?
- Q10-9** Why is it important to consider *cannibalisation* in situations where a company is considering adding substitute products to its product line?

- Q10-10** Before entering graduate school, a student estimated the value of earning an MBA at \$300,000. Based on that analysis, the student decided to go back to school. After completing the first year, the student ran the NPV calculations again. How would you expect the NPV to look after the student has completed one year of the program? Specifically, what portion of the analysis must be different than it was the year before?
- Q10-11** Furry Taxidermy Ltd (FT) operates a chain of taxidermy shops across New South Wales, with a handful of locations in Victoria. A rival company, Heads Up Ltd, has a few NSW-based locations, but most of its shops are located in Victoria. FT and Heads Up decide to consolidate their operations by trading ownership of a few locations. FT will acquire four Heads Up locations in New South Wales, and will relinquish control of its Victorian locations in exchange. No cash changes hands up-front. Does this mean that an analyst working for either company can evaluate the merits of this deal by assuming that the project has no initial cash outlay? Explain.
- Q10-12** What is the only relevant decision for independent projects if an unlimited capital budget exists? How does your response change if the projects are mutually exclusive? How does your response change if the company faces *capital rationing*?
- Q10-13** Explain why the *equivalent annual cost (EAC)* method helps companies evaluate alternative investments with unequal lives.
- Q10-14** Why isn't excess capacity free?

PROBLEMS

TYPES OF CASH FLOWS

- P10-1** Calculate the present value of depreciation tax savings on a depreciable asset with a purchase price of \$55 million and zero salvage value, assuming a 10% discount rate, a 30% tax rate, and prime cost depreciation over the following periods:
- The asset is depreciated over a three-year life.
 - The asset is depreciated over a seven-year life.
 - The asset is depreciated over a 20-year life.
- P10-2** A certain piece of equipment costs \$32 million, plus an additional \$2 million to install. This equipment will be depreciated over five years using the diminishing value method. For a company that discounts cash flows at 10% and faces a tax rate of 30%, what is the present value of the depreciation tax savings associated with this equipment? By how much would that number change if the company could treat the \$2 million installation cost as a deductible expense rather than include it as part of the depreciable cost of the asset?
- P10-3** Taylor United is considering overhauling its equipment to meet increased demand for its product. The cost of the equipment overhaul is \$3.8 million, plus \$200,000 in installation costs. The company will depreciate the equipment modifications under the prime cost method using a five-year recovery period. Additional sales revenue from the overhaul should amount to \$2.2 million per year, and additional operating expenses and other costs (excluding depreciation) will amount to 35% of the additional sales. The company has an ordinary tax rate of 30%. Answer the following questions about Taylor United, for each of the next six years.
- What additional earnings, before depreciation and taxes, will result from the overhaul?
 - What additional earnings after taxes will result from the overhaul?
 - What incremental operating cash flows will result from the overhaul?

P10-4 Wilbur Corporation is considering replacing a machine. The replacement will cut operating expenses by \$24,000 per year for each of the five years that the new machine is expected to last. Although the old machine has a zero book value, it has a remaining useful life of five years. The depreciable value of the new machine is \$72,000. Wilbur will depreciate the machine under the prime cost method using a five-year recovery period, and is subject to a 30% tax rate on ordinary income. Estimate the incremental operating cash flows attributable to the replacement.

P10-5 Primary Wines, a producer of medium-quality wines, has maintained stable sales and profits over the past eight years. Although the market for medium-quality wines has been growing by 4% per year, Primary Wines has been unsuccessful in sharing this growth. To increase its sales, the company is considering an aggressive marketing campaign that centres on regularly running ads in major food and wine magazines and airing TV commercials in large metropolitan areas. The campaign is expected to require an annual tax-deductible expenditure of \$3 million over the next five years. Sales revenue for 2015, as noted in the following income statement, totalled \$80 million. If the proposed marketing campaign is not initiated, sales are expected to remain at this level in each of the next five years, 2016–2020. With the marketing campaign, sales are expected to rise to the levels shown in the sales forecast table for each of the next five years. The cost of goods sold is expected to remain at 75% of sales; general and administrative expense (exclusive of any marketing campaign outlays) is expected to remain at 15% of sales; and annual depreciation expense is expected to remain at \$2 million. Assuming a 30% tax rate, find the cash flows over the next five years associated with Primary Wines' proposed marketing campaign.

PRIMARY WINES INCOME STATEMENT FOR THE YEAR ENDED 31 DECEMBER 2015		
Sales revenue		\$80,000,000
Less: Cost of goods sold (75%)		60,000,000
Gross profits		\$20,000,000
Less: Operating expenses		
General and administrative expense (15%)	12,000,000	
Depreciation expense	2,000,000	
Total operating expense		14,000,000
Net profits before taxes		\$6,000,000
Less: Taxes (rate = 30%)		1,800,000
Net profits after taxes		\$4,200,000
PRIMARY WINES SALES FORECAST		
YEAR	SALES REVENUE	
2016	\$82,000,000	
2017	84,000,000	
2018	86,000,000	
2019	90,000,000	
2020	94,000,000	

INCREMENTAL CASH FLOWS

P10-6 Identify each of the following situations as involving sunk costs, opportunity costs and/or cannibalisation. Indicate what amount, if any, of these items would be relevant to the given investment decision.

- a The investment requires use of additional computer storage capacity to create a data warehouse containing information on all your customers. The storage space you will use is

currently leased to another company for \$37,500 per year, under a lease that can be cancelled without penalty by you at any time.

- b An investment that will result in producing a new, lighter-weight version of one of the company's best-selling products. The new product will sell for 40% more than the current product. Because of its high price, the company expects the old product's sales to decline by about 10% from its current level of \$27 million.
- c An investment of \$8 million in a new venture that is expected to grow sales and profits. To date, you have spent \$135,000 researching the venture and performing feasibility studies.
- d Subleasing 100 parking spaces in your company's parking lot to the tenants in an adjacent building that has inadequate off-street parking. You pay \$20 per month for each space under a non-cancellable 50-year lease. The sublessee will pay you \$15 per month for each space. You have advertised the spaces for over a year with no other takers, and you do not anticipate needing the 100 spaces for many years.
- e The company is considering launching a completely new product that can be sold by your existing sales force, which is already overburdened with a large catalogue of products to sell. On average, each sales rep sells about \$2.1 million per year. You expect that, given the extra time involved in selling the new product, your sales reps will likely devote less time to selling existing products. Although you forecast that the average sales rep will sell about \$300,000 of the new product annually, you project a decline of about 7% per year in existing product sales.

P10-7 Barans Manufacturing is developing the incremental cash flows associated with the proposed replacement of an existing stamping machine with a new, technologically advanced one. Given the following costs related to the proposed project, explain whether each would be treated as a sunk cost or an opportunity cost in developing the incremental cash flows associated with the proposed replacement decision.

- a Barans could use the same dies and other tools (with a book value of \$40,000) on the new stamping machine that it used on the old one.
- b Barans could link the new machine to its existing computer system to control its operations. The old stamping machine did not have a computer control system. The company's excess computer capacity could be leased to another company for an annual fee of \$17,000.
- c Barans needs to obtain additional floor space to accommodate the new, larger stamping machine. The space required is currently being leased to another company for \$10,000 per year.
- d Barans can use a small storage facility, built by Barans at a cost of \$120,000 three years earlier, to store the increased output of the new stamping machine. Because of its unique configuration and location, it is currently of no use to either Barans or any other company.
- e Barans can retain an existing overhead crane, which it had planned to sell for its \$180,000 market value. Although the crane was not needed with the old stamping machine, it can be used to position raw materials on the new stamping machine.

P10-8 Blueberry Electronics is exploring the possibility of producing a new handheld device that will serve both as a basic PC, with internet access, as well as a mobile phone. Which of the following items are incremental costs for the project's analysis?

- a Research and development funds that the company has spent while working on a prototype of the new product.
- b The company's current-generation product has no mobile phone capability. The new product may therefore make the old one obsolete in the eyes of many consumers. However, Blueberry expects that other companies will soon bring to market products combining mobile phone and PC features, which will also reduce sales on Blueberry's existing products.
- c Costs of ramping up production of the new device.
- d Increases in receivables and inventory that will occur as production increases.

P10-9 Big Apple Pizza is considering replacing an existing oven with a new, more sophisticated oven. The old oven was purchased three years ago at a cost of \$20,000, and this amount was being depreciated under the diminishing value method using a five-year recovery period. The oven has five years of useable life remaining. The new oven being considered costs \$30,500, requires \$1,500 in installation costs, and would be depreciated under the diminishing value method using a five-year recovery period. The old oven can currently be sold for \$22,000, without incurring any removal or clean-up costs. The company pays taxes at a rate of 30% on both ordinary income and capital gains. The revenues and expenses (excluding depreciation) associated with the new and the old machines for the next five years are given in the following table.

YEAR	NEW OVEN		OLD OVEN	
	REVENUE	EXPENSES (EXCLUDING DEPRECIATION)	REVENUE	EXPENSES (EXCLUDING DEPRECIATION)
1	\$300,000	\$288,000	\$270,000	\$264,000
2	300,000	288,000	270,000	264,000
3	300,000	288,000	270,000	264,000
4	300,000	288,000	270,000	264,000
5	300,000	288,000	270,000	264,000

- a Calculate the initial cash outflow associated with replacement of the old oven with a new one.
- b Determine the incremental cash flows associated with the proposed replacement. Be sure to consider the depreciation in year 6.
- c Depict on a time line the incremental cash flows found in parts (a) and (b) that are associated with the proposed replacement decision.

P10-10 Speedy Auto Wash is contemplating the purchase of a new high-speed washer to replace the existing washer. The existing washer was purchased two years ago at an installed cost of \$120,000; it was being depreciated under the diminishing value method using a five-year recovery period. The existing washer is expected to have a useable life of five more years. The new washer costs \$210,000 and requires \$10,000 in installation costs; it has a five-year useable life and would be depreciated under the diminishing value method using a five-year recovery period. The existing washer can currently be sold for \$140,000, without incurring any removal or clean-up costs. To support the increased business resulting from purchase of the new washer, accounts receivable would increase by \$80,000, inventories by \$60,000 and accounts payable by \$116,000. At the end of five years, the existing washer is expected to have a market value of zero; the new washer would be sold to net \$58,000 after removal and clean-up costs, and before taxes. The company pays taxes at a rate of 30% on both ordinary income and capital gains. The estimated profits before depreciation and taxes over the five years for both the new and the existing washer are shown in the following table.

YEAR	PROFITS BEFORE DEPRECIATION AND TAXES	
	NEW WASHER	EXISTING WASHER
1	\$86,000	\$52,000
2	86,000	48,000
3	86,000	44,000
4	86,000	40,000
5	86,000	36,000

- a Calculate the initial cash outflow associated with the replacement of the existing washer with the new one.
- b Determine the incremental cash flows associated with the proposed washer replacement. Be sure to consider the depreciation in year 6.

- c Determine the terminal cash flow expected at the end of year 5 from the proposed washer replacement.
- d Depict on a time line the incremental cash flows associated with the proposed washer-replacement decision.

P10-11 PanPac Shipping is considering replacing an existing ship with one of two newer, more efficient ones. The existing ship is three years old, cost \$32 million, and is being depreciated under the diminishing value method using a five-year recovery period. Although the existing ship has only three years of effective life remaining under the diminishing value method for taxation purposes, it has a remaining useable life of five years. Ship A, one of the two possible replacement ships, costs \$40 million to purchase and \$8 million to outfit for service. It has a five-year useable life and will be depreciated under the diminishing value method using a five-year recovery period. Ship B costs \$54 million to purchase and \$6 million to outfit. It also has a five-year useable life and will be depreciated under the diminishing value method using a five-year recovery period. Increased investments in net working capital will accompany the decision to acquire ship A or ship B. Purchase of ship A would result in a \$4 million increase in net working capital; ship B would result in a \$6 million increase in net working capital. The projected profits before depreciation and taxes for each alternative ship and the existing ship are given in the following table.

PROFITS BEFORE DEPRECIATION AND TAXES			
YEAR	SHIP A	SHIP B	EXISTING SHIP
1	\$21,000,000	\$22,000,000	\$14,000,000
2	21,000,000	24,000,000	14,000,000
3	21,000,000	26,000,000	14,000,000
4	21,000,000	26,000,000	14,000,000
5	21,000,000	26,000,000	14,000,000

The existing ship can currently be sold for \$18 million and will not incur any removal or clean-up costs. At the end of five years, the existing ship can be sold to net \$1 million before taxes. Ships A and B can be sold to net \$12 million and \$20 million before taxes, respectively, at the end of the five-year period. The company is subject to a 30% tax rate on both ordinary income and capital gains.

- a Calculate the initial outlay associated with each alternative.
- b Calculate the operating cash flows associated with each alternative. Be sure to consider the depreciation in year 6.
- c Calculate the terminal cash flow at the end of year 5, associated with each alternative.
- d Depict on a time line the incremental cash flows associated with each alternative.

P10-12 The management of Cybuy is evaluating replacing their large mainframe computer with a modern network system that requires much less office space. The network would cost \$500,000 (including installation costs) and, because of efficiency gains, would generate \$125,000 per year in operating cash flows (accounting for taxes and depreciation) over the next five years. The mainframe has a remaining book value of \$50,000 and would be immediately donated to a charity for the tax benefit. Cybuy's cost of capital is 10% and the tax rate is 30%. On the basis of NPV, should management install the network system?

P10-13 Pointless Luxury Items (PLI), set up as a sole trader, produces unusual gifts targeted at wealthy consumers. The firm is analysing the possibility of introducing a new device designed to attach to the collar of a cat or dog. This device emits sonic waves which neutralise aeroplane engine noise, so that pets travelling with their owners can enjoy a more peaceful ride. PLI estimates that developing this product will require up-front capital expenditures of \$10 million. These costs will be depreciated on a straight-line basis for five years. PLI believes that it can sell the product initially for \$250. The selling price will increase to \$260 in years 2 and 3, before falling to \$245

and \$240 in years 4 and 5, respectively. After five years the firm will withdraw the product from the market and replace it with something else. Variable costs are \$135 per unit. PLI forecasts sales volume of 20,000 units the first year, with subsequent increases of 25% (year 2), 20% (year 3), 20% (year 4) and 15% (year 5). Offering this product will force PLI to make additional investments in receivables and inventory. Projected end-of-year balances appear in the following table.

	YEAR 0	YEAR 1	YEAR 2	YEAR 3	YEAR 4	YEAR 5
Accounts receivable	\$0	\$200,000	\$250,000	\$300,000	\$150,000	\$0
Inventory	0	500,000	650,000	780,000	600,000	0

The firm faces a tax rate of 34%. Assume that cash flows arrive at the end of each year, except for the initial \$10 million outlay.

- a Calculate the project's contribution to net income each year.
- b Calculate the project's cash flows each year.
- c Calculate two NPVs, one using a 10% discount rate and the other using a 15% discount rate.
- d A PLI financial analyst reasons as follows: 'With the exception of the initial outlay, the cash flows from this project arrive in a more or less continuous stream, rather than at the end of each year. Therefore, by discounting each year's cash flow for a full year, we are understating the true NPV. A better approximation is to move the discounting six months forward (discount year 1 cash flows for six months, year 2 cash flows for 18 months, and so on), as if all the cash flows arrive in the middle of each year rather than at the end.' Recalculate the NPV (at 10% and 15%) maintaining this assumption. How much difference does it make?

P10-14 TechGiant Infosys (TGI) is set up as a sole trader and is evaluating a proposal to acquire Fusion Chips, a young firm with an interesting new chip technology. This technology, when integrated into existing TGI silicon wafers, will enable TGI to offer chips with new capabilities to firms with automated manufacturing systems. TGI analysts have projected income statements for Fusion five years into the future. These projections appear in the following income statements, along with estimates of Fusion's asset requirements and accounts payable balances each year. These statements are designed assuming that Fusion remains an independent, standalone firm. If TGI acquires Fusion, analysts believe that the following changes will occur.

- 1 TGI's superior manufacturing capabilities will enable Fusion to increase its gross margin on its existing products to 45%.
- 2 TGI's massive sales force will enable Fusion to increase sales of its existing products by 10% above current projections (for example, if acquired, Fusion will sell \$110 million, rather than \$100 million, in 2014). This increase will occur as a consequence of regularly scheduled conversations between TGI salespeople and existing customers and will not require added marketing expenditures. Operating expenses as a percentage of sales will be the same each year as currently forecast (ranges from 10% to 12%). The fixed asset increases currently projected until 2018 will be sufficient to sustain the 10% increase in sales volume each year.
- 3 TGI's more efficient receivables and inventory management systems will allow Fusion to increase its sales as previously described, without making investments in receivables and inventory beyond those already reflected in the financial projection. TGI also enjoys a higher credit rating than Fusion, so after the acquisition, Fusion will obtain credit from suppliers on more favourable terms. Specifically, Fusion's accounts payable balance will be 30% higher each year than the level currently forecast.
- 4 TGI's current cash reserves are more than sufficient for the combined firm, so Fusion's existing cash balances will be reduced to \$0.

- 5 Immediately after the acquisition, TGI will invest \$50 million in fixed assets to manufacture a new chip that integrates Fusion's technology into one of TGI's best-selling products. These assets will be depreciated on a straight-line basis for eight years. After five years, the new chip will be obsolete, and no additional sales will occur. The equipment will be sold at the end of year 5 for \$1 million. Before depreciation and taxes, this new product will generate \$20 million in (incremental) profits the first year, \$30 million the second year, and \$15 million in each of the next three years. TGI will have to invest \$3 million in net working capital up-front, all of which it will recover at the end of the project's life.

- 6 Both firms face a tax rate of 34%.

FUSION CHIPS INCOME STATEMENTS (\$ IN THOUSANDS, FOR YEAR ENDED 31 DECEMBER)						
	2014	2015	2016	2017	2018	
Sales	\$100,000	\$150,000	\$200,000	\$240,000	\$270,000	
Cost of goods sold	60,000	90,000	120,000	144,000	162,000	
Gross profit	\$ 40,000	\$ 60,000	\$ 80,000	\$ 96,000	\$ 108,000	
Operating expenses	12,000	17,250	22,000	25,200	27,000	
Depreciation	12,000	18,000	24,000	28,800	32,400	
Pre-tax income	\$ 16,000	\$ 24,750	\$ 34,000	\$ 42,000	\$ 48,600	
Taxes	5,440	8,415	11,560	14,280	16,524	
Net income	\$ 10,560	\$ 16,335	\$ 22,440	\$ 27,720	\$ 32,076	

FUSION CHIPS ASSETS AND ACCOUNTS PAYABLE 2013–2018 (\$ IN THOUSANDS, ON 31 DECEMBER)						
	2013	2014	2015	2016	2017	2018
Cash	\$ 400	\$ 400	\$ 525	\$ 600	\$ 600	\$ 600
Accounts receivable	6,000	7,000	10,500	14,000	16,800	18,900
Inventory	10,000	12,500	18,750	25,000	30,000	33,750
Total current assets	\$16,400	\$ 19,900	\$ 29,775	\$ 39,600	\$ 47,400	\$ 53,250
Plant and equipment						
Gross	\$80,000	\$113,000	\$166,500	\$226,000	\$283,200	\$336,900
Net	\$50,000	\$ 71,000	\$106,500	\$142,000	\$170,400	\$191,700
Total assets	\$66,400	\$ 90,900	\$136,275	\$181,600	\$217,800	\$244,950
Accounts payable	\$ 7,500	\$ 13,500	\$ 20,250	\$ 27,000	\$ 32,400	\$ 36,450

Note: The 2013 figures represent the balances currently on Fusion's balance sheet.

- a Calculate the cash flows generated by Fusion as a stand-alone entity in each year from 2014–2018.
- b Assume that by 2018, Fusion reaches a 'steady state', which means that its cash flows will grow by 5% per year in perpetuity. If Fusion discounts cash flows at 15%, what is the present value at the end of 2018 of all cash flows that Fusion will generate from 2019 forward?
- c Calculate the present value, in 2013, of Fusion's cash flows from 2014 forward. What does this NPV represent?
- d Suppose TGI acquires Fusion. Recalculate Fusion's cash flows from 2014 to 2018, making all the changes previously described in items 1–4 and 6.
- e Assume that after 2018, Fusion's cash flows will grow at a steady 5% per year. Calculate the present value of these cash flows, at 2018, if the discount rate is 15%.
- f Ignoring item 5 in the list of changes, what is the PV, in 2013, of Fusion's cash flows from 2014 forward? Use a discount rate of 15%.

- g** Finally, calculate the NPV of TGI's investment to integrate its technology with Fusion's. Considering this in combination with your answer to part (f), what is the maximum price that TGI should pay for Fusion? Assume a discount rate of 15%.

P10-15 A project generates the following sequence of cash flows over six years:

YEAR	CASH FLOW (\$ IN MILLIONS)
0	-59.00
1	4.00
2	5.00
3	6.00
4	7.33
5	8.00
6	8.25

- a** Calculate the NPV over the six years. The discount rate is 11%.
- b** This project does not end after the sixth year, but instead will generate cash flows far into the future. Estimate the terminal value, assuming that cash flows after year 6 will continue at \$8.25 million per year in perpetuity, and then recalculate the investment's NPV.
- c** Calculate the terminal value, assuming that cash flows after the sixth year grow at 2% annually in perpetuity, and then recalculate the NPV.
- d** Using market multiples, calculate the terminal value by estimating the project's market value at the end of year 6. Specifically, calculate the terminal value under the assumption that at the end of year 6, the project's market value will be 10 times greater than its most recent annual cash flow. Recalculate the NPV.

SPECIAL PROBLEMS IN CAPITAL BUDGETING

P10-16 You have a \$10 million capital budget and must make the decision about which investments your company should accept for the coming year. Projects 1, 2 and 3 are mutually exclusive, and Project 4 is independent of all three. The company's cost of capital is 12%.

	PROJECT 1	PROJECT 2	PROJECT 3	PROJECT 4
Initial cash outflow	-\$4,000,000	-\$5,000,000	-\$10,000,000	-\$5,000,000
Year 1 cash inflow	1,000,000	2,000,000	4,000,000	2,700,000
Year 2 cash inflow	2,000,000	3,000,000	6,000,000	2,700,000
Year 3 cash inflow	3,000,000	3,000,000	5,000,000	2,700,000

- a** Use the information on the three mutually exclusive projects to determine which of those three investments your company should accept on the basis of NPV.
- b** Which of the three mutually exclusive projects should the company accept on the basis of PI?
- c** If the three mutually exclusive projects are the only investments available, which one do you select?
- d** Now given the availability of Project 4, the independent project, which of the mutually exclusive projects do you accept? (Note: Remember, there is a \$10 million budget constraint.) Is the better technique in this situation the NPV or the PI? Why?

P10-17 Semper Mortgage wishes to select the best of three possible computers, each expected to meet the company's growing need for computational and storage capacity. The three computers – A, B and C – are equally risky. The company plans to use a 14% cost of capital to evaluate each of them. The initial outlay and the annual cash outflows over the life of each computer are shown in the following table.

YEAR (t)	CASH OUTFLOWS (CF_t)		
	COMPUTER A	COMPUTER B	COMPUTER C
0	-\$50,000	-\$35,000	-\$60,000
1	7,000	5,500	18,000
2	7,000	12,000	18,000
3	7,000	16,000	18,000
4	7,000	23,000	18,000
5	7,000	—	18,000
6	7,000	—	18,000

- a Calculate the NPV for each computer over its life. Rank the computers in descending order, based on NPV.
- b Use the EAC method to evaluate and rank the computers in descending order, based on the EAC.
- c Compare and contrast your findings in parts (a) and (b). Which computer would you recommend the company acquire? Why?

P10-18 Seattle Manufacturing is considering the purchase of one of three mutually exclusive projects for improving its assembly line. The company plans to use a 15% cost of capital to evaluate these equal-risk projects. The initial outlay and the annual cash outflows over the life of each project are shown in the following table.

YEAR (t)	CASH OUTFLOWS (CF_t)		
	PROJECT X	PROJECT Y	PROJECT Z
0	-\$156,000	-\$104,000	-\$132,000
1	34,000	56,000	30,000
2	50,000	56,000	30,000
3	66,000	—	30,000
4	82,000	—	30,000
5	—	—	30,000
6	—	—	30,000
7	—	—	30,000

- a Calculate the NPV for each project over its life. Rank the projects in descending order based on NPV.
- b Use the EAC method to evaluate and rank the projects in descending order based on the EAC.
- c Compare and contrast your findings in parts (a) and (b). Which project would you recommend the company purchase? Why?

P10-19 As part of a hotel renovation program, a company must choose between two grades of carpet to install. One grade costs \$22 per square metre, and the other \$28. The costs of cleaning and maintaining the carpets are identical, but the less expensive carpet must be replaced after six years, whereas the more expensive one will last nine years before it must be replaced. The relevant discount rate is 13%. Which grade should the company choose?

P10-20 Gail Dribble is a financial analyst at Hill Propane Distributors. Gail must provide a financial analysis of the decision to replace a truck used to deliver propane gas to residential customers. Given its

age, the truck will require increasing maintenance expenditures if the company keeps it in service. Similarly, the market value of the truck declines as it ages. The current market value of the truck, as well as the market value and the required maintenance expenditures for each of the next four years, appears below.

YEAR	MARKET VALUE	MAINTENANCE COST
Current	\$7,000	\$0
1	5,500	2,500
2	3,700	3,600
3	0	4,500
4	0	7,500

The company can purchase a new truck for \$40,000. The truck will last 15 years and will require end-of-year maintenance expenditures of \$1,500. At the end of 15 years, the new truck's salvage value will be \$3,500.

- a Calculate the EAC of the new truck. Use a discount rate of 9%.
- b Suppose the company keeps the old truck one more year and sells it then rather than now. What is the opportunity cost associated with this decision? What is the present value of the cost of this decision as of today? Restate this cost in terms of year-1 dollars.
- c Based on your answers to (a) and (b), is it optimal for the company to replace the old truck immediately?
- d Suppose the company decides to keep the truck for another year. Gail must analyse whether replacing the old truck after one year makes sense, or whether the truck should stay in use another year. As of the end of year 1, what is the present value of the cost of using the truck and selling it at the end of year 2? Restate this answer in year-2 dollars. Should the company replace the truck after two years?
- e Suppose the company keeps the old truck in service for two years. Should it replace it rather than keep it in service for the third year?

P10-21 A company that manufactures and sells ball bearings currently has excess capacity. The company expects that it will exhaust its excess capacity in three years. At that time, it will spend \$5 million, which represents the cost of equipment as well as the value of depreciation tax shields on that equipment, to build new capacity. Suppose that this company can accept additional manufacturing work as a subcontractor for another company. By doing so, the company will receive net cash inflows of \$250,000 immediately, and in each of the next two years. However, the company will also have to spend \$5 million two years earlier than originally planned to bring new capacity on line. Should the company take on the subcontracting job? The discount rate is 12%. What is the minimum cash inflow that the company would require (per year) to accept this job?

CASE STUDY

CASH FLOW AND CAPITAL BUDGETING

Aus Car Execs (ACE) is set up as a sole trader and is analysing whether to enter the discount used rental car market. This project would involve the purchase of 100 used, late-model, mid-sized cars at the price of \$9,500 each. In order to reduce its insurance costs, ACE will have a Lojack Stolen Vehicle Recovery System installed in each car, at a cost of \$1,000 per vehicle. ACE

will also utilise one of its abandoned lots to store the vehicles. If ACE does not undertake this project, it could lease this lot to an auto-repair company for \$80,000 per year. The \$20,000 annual maintenance cost on this lot will be paid by ACE whether the lot is leased or used for this project. In addition, if this project is undertaken, net working capital will increase by \$50,000.



For taxation purposes, the useful life of the cars is determined to be five years, and they will be depreciated using the diminishing value method. Each car is expected to generate \$4,800 a year in revenue and have operating costs of \$1,000 per year. Starting six years from now, one-quarter of the fleet is expected to be replaced every year with a similar fleet of used cars. This is expected to result in a net cash flow (including acquisition costs) of \$100,000 per year continuing indefinitely. This discount rental car business is expected to have a minimum impact on ACE's regular rental car business, where the net cash flow is expected to fall by only \$25,000 per year. ACE expects to have a marginal tax rate of 32%.

Based on this information, answer the following questions.

ASSIGNMENT

- 1 What is the initial cash flow (fixed asset expenditure) for this discount used rental car project?
- 2 Is the cost of installing the LoJack System relevant to this analysis?

- 3 Are the maintenance costs relevant?
- 4 Should you consider the change in net working capital?
- 5 Estimate the depreciation costs incurred for each of the next six years.
- 6 Estimate the net cash flow for each of the next six years.
- 7 How are possible cannibalisation costs considered in this analysis?
- 8 How does the opportunity to lease the lot affect this analysis?
- 9 What do you estimate as the terminal value of this project at the end of year 6? (Use a 12% discount rate for this calculation.)
- 10 Applying the standard discount rate of 12% that ACE uses for capital budgeting, what is the NPV of this project? If ACE adjusts the discount rate to 14% to reflect higher project risk, what is the NPV?

11

RISK AND CAPITAL BUDGETING

WHAT COMPANIES DO

AS THE TEXTBOOKS WOULD WANT

Modern infrastructure developments in Australia provide many investment opportunities for companies. The Australian government, through its Infrastructure Australia arm, has developed a set of guidelines for project champions to use in presenting their proposals for government funding. The critical area of proposal evaluation is summarised in the following text, which should sound very familiar to experienced students of corporate finance looking at capital budgeting.

In preparing and presenting results of detailed economic appraisal, proponents must:

- 1 *Submit robust and objective cost benefit analysis which is supported by strong evidence.* In order to demonstrate that the cost benefit analysis is indeed robust, full transparency of the assumptions, parameters and values which are used in each cost benefit analysis is required. In addition, substantial supporting evidence to demonstrate that the input data underpinning the cost benefit analysis – notably the demand/price forecasts, and capital/operational costs are justified – is

also required. Clearly, independent verification of these elements will offer a greater degree of confidence that the data is robust.

- 2 *Consider as many monetised economic benefits and costs as possible.* Developments in cost benefit analysis methodologies mean that impacts such as noise and greenhouse can, in many circumstances, be monetised. Infrastructure Australia seeks proponents to capture impacts on a range of stakeholders to reflect the community-wide perspective of cost benefit analysis. In addition, highly beneficial or detrimental impacts should be monetised wherever possible, particularly if this benefit is the primary purpose of the initiative. All benefits and costs included in the cost benefit analysis should be economic impacts and not simply financial transfers between parties, or second round effects; all impacts should be incremental; and should all be directly associated with the initiative.



- 3 Consider non-monetised benefits and costs. Where impacts cannot be robustly expressed in monetary units ('non-monetised'), Infrastructure Australia will nevertheless incorporate them into the appraisal process and requests proponents to provide supporting information on the scale of these impacts.
- 4 Consider both the overall efficiency of an initiative (the combined scale of benefits and costs), as well as its equity and distributional impacts. Efficiency is determined by comparing the benefits and costs of an initiative – it specifically addresses the question: 'When all the benefits and costs are combined, will the initiative deliver net benefits (i.e. benefits in excess of costs)?' Equity and distributional impacts relate to who bears the benefits and costs. Thus, to aid its decision making, Infrastructure Australia not only requires the benefit cost ratio as a measure of net benefit, but also a breakdown of who is likely to bear the benefits and costs, and when.
- 5 Consider issues of risk and uncertainty. Infrastructure Australia is fully aware that the future cannot be predicted with certainty, and that economic growth, individuals' behaviour, oil prices,

carbon prices and so on may vary over time. To ensure that the appraisal process is robust to potential changes, Infrastructure Australia requests a series of sensitivity tests of the demand modelling and cost benefit analysis results.

- 6 *Infrastructure Australia requires all proponents to submit detailed appraisal information in support of all initiatives.* This should provide complete transparency of data, assumptions, and methodologies used; comprehensive supporting evidence to justify assumptions, including independent verification of demand forecasts and costings where possible; and a detailed picture of the results of the appraisal.

Australian Government Infrastructure Australia, *Better Infrastructure Decision-Making*, pp. 24–5.

As we shall see, this range of issues to consider can apply for any project. It is encouraging to see the textbook recommendations for capital budgeting being used in actual market decision making.

Source: Australian Government Infrastructure Australia, *Better Infrastructure Decision-Making: Guidelines for making submissions to Infrastructure Australia's infrastructure planning process*, December 2013. http://www.infrastructureaustralia.gov.au/priority_list/files/Reform_and_Investment_Framework_Guidance_August_2014.pdf. Accessed 11 July 2019. Used under Creative Commons Attribution 3.0 Australia licence (CC BY 3.0).

LEARNING OBJECTIVES

After studying this chapter, you should be able to:

- LO11.1** understand operating leverage and financial leverage, the potential effect each of them has on a company's cost of capital, and how we should estimate the company's weighted average cost of capital with and without tax deductibility of interest payments
- LO11.2** review the roles of breakeven analysis and sensitivity analysis in evaluating investment opportunities, and explain how scenario analysis and decision trees can be used to assess the risk of an investment
- LO11.3** describe the types of real options and their role in valuing potential investments
- LO11.4** discuss the strategic aspects of capital budgeting with regard to competition and the role of real options in improving the quality of decisions.

This chapter concludes our discussion of capital budgeting. Chapter 9 supported the virtues of NPV analysis, and Chapter 10 showed how to generate the cash flow estimates required to calculate a project's NPV. This chapter focuses on the risk dimension of project analysis. To calculate NPV, an analyst must evaluate the risk of a project and decide what discount rate adequately rewards investors for bearing that risk. Often, the best place to discover clues for use in estimating the discount rate is the market for the company's securities.

The chapter begins with a discussion of how managers can look to the market to calculate a

discount rate that properly reflects the risk of a company's investment projects. Even when managers are confident that they have estimated project cash flows carefully and have chosen a proper discount rate, they should perform additional analysis to understand the causes and effects of a project's risk. Their tools include breakeven analysis, sensitivity analysis, scenario analysis, simulation and decision trees – all covered in this chapter. We conclude with sections on real options and on strategy that describe the sources of value in investment projects and illustrate how rudimentary application of NPV analysis can underestimate the value of certain investments.

LO11.1

11.1 CHOOSING THE RIGHT DISCOUNT RATE

When we consider what discount rate to use for our present value calculations, we can see that we have several choices. The choices depend on the source of capital being used for the investment as well as the nature of the investment risks that the organisation faces. In this section, we examine some alternatives, building up from the return on equity to the weighted average cost of capital (WACC), and making comparisons with calculations arising from the capital asset pricing model (CAPM), which was introduced in Chapter 7.

11.1a COST OF EQUITY

What discount rate should managers use to calculate a project's net present value (NPV)? This is a difficult question, and is at times the source of heated discussions when companies evaluate capital investment proposals. *A project's discount rate must be high enough to compensate investors for the project's risk.*

Thus, conceptually, the discount rate should reflect the return on an alternative (or 'opportunity') project of equal risk. One implication of this statement is that if a company undertakes many different investment projects of various degrees of risk, then managers err if they apply a single, company-wide discount rate to value each investment. In principle, the appropriate discount rate to use in NPV calculations should vary from one investment to another if the risks vary across investments. Interestingly, survey data suggests that companies do not always follow this principle: CFOs appear to be fairly evenly split regarding the use of company-wide versus project-specific discount rates in NPV calculations.

To simplify things, we initially consider a company that finances its operations using only equity and invests in only one industry. Because the company has no debt, its investments must provide returns sufficient to satisfy just one type of investor: ordinary shareholders. Because the company invests in only one industry, we will assume that all its investments are *equally risky*. Therefore, when calculating the NPV of any project that this company might undertake, its managers can use the required return on equity, often called the *cost of equity*, as the discount rate. If the company uses the cost of equity as its discount rate then, by definition, any project with a positive NPV will generate returns that exceed shareholders' required returns.

To quantify shareholders' return expectations, managers look to the market. Recall from Chapter 7 that, according to the CAPM, the expected or required return on any security equals the risk-free rate *plus* the security's beta multiplied by the expected market risk premium:

(Eq. 11.1)

$$E(r_i) = r_f + \beta_i (E(r_m) - r_f)$$

Managers can estimate the return that shareholders require if they know: (1) their company's equity beta; (2) the risk-free rate; and (3) the expected market risk premium. Research has shown that most managers use the CAPM to compute their company's cost of equity this way.

Evidence from a number of surveys in the past two decades indicates that more than 50% of managers stated that they would almost always use company-wide discount rates to evaluate projects with different risk characteristics, while a much smaller fraction adopted a risk-matched discount rate. When risk factors are allowed for, they tended to be interest-rate risk, size of the project, inflation risk and foreign exchange risk. Few managers adjusted for book-to-market ratios, financial distress or momentum risk factors, which have been suggested by academic research.



Austral Carbonlite

Austral Carbonlite manufactures bicycle frames that are both extremely strong and very light. The company finances its operations 100% with equity, and is now evaluating a proposal to build a new manufacturing facility that will enable it to double its output within three years. Because Austral Carbonlite (Carbonlite, for short) sells a luxury good, its fortunes are sensitive to macroeconomic conditions; its shares have a beta of 1.5. Carbonlite's financial managers observe that the current interest rate on risk-free government bonds is 5%, and they expect that the return on the overall share market will be about 11% per year in the future. Given this information, Carbonlite should calculate the

NPV of the expansion proposal using a discount rate of 14%:

$$\begin{aligned} E(r) &= 5\% + 1.5(11\% - 5\%) \\ &= 14\% \end{aligned}$$

To reiterate, Carbonlite should use its cost of equity capital, 14%, to discount cash flows because we have assumed both that the company has no debt on its balance sheet and that undertaking any of Carbonlite's investment proposals will not alter the company's risk. If either assumption is invalid, then the cost of equity may not be the appropriate discount rate.

In the preceding example, Austral Carbonlite's share beta is 1.5 because sales of premium bicycle frames are highly correlated with the overall economy. Therefore, Carbonlite's investment in new capacity is riskier than an investment in new capacity by some other company producing a product whose sales are relatively insensitive to economic conditions. For example, managers of a food-processing company might apply a lower discount rate to an expansion project than Carbonlite's managers because the shares of a food processor have a lower beta. The general lesson is that the same type of capital investment project (such as capacity expansion, equipment replacement or new product development) may require different discount rates in different industries. The level of *systematic (non-diversifiable) risk* varies from one industry to another; so, too, should the discount rate used in capital budgeting analysis.

Cost Structure and Operating Leverage

Several other factors affect betas, which in turn affect project discount rates. One of the most important factors is a company's cost structure – specifically, its mix of fixed and variable costs. The greater the importance of fixed costs in a company's overall cost structure, the more volatile will be its cash flows and the higher will be its share beta (all other factors held constant). **Operating leverage** measures the tendency of operating cash flow volatility to increase with fixed operating costs. Mathematically, the definition of operating leverage can be expressed as

(Eq. 11.2)

$$\text{Operating leverage} = \frac{\Delta EBIT}{\frac{EBIT}{\Delta \text{sales}}}$$

operating leverage
Measures the tendency of operating cash flow volatility to increase with fixed operating costs

where EBIT is earnings before interest and taxes (see Chapter 2) and the symbol Δ (Greek upper-case delta) denotes 'change in'. Operating leverage equals the percentage change in earnings before interest and taxes divided by the percentage change in sales. In economics, this is known as a measure of the elasticity of a variable: it tells us by what percentage the EBIT may change for a given percentage change of sales. When a small percentage increase (decrease) in sales leads to a large percentage increase (decrease) in EBIT, the company has high operating leverage. The connection between operating leverage and costs is easy to see in the next example.



Carbonlite's Operating Leverage

Austral Carbonlite uses robotic technology to paint its finished bicycle frames, whereas its main competitor, US-based Fiberspeed Corp., offers customised, hand-painted finishes. Robots represent a significant fixed cost for Carbonlite, but robots help to keep variable costs low. Fiberspeed incurs very low fixed costs, but it has high variable costs because of the time required to paint frames by hand. Both companies sell their frames at an average price of \$1,000 apiece. Last year each company made a profit (EBIT) of \$1 million on sales of 10,000 bicycle frames, as shown in **Figure 11.1**. Suppose that next year, both companies experience a 10% increase in sales volume to 11,000 frames, holding constant all the other figures. Carbonlite's fixed costs do not change, and its EBIT will increase by \$600 (\$1,000 price – \$400 variable costs) per additional frame sold. Thus, Carbonlite's EBIT will increase 60% from \$1 million to \$1.6 million, so its operating leverage is 6.0 ($60\% \div 10\%$).

Fiberspeed's EBIT grows from \$1 million to \$1.3 million, an increase of just 30%, so its operating leverage is 3.0 ($30\% \div 10\%$).

Because Carbonlite has higher fixed costs and lower variable costs, its profits increase more rapidly in response to a given increase in sales than do Fiberspeed's profits. In short, Carbonlite has more operating leverage. **Figure 11.2** shows this graphically. The figure shows two lines, one tracing out the relationship between sales growth (from the base of 10,000 frames per year) and EBIT growth (from the \$1 million EBIT base) for Carbonlite, the other illustrating the same linkage for Fiberspeed.¹ Because of its greater operating leverage, the line for Carbonlite is much steeper than the one for Fiberspeed. Even though Carbonlite and Fiberspeed compete in the same industry, they may well use different discount rates in their capital budgeting analysis, because operating leverage increases the risk of Carbonlite's cash flows relative to Fiberspeed's.

¹ These comparisons are based on a reference point of 10,000 frames per year sold for \$1,000 per frame and an EBIT of \$1 million. All changes described and shown in Figure 11.2 assume these points of reference in each case. Clearly, the sensitivity of these values to change will vary depending on the point of reference utilised.



FIGURE 11.1 FINANCIAL DATA FOR AUSTRAL CARBONLITE AND FIBERSPEED

ITEM	CARBONLITE	FIBERSPEED
Fixed cost per year	\$5 million	\$2 million
Variable cost per bike frame	\$400	\$700
Sale price per bike frame	\$1,000	\$1,000
Contribution margin ^a per bike frame	\$600	\$300
Last year's sales volume	10,000 frames	10,000 frames
EBIT ^b	\$1 million	\$1 million

a The contribution margin is the sale price per unit minus the variable cost per unit.

For Carbonlite: \$1,000 – \$400 = \$600 per bike.

For Fiberspeed: \$1,000 – \$700 = \$300 per bike.

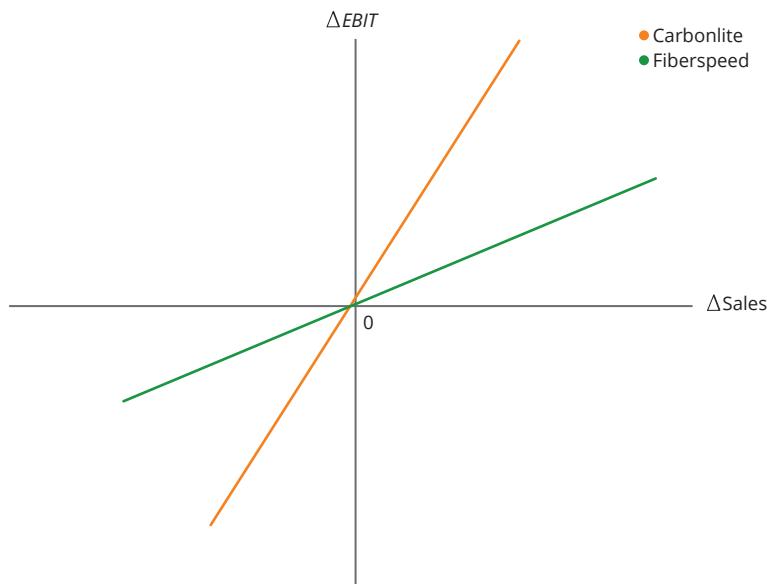
b EBIT equals sales volume multiplied by the contribution margin minus fixed costs.

For Carbonlite: (10,000 × \$600) – \$5,000,000 = \$1,000,000.

For Fiberspeed: (10,000 × \$300) – \$2,000,000 = \$1,000,000.

FIGURE 11.2 OPERATING LEVERAGE FOR AUSTRAL CARBONLITE AND FIBERSPEED

The higher operating leverage of Carbonlite is reflected in its steeper slope, demonstrating that its EBIT is more responsive to a given change in sales than is the EBIT of Fiberspeed. We assume in this figure that the responses of EBIT to sales are linear (straight lines), but this need not always be the case.



Financial Structure and Financial Leverage

We have seen that Austral Carbonlite's sales are extremely sensitive to the business cycle because the company produces a luxury item. We have also observed that, because of its high operating leverage, Carbonlite's profits are quite sensitive to changes in sales. These factors contribute to Carbonlite's relatively high equity beta of 1.5 and its correspondingly high cost of equity of 14%. One other factor looms large in determining whether companies have high or low equity betas. Remember that Carbonlite's financial structure is 100%

equity. In practice, it is much more common to see both debt and equity on the right-hand side of a company's balance sheet. When companies finance their operations with debt and equity, the presence of debt creates *financial leverage*, which leads to a higher equity beta. The effect of financial leverage on equity betas is much the same as the effect of operating leverage. When a company borrows money, it creates a fixed cost that it must repay regardless of whether sales are high or low.² As was the case with operating leverage, an increase (decrease) in sales will lead to sharper increases (decreases) in earnings for a company with financial leverage than for a company that has only equity on its balance sheet.

Figure 11.3 illustrates the effect of financial leverage on the volatility of a company's cash flows and on its beta. The table compares companies A and B, which are identical in every respect except that Company A finances its operations with 100% equity, while Company B uses 50% equity and 50% long-term debt with an interest rate of 8%. For simplicity, we assume that neither company pays taxes. These companies sell identical products at the same price; both have \$100 million in assets; and both face the same production costs. Suppose that over the next year, both companies generate EBIT equal to 20% of total assets, or \$20 million. Company A pays no interest, so it can distribute all \$20 million to its shareholders, a 20% return on their \$100 million equity investment. Company B pays 8% interest on \$50 million (\$4 million). After paying interest, Company B can distribute \$16 million to shareholders, which represents a 32% return on their equity investment of \$50 million. Suppose that under a different scenario, both companies have EBIT equal to just 5% of assets, or \$5 million. Company A pays out all \$5 million to its shareholders, a return of 5%. Company B pays \$4 million in interest, leaving just \$1 million for shareholders, a return of only 2%. Thus, when business is good, the debt that it uses causes shareholders of Company B to earn higher returns than shareholders of Company A, and the opposite happens when business is bad.

FIGURE 11.3 THE EFFECT OF FINANCIAL LEVERAGE ON SHAREHOLDER RETURNS		
ACCOUNT	COMPANY A	COMPANY B
Assets	\$100 million	\$100 million
Debt (interest rate = 8%)	\$0 (0%)	\$50 million (50%)
Equity	\$100 million (100%)	\$50 million (50%)
WHEN RETURN ON ASSETS EQUALS 20%		
EBIT	\$20 million	\$20 million
Less: Interest	<u>0</u>	<u>4 million (0.08 × \$50 million)</u>
Cash to equity	\$20 million	\$16 million
ROE	\$20 million/\$100 million = 20%	\$16 million/\$50 million = 32%
WHEN RETURN ON ASSETS EQUALS 5%		
EBIT	\$5 million	\$5 million
Less: Interest	<u>0</u>	<u>4 million (0.08 × \$50 million)</u>
Cash to equity	\$5 million	\$1 million
ROE	\$5 million/\$100 million = 5%	\$1 million/\$50 million = 2%

When companies use debt to finance operations, discount-rate selection becomes complicated in two ways. First, debt creates financial leverage, which increases a company's equity beta relative to the value it would have if the company financed investments only with equity. Second, when a company issues debt, it must satisfy two groups of investors rather than one. Cash flows generated from capital investment projects must be sufficient to meet the return requirements of bondholders as well as shareholders. Therefore, a company that issues debt cannot discount project cash flows using only its cost of equity capital: it must

2 We use the term *fixed cost* here to mean a cost that does not vary with sales rather than simply a cost that is constant over time. Even when a company agrees to a loan with a variable interest rate, which means that interest payments are not constant over time, the cost of repaying the debt does not generally vary as a function of sales.

choose a discount rate that reflects the expectations of both investor groups. Fortunately, finance theory offers a way to find that discount rate.

11.1b WEIGHTED AVERAGE COST OF CAPITAL (WACC)

In Chapter 7, we learned that the expected return on a portfolio of two assets equals the weighted average of the expected returns of each asset in the portfolio. We can apply that idea to the problem of selecting an appropriate discount rate for a company that has both debt and equity in its capital structure. Imagine that Croc-in-a-Box Ltd, a chain of fast-food stores in the Northern Territory, has \$100 million of ordinary shares outstanding, on which investors require a return of 15%. In addition, the company has \$50 million in bonds outstanding that offer a 9% return.³ To simplify our discussion, we hold the company's overall risk constant by *assuming that the investments being considered do not change either the company's cost structure or its financial structure*. Using this information, we can answer the question: what rate of return must the company earn on its investments to satisfy both groups of investors?

The Basic Formula

The answer lies in a concept known as the *weighted average cost of capital (WACC)*. Let D and E denote the *market value* of the company's debt and equity securities, respectively, and let r_d and r_e represent the rate of return that investors require on bonds and shares. The *WACC* is the simple weighted average of the required rates of return on debt and equity, where the weights equal the percentage of each type of financing in the company's overall capital structure.⁴

$$(Eq. 11.3) \quad WACC = \left(\frac{D}{D+E} \right) r_d + \left(\frac{E}{D+E} \right) r_e$$

Inserting the values from our example, we find that the WACC for Croc-in-a-Box is 13%:

$$WACC = \left(\frac{\$50}{\$50 + \$100} \right) \times 9\% + \left(\frac{\$100}{\$50 + \$100} \right) \times 15\% = 13\%$$

How can Croc-in-a-Box managers be sure that earning a 13% return on its investments will satisfy the expectations of both bondholders and shareholders? Here's a simple way to see the answer. Assume the company invests in a project that does not alter the company's overall risk and earns exactly 13%. It therefore has a zero NPV if the company uses the WACC as its hurdle rate. Croc-in-a-Box has \$150 million in assets. A project that offers a 13% return will generate \$19.5 million in cash flow each year ($13\% \times \$150$ million). Suppose that the company distributes this cash flow to its investors. Will they be satisfied? **Figure 11.4** illustrates that the cash flow the company generates is just enough to meet the expectations of bondholders and shareholders. Bondholders receive \$4.5 million, or exactly the 9% return they expected when they purchased bonds. Shareholders receive \$15 million, representing a 15% return on their \$100 million investment in the company's shares.

3 The return we have in mind here is the yield to maturity (YTM) – developed in Chapter 4 – on the company's bonds. Unless the bonds sell at par, the coupon rate and the YTM will be different, and the YTM provides a better measure of the return that investors who purchase the company's debt can expect.

4 As a practical matter, companies in many countries can deduct interest payments to bondholders when they calculate taxable income. If a company's interest payments are tax deductible, and if the corporate tax rate equals T_c , we have the following:

$$WACC = \left(\frac{D}{D+E} \right) (1-T_c) r_d + \left(\frac{E}{D+E} \right) r_e$$

We address this important adjustment for tax-deductible interest later in this chapter, after we have fully developed the key concepts.

FIGURE 11.4 CASH DISTRIBUTIONS TO CROC-IN-A-BOX INVESTORS

Total cash flow available to distribute ($13\% \times \$150$ million)	\$19.5 million
Less: Interest owed on bonds ($9\% \times \$50$ million)	<u>4.5 million</u>
Cash available to shareholders ($\$19.5$ million – \$4.5 million)	\$15.0 million
Rate of return earned by shareholders ($\$15$ million ÷ \$100 million)	15%

The WACC has a large impact on the value of a company's investments, and hence, on the value of the company itself. Holding an investment's cash flows constant, a lower WACC implies that the investment has a higher value. Thus, policies that reduce the cost of capital in an economy encourage companies to undertake new projects. The 'Finance in the Real World' box explains that when countries open their financial markets to foreign investors, the cost of capital falls and companies respond by investing more.

FINANCE IN THE REAL WORLD

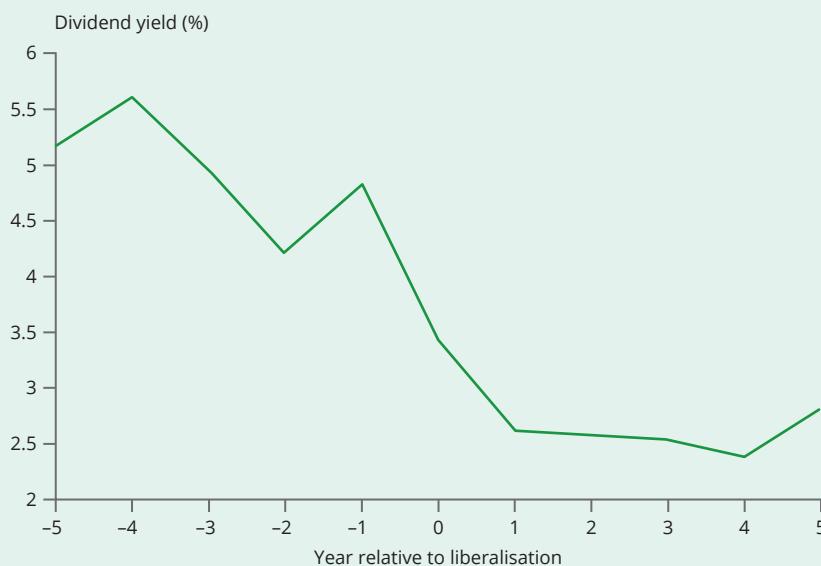


CAN FOREIGN INVESTORS REDUCE THE COST OF CAPITAL?

What happens to the cost of capital when a nation that has been closed to foreign financial investment opens up to foreign investors? Finance theory suggests that allowing foreign capital in should reduce the cost of external financing for the country's publicly traded companies by increasing the supply of potential lenders and equity investors. Academic research strongly supports this idea.

It has been found that three economically important things happen when emerging economies open their share markets to foreign investors. First, the aggregate dividend yield on publicly traded shares falls by approximately 240 basis points (2.4%). This drop will lower

the cost of equity capital, r_e , and the WACC. The figure below demonstrates how dividend yields may change in the five years before (-5 to -1) and five years after (+1 to +5) opening share markets, which occurs in year 0 in the figure. Second, the nation's overall stock of capital increases by an average of about 1.1 percentage points per year, meaning that companies invest more in productive assets. Third, the growth rate of output per worker rises by an estimated 2.3 percentage points per year. Together these three outcomes make a clear policy statement: let foreign financial investment in!



Modifying the Basic WACC Formula

The WACC formula can be modified to accommodate more than two sources of financing. For instance, suppose a company raises money by issuing long-term debt, D , equity, E , and preferred shares, P . Denoting the respective required return on each security by r_d , r_e , and r_p , we can determine the WACC (still ignoring taxes) as follows:

$$WACC = \left(\frac{D}{D+E+P} \right) r_d + \left(\frac{E}{D+E+P} \right) r_e + \left(\frac{P}{D+E+P} \right) r_p$$



Calculating WACC

The Smith & Jones Company has one million ordinary shares outstanding, which currently trade at a price of \$50 per share. The market value of the ordinary shares is therefore \$50 million (\$50 per share multiplied by 1 million shares). The company believes that its shareholders require a 15% return on their investment. The company also has \$47.1 million (par value) in five-year, fixed-rate notes with a coupon rate of 8% and a YTM of 7%. Because the yield on these bonds is less than the coupon rate, they trade at a premium. The current market value of the five-year notes is \$49 million. Lastly, the company has 200,000 outstanding preferred shares, which pay an \$8 annual dividend and currently sell for \$80 per share. The market value

of the preferred shares is therefore \$16 million (\$80 per share multiplied by 200,000 shares) and the rate of return on the preferred shares is 10% (\$8 annual dividend divided by \$80 current price). What is the company's WACC?

Begin by calculating the market value of each security. Smith & Jones has \$50 million in ordinary shares, \$49 million in long-term debt and \$16 million in preferred shares for a total capitalisation of \$115 million. Next, determine the required rate of return on each type of security. The rates on ordinary shares, long-term debt and preferred shares are 15%, 7% and 10%, respectively. Put all these values into the WACC equation to obtain 10.9%:

$$\begin{aligned} WACC &= \left(\frac{\$49}{\$115} \right) \times 7\% + \left(\frac{\$50}{\$115} \right) \times 15\% \\ &\quad + \left(\frac{\$16}{\$115} \right) \times 10\% = 10.9\% \end{aligned}$$

An Important Proviso

Now we have seen two approaches for determining the correct discount rate to apply when addressing capital budgeting problems. A company that uses only equity should discount project cash flows using the cost of equity, and a company that uses both debt and equity should discount cash flows using the WACC. Both recommendations are subject to the important proviso (noted earlier) that the company makes investments in only one line of business – or, stated differently, that the company discounts cash flows using the WACC only when the project under consideration is very similar to the risk and financing choices of the company's existing assets. For example, assuming an unchanged financing mix, if managers at Croc-in-a-Box believe that the company should vertically integrate by investing in a crocodile farming company, they should not discount cash flows from that investment at the company's WACC. The risks of crocodile farming hardly resemble those of running a fast-food chain, and it is the risk of the fast-food chain that is reflected in the company's current WACC. Evaluating investments that deviate significantly from a company's existing investments requires a different approach. To better understand that approach, we need to revisit the CAPM and see how it is related to the WACC.

11.1c THE WACC, THE CAPM AND TAXES

The CAPM states that the required return on any asset is directly linked to the asset's beta. By now, we are used to thinking about betas of shares of ordinary equity, but there is nothing about the CAPM that restricts its predictions to ordinary shares. When a company issues preferred shares or bonds, the required returns on those securities should reflect their systematic risks (that is, their betas) just as the required returns on the company's ordinary shares should. We could use the same procedure to estimate the beta of a preferred share or a bond that we use to estimate an ordinary share's beta. However, preferred shares and bonds generally make fixed, predictable cash payments over time, so measuring the rate of return that investors require on these securities is relatively easy, even without knowing their betas. *For preferred equity, the dividend yield (annual dividend ÷ price) provides a good measure of required returns; for debt, the yield to maturity (YTM) does the same, at least for high-grade debt with relatively low default risk.*

The Main Lessons

Summarising the main lessons we have learned thus far, we offer the following rules about finding the right discount rate for an investment project:

- 1 If an all-equity company invests in an asset that is similar to its existing assets, then the cost of equity is the appropriate discount rate to use in NPV calculations.
- 2 If a company with both debt and equity invests in an asset that is similar to its existing assets, then the WACC is the appropriate discount rate to use in NPV calculations, as long as the company's financial structure remains unchanged.
- 3 The WACC reflects the return that the company must earn on average across all its assets in order to satisfy investors, but using the WACC to discount cash flows of any one investment can lead to mistakes. The reason for this is that a particular investment may be more or less risky than the company's average investment and so, in return, require a higher or lower discount rate than the WACC, assuming an unchanged financial structure.

Considering Taxes

Nothing in the real world is as simple as it is portrayed in textbooks. One important item that we have neglected thus far is the effect of taxes on project discount rates. In Australia and many other countries, interest payments to bondholders are tax-deductible. This results in a lower cost of debt. For example, a company with a before-tax cost (r_d) of debt of 7% and a tax rate (T_c) of 30% would have an after-tax cost of debt ($r_d \times (1 - T_c)$) of 4.9% ($7.0\% \times (1 - 0.30)$). The tax-deductibility of interest lowers a company's tax payments, and therefore effectively reduces its cost of debt. So the opportunity to deduct interest payments reduces the after-tax cost of debt and changes the basic WACC formula:

WACC when interest on debt is tax-deductible:

$$(Eq. 11.4) \quad WACC = \left(\frac{D}{D+E} \right) \left(1 - T_c \right) + \left(\frac{E}{D+E} \right) r_p$$

where T_c is the marginal corporate tax rate.

Fortunately, the three main lessons listed previously do not change when we add taxes to the picture. Only the calculations change. When a company is making an 'ordinary' investment, it can use **Equation 11.4** to determine its after-tax WACC, which serves as the discount rate in NPV calculations.

This reduction for a company of the cost of debt because it is tax-deductible gives rise to a concept called the **tax shield**. As the name implies, the ability to make an interest deduction against income before taxation

tax shield

The ability to make an interest deduction against income before taxation is imposed protects, or shields, the corporate profits from taxation

is imposed protects, or shields, the corporate profits from taxation. In fact, this effect can be significant enough to raise the value of a company that employs debt in its capital funding as opposed to the value of a company that is financed only from equity (which is not tax-deductible). We shall explore this tax shield effect on value in later chapters when we examine how companies decide on their capital structures; that is, the balance of debt and equity they use to fund their activities.

In some countries such as Australia and New Zealand, there is a further tax implication that follows from the 'dividend imputation tax' regime run in those nations. We examine this more fully in section 13.3c of Chapter 13, but note here that the impact of dividend imputation – the process of allowing individual investors receiving dividends to deduct tax already paid by companies before those individuals pay their personal taxes on dividends – is to offset the after-tax required return to equity that is pushed up by leverage, and thereby reduce the overall cost of capital to the company. In effect, under a regime of full dividend imputation, the investor in a company is indifferent as to whether she receives returns on the investment in the form of interest payments on bonds or dividends on shares if they are at the same rate because the tax shield gain on bond interest payments is matched by the tax allowances imputed to the dividend payments.

11.1d THE RISK-ADJUSTED DISCOUNT RATE AND COST OF CAPITAL

The general principle we are following in this section is to describe how we may adjust the discount rate to accommodate perceived varying levels of risk associated with the investments of interest to us. A simple way for us to do this, based on the ideas about CAPM outlined in earlier chapters, would seem to be to add a risk premium to some market-based required return where the risk premium reflects the risks of the project. This concept is sometimes referred to as the risk-adjusted discount rate (RADR).

We should note, however, that there are several issues we need to consider with this approach. First, the idea gives us no concept of the size of the risk premium to add: we need further theory to be confident that we would be adding an appropriate risk premium associated with the project. The CAPM is one such method for adjusting the required rate of return to allow for the relative risk of an investment compared with a 'market' rate. There are variants of this, using methods developed by Stephen Ross (the 'arbitrage pricing theory') and Eugene Fama and Kenneth French (their 'three-factor' and 'five-factor' models). These all provide consistent approaches to developing a risk-adjusted return, starting with the risk-free rate of return and adding to it various premia for risks.

Second, embedded in these approaches is a recognition that the risk adjustments are those associated with market factors for a well-diversified set of investors. None uses the unique, specific or idiosyncratic risk linked to a particular project. It is the risk associated with a class of investment – shares, bonds, projects undertaken by groups of companies in the market – that is providing the risk premium added to the risk-free rate.

Third, if we do adopt the approach of adding a single risk premium to an existing risk-free rate intended to capture the risk profile of an investment, we are implicitly assuming that the risk remains the same for all future periods in the life of the investment, and a constant discount rate is to be used. This means the impact of the discounting is growing in a non-linear fashion over time, with proportionately greater discounting occurring each period into the future. This may be appropriate for some investments, if we feel the long-term future is much less certain than the short-term future; but not all investments are of this nature. For example, pharmaceutical companies that must put their new drugs through sequences of clinical trials actually become more confident about their products' success if they survive the early trials. The risk of the drug actually declines with more success in future clinical trials.

LO11.1

CONCEPT REVIEW QUESTIONS

- 1 Why is using the cost of equity to discount project cash flows inappropriate when a company uses both debt and equity in its capital structure?
- 2 Two companies in the same industry have very different equity betas. Offer two reasons why this could occur.
- 3 For a company considering expansion of its existing line of business, why is the WACC, rather than the cost of equity, the preferred discount rate if the company has both debt and equity in its capital structure?
- 4 The cost of debt, r_d , is generally less than the cost of equity, r_e , because debt is a less risky security. A naïve application of the WACC formula might suggest that a company could lower its cost of capital (thereby raising the NPV of its current and future investments) by using more debt and less equity in its capital structure. Give one reason why using more debt might not reduce a company's WACC, even if $r_d < r_e$.

THINKING CAP QUESTIONS

- 1 When you look at company annual reports, can you find references to the cost of capital used by the companies? Why might companies be reluctant to state explicitly such a cost?
- 2 What do you think are the reactions of different national governments to actions taken by multinational companies to locate their funding in different national tax jurisdictions?

LO11.2

11.2 A CLOSER LOOK AT RISK

Thus far, the only consideration we have given to risk in our capital budgeting analysis is selecting the right discount rate. But it would be simplistic to say that, given a stream of cash flows, an analyst's work is done after she has discounted those cash flows using a risk-adjusted discount rate to determine the NPV. Managers generally want to know more about a project than just its NPV. They want to know the sources of uncertainty and the downside risk, as well as the quantitative importance of each source. Managers need this information to decide whether a project requires additional analysis, such as market research or product testing. Managers also want to identify a project's key value drivers, so they can closely monitor them after an investment is made. Next, we explore techniques that give managers deeper insights into the uncertainty structure of capital investments.

11.2a BREAK EVEN ANALYSIS

When companies make investments, they do so with the objective of earning a profit. But another objective that sometimes enters the decision process is avoiding losses. Therefore, managers often want to know what is required for a project to break even. Breakeven analysis can be expressed in many different ways. For instance, when a company introduces a new product, it may want to know the level of sales at which incremental net income turns from negative to positive. When evaluating a new product launch over several years, managers might ask what growth rate in sales the company must achieve in order to reach a project *NPV* of zero. Perhaps the most common form of breakeven analysis focuses on the minimum sales volume

breakeven point (BEP)

The level of sales or production that a company must achieve in order to fully cover all costs. Sales or production above the BEP results in profits

contribution margin

The sale price per unit (SP) minus variable cost per unit (VC)

needed for a company to fully cover all costs. The standard equation for the **breakeven point (BEP)** is found by dividing the fixed costs (FC) by the **contribution margin**, which is the sale price per unit (SP) minus variable cost per unit (VC).

(Eq. 11.5)

$$BEP = \frac{\text{Fixed costs}}{\text{Contribution margin}} = \frac{\text{Fixed costs}}{SP - VC}$$

**Carbonlite's Breakeven Production**

Take another look at **Figure 11.1**, which shows price and cost information for Austral Carbonlite and Fiberspeed Corp. How many bicycle frames must each company sell to achieve a breakeven point with EBIT equal to zero? We can obtain the answer by substituting the data for each company into **Equation 11.5**.

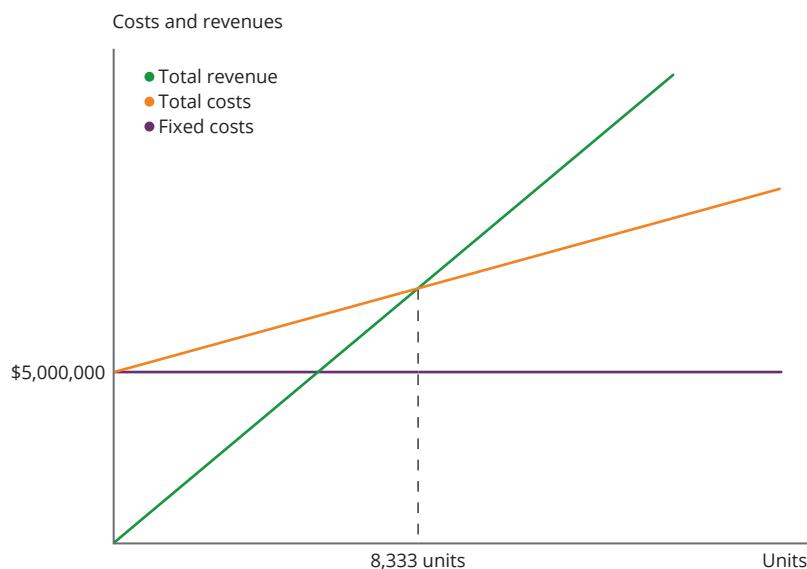
$$\text{Carbonlite breakeven point} = \frac{\$50,000,000}{(\$1,000 - \$400)} = 8,333 \text{ frames}$$

$$\begin{aligned}\text{Fiberspeed breakeven point} &= \frac{\$20,000,000}{(\$1,000 - \$700)} \\ &= 6,667 \text{ frames}\end{aligned}$$

Figures 11.5a and **11.5b** illustrate the breakeven point (BEP) for each company. Despite its \$600 contribution margin, Carbonlite's high fixed costs result in a breakeven point at higher sales volume than Fiberspeed's breakeven point. This should not surprise us, since we already know that Carbonlite's production process results in higher operating leverage than Fiberspeed's.

FIGURE 11.5A BREAKEVEN POINT FOR AUSTRAL CARBONLITE

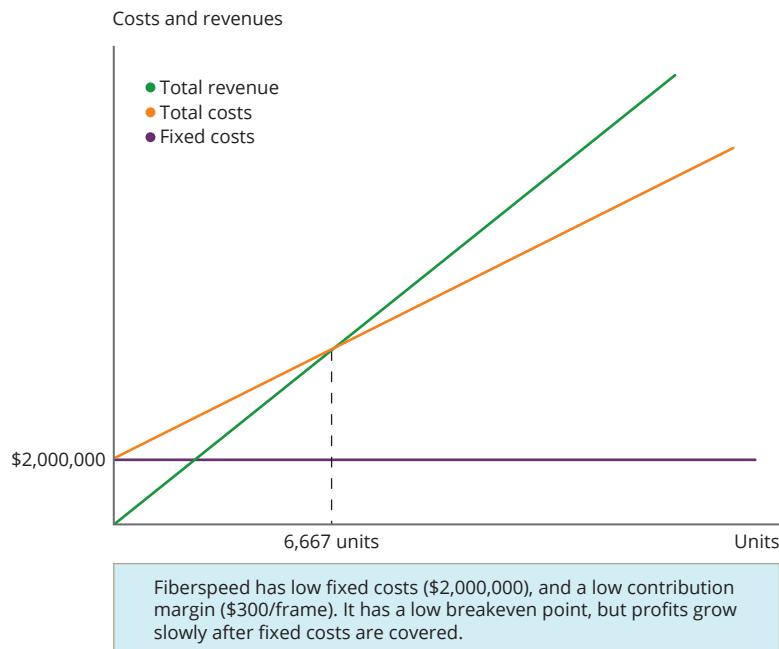
The breakeven point (BEP) for Austral Carbonlite is 8,333 units, which occurs at the point where its total costs equal its total revenue.



Carbonlite has high fixed costs (\$5,000,000) and a high contribution margin (\$600/frame). The breakeven point is high, but profits grow rapidly after fixed costs are covered.

FIGURE 11.5B BREAKEVEN POINT FOR FIBERSPEED

The breakeven point (BEP) for Fiberspeed is 6,667 units, which occurs at the point where its total costs equal its total revenue.



Breakeven analysis is popular in part because it provides clear targets. From breakeven calculations, managers can derive specific goals for different functional areas in the company (for example, produce at least 10,000 units, gain at least a 5% market share, hold variable costs to no more than 65% of the selling price). As always, we encourage managers to use breakeven analysis in the context of net present values rather than earnings targets. A project that reaches the breakeven point in terms of net income would still destroy shareholder value if it does not recover the company's cost of capital. A company that exceeds the NPV breakeven point will create shareholder value.

11.2b SENSITIVITY ANALYSIS

Most capital budgeting problems require analysts to make many different assumptions before arriving at a final NPV. For instance, forecasting project cash flows may require assumptions about the selling price of output, costs of raw materials, market share and many other unknown quantities. Managers use **sensitivity analysis** to explore the importance of each individual assumption, holding all other assumptions fixed, on the project's NPV. A common way of conducting sensitivity analysis is first to establish a base case set of assumptions for a particular project, and then to calculate its NPV based on those assumptions. Next, managers allow one assumption to change while holding all others fixed, recalculating the NPV based on that one change. By repeating this process for all the uncertain variables in an NPV calculation, managers can see how sensitive the NPV is to changes in baseline assumptions. The following example illustrates this procedure.

sensitivity analysis
Exploration of the impact of individual assumptions on a decision variable, such as a project's NPV, by determining the effect of changing one assumption while holding all others fixed

 **EXAMPLE**

Sensitivity Analyses

Imagine that Galimantan Transportation Incorporated (GTI) has developed a new skateboard equipped with a gyroscope for improved balance, called the Gyroscope Skateboard project. GTI estimates that this project has a positive NPV of \$236,000 under the following base-case assumptions:

- 1 The project's life is five years.
- 2 The project requires an up-front investment of \$7 million.
- 3 GTI will depreciate the initial investment on a straight-line basis for five years.
- 4 One year from now, the skateboard industry as a whole will sell 500,000 units.
- 5 Total industry unit volume will increase by 5% per year.
- 6 GTI expects to capture 5% of the market in the first year.
- 7 GTI expects to increase its market share by one percentage point each year after year 1.
- 8 The selling price will be \$200 in year 1.
- 9 The selling price will decline by 10% annually after year 1.
- 10 All production costs are variable and will equal 60% of the selling price.
- 11 GTI's tax rate is 30%.
- 12 The appropriate discount rate is 14%.

Under the base-case assumptions, the project has a small (relative to the \$7 million

investment) but positive NPV (\$236,000), so GTI's managers may want to explore how sensitive the NPV is to changes in the assumptions. Analysts often begin a sensitivity analysis by developing both pessimistic and optimistic forecasts for each of the model's important assumptions. These forecasts may be based on subjective judgements about the range of possible outcomes, or on historical data drawn from the company's past investments. For example, a company with historical data available on output prices might set the pessimistic and optimistic forecasts at one standard deviation below and above its expected price.

Figure 11.6 shows pessimistic and optimistic forecasts for several of the NPV model's key assumptions. Next to each assumption is the project NPV that results from changing one (and only one) assumption from the base-case scenario. For example, if GTI can sell its product for \$225 rather than \$200 per unit the first year, the project NPV increases to \$960,000. If, however, the selling price is less than expected – say, \$175 per unit – then the project NPV declines to -\$488,000. A glance at **Figure 11.6** reveals that small deviations in assumptions about market share generate large NPV changes, whereas assumptions about market size have less impact.

FIGURE 11.6 SENSITIVITY ANALYSIS OF THE GYROSCOPE SKATEBOARD PROJECT (BASE-CASE NPV = \$236)

NPV	PESSIMISTIC	ASSUMPTION	OPTIMISTIC	NPV
-\$558	\$8,000	Initial investment	\$6,000	\$1,030
-343	450,000 units	Market size in year 1	550,000 units	815
-73	2% per year	Growth in market size	8% per year	563
-1,512	3%	Initial market share	7%	1,984
-1,189	0%	Growth in market share	2% per year	1,661
-488	\$175	Initial selling price	\$225	960
-54	62% of sales	Variable costs	58% of sales	526
-873	-20% per year	Annual price change	0% per year	1,612
-115	16%	Discount rate	12%	617

Note: all dollar values in thousands, except initial selling price.

11.2c SCENARIO ANALYSIS

Scenario analysis is a variation of sensitivity analysis. Rather than adjusting a single assumption up or down, analysts conduct scenario analysis by calculating the project's NPV when a whole set of assumptions changes in a particular way. For example, what if consumer interest in GTI's new skateboard is low, leading to a lower market share and a lower selling price than originally anticipated? If production volume falls short of expectations, cost as a percentage of sales may also be higher than expected.

scenario analysis

A variation of *sensitivity analysis* that provides for calculating the decision variable, such as net present value, when a whole set of assumptions changes in a particular way

11.2d DECISION TREES

Most important investment decisions are much more complex than simply forecasting cash flows, discounting at the appropriate rate and investing if the NPV exceeds zero. In the real world, managers face a sequence of future decisions that influence an investment's value. These decisions might include whether to expand or abandon a project, whether to alter a marketing program, when to upgrade manufacturing equipment and, most important, how to respond to the actions of competitors. A **decision tree** is a visual representation of the sequential choices that managers face with regard to a particular investment. Sketching out a decision tree is somewhat like thinking several moves ahead in a game of chess. The value of decision trees is that they force analysts to think through a series of *if... then* statements that describe how they will react as the future unfolds. The following example illustrates the use of decision trees.

decision tree

A visual representation of the sequential choices that managers face with regard to a particular investment



Decision Tree Analysis

Imagine that Seoul Foods Ltd of Western Australia has invented a new salt substitute, Pinch, which it plans to use in snack foods such as potato chips and crackers. The company is trying to decide whether to spend \$5 million to test-market, in Perth, a new line of potato chips flavoured with Pinch. Depending on the outcome of that test, Seoul Foods may spend an additional \$50 million one year later to launch a full line of snack foods across Australia. If consumer acceptance in Perth is high, the company predicts that its full product line will generate net cash inflows of \$12 million per year for 10 years.⁵ If consumers in Perth respond less favourably, Seoul Foods expects cash inflows from a nationwide launch to be just \$2 million per year for 10 years. Seoul Foods' cost of capital is 15%.

Figure 11.7 shows the decision tree for this problem. Initially, the company can choose whether or not to spend the \$5 million on test marketing. If Seoul Foods goes ahead with the market test, it estimates the probability of high and low consumer acceptance to be 50%. After the company sees the test results, it will decide

whether to invest \$50 million for a major product launch.

The proper way to work through a decision tree is to begin at the end and work backward to the initial decision. Suppose that Seoul Foods learns one year from now that the Perth market test was successful. At that point, Seoul Foods calculates the NPV (in millions of dollars) of launching the product as follows:

$$NPV = -\$50 + \frac{\$12}{1.15^1} + \frac{\$12}{1.15^2} + \frac{\$12}{1.15^3} + \dots + \frac{\$12}{1.15^{10}} \\ = \$10.23$$

Clearly, Seoul Foods will invest if it winds up in this part of the decision tree. But what if initial test results are unfavourable and it still launches the product? In that situation, the NPV is as follows:

$$NPV = -\$50 + \frac{\$2}{1.15^1} + \frac{\$2}{1.15^2} + \frac{\$2}{1.15^3} + \dots + \frac{\$2}{1.15^{10}} \\ = -\$39.96$$

Thus, the product should not launch if the test marketing is unfavourable. The best decision to make if the initial test does not go well is to walk

⁵ Note that the test begins immediately, the \$50 million investment starts one year later and the stream of \$12 million annual cash inflows begins one year after that.



away. After the test has been done, its cost is a *sunk cost*. As of time 1, the NPV of doing nothing is zero.

A decision tree helps to create a set of simple *if ... then* decision rules. If initial test results indicate high consumer acceptance of Pinch, then Seoul Foods should go ahead with the full product launch to capture a positive NPV of \$10.23 million. But if initial results show that consumers do not like foods flavoured with Pinch, Seoul Foods should not invest the additional \$50 million.

With this information in hand, we now step back and evaluate the project at time 0. We

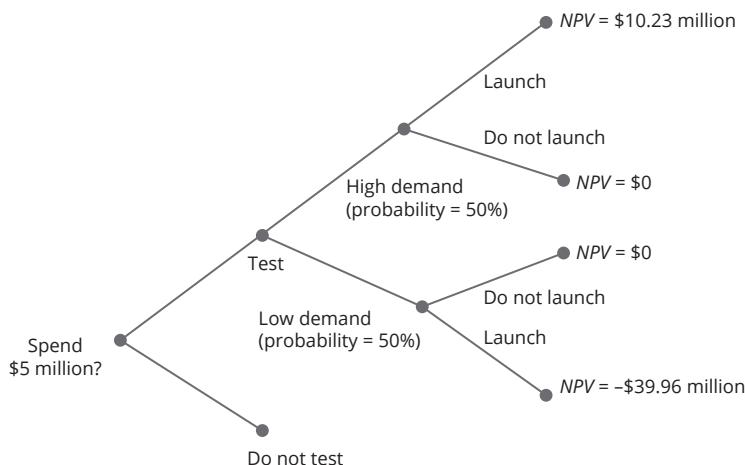
can evaluate today's decision about whether or not to spend the \$5 million on testing. Recall that we calculated the NPVs in terms of year-1 dollars – that is, as of the date of the decision on whether or not to launch the product nationwide. In terms of today's dollars (millions), the expected NPV of conducting the market test is determined to be:

$$NPV = -\$5 + 0.5 \left(\frac{\$10.23}{1.15} \right) + 0.5 \left(\frac{\$0}{1.15} \right) = -\$0.55$$

Spending the money on test marketing does not appear to be worthwhile.

FIGURE 11.7 DECISION TREE FOR PINCH INVESTMENT

The decision tree depicts the sequence of decisions facing Seoul Foods' decision whether to spend \$5 million to test-market Pinch, a new salt substitute. If the test market is successful, the NPV of launching the product is \$10.23 million; if the initial test results are negative, and it launches the product, it will have an NPV of -\$39.96 million. By working backwards (from right to left on the tree), Seoul Foods can decide whether to conduct the test in the first place.



A Subtle Decision Tree Issue

There is a subtle flaw in our analysis of Seoul Foods. Can you spot it? Currently, when Seoul Foods must decide whether or not to invest in test marketing, it does not know what the test results (unavailable for another year) will indicate. So at the end of one year, when the company chooses whether or not to invest \$50 million for a major product launch, it will know a great deal more. If the market research in Perth indicates a high demand for Pinch, then the risk that it will fail elsewhere in Australia is probably very low. If so, does it make sense to use a discount rate of 15% when calculating the NPV of the product launch decision? A mere one-percentage point reduction in the discount rate, from 15% to 14%, would be enough to cause the expected

NPV of conducting the market test to increase from $-\$0.55$ to $\$0.52$, thereby suggesting that Seoul Food's test marketing *would* be worthwhile.

This insight leads us to consider the use of *real options* in making present-value calculations, and to accommodate the observation that we learn about risks and outcomes for the future as we go through a project. This is covered in the next section.

LO11.2

CONCEPT REVIEW QUESTIONS

- 5 Why might a project that reaches the *breakeven point (BEP)* in terms of net income be bad for shareholders?
- 6 Which variable do you think would be more valuable to examine in a project *sensitivity analysis*: the growth rate of sales or the allowable depreciation deductions each year? Explain.
- 7 Why might the discount rate vary as you move through a *decision tree*?

THINKING CAP QUESTION

- 3 How would you determine the best output mix for a factory producing at full capacity?

LO11.3

11.3 REAL OPTIONS

We turn now to a method of analysis in valuing projects that draws from our discussion of options in Chapter 8. You may recall that financial options are securities that allow an investor to secure access to making a decision in the future: for a small fee, a call option allows us to take up the option at a future date to buy something; and a put option allows us the option to sell something. This idea of having choices during a project which were not available in the original design of the project – for example, to delay the start of a project, to expand its scale, to diminish its scale or to stop it before its original final date – gives great flexibility to our valuation process; and we can use option-pricing logic to determine these values. By recognising the options embedded in a project or investment, we can more fairly value it.

11.3a WHY NPV MAY NOT ALWAYS GIVE THE RIGHT ANSWER

Only a few decades ago, the net present value method was essentially absent from the world of corporate practice. Today, it has become the standard tool for evaluating capital investments, especially in very large companies. Even so, NPV can systematically overstate or understate the value of certain types of investments. These systematic errors occur because the NPV method is essentially static. That is, NPV calculations do not typically take into account potential future actions by managers that may increase the value of an investment once it has been made. When managers can react to changes in the environment in ways that alter an investment's value, we say that the investment has an embedded **real option**. A real option is the right, but not the obligation, to take a future action (such as cancel or delay) when implementing a project. Note that these actions can change an investment's value. We presented an in-depth analysis of financial option pricing techniques in Chapter 8, so only a brief reminder is presented here.

A simple example shows where NPV can go wrong. Suppose that you are bidding on the rights to extract oil from a proven site over the next year. You expect extraction costs from this field to run about \$79 per barrel.

real option

The right, but not the obligation, to take a future action (such as cancel or delay) when implementing a project. Note that these actions can change an investment's value

random walk

When next period's value for a variable equals this period's value plus or minus a random shock. When financial asset prices follow a random walk, future and past prices are statistically unrelated, and the best estimate of the future price is simply the current price

Suppose oil currently sells for \$75 per barrel. You know that oil prices fluctuate over time, but you do not possess any unique ability to predict where the price of oil is headed next. Accordingly, you assume that the price of oil follows a **random walk**, meaning that next period's value equals this period's value plus or minus a random shock. Because future and past oil prices are statistically unrelated, your best estimate of the future price of oil is simply the current price. How much would you bid?

An NPV analysis would tell you not to bid at all. If your best forecast of the future price of oil is \$75 per barrel, then you cannot make money when extraction costs are \$79 per barrel. The expected NPV of this investment is negative, no matter how much oil you can pump out of the ground.

A real options approach to the problem yields a different answer. If you own the rights to extract oil, you are not obliged to do so if the price is too low. You reason that you will pump oil only when the market price is high enough to justify incurring the extraction costs. Predicting exactly when the price of oil will be high enough to make pumping profitable is impossible, but historical price fluctuations persuade you that the price of oil will be higher than extraction costs at least some of the time. Therefore, extraction rights at this site are worth more than zero.⁶

The oil extraction problem is analogous to the test-marketing problem in the previous section. In both cases, managers have the option of spending additional resources at a future date. These options add to a project's value in a way that traditional NPV analysis often ignores because of its static approach to decision making. In general, we can say that the value of a project equals the sum of two components – the part captured by NPV, and the remaining value of real options:

$$\text{Project value} = \text{NPV} \pm \text{Option value including premium}$$

The NPV may either understate or overstate a project's value, depending on whether the proposed investment creates or destroys future options for the company. In the oil drilling example, buying extraction rights creates an option – to pump or not to pump oil in the future – and the NPV understates the investment's value. But it is just as easy to imagine projects that eliminate options rather than create them. For instance, by signing a long-term contract to supply a refinery with a certain quantity of crude oil each month, a company loses its flexibility in the extraction decision.

11.3b TYPES OF REAL OPTIONS

Real options analysis is growing in popularity in many industries. We now consider common types of real options encountered in capital budgeting decisions: expansion, follow-on investment, abandonment and flexibility options.

Expansion Options

What do companies do when one of their investments becomes a huge success? They look for new markets in which to expand that investment. For instance, once Blu-Ray technology gained significant popularity, consumers could rent Blu-Ray DVDs in video stores, grocery stores and many other places where they were previously unavailable. Likewise for Blu-Ray players: the number of retail outlets selling them also expanded dramatically. Subsequently, the newer technology of streaming, which has grown substantially in the past five years, is now reducing the markets for Blu-Ray players and content on Blu-Ray discs.

Naturally, companies invest in expansion only for their most successful investments. As mentioned in the decision-tree problem, the risk of expanding an already successful project is much less than the risk when the project first begins. A traditional NPV calculation misses both of these attributes – the *option to expand* or not, depending on initial success, and the change in risk that occurs when the initial outcome is favourable.

⁶ To determine exactly how much these rights are worth, we must use techniques that were presented in Chapter 8.

Follow-On Investment Options

A *follow-on investment option* is similar to an expansion option. It entitles a company to make additional investments should earlier investments prove to be successful. The difference between this and the expansion option is that here the subsequent investments are more complex than a simple expansion of the earlier ones.

Hollywood movies offer an excellent example of follow-on options. The rights to make sequels to commercial movies are sometimes bought and sold before the original film is completed. By purchasing the right to produce a sequel, a movie studio obtains the opportunity to make an additional investment should the first film become a commercial success.

Abandonment Options

Just as companies have the right to invest additional resources to expand projects that enjoy early success, they also can withdraw resources from projects that fail to live up to short-run expectations. In an extreme case, a company may decide to withdraw its entire commitment to a particular project and exercise its *option to abandon*.

In legal systems, such as those in Australia, New Zealand, Singapore or India, that provide limited liability to corporations, shareholders have the ultimate abandonment option. A company may borrow money to finance its operations, but if it cannot generate cash flow sufficient to pay back its debts, then management may declare bankruptcy, turn over the company's assets to its lenders and let the shareholders walk away. Although declaring bankruptcy is not what shareholders hope for when they invest, it means that the most shareholders can lose is their initial investment. Put another way, investors who buy shares are willing to pay a little more because of the embedded option to abandon (in this case, the *default option*) than they would be willing to pay without that option. We can express this mathematically as follows:

$$\text{Share value} = \text{NPV} + \text{Value of default option}$$

Consider the same situation from the lender's perspective. When lenders commit funds to a corporation, they know that the borrower may default and that the lender's ability to recover the associated losses does not extend to the shareholders' personal assets. We could even say that an investor who buys a bond from a corporation is simultaneously selling an option to the company – the option to default. So the price paid by the investor for the bond is effectively net of the proceeds from the option to default. Typically, we assume that an option to default is essentially absent in government securities, although some countries have, over time, defaulted or partially defaulted on their debt. During the global financial crisis (2007–2011) and its aftermath (2011–2015), deep concerns were held that the national governments of some European economies such as Spain and Italy would not have the ability to fully repay their debts; and Greece was given an option of providing only partial repayment of some of its debt. But if a government bond and a corporate bond offer the same interest payments to investors, which one would sell at a higher price? The government bond because:

$$\text{Corporate bond value} = \text{Government bond value} - \text{Value of company's default option}$$

Abandonment options crop up in unexpected places, and it is important for managers to recognise whether a given investment has an attached abandonment option or grants another party the right to abandon. Consider refundable and non-refundable airline tickets. With a refundable ticket, the traveller has the right to abandon travel plans without incurring a penalty. Such a ticket is more valuable than one that requires a traveller to pay a penalty if plans change.

Flexibility Options

Other options that have recently come to prominence in capital budgeting analyses are collectively known as *flexibility options*. Three examples illustrate the nature of flexibility options. First, the ability to use multiple production inputs creates option value. An example of such *input flexibility* is a boiler that can switch between oil or gas as a fuel source, enabling managers to switch from one type of fuel to another as prices change.

Second, having a flexible production technology capable of producing (and switching between) a variety of outputs using the same basic plant and equipment can be useful. For example, an oil refiner can switch its output between different grades or types of fuel, such as 87 or 91 octane gas or kerosene. This type of *output/operating flexibility* creates value when output prices are volatile.

Finally, option value can be created by maintaining excess production capacity that can quickly be used to meet peak demand. Although it is costly to purchase and maintain, this *capacity flexibility* can be quite valuable in capital-intensive industries subject to wide swings in demand and long lead times for building new capacity. For example, consider the profit opportunities a multinational company can employ if it has the excess capacity needed to move production around the world in response to movements in the real exchange rate. In 2010 and 2011, this capacity flexibility was demonstrated in Australia in the completion of desalination plants in New South Wales and Victoria in order to provide additional drinking water drawn from seawater for residents of those states if water levels in the main freshwater, rain-fed reservoirs fell to dangerously low levels. Rainfall did increase over subsequent years until 2019, when the desalination plants were switched on to cope with sudden drought conditions. This outcome did show how important it was that the plants should be maintained in working condition.

11.3c THE SURPRISING LINK BETWEEN RISK AND REAL OPTION VALUES

Until now, the approach presented for every standard valuation problem covered in this text satisfies the following statement: holding other factors constant, an increase in an asset's risk decreases its price. If two bonds offer the same coupon, but investors perceive one to be riskier than the other, then the safer bond will sell at a higher price. If two investment projects have identical cash flows, but one is riskier, then analysts will discount the cash flows of the riskier project at a higher rate, resulting in a lower NPV.

A surprising fact is that this relationship does not hold for options. We saw this in Chapter 8. For a brief explanation, we go back to the oil extraction problem. The extant price of oil is \$75 per barrel and extraction costs are \$79. The expected future price of oil is the same as the current price, so an NPV calculation would say that this investment is worthless.

Consider two different scenarios regarding the future price of oil. In the low-risk scenario, the price of oil in the future will be \$79 or \$71, with each price equally probable. This means that the expected price of oil is still \$75. However, both an NPV and an options analysis would conclude that bidding on the rights to this site is not a good idea because the price of oil will never be above the \$79 extraction cost.

Next, think about the high-risk scenario. The price of oil may be \$90 or \$60 with equal probability, so again we have an expected price of \$75. If the price turns out to be \$60, extracting the oil clearly does not make sense. But if the price turns out to be \$90, extracting oil generates a profit of \$11 per barrel (\$90 sale price – \$79 extraction cost). Therefore, a real options analysis would say that bidding for the right to extract the oil is a sensible decision.

Why does more risk lead to higher option values? Observe that in these two scenarios, the payoff from extracting oil equals zero whether the price of oil falls to \$71 or all the way to \$60. At either price, an oil producer would simply decline to incur extraction costs; thus, a huge decrease in the price of oil is no more costly than a small decrease. On the other hand, the payoffs on the upside increase as the price of oil rises. This all means that options are characterised by asymmetric payoffs. When the price of oil is extremely volatile, the potential benefits if prices rise are quite large. Yet if oil prices fall precipitously, then there is no additional cost relative to a slight decline in prices, since in either case the payoff is zero. When describing financial option pricing theory in Chapter 8, we showed that an increase in the volatility of the underlying price on which the option is based increases the value of the option: more opportunities can occur with higher volatility and, due to the asymmetric payoffs in options, this greater volatility adds to the value of the option that the investor holds. This insight applies to both call and put options.

LO11.3

CONCEPT REVIEW QUESTIONS

- 8 Give a real-world example of an *expansion option* and an *abandonment option*.
- 9 We know that riskier companies must pay higher interest rates when they borrow money. Explain this using the language of *real options*.

THINKING CAP QUESTIONS

- 4 Under what conditions might an NPV calculation recommend the wrong investment decision?
- 5 Sometimes companies use the first part of real options analysis, laying out a decision tree, in their decision making; but they do not continue with the full analysis using probabilities, differently discounted cash flows and multiple branches at the nodes in the decision trees. Why do you think companies may be reluctant to undertake the 'full' real options analysis for a given investment?

LO11.4

11.4 STRATEGY AND CAPITAL BUDGETING

Finance textbooks tend to focus on the mechanics of project evaluation: how to estimate cash flows, how to select the right discount rate, how to calculate an NPV or IRR, and so on. This emphasis on technique is intentional. Knowing how to apply quantitative discipline to the project selection process is crucial. Nevertheless, experienced managers rarely make major investment decisions based solely on NPV calculations. The best managers have a well-honed intuition that tells them why a particular project would or would not be a good investment. Their business acumen helps them to recognise projects that will create shareholder value, even if the NPV numbers from financial analysts are negative, and to avoid investments that will destroy value, even when the NPV calculations are positive.

11.4a COMPETITION AND NPV

Sadly, no textbook can adequately substitute for the invaluable experience of making many investment decisions over several years and then watching some of them succeed and others fail.⁷ However, there are certain common characteristics shared by projects that enhance shareholder value.

Recall some of the most basic lessons from microeconomics about a perfectly competitive market. In such a market, there are many buyers and sellers trading a similar product or service. Because every player in the market is small relative to the whole market, everyone behaves as if his or her decisions and actions will not affect prices. Competition and the lack of entry or exit barriers ensures that in the long run, the product's market price equals the marginal cost of producing it, and no company earns pure economic profit.⁸ In a market with zero economic profits, the NPV of any investment equals zero: every project earns just enough to recover the cost of capital, no more and no less.

⁷ Although the very act of creating a new edition of a textbook is the exercise of a real option based on the earlier text edition(s), and the new edition may or not be a success – the real option may or may not succeed!

⁸ Remember that the notion of 'economic profit' differs from 'accounting profit'. If a company makes a zero economic profit, then it earns just enough to pay competitive prices for the labour and capital that it employs to produce a good or service. Zero economic profit is equivalent to an NPV of zero.

Therefore, how can any project earn a positive NPV? The answer: a project can earn a positive NPV *only when markets are not perfectly competitive*. For example, if the project calls for production of a new good, is there something about this good that clearly differentiates it from similar goods already in the market? If the new product is genuinely unique, is there some kind of entry barrier (such as patents or limited access to production inputs) that will prevent other companies from producing their own, nearly identical versions of the product, competition that would eventually preclude any pure economic profits?

Competitive advantages of this sort can come in many forms. One company may have superior engineering or R & D talent that generates a continuous stream of innovative products. Another may excel at low-cost manufacturing processes. Still another may create a sustainable competitive advantage through its unique marketing programs. The main point is that *if any project is to have a positive NPV, then advocates of that project should be able to articulate its lasting competitive advantage even before running the numbers*. No matter how positive the project's NPV appears to be on paper, if no one can explain its main competitive advantage in the market, then the company should probably think twice about investing. Similarly, when an investment proposal has a compelling reason for its competitive edge, but the NPV numbers come out negative, it may be worth sending the financial analysts back to their desks to take a second look at their assumptions.

We want to emphasise here that, although the numbers are extremely important, they should line up with experienced intuition. When the two are in conflict, managers need to think hard about whether the NPV model is in error or whether the project lacks a true competitive advantage.

11.4b STRATEGIC THINKING, REAL OPTIONS AND SYSTEMIC RISK

We conclude this chapter with a return to the topic of real options and the consideration of some extensions. The technical aspects of calculating the option value of a given financial investment (which we covered in Chapter 8) can be quite complex. Real options techniques are still relatively new, and are used extensively by companies in only a few industries. Although we expect an increasing number of companies to include real options analysis as part of their standard capital budgeting approach, we believe that just thinking about a project from a real options perspective can be valuable, even if coming up with a dollar value for a real option proves to be elusive.

Investments generally have option value as long as they are not all-or-nothing bets. Almost all investments fit this description. Managers usually have opportunities subsequent to the initial investment to make decisions that can increase or decrease the value of the investment – decisions that create (or destroy) an investment's option value. To maximise, or at least recognise, an investment's option value, managers should try to describe – before the company commits to an investment – all the subsequent decisions they will make as events unfold. In other words, managers must articulate their strategy for a given investment. This strategy may consist of a series of statements like these:

- *If sales in the first year exceed our expectations, then we plan to commit another \$50 million to ramp up production.*
- *If consumers enjoy sending and receiving files on their mobile phones, then we will be prepared to invest additional resources so that our mobile phones will be capable of performing other tasks on the internet.*
- *If our laptop computer cannot hold as much memory as the leading model, then the unit must weigh less than the market leader or we will not commit the resources necessary to manufacture it.*

These *if... then* statements are necessary to value a real option, but they also have intangible value in that they force managers to think through their strategic options before they invest. Identifying a real option is tantamount to identifying future points at which it may be possible for managers to create and sustain changes which generate competitive advantages.

In the past decade, following the global financial crisis, we have also seen a growth of research literature in finance and other fields examining *systemic risk*. As its name implies, the risk content relates to a *system* rather than an individual entity: for example, systemic risk describes how vulnerable a financial or economic system of a country is to an economic or political shock that occurs to the country as a whole. In a paper published in the journal *Review of Finance* in 2016, Benoit et al. noted that there are three sources of analysis of systemic risk:

- 1 Systemic risk-taking or ‘why many financial institutions take bets that are both large and correlated’
- 2 *contagion* mechanisms, or ‘how losses can spillover from one part of the financial system to another’
- 3 *amplification* mechanisms, or ‘why small shocks can end up having large impacts’.⁹

As the authors show, before development of systemic risk analysis, the financial research literature focused on the risks – as outlined in our earlier chapters of this text – highlighting individual or non-systematic risks and systematic risks. The idea in systemic risk is that a shock to a financial or economic system may *propagate through* the system, depending on how closely linked (highly correlated) are the elements of the system, and this was new ground.

This insight has required a great deal of new thinking. The traditional financial risk literature did indeed recognise correlations: we ask how the elements of a portfolio may be correlated because we know the degree of correlation will affect the gains to diversification from forming a portfolio, such that if correlations are high, diversification gains are reduced. This insight was, however, a static measure of linkage, which did not capture fully how an external shock may *travel through* a portfolio over time in a dynamic way (*contagion*), especially if the portfolio consisted of entities with differing levels of linkages with each other, similar to different industries in an economy. The traditional literature also did not really allow for the outcome that if the shock hits some entities, the effect may be *amplified* (increased) rather than passed on with the same intensity.

The authors of the research concluded, after reviewing what has been published in the past decade, that some issues remain unsolved:

- *Measurement*: as a result of the growth of interest in systemic risk, a large number of different measures has been produced, but it is not clear how they may be linked with each other. Further, for policymakers makers, there are no obvious connections between the various measures and what sort of regulatory intervention may be appropriate. If a bank becomes more central in the market of banking in a country and hence more likely to influence other banks if it fails economically, it is not clear how central banks should respond in this circumstance. Benoit et al. recommend that we build more structural economic models, ‘linking risk estimates to well-defined policy objectives and available tools’, which ‘would be useful to regulators’.
- *Information inputs*: ‘[t]he quest for a global risk measure that encompasses different sources of systemic risk, and yet produces a single metric that can directly be used for regulation, is still ongoing’. The authors are optimistic that more data will allow researchers to combine different measures so that it is easier to develop an overall risk measure which can be connected in a model to a systemic risk tax or capital surcharge to allow monetary authorities to align systemic banks – those which affect the entire financial system by their actions – with a socially beneficial optimum.

⁹ Source: S. Benoit, J.-E. Colliard, C. Hurlin and C. Perignon, ‘Where the Risks Lie: A Survey on Systemic Risk’, *Review of Finance*, vol. 21, iss. 1, March 2017, pp. 109–52, https://econpapers.repec.org/article/ouprefin/v_3a21_3ay_3a2017_3ai_3a1_3ap_3a109-152..htm. Accessed 15 July 2019.

LO11.4

CONCEPT REVIEW QUESTIONS

10 Why must manager intuition be part of the investment decision process regardless of a project's NPV (or IRR)?

11 Why is it helpful to think about *real options* when making an investment decision?

THINKING CAP QUESTION

6 How can a project earn a positive NPV in the long run? Why doesn't competition drive all projects to $NPV = \$0$?

STUDY TOOLS

SUMMARY

LO11.1

- All-equity companies can discount their 'standard' investment projects at the cost of equity. Managers can estimate the cost of equity using the CAPM.
- The cost of equity is influenced by a company's cost structure (operating leverage) as well as by its financial structure (financial leverage).
- Companies with both debt and equity in their capital structures can discount their 'standard' investments using the company-wide weighted average cost of capital, or WACC.

LO11.2

- The WACC is the company-wide weighted average of the cost of each source of financing used by a company, where the weights are equal to the proportion of the market value represented by each source of financing.
- A company's WACC and CAPM are connected, in that the cost of equity and debt (and any other financing source) are driven by the betas of the company's equity and debt. Rather than calculate betas for preferred shares and debt, we can estimate their returns using dividend yield for preferred shares and yield to maturity (YTM) for debt.
- The WACC can be calculated on both a pre-tax and an after-tax basis. In many countries, interest payments to bondholders are tax deductible, so we focus on the after-tax WACC formula.
- Several tools exist to assist managers in understanding the sources of uncertainty in a project's cash flows. These tools include breakeven analysis, sensitivity analysis, scenario analysis and decision trees. The value of many investments includes not just the NPV but also the investment's option value. As a static analytical tool, NPV analysis often misses the value of management's ability to alter an investment in response to environmental changes that may occur after it is made.

LO11.3

- Types of real options include the option to expand, the option to make follow-on investments, the option to abandon and flexibility options related to production inputs, outputs and capacity.
- An investment's option value, unlike its NPV, increases as risk increases.

LO11.4

- For an investment to have a positive NPV, it must have a competitive advantage – something that distinguishes it from the economic ideal of perfect competition.
- Valuing an investment's option value requires strategic thinking. Articulating the strategy may be as important as calculating the project's value.

IMPORTANT EQUATIONS

TABLE OF IMPORTANT EQUATIONS	
11.1 $E(r_f) = r_f + \beta_f (E(r_m) - r_f)$	
11.2 Operating leverage = $\frac{\Delta EBIT}{EBIT} \cdot \frac{Sales}{\Delta Sales}$	
11.3 $WACC = \left(\frac{D}{D+E} \right) r_d + \left(\frac{E}{D+E} \right) r_e$	
11.4 WACC when interest on debt is tax-deductible:	
$WACC = \left(\frac{D}{D+E} \right) (1-T_c) + \left(\frac{E}{D+E} \right) r_p$	
11.5 BEP = $\frac{\text{Fixed costs}}{\text{Contribution margin}} = \frac{\text{Fixed costs}}{SP - VC}$	

SELF-TEST PROBLEMS

Answers to these 'Self-test problems' and the 'Concept review' questions throughout the chapter appear on the Student Companion Website (<http://login.cengagebrain.com>) or via your instructor.

ST11-1 A financial analyst for Quality Investments, a diversified investment fund, has gathered the following information for the years 2016 and 2017 on two companies – A and B – that it is considering adding to its portfolio. Of particular concern are the operating and financial risks of each company.

	2016		2017	
	COMPANY A	COMPANY B	COMPANY A	COMPANY B
Sales (\$ million)	10.7	13.9	11.6	14.6
EBIT (\$ million)	5.7	7.4	6.2	8.1
Assets (\$ million)			10.7	15.6
Debt (\$ million)			5.8	9.3
Interest (\$ million)			0.6	1.0
Equity (\$ million)			4.9	6.3

- Use the data provided to assess the *operating leverage* of each company (using 2016 as the point of reference). Which company has more operating leverage?
- Use the data provided to assess each company's ROE (cash payments to equity/ordinary shares), assuming the company's return on assets is 10% and 20% in each case. Which company has more *financial leverage*?
- Use your findings in parts (a) and (b) to compare and contrast the operating and financial risks of companies A and B. Which company is more risky? Explain.

ST11-2 South Island Valley Industries (SVI) wishes to estimate its cost of capital for use in analysing projects that are similar to those that already exist. The company's current capital structure, in terms of market value, includes 40% debt, 10% preferred equity and 50% ordinary shares. The company's debt has an average yield to maturity of 8.3%. Its preferred shares have a \$70 par value and an 8% dividend, and are currently selling for \$76 per share. SVI's beta is 1.05, the risk-free rate is 4% and the return on the S&P 500 (the market proxy) is 11.4%. SVI is in the 40% tax bracket.

- a What are SVI's pre-tax costs of debt, preferred shares and ordinary shares?
- b Calculate SVI's weighted average cost of capital (WACC) on both a pre-tax and an after-tax basis. Which WACC should SVI use when making investment decisions?
- c SVI is contemplating a major investment that is expected to increase both its operating and financial leverage. Its new capital structure will contain 50% debt, 10% preferred shares and 40% ordinary shares. As a result of the proposed investment, the company's average yield to maturity (YTM) on debt is expected to increase to 9%; the market value of preferred shares is expected to fall to its \$70 par value; and its beta is expected to rise to 1.15. What effect will this investment have on SVI's WACC? Explain your finding.

QUESTIONS

Q11-1 Explain when companies should discount projects using the cost of equity. When should they use the WACC instead? When should they use neither?

Q11-2 If a company takes actions that increase its *operating leverage*, we might expect to see an increase in its equity beta. Why?

Q11-3 Company A and Company B plan to raise \$1 million to finance identical projects. Company A finances the project with 100% equity, whereas Company B uses a 50–50 mix of debt and equity. The interest rate on the debt equals 7%. At what rate of return on the investment (assets) will the rate of return on equity be the same for companies A and B? (Hint: think through **Figure 11.3**.)

Q11-4 Why do you think it is important to use the market values of debt and equity, rather than their book values, when calculating a company's WACC?

Q11-5 Assuming that there are no corporate income taxes, how can the costs of preferred equity and debt be estimated?

Q11-6 In what sense could one argue that, if managers make decisions using breakeven analysis, they are not maximising shareholder wealth? How can breakeven analysis be modified to solve this problem?

Q11-7 In Chapter 10, we discussed how one might calculate the NPV of earning a university degree. Suppose you are asked to perform a sensitivity analysis on the degree decision. Which of the following factors do you think would have the greatest impact on the degree's NPV?

- a The ranking of the university you choose to attend
- b Your choice of a major or specialisation in your degree
- c Your Weighted Average Mark (WAM) or Grade Point Average (GPA)
- d The state of the job market when you graduate

Q11-8 Suppose you want to model the value of a degree with a *decision tree*. What would such a decision tree look like?

Q11-9 If you decide to invest in a degree, what is your *follow-on investment option*? What is your *abandonment option*?

PROBLEMS

CHOOSING THE RIGHT DISCOUNT RATE

P11-1 Puritan Motors has a capital structure consisting almost entirely of equity.

- a If the beta of Puritan shares equals 1.2, the risk-free rate equals 4% and the expected return on the market portfolio equals 9%, then what is its cost of equity?
- b Suppose that a 1% increase in expected inflation causes a 1% increase in the risk-free rate. Holding all other factors constant, what will this do to the company's cost of equity? Is it reasonable to hold all other factors constant? What other part of the calculation of the cost of equity is likely to change if expected inflation rises?

P11-2 Fournier Industries, a publicly traded waste disposal company, is a highly leveraged company with 70% debt, 0% preferred shares and 30% ordinary shares financing. Currently, the risk-free rate is about 4.5%, and the return on the ASX 200 (the market proxy) is 12.7%. The company's beta is currently estimated to be 1.65.

- a What is Fournier's current cost of equity?
- b If the company shifts its capital structure to a less highly leveraged position by selling preferred shares and using the proceeds to retire debt, it expects its beta to drop to 1.20. What is its cost of equity in this case?
- c If the company shifts its capital structure to a less highly leveraged position by selling additional shares of ordinary equity and using the proceeds to retire debt, it expects its beta to drop to 0.95. What is its cost of equity in this case?
- d Discuss the potential impact of the two strategies discussed in parts (b) and (c) above on Fournier's weighted average cost of capital (WACC).

P11-3 Gail and Company had the following sales and EBIT during the years 2016 through 2018.

	2016	2017	2018
Sales (\$ million)	75.2	82.7	95.1
EBIT (\$ million)	26.3	30.5	36.0

- a Use the data provided to assess Gail and Company's operating leverage over the following periods
 - i 2016–2017
 - ii 2017–2018
 - iii 2016–2028.
- b Compare, contrast and discuss the company's operating leverage between the 2016–2017 period and the 2017–2018 period. Explain any differences.
- c Compare the operating leverage for the entire 2016–2018 period to the values found for the two sub-periods, and explain the differences.

P11-4 Company A's capital structure contains 10% debt and 90% equity. Company B's capital structure contains 50% debt and 50% equity. Both companies pay 8% annual interest on their debt. The shares of Company A have a beta of 1.1, and the shares of Company B have a beta of 1.45. The risk-free rate of interest equals 5%, and the expected return on the market portfolio equals 12%.

- a Calculate the WACC for each company, assuming there are no taxes.
- b Recalculate the WACC for each company, assuming that they face a tax rate of 34%.
- c Explain how taking taxes into account in part (b) changes your answer found in part (a).

P11-5 Dingo Co. is attempting to evaluate three alternative capital structures, A, B and C. The following table shows the three structures along with relevant cost data. The company is subject to a 40% tax rate. The risk-free rate is 6% and the market return is currently 12%.

ITEM	CAPITAL STRUCTURE		
	A	B	C
Debt (\$ million)	35	45	55
Preferred shares (\$ million)	0	10	10
Ordinary shares (\$ million)	65	45	35
Total capital (\$ million)	100	100	100
Debt (yield to maturity)	7.0%	7.5%	8.5%
Annual preferred shares dividend	–	\$2.80	\$ 2.20
Preferred shares (market price)	–	\$30.00	\$21.00
Ordinary equity beta	0.95	1.10	1.25

- a Calculate the after-tax cost of debt for each capital structure.
- b Calculate the cost of preferred shares for each capital structure.
- c Calculate the cost of ordinary shares for each capital structure.
- d Calculate the weighted average cost of capital (WACC) for each capital structure.
- e Compare the WACCs calculated in part (d) and discuss the impact of the company's financial leverage on its WACC and its related risk.

A CLOSER LOOK AT RISK

P11-6 Alliance Pneumatic Manufacturing, a specialty machine-tool producer, has fixed costs of \$20 million per year. Across all the company's products, the average contribution margin equals \$120. What is Alliance's breakeven point in terms of units sold?

P11-7 JK Manufacturing is considering a new product and is unsure about its price as well as the variable cost associated with it. JK's marketing department believes that the company can sell the product for \$500 per unit, but feels that if the initial market response is weak, the price may have to be 20% lower in order to be competitive with existing products. The company's best estimates of its costs are fixed costs of \$3.6 million and variable cost of \$325 per unit. Concern exists with regard to the variable cost per unit due to currently volatile raw material and labour costs. Although the company expects this cost to be about \$325 per unit, it could be as much as 8% above that value. The company expects to sell about 50,000 units per year.

- a Calculate the company's *breakeven point (BEP)*, assuming its initial estimates are accurate.
- b Perform a sensitivity analysis by calculating the breakeven point for all combinations of the sale price per unit and variable cost per unit. (Hint: there are four combinations.)
- c In the best case, how many units will the company need to sell to break even?
- d In the worst case, how many units will the company need to sell to break even?
- e If each of the possible price/variable cost combinations is equally probable, what is the company's expected breakeven point?
- f Based on your finding in part (e), should the company go forward with the proposed new product? Explain why or why not.

REAL OPTIONS

P11-8 Vanis Yaroufakis, a financial intern at Mega Manufacturing Company (MMC), was asked by the CFO to review the NPV calculations on a major new product investment. After analysing the cash flows and other calculations, Vanis confirmed that the NPV was \$3 million. In the process of investigating

all aspects of the project and its cash flows, Vanis learned that, were the new product to be successful, it would open the door to a number of opportunities to further expand the company's product line. Using option valuation techniques that he learned in an advanced finance course, he estimated the value of these expansion options to be \$0.7 million.

- a** Based on Vanis' analysis, what is the value of the proposed new product investment?
- b** How could Vanis explain the value found in part (a) to the CFO, who is unfamiliar with the concept of real options?

P11-9 Tech Industries, a contract manufacturer of circuit boards, is evaluating an investment in a new production line to handle the growing demand from its customers, who produce consumer electronic products. Based on reasonable growth assumptions, the NPV of the new production line was found to be -\$2.3 million. Therefore, management feels obliged to reject the project. It recognises that the production line would provide a high degree of output flexibility because it could be repurposed easily and inexpensively to produce circuit boards for numerous other applications. The company's project analyst estimated the value of this *output flexibility* option to be \$3.3 million.

- a** Based on the information provided, what is the true value of Tech Industries' proposed new production line?
- b** What recommendation would you give Tech Industries regarding the proposed new production line? Explain.

CASE STUDY

COST OF CAPITAL AND PROJECT RISK

Cascade Water Company (CWC) currently has 30,000,000 ordinary shares outstanding that trade at a price of \$42 per share. CWC also has 5,000,000 bonds outstanding that currently trade at \$92.34 each. CWC has no preferred shares outstanding and has an equity beta of 2.639. The risk-free rate is 3.5%, and the market is expected to return 12.52%. The company's bonds have a 20-year life, a \$100 face value, a 10% coupon rate and pay interest semiannually.

CWC is considering adding to its product mix a healthy bottled water geared towards children. The initial outlay for the project is expected to be \$3,000,000, which will be depreciated using the straight-line method to a zero salvage value, and sales are expected to be 1,250,000 units per year at a price of \$1.25 per unit. Variable costs are estimated to be \$0.24 per unit, and fixed costs of the project are estimated at \$200,000 per year. The project is expected to have a three-year life and a terminal value (excluding the operating cash flows in year 3) of \$500,000. CWC has a 34% tax rate. (For the purposes of this project, working capital effects will be ignored.) Bottled water targeted at children is expected to have different risk characteristics from the company's current products. Therefore, CWC has decided to use the 'pure play' approach to evaluate this project. After researching the market, CWC managed to find two pure play companies. The specifics for those two companies are as follows.

COMPANY	EQUITY BETA	D/E	TAX RATE
Fruity Water	1.72	0.43	34%
Ladybug Drinks	1.84	0.35	36%

ASSIGNMENT

- 1** Determine the current weighted average cost of capital for CWC.
- 2** Determine the appropriate discount rate for the healthy bottled water project.
- 3** Should the company undertake the healthy bottled water project? As part of your analysis, include a sensitivity analysis for sales price, variable costs, fixed costs and unit sales at $\pm 10\%$, 20% and 30% from the base case. Also perform an analysis of the following two scenarios:
 - a** *Best case:* Selling 2,500,000 units at a price of \$1.24 per unit, with variable production costs of \$0.22 per unit.
 - b** *Worst case:* Selling 950,000 units at a price of \$1.32 per unit, with variable production costs of \$0.27 per unit.

REAL-WORLD CASE STUDY

CANNIBALS IN THE MARKET!

Product cannibalisation: this is an outcome in which sales generated by one product then substitute for sales of other goods or services manufactured by the same firm.

'How should we treat product cannibalisation in capital budgeting?

Product cannibalisation refers to the phenomenon whereby a new product introduced by a firm competes with and reduces sales of the firm's existing products. On one level, it can be argued that this is a negative incremental effect of the new product, and the lost cash flows or profits from the existing products should be treated as costs in analysing whether or not to introduce the product. Doing so introduces the possibility, that the new product will be rejected, however. If this happens, and a competitor now exploits the opening to introduce a product that fills the niche that the new product would have and consequently erodes the sales of the firm's existing products, the worst of all scenarios is created – the firm loses sales to a competitor rather than to itself.

Thus, the decision whether or not to build in the lost sales created by product cannibalisation will depend on the potential for a competitor to introduce a close substitute to the new product being considered. Two extreme possibilities exist: the first is that close substitutes will be offered almost instantaneously by competitors; the second is that substitutes cannot be offered.

If the business in which the firm operates is extremely competitive and there are no barriers to entry, it can be assumed that the product cannibalisation will occur anyway, and the costs associated with it have no place in an incremental cash flow analysis. For example, in considering whether to introduce a new brand of cereal, a company like Kellogg's can reasonably ignore the expected product cannibalisation that will occur because of the competitive nature of the cereal business and the ease with which Post or General Food

could introduce a close substitute. Similarly, it would not make sense for Compaq to consider the product cannibalisation that will occur as a consequence of introducing a Pentium notebook PC since it can be reasonably assumed that a competitor, say IBM or Dell, would create the lost sales anyway with their versions of the same product if Compaq does not introduce the product.

If a competitor cannot introduce a substitute, because of legal restrictions such as patents, for example, the cash flows lost as a consequence of product cannibalisation belong in the investment analysis, at least for the period of the patent protection. For example, Glaxo, which owns the rights to Zantac, the top selling ulcer drug, should consider the potential lost sales from introducing a new and maybe even better ulcer drug in deciding whether and when to introduce it to the market.

In most cases, there will be some barriers to entry, ensuring that a competitor will either introduce an imperfect substitute, leading to much smaller erosion in existing product sales, or that a competitor will not introduce a substitute for some period of time, leading to a much later erosion in existing product sales. In this case, an intermediate solution, whereby some of the product cannibalisation costs are considered, may be appropriate. Note that brand name loyalty is one potential barrier to entry. Firms with stronger brand name loyalty should therefore factor into their investment analysis more of the cost of lost sales from existing products as a consequence of a new product introduction.'

Source: Adapted from Aswath Damodaran, *Applied Corporate Finance 4e*, Wiley, 2014, Chapter 6. Accessed 15 July 2019.

ASSIGNMENT

If you were worried about cannibalisation of sales or products in your business, how might you measure if such cannibalisation was taking place? (Hint: search for 'cannibalisation of sales' on the internet for some ideas of measurement.)

SOUND BITES: ETHICS IN CORPORATE FINANCE – PART 3

WRITTEN BY BORIS BIELER

Boris Bieler has over twenty years of risk management experience mainly gained in senior audit leadership roles at foreign corporate and investment banks in Australia. For his full biography, please see p. 114.



MATCHING THE COMPANY'S AND JANE'S VALUE SETS – PERFORMANCE AND GOAL SETTING AS AN EXAMPLE

In the performance and goal setting process, Jane's manager formalises the company's expectation of her work. Her performance objectives consist of quantitative measures and behavioural expectations that are tied to the company's value statement. As an example, Jane will be assessed against the company's objective of working together as a team, which is reviewed by surveys of team members and external clients. Her employer's key focus on aligning organisational and staff members' values has been embedded in the hiring process, the introductory and periodic staff training, senior management's day-to-day role modelling and the performance and goal setting process which then feeds into Jane's remuneration.

- The company's values-based hiring identifies the best cultural fit among the candidates and tests that new starters identify, understand and resonate with the organisation's values. Using case studies, the recruiter challenges the candidate's ethical decision making in situations of conflicts of interest. In Jane's job interview, they discussed the firm's principle of servicing the client first and building long-lasting relationships, and not 'chasing the quick bucks' with advice and products which might not match the client's needs.
- Jane's manager is leading by example and influences his staff members by abiding by the same standards and by demonstrating his day-to-day ethical behaviour.

Jane understands that all employees are ambassadors of the company and hence represent the values for which the organisation stands.

- Performance and goal setting translate the company's values into measurable actions and provide recognition and commitment by staff members to behave ethically. Jane's manager provides praise and suggestions for her development, which should enable her to achieve her personal goals and those of the company.
- Performance-based components in the form of long-term incentives are included in the company's overall remuneration strategy. Jane's ethical conduct can be rewarded, and her long-term incentive award is linked to her clients' satisfaction levels, which takes into account her company's principle of building sustainable client relationships.

Jane has experienced how the Code of Ethics is lived by the organisation, evidenced in daily meetings, announcements, decision making and across HR-related processes for hiring, training, performance management and remuneration. For Jane, however, the best example of what the company expects from her comes from the behaviour of her manager and her immediate colleagues. Their role modelling makes those expectations authentic, real and achievable.



ASSIGNMENT

- 1 Imagine you are in a job interview for a company position, and the recruiter explains to you that the company stands for resilience and strives for servicing the community. Can you give an example from your own experience where you demonstrated such values?
- 2 You have started a new job, and as part of your introductory training the CEO of this mid-sized company gave an overview about the company's principles and behavioural expectations. You were amazed by how many senior leaders you had already met on day 1. In your view, how important is the involvement of senior management in staff training and its constant dialogue with all levels of staff within an organisation? Why does it make a difference if you hear about the company's principles from the CEO rather than from the HR training associate?
- 3 When conducting research online, have you found examples of leaders where 'the tone from the top' did not condemn unethical behaviour and might have even facilitated it? Thinking about the big financial scandals over the past 15 years, do you feel that any of them can be linked to senior management failures, which then cascaded down within the organisation?
- 4 Thinking about organisational leaders, can you identify a leader who is a role model for you? What makes her or him inspiring? Can you assess whether her or his values are flowing down to all levels of the company?



Corporate finance is the art of measuring and managing value over time and with uncertainty

Cash is the physical measure of value, which is embedded in the flow of **Time** and affected by **Uncertainty**. Exchange of value occurs through **Market interaction**.

PART 4

Financial Strategy

- 12 Raising Long-term Financing**
- 13 Capital Structure**
- 14 Long-term Debt and Leasing**
- 15 Payout Policy**
- 16 Exchange Rates and International Investment Decisions**
- 17 Mergers, Acquisitions and Corporate Control**

In the previous chapters, we provided a framework for deciding how an organisation or business should invest its money. In this part, we examine a broader set of questions which arise as the organisation considers its overall strategy: what should be the financial strategy for the entity that will support the overall future development? How should managers finance the investments they undertake? Should managers pay for new investments, mergers or acquisitions by using cash that the firm generates internally, or should external sources of funds be tapped? Is it better to finance with equity or with debt? If the organisation's investments are successful, should the company return capital to shareholders by paying a dividend, or should it repurchase shares instead? Should the organisation embark on international investments to increase its value, and how might it protect itself from greater risks associated with exchange rate fluctuations?

Chapter 12 describes the trade-offs firms face when they choose between internal or external financing or between debt and equity. The chapter explains how organisations work with investment bankers to issue equity. Because investment bankers serve two masters – firms that want to sell securities and investors who must be persuaded to buy them – the investment banking business is fraught with potential conflicts of interest. Chapter 12 describes some of the conflicts that arise in this industry.

In Chapter 13, we explore the question of whether managers can increase the value of an organisation by financing its operations with an optimal mix of debt and equity. A classic and important line of argument suggests that such an optimal capital structure may not exist, but the chapter offers useful guidelines that managers can consult when deciding what type of funding to raise for their companies.

Chapter 14 looks at long-term debt and leasing. It may seem odd to put debt and leasing together, but a lease is a fixed obligation, just like the obligation organisations undertake when they borrow money by issuing bonds. Managers evaluate lease financing in a fashion similar to that used when deciding how much long-term debt to issue.

Chapter 15 examines how managers can affect the value of an organisation through its dividend payout policy. In Chapter 5, we presented a model that showed that the value of any stock can be viewed as the present value of all dividends that the stock will pay through time. We explore the ways that dividends may, or may not, affect organisation value.

In Chapter 16 we acknowledge that many organisations today have some exposure to international market fluctuations. These may arise from transactions in goods and services with overseas markets or be associated with direct investments made

or changed in foreign countries, with related foreign currency exchange rates and issues such as international political risk. Although international investment and its management is a large topic, we can review the key elements of this field in one chapter and recognise that much of the valuation technology developed earlier in the book can apply directly to the international context.

Finally, Chapter 17 tackles the important topic of financial strategy generated by decision making related to mergers, acquisitions and corporate control. If an organisation decides it should seek a merger with another company, or is itself the subject of a takeover bid, it faces some complex issues of valuation; but these are still based on the ideas and models we introduced from Chapter 3 onward. In Chapter 17, we see how we can extend the models to accommodate merger and acquisition valuations, as well as explore the impacts of these decisions on corporate control.

12

RAISING LONG-TERM FINANCING

WHAT COMPANIES DO

FINANCIAL ENGINES REVVED UP

What comes to mind when you think about a firm ‘going public’ by conducting an initial public offering (IPO) of common stock (called ordinary shares in Australia)? Most people would probably think about hot technology stocks (or shares, as they are called in Australia) like Google, or emerging social networking companies like Facebook; but excitement in the IPO market isn’t limited to glamorous firms. On 16 March 2010, US company Financial Engines, Inc. (founded in 1996 by William Sharpe, Nobel Laureate and finance professor) completed its IPO, selling 10.6 million shares at US\$12 and raising more than US\$125 million. The company, which provides services to nearly one-quarter of all Fortune 500 companies, advises clients on retirement account investing decisions. Financial Engines’ computer programs decide how investors should allocate their retirement savings among different types of assets. That business model may not excite many people, but the company’s initial returns were very exciting for its investors.

The initial buyers of Financial Engines’ stock paid US\$12 per share, but shares began trading

in the secondary market at US\$15 and kept climbing higher, ending the first trading day up 44%. With millions of Baby Boomers (those born between 1946 and 1964) struggling to manage their retirement nest eggs, Wall Street apparently felt that Financial Engines’ retirement investment advisory business would be a growth business. With the equity that it raised in its IPO, Financial Engines was well positioned to achieve rapid growth in the next few years. Looking forward over eight years to 19 July 2018, the company was acquired by private equity firm, Hellman and Friedman. Its share price had grown to US\$45 and it was valued at US\$3.02 billion.

Sources: ‘Hot IPO: Retirement-Savings Advisor Financial Engines Soars in Debut’, *Business Money & Company, Los Angeles Times*, 16 March 2010, accessed at http://www.latimesblogs.latimes.com/money_co/2010/03/financial-engines.html, 8 June 2010; Rick Aristotle Munarriz, ‘Finally! A Hot IPO!’, *The Motley Fool*, Fool.com, 17 March 2010, accessed at <http://www.fool.com/investing/general/2010/03/17/finally-a-hot-ipo.aspx>, 8 June 2010; and Google, <https://www.google.com.au/webhp?sourceid=chrome-instant&ion=1&espv=2&ie=UTF-8#q=FNGN+market+cap>. Accessed 8 December 2015; ‘Hellman & Friedman Completes Acquisition of Financial Engines’, *Business Wire*, 19 July 2018, <https://www.businesswire.com/news/home/20180719005438/en/Hellman-Friedman-Completes-Acquisition-Financial-Engines>. Accessed 30 December 2019.

LEARNING OBJECTIVES

After studying this chapter, you should be able to:

- LO12.1 discuss the basic choices that corporations face in raising long-term financing, and describe the costs and benefits of raising long-term funds by issuing securities rather than by borrowing from a financial intermediary
- LO12.2 understand how investment banks help corporations issue securities, and describe the services investment banks provide before, during and after a security issue
- LO12.3 explain the basic issuance and pricing patterns observed in the initial public offering (IPO) market
- LO12.4 describe the basic issuance and pricing patterns observed in the market for seasoned equity offerings (SEOs), explain why so few large companies issue seasoned ordinary equity, and understand some important aspects of international ordinary equity offerings, including the role of American depositary receipts (ADRs).

This chapter introduces the primary instruments that companies around the world use for long-term financing: ordinary equity, preferred equity and long-term debt. Although the types of securities are similar, significant differences exist across countries in terms of how corporations use them and in the degree to which firms obtain financing in capital markets rather than through financial intermediaries.

internal financing

Relying on internally generated cash flow (principally retained profits) as the dominant source of new financing

external financing

Raising money from sources external to the firm, such as banks or capital markets

For example, countries such as Australia, Canada, the United States and the United Kingdom are characterised by large, highly liquid equity and bond markets. Other industrialised countries, particularly those in continental Europe, have much smaller capital markets and rely primarily on commercial banks for financing. Despite these differences in financial systems, corporations around the world display certain common tendencies; most importantly, they universally rely on internally generated cash flow (principally retained profits) as the dominant source of new financing. Funding a company's operations this way – by retaining rather than paying out corporate profits – is called **internal financing**. The alternative, **external financing**, refers to raising money from sources external to the firm, such as banks or capital markets.

LO12.1

12.1 THE BASIC CHOICES IN LONG-TERM FINANCING

seniority

The order in which repayments must be made to investors, in the event of loan defaults, liquidations, bankruptcy or similar negative events. In general, bondholders (or debt investors) must be repaid before equity investors; senior debt must be repaid before subordinated debt and preferred equity must be repaid before ordinary equity. This is why equity investment is considered much riskier than debt investment. It is said to be junior to debt

Debt and equity constitute the two main sources of corporate long-term financing. Equity capital represents an ownership interest that is junior to debt (in the **seniority** rankings) because debt capital represents a legally enforceable claim, with cash flows that can be either fixed or varied, according to a predetermined formula. These basic financial instruments exist in most countries, and the rights and responsibilities of the holders of these instruments are very similar. Companies around the world face the same basic financing problem: how to fund projects and activities that will allow the firm to grow and prosper. This section examines the firm's financing alternatives, particularly the choice between internal and external financing, and surveys key issues related to raising external financing either through financial intermediaries or in capital markets. In Australia, these markets for raising equity and debt capital are respectively referred to as the **equity capital market (ECM)** and the **debt capital market (DCM)**.

Since the US capital market is one of the largest and most developed markets in the world, as well as one of those that tends to display the most activity, it has had a significant influence on the process of raising long-term finance around the globe. With this in mind, much of this chapter draws on the experience of the US market.

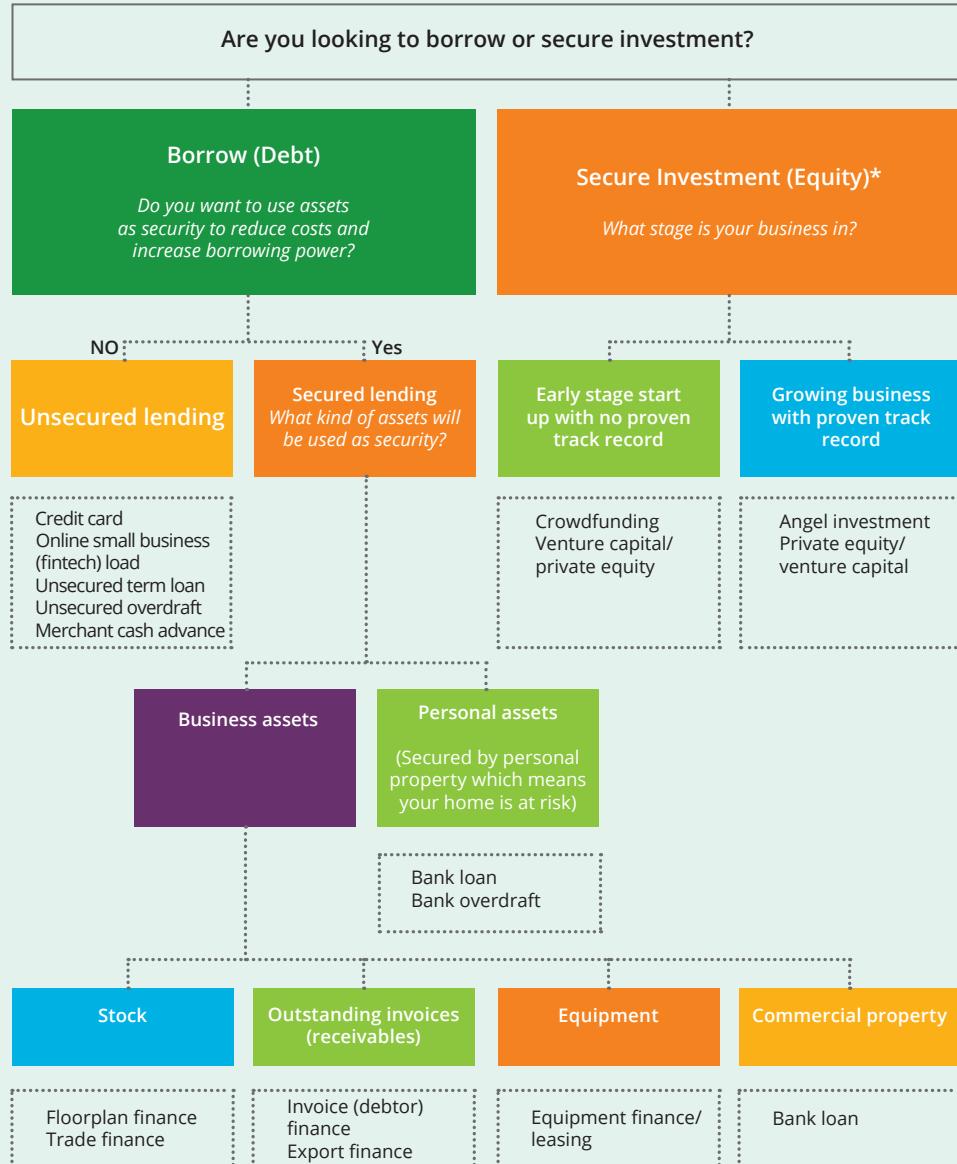
FINANCE IN THE REAL WORLD



ASSESSING SOURCES OF FUNDING

Companies can access various sources of funding, but how do they decide which sources to use for different business objectives? The flow chart in **Figure 12.1** outlines the decision process:

FIGURE 12.1 FUNDING DECISION FLOW CHART



Source: The Australian Small Business and Family Enterprise Ombudsman and Scottish Pacific Business Finance.

Note: * Business owners will relinquish a level of control over the business with the involvement of equity partners.
Floorplan finance is a type of inventory finance, where a loan is provided to purchase inventory.

equity capital market (ECM)

The market for raising equity capital. Financial institutions providing ECM services in Australia will often have separate divisions or teams focusing purely on these services, rather than covering both debt and equity markets. Some broking firms get involved in this market

debt capital market (DCM)

This refers to the market for raising debt capital. Financial institutions providing DCM services in Australia will often have separate divisions or teams focusing purely on these services, rather than covering both debt and equity markets



The matrix in **Figure 12.2** shows which funding options suit different business situations that companies may face.

FIGURE 12.2 FUNDING DECISION MATRIX

Business life cycle	Debt options									Equity options					
	Business credit card	Equipment finance	Export finance	Floorplan finance	Import finance	Invoice finance (debtor finance)	Merchant cash advance	Bank overdraft	Peer to peer lending	Bank loan	Trade finance	Online small business (fintech) loan	Angel investing	Crowd funding	Private equity
Start up – pre-trading									^	^		●			
Trading but not yet profitable	●	●	●	●	●	●	●	^	^	^	●	●	●	●	●
Growing – profitable or projected profits	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
Established, stable business	●	●	●	●	●	●	●	●	●	●	●				
Established business with stressed requirements	●	●	●	●	●	●	●	^	^	●	●			●	
What plans, needs or opportunities do you have right now?															
Start-up funding		*		*			^		^	^	●	●	●	●	●
Launch new product/expand territory/accept new opportunity		●		●	●	●	●	●	●	●	●	●	●	●	●
Expand internationally		●		●	●	●	●	●	●	●	●		●	●	●
Buy stock		●	●		●					●			●		●
Invest in new equipment	●				●		●	●	●	●	●			●	
Refinance existing loans/reduce borrowing cost or consolidate		●	●		●		●	●	●	●			●	●	
Improve cash flow	●		●		●	●	●	●	●		●	●	●	●	
Pay tax/creditors					●			●					●		●
Acquire another business					●				●					●	

* Pre approval to fund invoices once trading

^ Secured

Source: The Australian Small Business and Family Enterprise Ombudsman and Scottish Pacific Business Finance.

12.1a THE NEED TO FUND A FINANCIAL DEFICIT

Corporations everywhere are net dis-savers, which is an economic way of saying they demand more financial capital for investment than they supply in the form of retained earnings. Corporations must close this **financial deficit** by borrowing or by issuing new equity securities. Every major firm confronts four key financing decisions on an ongoing basis:

- 1 How much capital must the company raise each year?
- 2 How much should be raised externally rather than through retained earnings?
- 3 How much of the external funding should be raised through borrowing from a bank or another financial intermediary, and how much should be raised externally by selling securities directly to investors?
- 4 What proportion of the external funding should be structured as long-term debt, ordinary equity or preferred equity?

financial deficit
Occurs when a corporation requires more financial capital for investment than it supplies in the form of retained earnings

The answer to the first question depends on the capital budgeting process followed by a company, which would ideally raise enough capital to fund all its positive-NPV investment projects and to cover its working capital needs.

12.1b THE CHOICE BETWEEN INTERNAL AND EXTERNAL FINANCING

At first glance, the internal/external choice in Question 2 seems to be a decision that companies can make mechanically. The difference between total financing needs and internally generated funding equals the external financing requirement. Its *internally generated funds* are its **cash flow from operations**, calculated as net income plus depreciation and other non-cash charges minus dividends. So, the *external financing requirement* would equal the firm's capital expenditures plus change in net working capital minus its internally generated funding.

$$\text{External financing requirement} = (\text{Capital expenditures}) + (\text{Change in net working capital}) - (\text{Internally generated funding})$$

where:

$$\begin{aligned}\text{Internally generated funding} &= \text{Cash flow from operations} \\ &= (\text{Net income}) + \text{Depreciation} + (\text{Other non-cash charges}) - \text{Dividends}\end{aligned}$$

cash flow from operations
Cash inflows and outflows directly related to the production and sale of a company's products and services. Calculated as net income plus depreciation and other non-cash charges minus dividends

The external financing decision is not simple, however. Management may want to build up or reduce net working capital over time, and besides, its dividend policy is not fixed, except in the very short term. Additionally, there are higher legal and transactions costs to raising capital externally than to retaining internally generated funds. Not surprisingly, the residual nature of external financing needs implies that the amount required by a given company will be highly variable from year to year.

Internal cash flow is the dominant source of corporate funding in the United States, with businesses regularly financing two-thirds to three-quarters of all their capital spending needs internally. Over time, many other countries have also moved in the same direction. However, Chinese corporations still meet well over half of their total financing needs externally, primarily through bank borrowing, largely because they are growing faster than they can finance internally.

12.1c RAISING CAPITAL FROM FINANCIAL INTERMEDIARIES OR ON CAPITAL MARKETS

Does it matter whether a company raises capital by dealing with a financial intermediary or by selling securities directly to investors? Shouldn't a bank's money and an investor's money be perfect substitutes? In reality, a corporation's choice between intermediated and security market financing significantly influences its ownership structure. Before analysing this issue, we define a financial intermediary and briefly describe what it does.

What is a Financial Intermediary, and What Does It Do?

A *financial intermediary* (*FI*) is an institution, such as a bank, that raises capital by issuing liabilities against itself – for example, cheque accounts or savings accounts. The intermediary pools the capital that has been raised and uses it to make loans to borrowers or, where allowed, to make equity investments in other companies. Borrowers repay their loans to the intermediary and have no direct contact with the individual savers who provided funds to the intermediary. In other words, both borrowers and savers deal directly with the intermediary. Because of their role in serving both borrowers and savers, intermediaries specialise in credit analysis and collection. They offer financial products tailored to the particular needs of borrowers and savers.

The Role of Financial Intermediaries in US Corporate Finance

A general distrust of concentrated, private economic power has dramatically influenced US financial regulation. Throughout most of the twentieth century, policymakers discouraged the growth of large intermediaries (especially commercial banks), in part by imposing on them severe geographical restrictions. Congress passed the McFadden Act in 1927 to prohibit interstate banking. The tide began to change when enormous financial institutions formed overseas, making it more difficult for US institutions to compete. After numerous failed attempts to repeal the McFadden Act, in July 2004, US Congress finally approved a bill allowing full interstate branch banking. As a result, the number of US banks has significantly declined, primarily through mergers.

The second pivotal law affecting American US markets was the **Glass-Steagall Act**, passed in 1933 in response to perceived banking abuses during the Great Depression. This legislation mandated the separation of investment and commercial banking: it prohibited commercial banks from underwriting corporate security issues, from providing security brokerage services to their customers and even from owning voting equity securities on their own account. Banking's corporate financing role was effectively restricted to making commercial loans and providing closely related services, such as leasing. As with the McFadden Act, there were repeated attempts to repeal Glass-Steagall, and these finally succeeded in November 1999.

Non-bank FIs, such as insurance companies, pension funds and specialised finance companies such as General Electric Credit Corporation and General Motors Acceptance Corporation, also play important roles in US corporate finance, both as creditors and as equity investors.

The Corporate Finance Role of Non-US Financial Intermediaries

In markets outside the United States, commercial banks typically play much larger roles in corporate finance. In most countries, a handful of very large banks service most large firms, and the size and competence of these banks give them tremendous influence over corporate financial and operating policies. This power is further strengthened by the ability of most non-US banks to underwrite corporate security issues and to make direct equity investments in commercial firms. Most countries other than the United States also allow commercial banks to provide a full range of financial services.

This industry has a rich history, and in Europe it can trace its origins back to the Middle Ages or even earlier, when funding was needed to finance long trade journeys. The need for this type of funding grew, as the cross-border trading and shipping industries expanded in the seventeenth and eighteenth centuries. These institutions became known as *merchant banks*, a term that is still used in the UK today to refer to the British investment banks. Many of these started out as family-owned businesses, which were quite entrepreneurial in terms of the types of transactions they undertook. Many grew into large organisations, with multinational operations, but in the late twentieth century and early twenty-first century, the industry underwent substantial consolidation following various global financial crises. As a result, there are fewer merchant banks in operation today. An example of one of these merchant banks that is still in operation around the world is provided by Rothschild. This organisation can trace its origins back to the nineteenth

Glass-Steagall Act
US Congressional act
of 1933 mandating the
separation of investment
and commercial banking
(Act repealed 1999)

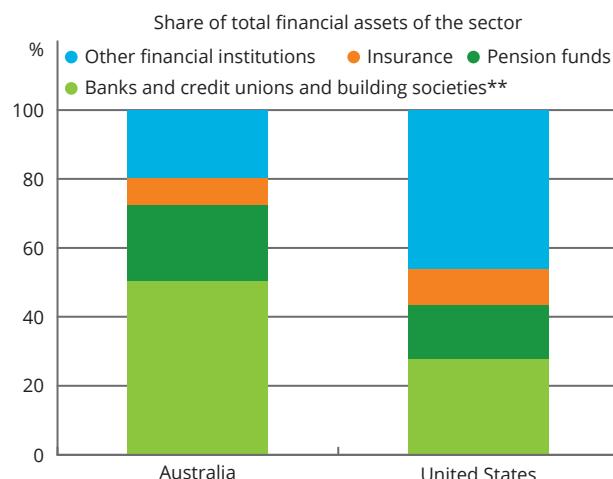
century. Although it has undergone various structural and name changes in France and the United Kingdom, it is still predominantly controlled by the founding family – the Rothschild family. In Australia, it provides some advisory services but is not a full-service investment bank, and focuses on mergers and acquisitions in the resources and utilities sectors.

A growing global trend in long-term financing in the past decade has been the increasing role played by private equity funds and hedge funds in the corporate finance scene. These FIs have become large financial backers for many deals, providing equity and **mezzanine debt** capital.

Financial Intermediaries in Australian Corporate Finance

The Australian market for long-term financing has developed as a hybrid, with some characteristics drawn from the US, UK and European markets. The domestic market tends to be more heavily dominated by the traditional banking sector, which provides the bulk of financing and accounts for the majority of the financial assets. In Australia, banks, building societies, credit unions, superannuation funds and insurers own around 80% of financial sector assets.¹ Their activities are regulated by the **Australian Prudential Regulation Authority (APRA)**. As **Figure 12.3** shows, this market structure is very different from the US market, where similar organisations only account for around half of the assets.

FIGURE 12.3 FINANCIAL SECTOR COMPOSITIONS FOR AUSTRALIA AND THE US*



*As at 30 June 2010; excludes the central bank and central borrowing authorities

**For the US, these comprise commercial banks, savings institutions and credit unions

Sources: ABS; APRA; Board of Governors of the Federal Reserve System; RBA

Source: Reserve Bank of Australia.

There are a variety of advisers who get involved with various aspects of raising long-term finance in Australia:

- *Corporate advisers and underwriters* provide advice about the corporate and strategic ramifications of raising funding.
- *Stockbrokers and investment banks* assist with transactions, providing industry and company analysis, valuations, advice on structuring, timing and pricing, and assisting with identifying and negotiating with potential investors.

mezzanine debt
A hybrid form of debt funding that is structured with some sort of equity component – for example, a convertible structure, like a warrant. This allows mezzanine investors to be placed ahead of equity investors in terms of seniority, should the company receiving funding fall into financial difficulty. However, it also gives the mezzanine investors the option to convert their investments into an equity stake and benefit from the upside of equity ownership, should the company become extremely successful

Australian Prudential Regulation Authority (APRA)

The Australian regulatory body responsible for overseeing the activities of banks, credit unions, building societies, general insurance, life insurance and reinsurance companies, friendly societies and most members of the superannuation industry

¹ *Financial Stability Review*, Reserve Bank of Australia, September 2012, RBA Shadow Banking System, Graph B1, p. 36.

- *Underwriters and stockbrokers* ensure that listed capital raisings will be successful by agreeing to take up any excess shares that are not sold.
- *Lawyers* assist with all the legal aspects, including advising on *ASX Listing rules*, *Corporations Act 2001* requirements, preparing prospectuses and managing the due diligence process (often in conjunction with the *investment banks*).

In addition, *accounting firms* provide auditing, reporting, valuation and taxation advice. Many accounting firms also provide similar services to investment banks, especially for smaller capital raisings.

Although it is nothing like the US market in size, the Australian listed equity market is one of the larger single country markets for raising listed equity around the world. As **Figure 12.4** shows, in the twelve months of 2019, the Australian Securities Exchange (ASX) accounted for 3.4% of global equity capital market activity by US \$ value, and 16.3% of the activity by number of deals. During the same period, the Asia-Pacific region (including both Australia and Japan) dominated the activity, accounting for 38.6% of activity by US\$ value and 51.7% by number of deals.

FIGURE 12.4 GLOBAL EQUITY CAPITAL MARKET (ECM) ACTIVITY, 2018–2019

DOMICILE NATION/REGION	1/1/2019–12/31/2019		1/1/2018–12/31/2018		YOY %
	PROCEEDS (\$MIL)	# OF DEALS	PROCEEDS (\$MIL)	# OF DEALS	
Global Equity & Equity-Related	677,129	4,577	698,461	4,969	-3%
United States	207,476	805	212,693	907	-2%
Asia Pacific ex Australia	216,300	1,445	199,719	1,585	8%
Australia	23,150	748	27,427	695	-16%
EMEA – Europe, Middle East & Africa	151,479	931	159,672	1,008	-5%
Japan	21,625	171	55,110	244	-61%
Latin America	34,515	67	16,924	37	104%
Global Common Stock	551,565	4,187	603,417	4,590	-9%
United States	158,224	694	171,138	792	-8%
Asia Pacific ex Australia	162,013	1,272	169,774	1,444	-5%
Australia	22,779	736	26,800	683	-15%
EMEA – Europe, Middle East & Africa	133,470	890	146,945	968	-9%
Japan	20,615	163	49,277	219	-58%
Global IPOs	171,324	1,123	200,880	1,395	-15%
United States	41,790	122	34,226	156	22%
Asia Pacific ex Australia	66,106	670	75,880	742	-13%
Australia	1,379	41	5,343	65	-74%
EMEA – Europe, Middle East & Africa	51,011	124	45,351	198	12%
Japan	4,025	91	28,791	97	-86%
Latin America	6,078	9	9,764	15	-38%
Global Convertible Offerings	125,564	390	95,044	379	32%
United States	49,252	111	41,555	115	19%
Asia Pacific ex Australia	54,287	173	29,945	141	81%
Australia	371	12	627	12	-41%
EMEA – Europe, Middle East & Africa	18,009	41	12,727	40	41%
Japan	1,010	8	5,833	25	-83%

Refinitiv report 'Global Equity Capital Markets Review Full Year 2019'.

12.1d THE EXPANDING ROLE OF SECURITIES MARKETS IN CORPORATE FINANCE

No trend in modern finance is as clear or as transforming as the worldwide shift towards corporate reliance on securities markets rather than intermediaries for external financing. Important observations related to external financing and the shift towards securities financing include:

- 1 **Primary issues**, the initial sale of a security by a firm to raise capital, have increased by a factor of more than 15 over the past 20 years.
- 2 **Secondary offerings**, the sale of previously issued securities, which are typically held in large blocks by one or more investors, raise no additional funds for the initial issuer.
- 3 The increase in security market financing reflects a trend towards **securitisation**, which involves the repackaging of loans and other traditional bank-based credit products into securities that can be sold to public investors.
- 4 *Initial public offerings (IPOs)*, which are the first public sales of a company's ordinary equity to outside investors, generally represent less than one-third of all ordinary equity sold in a given year. The remaining ordinary equity sales are *seasoned equity offerings (SEOs)*, which are new issues of ordinary equity by companies that have previously conducted an IPO, and therefore have existing shares trading in the market.
- 5 The credit crisis that began in 2008 caused the volume of almost every type of security issued to fall sharply. Issuances have rebounded somewhat since then.
- 6 Certain securities, most notably Eurobonds, cannot be offered in the United States, but can be sold to international investors. A **Eurobond** issue is a single-currency bond that is sold in several countries simultaneously. An example is a dollar-denominated bond issued by a US corporation and sold to European investors. Non-Australian dollar-denominated bonds issued outside Australia by an Australian company could be classed as Eurobonds, as could non-Australian dollar-denominated bonds issued in Australia by a non-Australian company. For example, in May 2012, BHP issued a two-part Eurobond note program, which comprised €1.25 billion in 2.125% coupon bonds due 2018, and €750 million in 3% coupon bonds due 2024.
- 7 A **foreign bond** is an issue that is sold by a non-resident corporation in a foreign country and is denominated in the host country's currency. An example is a Swiss franc-denominated bond sold in Switzerland by a Japanese corporate issuer. In most years **Yankee bonds**, dollar-denominated bonds issued by foreign firms in the US market, are the single largest category of foreign bonds. The Australian equivalents to these bonds are often referred to as **Kangaroo bonds** – these are issued in the Australian market by non-Australian companies, are denominated in Australian dollars and are subject to Australian laws and regulations.
- 8 **International ordinary equity**, issues that are sold in more than one country by non-resident corporations, typically represents between 5% and 10% of all worldwide offerings.

Equity capital raisings are conducted by the equity capital market (ECM). Activity in this market can be quite volatile, as can be seen from **Figure 12.5**, which shows the volume and value of transactions undertaken by the Asia Pacific market (excluding Japan) every year over the 10 years to 2019 (although part of this volatility may reflect changes in US\$ values). The market mainly comprises IPOs which occur when companies first list, and follow-on deals, which relate to subsequent capital raisings and convertibles and which refer to the issuance of debt instruments that can be converted to equity instruments, once certain conditions are met. Convertibles are often used by companies with a reduced credit rating because they can be issued at a discounted interest rate (companies with poor credit ratings will typically need to pay a premium on standard interest rates to borrow in debt markets). They have the added advantage that, once they are

primary issues

Initial sale of securities by a firm to raise capital

secondary offerings

The sale of previously issued securities, which are typically held in large blocks by one or more investors, and raises no additional funds for the initial issuer

securitisation

The repackaging of loans and other traditional bank-based credit products into securities that can be sold to public investors

Eurobond

A bond issued by an international borrower and sold to investors in countries with currencies other than that in which the bond is denominated

foreign bond

A bond issued in a host country's financial market, in the host country's currency, by a non-resident corporation

Yankee bonds

Bonds sold by foreign corporations to US investors

Kangaroo bonds

Bonds sold by foreign corporations to Australian investors, issued in the Australian market, denominated in Australian dollars and subject to Australian laws and regulations

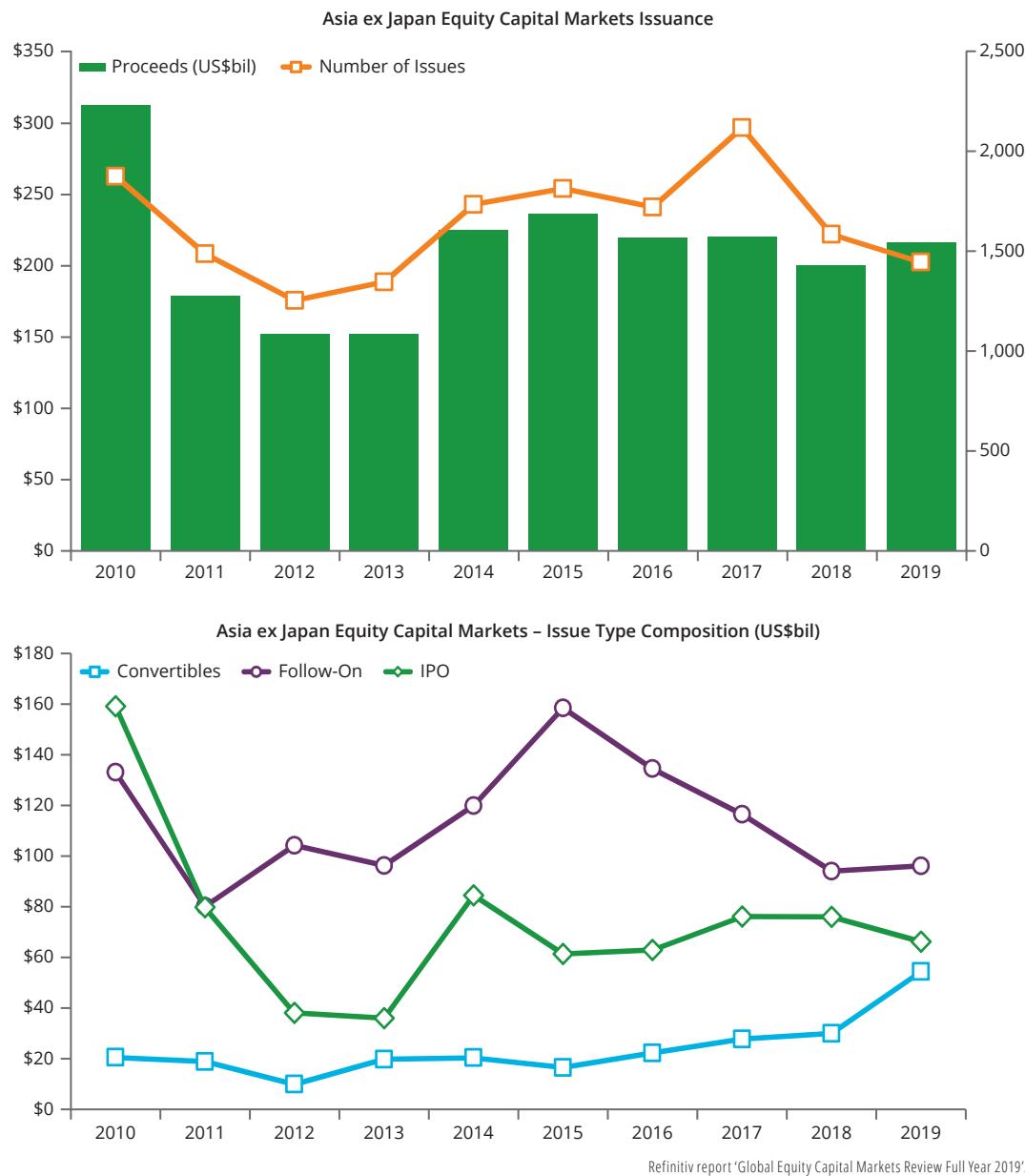
international ordinary equity

Equity issues sold in more than one country by non-resident corporations

converted, the company no longer bears the liability of having to pay back the capital. However, conversion will dilute the existing equity holdings, since it will increase the issued equity of the company.

It is interesting to note that, although the value of proceeds raised during IPOs was higher than the amount raised in follow-on transactions in 2010, that trend has been reversed since, with follow-on capital raisings accounting for a larger proportion of the capital raised in subsequent years. Furthermore, convertibles have accounted for an increased proportion of the amount raised in recent years (and these accounted for almost as much as IPOs in 2019).

FIGURE 12.5 A DECADE OF ASIA-PACIFIC EQUITY CAPITAL MARKET (ECM) ACTIVITY



LO12.1

CONCEPT REVIEW QUESTION

- 1 What are financial intermediaries, and what role do these firms play in providing long-term capital to publicly traded corporations?

LO12.2

12.2 INVESTMENT BANKING AND THE PUBLIC SALE OF SECURITIES

Although corporations around the world rely on internal financing for most of their funding, companies also raise large amounts of capital externally each year. Once corporate managers have decided to raise external capital and to raise equity rather than debt, they usually enlist an investment bank to help sell the firm's securities. Issuing firm managers can either negotiate privately with individual banks regarding the terms of the equity sale, or they can solicit competitive bids for the business. On behalf of firms, investment banks can issue shares to a small group of sophisticated investors in a private placement, they can issue new shares to existing shareholders through a rights offering or they can engage in a much broader public share offering that reaches domestic as well as international investors.

The investment banks that are ranked highest each year in terms of the total amount of money raised typically include the same group of firms. Among them are Bank of America Merrill Lynch, J. P. Morgan, Barclays Capital, Citigroup, Deutsche Bank, Goldman Sachs, Morgan Stanley, Credit Suisse and UBS. These firms are perennial members of investment banking's prestigious **bulge bracket**, firms that generally occupy the lead or co-lead manager's position in large, new security offerings, meaning that they take primary responsibility for the new offering (even though other banks participate as part of a *syndicate*). As a result, they earn higher fees. Investment banks are compensated with an *underwriting spread*, the difference between the price at which the banks sell shares to investors and the price at which they purchase shares from firms. You can readily identify the lead investment bank in a security offering by looking at the offering *prospectus*, the legal document that describes the terms of the offering. The lead bank's name appears on the front page, usually in larger, bolder print than the names of other participating banks.

bulge bracket
Consists of firms that generally occupy the lead or co-lead manager's position in large, new security offerings

EXAMPLE

A Typical Prospectus Title Page

Figure 12.6 presents the prospectus title page for the March 2010 initial public share offering by Financial Engines, Inc., a leading US provider of independent, technology-enabled portfolio management services, investment advice and retirement help to participants in employer-sponsored defined contribution retirement plans. The lead underwriters were Goldman Sachs and UBS Investment Bank. Both firms are perennial members of investment banking's bulge bracket. Piper Jaffray and Cowen and Company are also

important underwriters for this offering, though these companies are not routinely members of investment banking's bulge bracket. The title page also shows an underwriting discount of \$0.84 per share and an offer price of US\$12.00 per share, for a percentage discount of 7.00% ($\text{US\$0.84} \div \text{US\$12.00}$). The underwriters thus stood to receive total compensation of US\$8,904,000 for their efforts in this underwriting. This represented a fairly normal underwriting discount for an offering of this size.

FIGURE 12.6 IPO ANNOUNCEMENT

10,600,000 Shares


Common Stock

This is an initial public offering of shares of common stock of Financial Engines, Inc.

Financial Engines is offering 5,868,100 of the shares to be sold in the offering. The selling stockholders identified in this prospectus are offering an additional 4,731,900 shares. Financial Engines will not receive any of the proceeds from the sale of the shares being sold by the selling stockholders.

Prior to this offering, there has been no public market for the common stock. Our common stock has been approved for listing on The Nasdaq Global Market under the symbol "FNGN."

See "Risk Factors" on page 15 to read about factors you should consider before buying shares of the common stock.

Neither the Securities and Exchange Commission nor any state securities commission has approved or disapproved of these securities or determined if this prospectus is truthful or complete. Any representation to the contrary is a criminal offense.

	Per Share	Total
Initial public offering price	\$ 12.00	\$127,200,000
Underwriting discounts and commissions	\$ 0.84	\$ 8,904,000
Proceeds, before expenses, to Financial Engines	\$ 11.16	\$ 65,487,996
Proceeds, before expenses, to the selling stockholders	\$ 11.16	\$ 52,808,004

To the extent that the underwriters sell more than 10,600,000 shares of common stock, the underwriters have the option to purchase up to an additional 1,590,000 shares from Financial Engines at the initial public offering price less the underwriting discounts and commissions.

The underwriters expect to deliver the shares against payment in New York, New York on March 19, 2010.

Goldman, Sachs & Co.

UBS Investment Bank

Piper Jaffray

Cowen and Company

Prospectus dated March 15, 2010

Source: SEC

Underwriting spreads vary considerably depending on the type of security being issued. Banks charge higher spreads on equity issues than on debt issues. They also charge higher spreads for *unseasoned equity offerings* (that is, IPOs) than they do for *seasoned equity offerings*. In general, the riskier the security being offered, the higher the spread charged by the underwriter. Securities that have both debt- and equity-like features, such as convertible bonds and preferred shares, have spreads that are higher than those of ordinary debt but lower than those of ordinary shares.

Spreads on non-US IPOs tend to be significantly lower than on US initial offers. In part, this reflects differences in underwriting practices across countries. To assess demand for a company's shares and to set the offer price, US underwriters typically use a process known as **book building**, in which underwriters ask prospective investors to indicate their demand for the offering. Through conversations with investors, the underwriter tries to measure the demand curve for a given issue, and the investment bank sets the offer price after gathering all the information it can from investors. Book building has become increasingly common in international markets, but a method called a **fixed-price offer** also survives. In fixed-price offers, underwriters set the final offer price for a new issue weeks in advance. This imposes more risk on the underwriters, for which they must either charge higher spreads or price the shares far below the expected post-offer price. Thus, the observed spreads are actually lower on fixed-price offers than in book-built offerings.

In Australia, both book building and fixed-price offers are common. Companies usually rely on their stockbrokers or investment banks to provide advice on the most appropriate method, as well as the most appropriate offer price, the number of shares to be issued at the IPO and its structure, size and timing.

Since investment banks compete for business by getting recognition of their deals, publicity is often an important aspect of many of the deals they complete. Various organisations publish league tables to show how different market participants rank against each other. If a financial intermediary has achieved a high ranking, they may use these league tables as part of their credentials for winning further business. **Figure 12.7a** and **Figure 12.7b** provide examples of league tables for the Australian and New Zealand capital markets.

FIGURE 12.7A AUSTRALIAN BOND ISSUANCE LEAGUE TABLE, 2018 AND 2019

FIRM RANK	FY 2019			FY 2018			CHG(%)
	MKT SHARE(%)	VOLUME (AUD MLN)	DEAL COUNT	PREV RANK	PREV MKT	SHARE(%) MKT SHARE	
ANZ Banking Group	1	18.711	23,341	108	1	18.266	0.445
Westpac Banking	2	17.265	21,538	111	3	13.719	3.546
National Australia Bank	3	16.775	20,926	102	2	14.297	2.478
Commonwealth Bank Australia	4	9.734	12,143	71	4	11.561	-1.827
UBS	5	6.009	7,496	32	5	7.317	-1.308
TD Securities	6	5.063	6,316	64	6	5.736	-0.673
Nomura	7	4.177	5,210	58	10	3.091	1.086
RBC Capital Markets	8	3.437	4,288	40	9	3.613	-0.176
Deutsche Bank	9	3.233	4,033	28	7	5.671	-2.438
JP Morgan	10	2.396	2,989	28	11	2.128	0.268
Mizuho Financial	11	2.112	2,634	32	12	1.667	0.445
HSBC	12	1.783	2,224	25	14	1.119	0.664
Citi	13	1.523	1,900	15	8	4.617	-3.094
Bank of China	14	0.820	1,022	9	22	0.199	0.621

book building

A process in which underwriters ask prospective investors to reveal information about their demand for the offering

fixed-price offer

An offer in which the underwriters set the final offer price for a new issue weeks in advance



FIRM RANK	FY 2019				FY 2018		
	MKT SHARE(%)	VOLUME (AUD MLN)	DEAL COUNT	PREV RANK	PREV MKT	SHARE(%) MKT SHARE	CHG(%)
Morgan Stanley	15	0.793	990	6	16	0.609	0.184
BofA Securities	16	0.681	850	2	-	-	0.681
Mitsubishi UFJ Financial Group Inc	17	0.675	842	8	23	0.196	0.479
Morgans	18	0.624	778	5	15	0.794	-0.170
Macquarie	19	0.598	746	6	37	0.070	0.528
DBS Group	20	0.404	504	4	18	0.376	0.028
TOTAL		100%	124,745	378		100%	

This table consists of debt securities denominated in Australian Dollars, with market type 'Australian', 'Domestic' or 'Domestic MTN.' This excludes asset-backed securities, bonds with warrants, convertible securities, and credit-linked notes. There is a minimum threshold of 12 months for maturities, call or put periods and USD 50MM minimum amount for self-led securities. Please see League Table Standards and Guidelines for further details.

Source: Bloomberg, 'Australia/New Zealand Capital Markets League Tables FY 2019', preliminary as of 23 December 2019,
<https://data.bloomberg.com/professional/sites/10/Bloomberg-AUNZ-Capital-Markets-Preliminary-League-Tables-FY-2019.pdf>. Accessed 4 January 2020

FIGURE 12.7B AUSTRALIAN AND NEW ZEALAND EQUITY AND RIGHTS ISSUANCE LEAGUE TABLE, 2018 AND 2019

FIRM	FY 2019				FY 2018		
	RANK	MKT SHARE(%)	VOLUME (USDMLN)	DEAL COUNT	PREV RANK	PREV MKT SHARE(%)	MKT SHARE CHG(%)
UBS	1	24.585	6,030	50	1	24.314	0.271
JP Morgan	2	11.245	2,758	27	5	5.422	5.823
Citi	3	8.771	2,151	13	4	6.911	1.860
Macquarie	4	6.211	1,523	25	2	15.230	-9.019
Morgan Stanley	5	6.108	1,498	11	3	10.111	-4.003
Bell Potter Securities Ltd	6	4.532	1,111	85	7	3.752	0.780
Goldman Sachs	7	3.988	978	13	10	1.996	1.992
Moelis & Co	8	2.883	707	22	15	1.219	1.664
Credit Suisse	9	2.797	686	10	19	0.633	2.164
Morgans	10	2.636	647	48	8	3.004	-0.368
Ord Minnett Ltd	11	2.612	641	25	11	1.979	0.633
RBC Capital Markets	12	2.121	520	10	30	0.258	1.863
Deutsche Bank	13	2.030	498	6	6	4.668	-2.638
BofA Securities	14	1.858	456	3	-	-	1.858
Taylor Collison Ltd	15	1.825	448	42	13	1.678	0.147
Wilsons Corporate Finance Ltd	16	1.671	410	14	14	1.430	0.241
Shaw & Partners Ltd	17	1.630	400	25	21	0.558	1.072
Canaccord Genuity	18	1.217	299	35	16	1.173	0.044
National Australia Bank	19	1.186	291	6	17	1.151	0.035
Commonwealth Bank Australia	20	1.044	256	8	26	0.361	0.683
TOTAL		100%	24,526	747		100%	

This table consists of equity & rights offerings issued by Australian or New Zealand issuers. This excludes self-led offerings. Note: Issuer country is determined by country of risk. Please see League Table Standards and Guidelines for further details.

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12.2a CONFLICTS OF INTEREST FACING INVESTMENT BANKS

The institutional arrangements for selling securities to the public, as described above, confront investment banks with potential conflicts of interest. Banks are providing advice and underwriting services to companies that want to issue securities. On the one hand, issuing firms want to obtain the highest possible price for their shares. But they also want favourable coverage from their investment banks' research analysts, who produce reports that are intended to advise clients on whether securities are fairly priced. Investors, on the other hand, want to purchase securities at the lowest price possible, but they also value dispassionate, unbiased advice from analysts. Investment bankers must therefore walk a thin line, in terms of both ethics and economics, when attempting to please their constituents. Firms issuing securities are wise to bear this in mind. Investment bankers deal with investors, particularly institutional investors such as mutual funds, on a repeated basis. They must approach this group each time they bring a new offering to market. In contrast, over the life of a firm, there is just one IPO and perhaps a few SEOs.

Banks struggle with these conflict-of-interest problems; instead, they must price new security issues to strike a balance between the revenue maximisation goal of the issuing firms and the profit maximisation objective of their investing clients. Of course, lawmakers and regulators recognise that the investment banking business is susceptible to conflict-of-interest problems, and so there is an extensive set of rules that impose constraints on how securities may be sold. The Facebook IPO debacle (discussed in Chapter 20) provides an example of these issues. As a result of litigation in relation to the Facebook IPO, Nasdaq OMX Group agreed to settle a class-action lawsuit for US\$26.5 million, in addition to a penalty of US\$10 million paid to the US Securities and Exchange Commission.² The lead investment bankers behind the IPO, Morgan Stanley, were also fined US\$5 million for their part in allowing investment bankers to influence the activities of investment research analysts, who were supposed to provide independent research about the equity issue.

Now we turn to a brief overview of the legal environment surrounding security issues.

12.2b LEGAL RULES GOVERNING PUBLIC SECURITY SALES

The basis for the regulation of the sale of securities is the concept of **full disclosure**, which means that issuers must reveal all relevant information concerning the company selling the securities and the securities themselves to potential investors.

Given the emphasis that securities law places on disclosure, it is not surprising that investment banks are required to perform **due diligence** examinations of potential security issuers. This means that they must search out all relevant information about an issuer before selling securities to the public. Investors can sue underwriters if they do not perform adequate due diligence; of course, in such cases, the underwriter's reputation suffers as well. The fact that investment banks are willing to underwrite an issue provides valuable **certification** that the issuing company is in fact disclosing all material information.

In Australia, financial markets are regulated by the *Corporations Act 2001*, which is administered by the Australian Securities and Investments Commission (ASIC) under the *Australian Securities and Investments Commission Act 2001*. Companies choosing to raise funds in Australia need to follow the various rules and regulations set out by ASIC, and these are available on the ASIC website (<http://www.asic.gov.au>). The principal disclosure document for all public security offerings is the prospectus. In addition, companies wishing to raise funds through the listed equity market need to follow the ASX Listing Rules, which are available on the ASX website (<https://www.asx.com.au/index.htm>). Companies need to meet certain criteria before they are eligible to apply for listing on the ASX. The minimum listing criteria are summarised in **Figure 12.8**.

full disclosure
Requires issuers to reveal all relevant information concerning the company selling the securities and the securities themselves to potential investors

due diligence
Examination of potential security issuers in which investment banks are legally required to search out and disclose all relevant information about an issuer before selling securities to the public

certification
Assurance that the issuing company is in fact disclosing all material information

2 'NASDAQ to Settle Facebook IPO Lawsuit for \$26.5 Million'. *Reuters*, 23 April 2015. <http://www.reuters.com/article/us-nasdaq-omx-facebook-litigation-idUSKBNONE1FD20150423>. Accessed 15 December 2015.

FIGURE 12.8 MINIMUM LISTING CRITERIA FOR THE ASX

ADMISSION CRITERIA		GENERAL REQUIREMENT
Number of shareholders		Minimum 300 non-affiliated investors @ A\$2,000
Free float		20%
Company size	Profit test or Assets test	A\$1 million aggregated profit from continuing operations over past 3 years – A\$500,000 consolidated profit from continuing operations over the last 12 months
		A\$4 million net tangible assets or A\$15 million market capitalisation

Note: This is a general guide to listing requirements and is not exhaustive, nor a guarantee of a successful listing application. For full details of the ASX Listing Rules please refer to ASX Compliance at <http://www.asx.com.au/regulation/rules/asx-listing-rules.htm>.

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Figure 12.9 shows the steps that companies usually need to complete as part of the listing process on the ASX.

FIGURE 12.9 THE LISTING PROCESS IN AUSTRALIA

Pre-IPO structuring matters for consideration include a review of the board composition, determining the ideal legal structure for the float, and identifying the businesses within the group that will be included or not included. The listing process usually involves the following steps:

Step 1	Appoint and consult with advisers Underwriters, stockbrokers Corporate advisers Accountants Lawyers Experts
Step 2	Preparation of prospectus and due diligence Detailed company examination carried out by: Management Company directors Appointed advisers Underwriters
Step 3	Institutional marketing program commences Preliminary stages – guidance on general IPO process Advanced stages – guidance on ASX Listing rules
Step 4	Lodge prospectus. An exposure period of seven days commences, during which the prospectus is made available for public comment. This can be extended to 14 days by ASIC.
Step 5	Apply to list with the ASX (Listing application must be lodged within seven days of lodging the prospectus with ASIC.)
Step 6	Marketing and offer period (Average of three to four weeks)
Step 7	Offer closes, shares allocated, trading commences

ASX, <http://www.asx.com.au/cs/media-centre.htm>.

If the purpose of the offering is to allow an existing shareholder to sell a large block of shares to new investors, the issue is a *secondary offering* and raises no capital for the firm. If the shares offered for sale are newly issued shares, which increase the number of outstanding shares and raise new capital for firms, the issue is a *primary offering*. If some of the shares come from existing shareholders and some are new, the issue is a *mixed offering*.

The process is similar in New Zealand, where the key regulators are the NZX Market Supervision, the NZX Markets Disciplinary Tribunal and the Financial Markets Authority. The NZX Market Supervision supervises

market participants and issuers, and assists the Financial Markets Authority under the *Securities Markets Act 1988*. The NZX Markets Disciplinary Tribunal investigates and enforces matters in relation to the conduct of parties regulated by NZX's market rules, and the Financial Markets Authority enforces applicable securities, financial reporting and company law.



A Primary and a Secondary Offering of Shares

The Financial Engines IPO was a mixed offering. The company itself was issuing 5,868,100 new shares to raise US\$70.42 million, and intended to use the net proceeds from this offering for

general corporate purposes, including working capital and capital expenditures. A group of existing shareholders sold an additional 4,731,900 shares, netting themselves US\$56.78 million.

Ongoing Regulatory Requirements for a Publicly Traded Company

Once a company successfully completes an IPO and lists its shares for trading on an exchange, it becomes subject to all the costs and reporting requirements of a public company. These include cash expenses, such as exchange-listing fees and the cost of preparing and distributing proxies, annual reports and other documents to shareholders. Additionally, public companies must hold general shareholders' meetings at least once each year and must obtain shareholder approval for important decisions, such as approving a merger, authorising additional shares and approving new share option plans. The most costly regulatory constraints on public companies are the disclosure requirements for the firm, its officers and directors, and its principal shareholders. In essence, the company must report any material change in its operations, ownership or financing. Once a firm goes public, life becomes very public indeed.

LO12.2

CONCEPT REVIEW QUESTIONS

- 2 What does the term 'bulge bracket' mean?
- 3 What is the guiding principle behind most securities' legislation? What role does the security registration process play in implementing this philosophy?

LO12.3

12.3 THE MARKET FOR INITIAL PUBLIC OFFERINGS (IPOS)

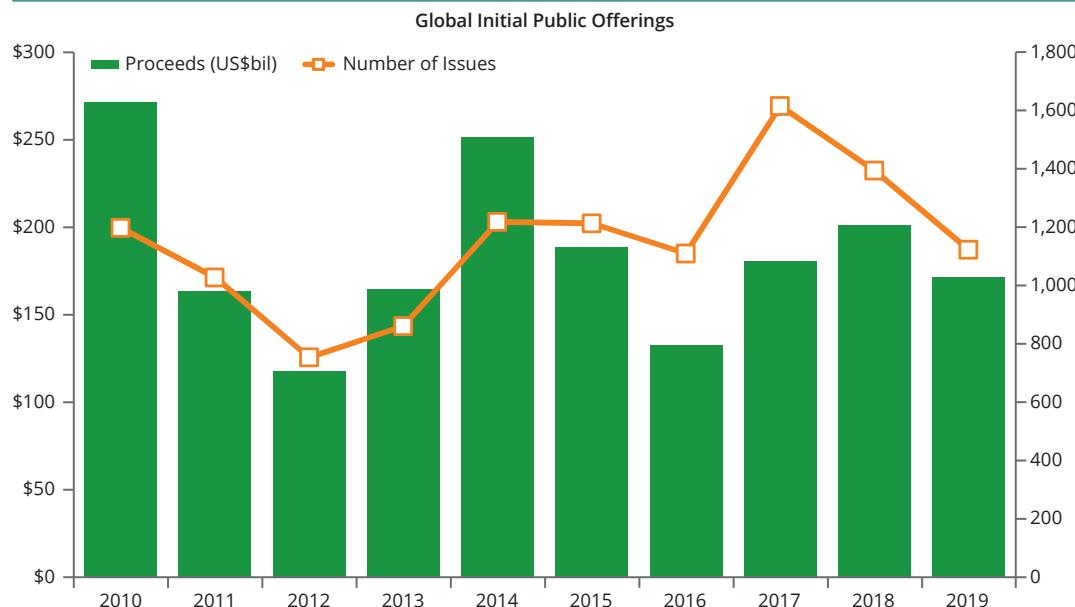
Given its role in providing capital market access to entrepreneurial growth companies, the US initial public offering (IPO) market has long been considered a vital economic and financial asset. Indeed, a welcoming IPO market has been a key building block of American success in high-technology industries. In Australia, the IPO market has been particularly important in promoting the growth of sectors like biotechnology, healthcare and information technology, as well as providing funding options for the resources and mining sector.

For at least the past 10 years, global IPO markets have been quite volatile, as can be seen from **Figure 12.10**. As this figure highlights, this volatility also seems to display substantial seasonality, varying from quarter to quarter from 2014 to 2019.

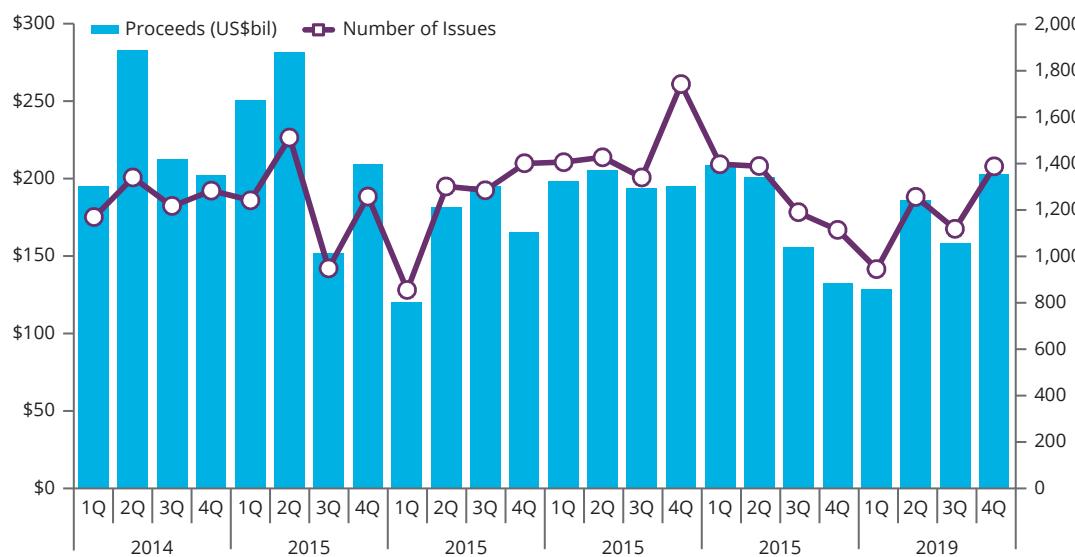
The US market share of global IPOs has been in decline. According to research by Doidge, Karolyi and Stulz, the US share of the worldwide IPO market (in terms of the number of IPOs) fell from close to 60%

in 1990 to roughly 20% in 2007. Given its size and history, the US IPO market provides useful lessons for understanding the domestic market. However, as we saw earlier in [Figure 12.4](#), the Asia-Pacific region has taken over as the leading region for ECM activity, including IPOs. In 2019, the Asia-Pacific region (including Australia and Japan) accounted for 41.7% of IPOs by US\$ value, and 71.4% of the total number of IPOs.

FIGURE 12.10 GLOBAL IPO ACTIVITY



Global Equity and Equity-Related Volume



Refinitiv report 'Global Equity Capital Markets Review Full Year 2019'.

12.3a PATTERNS OBSERVED IN THE US IPO MARKET

To the uninitiated, some quick facts about the US IPO market reveal some very interesting patterns:

- 1 The IPO market is highly cyclical. Over time, aggregate IPO volume shows a very distinct pattern of boom and bust. [Figure 12.5](#) shows that the Australian market displays similar characteristics.
- 2 There is a tendency for firms going public in a certain industry to cluster in time. It is common to see bursts of IPO activity in fairly narrow industry sectors, such as energy, biotechnology and communications, and, more recently, social networking companies. Perhaps the most famous of these industry IPO waves occurred in the late 1990s, when the market witnessed an incredible boom in both the number of internet companies going public and the valuations assigned to them by the market. The Australian market has experienced similar, albeit much smaller, industry IPO clusters. The recent mining industry IPO wave is more unique to the Australian market, reflecting the importance of resources in this economy. However, some of this activity has been masked by the reverse-listing phenomenon, which occurred in the past decade. Via this process, many smaller mining and resource companies obtained listed entity status by taking over Australian listed technology companies that were effectively shell companies, since they had ceased trading during the technology bust in the early to mid-2000s.
- 3 As recently as the early 1980s, investment banks targeted initial offerings almost exclusively at individual investors, particularly at retail customers of the brokerage firms involved in the underwriting syndicate. Since the mid-1980s, however, institutional investors have grown in importance, and they generally receive half to three-quarters of the shares offered in the typical IPOs and up to 90% or more of the hot issues.
- 4 Over the past two decades, numerous international companies raised capital in the US IPO market. Both established international companies and non-US entrepreneurial firms frequently make initial stock offerings to US investors, either publicly via a straight IPO or to institutional investors through a [Rule 144A offering](#). This special type of offering allows issuing companies to waive some disclosure requirements by selling stock only to sophisticated institutional investors, who may then trade the shares among themselves.



Share Price Volatility in extremis

In 1999 the short-term share-price increases for internet-related IPOs had financial experts scratching their heads, none more so than the 9 December 1999 debut of VA Linux. The US company went public with an offer price of US\$30 per share; after one trading day, the stock closed at almost US\$240 per share. For investors who bought shares at the offer price and sold them

as soon as possible, the one-day return was an astronomical 700%. Investors who held on for the long term did not fare as well. After the IPO, the stock closed above US\$240 only once, and it fell to an intra-day low of 54 cents on 24 July 2002. By August 2011, the company, now renamed Geeknet, Inc., saw its stock trading at less than 1% of its original IPO date value.

Rule 144A offering

A special type of offering in the US market, first approved in April 1990, that allows issuing companies to waive some disclosure requirements by selling stock only to sophisticated institutional investors, who may then trade the shares among themselves

12.3b THE INVESTMENT PERFORMANCE OF US INITIAL PUBLIC OFFERINGS

Are IPOs good investments? The answer seems to depend on the investment horizon of the investor and whether or not the investor can purchase IPO shares at the offer price. If an investor can buy shares at the

flip

To buy shares at the offer price and sell them on the first trading day

IPO underpricing

Occurs when the offer price in the prospectus is consistently lower than what the market is willing to bear

IPO initial return

The gain (or loss) when an allocation of shares from an investment banker is sold at the first opportunity

offer price and then **flip** them – sell them on the first trading day – then the returns on IPOs are on average substantial. But if the investor buys shares in the secondary market and holds them for the long term, the average returns are much less rewarding.

Positive Initial Returns for IPO Investors (Underpricing)

Year in and year out, in virtually every country around the world, including Australia, the very short-term returns on IPOs are surprisingly high. In the United States, the share price in the typical IPO closes roughly 15% above the offer price after just one day of trading. Researchers refer to this pattern as **IPO underpricing**, meaning that the offer price in the prospectus is consistently lower than what the market is willing to pay. To capture this **initial return**, an investor must be fortunate enough to receive an allocation of shares from the investment banker and to sell those shares at the first opportunity. Investors who buy IPO shares when open-market trading begins usually receive much smaller returns, and take on much greater risks, than do investors who participate in the initial offering.

Clearly, underpricing is a pervasive phenomenon. However, the long-run performance of IPOs presents a different puzzle.



Some IPO Prices and Their Subsequent Histories

The US-based maker of fashion accessories, Vera Bradley, went public by selling shares in an IPO on 21 October 2010. Shares in the company were offered to initial investors at US\$16, but after one trading day the company's share price stood at US\$24.85 – a one-day gain of more than 55%. Even investors who purchased shares on the open market fared well, as Vera Bradley's shares doubled in the six months following its IPO.

Contrast that performance with the experience of Mecox Lane, an e-commerce fashion retailer in China. Mecox conducted an IPO on the Nasdaq in October 2010 and saw its share price rise from the US\$11 offer price to US\$17.50 on its first day (a gain of 59%). However, Mecox's share price fell by more than 50% in the firm's first six months as a public company, trading below US\$6 per share by May 2010.

Negative Long-Term IPO Returns

Early research on the long-run performance of IPOs has not been encouraging for investors. It showed that investors who buy IPO shares at the end of the first month of trading and then hold these shares for five years thereafter fare much worse than they would have by purchasing the shares of comparable, size-matched firms. On average, investors' net returns are more than 40% *below* what they would have earned after five years of alternative equity investments.

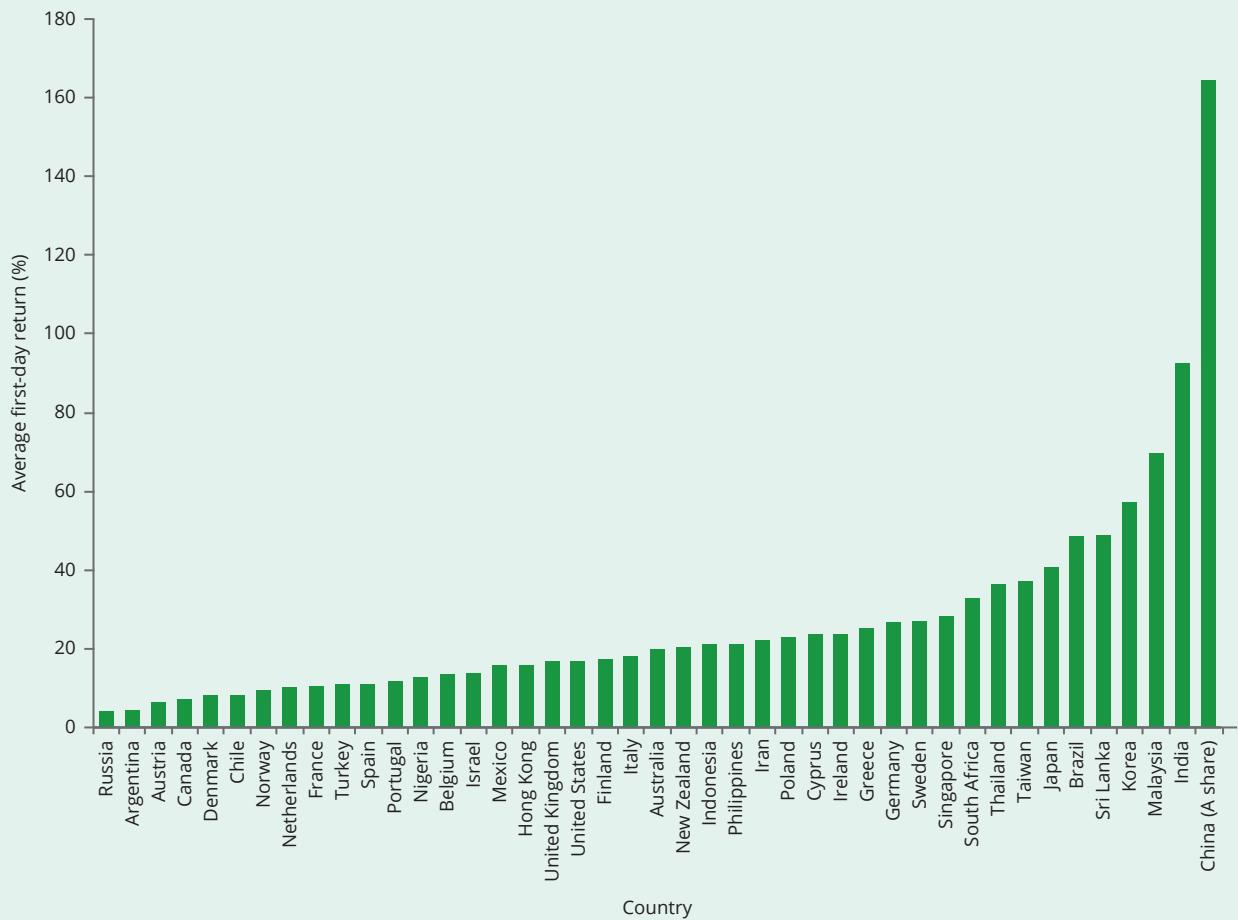
These findings are controversial because they challenge the notions that investors are rational and financial markets efficient. More recent research casts doubt on this long-run underperformance for IPO shares. Studies conclude that most IPOs do not yield significant long-run underperformance – provided that IPO returns are compared to an appropriate benchmark. In particular, a compelling case is made that much of the observed underperformance can be explained by leverage effects and risk reductions resulting from the IPO itself. Raising new equity capital via an IPO reduces the firm's leverage and its financial risk, so investors will accept a lower required return subsequent to the offering. On balance, we conclude that IPOs tend to earn normal long-term returns. Given these conflicting findings, we cannot yet draw firm conclusions about the long-run return on IPO shares.



FINANCE IN THE REAL WORLD

AVERAGE FIRST-DAY RETURNS ON IPOS FOR 43 COUNTRIES

Significantly positive initial returns on IPOs are observed in many countries. As this figure shows, IPO underpricing is observed in at least 43 countries; all show significant underpricing, and 24 of these countries have mean initial returns that are greater than the US average. The average level of underpricing varies greatly across countries – from about 5% in Russia and Argentina to about 100% in India to an amazing 170% in China.



12.3c NON-US INITIAL PUBLIC OFFERINGS

Relative to activity in the United States, the global market for IPOs has been growing rapidly for many years. In terms of both the number of firms going public and the total capital raised, the US share of the worldwide IPO market has been in decline for many years. Yet many of the same investment anomalies documented in the United States are also observed internationally, and this is applicable to Australia and New Zealand. First, non-US private-sector IPOs also demonstrate significant first-day returns that are often much higher than for US IPOs. The figure in the ‘Finance in the Real World’ box above summarises IPO underpricing studies from

43 different countries; all show significant underpricing, and 24 have mean initial returns that are greater than the US average.

A second anomaly, common to both US and international IPOs, is that initial international offers also may yield negative long-term returns. However, studies of non-US long-run returns are subject to all the methodological problems bedevilling US studies (and perhaps even more), so it is unclear whether international IPOs truly underperform or not.

Third, popular non-US issues also tend to be heavily oversubscribed, and the allocation rules mandated by national law or exchange regulations largely determine which investors capture the IPO initial returns. In many developing markets, there is a shortage of easily accessible investment opportunities. This can create pent-up demand, meaning that when IPOs occur, they are often substantially oversubscribed (meaning that there are not enough shares issued to meet the demand). This pushes up the post-IPO prices, as can be seen in the previous ‘Finance in the Real World’ box showing average first-day returns on IPOs for 43 countries. According to these results, the countries with the highest first-day returns tend to be developing markets, with China and India being the worst offenders.

Fourth, hot-issue markets are as prevalent internationally as in the United States. Finally, taxation issues (particularly capital gains tax rules) significantly affect how issues are priced and/or which investors the offers are targeting.

Some international IPO markets do, however, differ in important ways from US markets. For example, many governments impose politically motivated mandates on firms wishing to go public, requiring them to allocate minimum fractions of the issue to their employees or to other targeted groups. Furthermore, the net effect of pricing restrictions in many countries is to ensure that IPOs are severely underpriced; this is especially common in countries where shares must be priced on a par-value basis and/or where minimum dividend payouts are mandated. Some governments (even in advanced economies like Japan’s) routinely prohibit companies from making IPOs during periods when market conditions are unsettled and/or require explicit permission to be obtained before an IPO can be launched. Many countries require that initial offering prices be set far in advance of the issue, which usually means that offerings that actually proceed tend to be highly underpriced. Finally, non-US entrepreneurs often have different motivations for taking firms public than do owners or managers of US private companies. Whereas many US companies go public in order to acquire the equity capital needed to finance rapid growth, continental European entrepreneurs go public mainly to rebalance their firms’ capital structures and to achieve personal liquidity. Entrepreneurs from Australia and New Zealand tend to have similar motivations to those from the UK, since they operate under very similar regulatory and legal frameworks. These motivations tend to be closer to those of US entrepreneurs. This might be one of the factors that explains why IPOs from the UK, US, Australia and New Zealand displayed a similar level of underpricing in the chart included in the ‘Finance in the Real World’ box.

On a more balanced note, most other countries place fewer restrictions on pre-offer marketing and dissemination of information than do US regulators.

12.3d INTERNATIONAL SHARE ISSUES

Although the international market for ordinary equity is not, and probably never will be, as large as the international market for debt securities, cross-border trading and issuance of ordinary equity have increased dramatically since 1990. Much of this increase can be attributed to a growing desire on the part of institutional and individual investors to diversify their investment portfolios internationally. Foreign shares currently account for a small fraction of US institutional holdings and of holdings in other developed economies, but it is likely that this total will grow in the years ahead.

Besides issuing shares to local investors, corporations have also discovered the benefits of issuing equity outside their home markets. For example, several top US multinational companies have chosen to list their stock in half a dozen or more stock markets. Issuing stock internationally broadens the ownership base and helps a company integrate itself into the local business scene. A local stock listing increases local business press coverage and also serves as effective corporate advertising. Furthermore, having locally traded shares can facilitate corporate acquisitions because shares can then be used as an acceptable method of payment.

American Depository Receipts

Many non-US companies, including numerous Australian companies like Rio Tinto, have discovered the benefits of trading their shares in the United States, though they do so differently than do US companies. The disclosure and reporting requirements mandated by the US Securities and Exchange Commission have historically discouraged all but the largest foreign firms from directly listing their shares on American stock exchanges. Instead, most foreign companies tap the US market through **American depositary receipts (ADRs)**. These dollar-denominated claims issued by US banks represent ownership of shares of a foreign company's equity held on deposit by the US bank in the issuing firm's home country.

ADRs have proven to be very popular with US investors, at least partly because they allow investors to diversify internationally. In addition, because the shares are covered by American securities laws and pay dividends in dollars (dividends on the underlying shares are converted from the local currency into dollars before being paid out), US investors are able to diversify at very low cost. The non-US companies benefit from expanded sources of funding and expanded markets. For example, via its ADR listing, Rio Tinto gains exposure to US investors, and potentially increases awareness of its existence and products among US customers. Because of these factors, the market value and trading volume of ADRs on the major US stock exchanges grew rapidly in the 1990s. More recently, though, foreign firms increasingly opt to raise capital abroad rather than in the United States.

American depositary receipts (ADRs)

Dollar-denominated claims, issued by US banks, that represent ownership of shares of a foreign company's equity held on deposit by the US bank in the issuing firm's home country

12.3e SHARE ISSUE PRIVATISATIONS

Anyone who examines international share offerings is soon struck by the size and importance of share issue privatisations in non-US stock markets. A government executing a **share issue privatisation (SIP)** will sell all or part of its ownership in a state-owned enterprise to private investors, via a public share offering. The words '*public*' and '*private*' can become confusing in this context; a SIP involves the sale of shares in a state-owned company to *private* investors via a *public* capital market share offering. Since Britain's Thatcher government first popularised privatisations in the early 1980s, there have been privatising share offerings by more than 100 national governments. These SIPs have raised almost \$2.5 trillion. Australian examples include the privatisation of Commonwealth Bank, Telstra and various power, rail and airport assets.

share issue privatisation (SIP)

A government executing one of these will sell all or part of its ownership in a state-owned enterprise to private investors via a public share offering

The importance of SIPs in creating new shareholders derives from the way these issues are generally priced and allocated. Governments almost always set offer prices well below their expected open-market value (they deliberately underprice), thereby ensuring great excess demand for shares in the offering. The issuing governments then allocate shares in a way that ensures maximum political benefit. Invariably, governments favour employees and other small domestic investors (who typically have never purchased shares before) with relatively large share allocations, whereas domestic institutions and foreign investors are allocated far less than they desire. The net result of this strategy is to guarantee that most of the short-term capital gains of privatisation IPOs are captured by the many citizen-investors (who

vote) rather than by institutional and foreign investors (who do not vote). Furthermore, the long-run returns to investors who purchase privatising share issues are typically quite high. In all, privatisation share offerings have done as much as any other single factor to promote the development of international stock markets since the mid-1990s.

12.3f ADVANTAGES AND DISADVANTAGES OF AN IPO

The decision to convert from private to public ownership is not an easy one. The benefits of having publicly traded shares are numerous, but so, too, are the costs. This section describes the costs and benefits of IPOs that have been highlighted by the ASX³ and accounting firm KPMG Peat Marwick.⁴ As we discussed in section 12.3c, the motivations for going public can be significantly different for continental European business owners than for their Australian, New Zealand, British or US counterparts.

Benefits of Going Public

- 1 *New capital for the company.* An IPO gives the typical private firm access to a larger pool of equity capital than is available from any other source. Whereas venture capitalists can provide perhaps \$10–\$40 million in funding throughout a company's life as a private firm, an IPO allows the company to raise many times that amount in one offering. An infusion of ordinary equity not only permits the firm to pursue profitable investment opportunities but also improves the firm's overall financial condition and provides additional borrowing capacity. Furthermore, if the firm's shares perform well, the company will be able to raise additional equity capital in the future. By being listed, the company creates a secondary market for its shares, stimulating liquidity. This can encourage investors to purchase shares by reducing their fear that they will be unable to exit their investments if they need to.
- 2 *Publicly traded shares for use in acquisitions.* Unless a firm has publicly traded shares, the only way it can acquire another company is to pay in cash. After going public, a firm has the option of exchanging its own shares for those of the target firm. Not only does this minimise cash outflow for the acquiring firm, but such a payment method may be free from capital gains tax for the target firm's owners. This tax benefit may reduce the price that an acquirer must pay for a target company.
- 3 *Listed shares for use as a compensation vehicle.* Having publicly traded shares allows the company to attract, retain and provide incentives for talented managers and employees by offering them employee share options and other share-based compensation. Going public also offers liquidity to employees who were awarded options while the firm was private.
- 4 *Personal wealth and liquidity.* Entrepreneurship almost always violates finance's basic dictum about diversification: entrepreneurs generally have most of their financial wealth and their human capital tied up in their companies. Going public allows entrepreneurs to reallocate cash from their businesses and to diversify their portfolios. Entrepreneurial families also frequently execute IPOs during times of transition – for example, when the company founder wishes to retire and provide a method of allocating family assets among those heirs who do and do not wish to remain active in the business.
- 5 *Increased public and investor profile.* Listed companies tend to receive greater media attention, increasing awareness of their products and services. In addition, coverage by investment research analysts can

3 Details: ASX IPO brochure IPO: *The Road to Growth*. 2011.

4 KPMG Peat Marwick, *Going Public: What the CEO Needs to Know*. Chapter 2. 1998.

help sustain demand for shares and enhance the company's reputation within an industry – ultimately increasing demand for its products and improving its ability to attract more business.

- 6 *Institutional investment.* The increased transparency that occurs as a result of listing (through the disclosure and public information requirements) and liquidity introduced due to their ability to trade the company's shares on the stock market can be attractive to institutional investors. This has the potential to improve credibility, business networks and access to new funding sources.
- 7 *Market valuation.* As listed entities, company shares are continuously priced by the market. Thus, being listed generates an independent market valuation.
- 8 *Enhanced operating efficiency.* According to the ASX, 'the requirement for more rigorous disclosure tends to lend itself to better systems and controls, improved management information and greater operating efficiency of the business as a whole'.⁵
- 9 *Reassurance of customers and suppliers.* Companies that are listed may find that the perception of their financial and business strength is improved. This is facilitated by the rigorous due diligence process that they go through in order to qualify for listing, as well as the stringent continuous disclosure requirements that they face on an ongoing basis.

In addition to these benefits, being a public company also increases a firm's overall prestige. However, the often massive costs must be weighed against the obvious benefits of an IPO.

Drawbacks to Going Public

- 1 *Potential loss of control.* One of the inevitable aspects of selling shares is ceding a degree of control to external shareholders. This can make it harder to pursue some corporate transactions (like related party transactions). It can also make the company vulnerable to attacks as a takeover target.
- 2 *Susceptibility to market conditions and media exposure.* Once companies are listed, they open themselves up to an extra set of risks – those that affect the stock market. Thus, even if the business is run extremely well, the company can be affected by market rumour and other market factors that would not have had an impact on the business before listing. Similarly, heightened media exposure, because of its listed status, could be unwelcome if the company faces any negative situations.
- 3 *The financial costs of an IPO.* Few entrepreneurs are truly prepared for just how costly the process of going public can be in terms of out-of-pocket cash expenses and opportunity costs. Companies will incur various costs including underwriting, prospectus preparation, legal and advisor fees and printing costs. In the US, total cash expenses of an IPO, such as printing, accounting and legal services, frequently approach \$1 million, and most of this must be paid even if the offering is postponed or cancelled. Additionally, the combined costs associated with the underwriter's fees (usually 7% in the US) and the initial underpricing of the firm's stock (roughly 15% on average in the US) represent a large transfer of wealth from current owners to the underwriters and to the new shareholders. In addition, there are initial and annual listing fees that have to be paid. **Figure 12.11** provides estimated listing fees faced by Australian listed companies.
- 4 *The managerial costs of an IPO.* As costly as an IPO is financially, many entrepreneurs find the continuous demands made on their time during the IPO process to be even more burdensome. Rarely can CEOs and other top managers delegate these duties, which grow increasingly intense as the offering date approaches. There are also severe restrictions on what an executive can say or do during the immediate pre-offering period, and because the process can take months to complete, the distraction costs of going

5 ASX IPO brochure, *IPO: The Road to Growth*. 2011.

FIGURE 12.11 ESTIMATED LISTING COSTS IN AUSTRALIA

The following extract provides a guide to the fees that apply to equity listings in Australia from 1 January 2020. Full details are available on the ASX website: <https://www.asx.com.au/regulation/rules/asx-listing-rules.htm>.

Schedule 1 – ASX Listings, ASX Debt Listings (ASX market) and ASX Foreign Exempt Listings

Initial listing fees (effective from 1 January 2020)

Table 1A – initial listing fee for equity securities and debt securities quoted on the ASX market¹

VALUE OF SECURITIES FOR WHICH QUOTATION IS SOUGHT ²	FEE (PAYABLE ON APPLICATION FOR ADMISSION)
Up to \$3 million	\$38,422
\$3,000,001 to \$10m	\$38,422 + 0.54888573% on excess over \$3m
\$10,000,001 to \$50m	\$76,844 + 0.10977751% on excess over \$10m
\$50,000,001 to \$100m	\$120,755 + 0.07684400% on excess over \$50m
\$100,000,001 to \$500m	\$159,177 + 0.04665550% on excess over \$100m
\$500,000,001 to \$1,000m	\$345,799 + 0.04171540% on excess over \$500m
Over \$1,000 million	\$554,376 + 0.03490925% on excess over \$1,000m

A minimum initial listing fee of \$100,000 applies to foreign exempt listings other than foreign exempt listings with a primary listing on the NZX Main Board. A maximum initial listing fee of \$1,000,000 applies to all foreign exempt listings including foreign exempt listings with a primary listing on the NZX Main Board.

Annual listing fees (effective from 1 July 2019)

Table 1B – annual listing fee for equity securities and debt securities³ quoted on the ASX market

VALUE OF QUOTED SECURITIES ⁴	FEE
Up to \$3 million	\$14,141
\$3,000,001 to \$10m	\$14,141 + 0.18231429% on excess over \$3m
\$10,000,001 to \$100m	\$26,903 + 0.02110889% on excess over \$10m
\$100,000,001 to \$1,000m	\$45,901 + 0.00426567% on excess over \$100m
\$1,000,000,001 to \$10,000m	\$84,292 + 0.00142188% on excess over \$1,000m
Over \$10,000 million	\$212,261 + 0.00035547% on excess over \$10,000m capped at \$475,000

In the case of an entity whose securities have been continuously suspended from quotation for 6 months or more as at the calculation date for annual listing fees (31 May), the annual listing fee payable is \$25,000.

- 1 The ASX market and the ASX wholesale loan securities market are treated as separate markets for the purposes of charging initial listing fees.
- 2 In the case of an entity in the Foreign Exempt Listing category with its primary listing on the NZX Main Board, the value of securities for which quotation is sought means the value of all of the securities in the relevant class which the entity is seeking to have quoted on ASX (see Listing Rules 1.11 condition 6 and 2.4). In any other case, it means the value of the specific securities or CHESS Depositary Interests ('CDIs') to be included on the entity's Australian register (including its CHESS sub-register and its issuer sponsored sub-register) which it is seeking to have quoted on ASX (see Listing Rule 1.11 condition 6).
- 3 This includes simple corporate bonds (as defined in note 5 below).
- 4 In the case of an entity in the Foreign Exempt Listing category with its primary listing on the NZX Main Board, the value of quoted securities means the value of all of the securities in the relevant class quoted on ASX (see Listing Rules 1.11 condition 6 and 2.4). In any other case, it means the value of the specific securities or CDIs included on the entity's Australian register (including its CHESS sub-register and its issuer sponsored sub-register) which are quoted on ASX (see Listing Rule 1.11 condition 6).

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public are very high. Top executives must also take time to meet with important potential shareholders before completing the IPO and indefinitely thereafter. Even after the IPO is completed, ongoing disclosure and reporting requirements can be a significant draw on management's time.

- 5 *Stock price emphasis.* Owners and managers of private companies frequently operate their firms in ways that balance competing personal and financial interests. This includes seeking profits, but it can also include employing family members in high positions as well as other personal benefits. Once a company goes public, however, external pressures build to maximise the firm's share price; as managerial shareholdings fall, managers become vulnerable to job loss either through takeover or through dismissal by the board of directors.
- 6 *Life in a fishbowl.* Public shareholders have the right to a great deal of information about a firm's internal affairs, and releasing this information to shareholders also implies releasing it to competitors and potential acquirers as well. Managers must disclose, especially in the IPO prospectus, how and in what markets they intend to compete, information that is obviously valuable to competitors. Additionally, managers who are also significant shareholders are subject to binding disclosure requirements and face serious constraints on their ability to buy or sell company shares. Similarly, company directors will be subject to greater scrutiny, disclosure and trading restrictions.

In spite of these drawbacks, often several hundred management teams each year decide that the benefits of going public outweigh the costs, and begin the process of planning for an IPO. In addition to these standard IPOs, four special types of IPOs warrant attention.

12.3g SPECIALISED INITIAL PUBLIC OFFERINGS: ECOS, SPIN-OFFS, REVERSE LBOS AND TRACKING STOCKS

The four special types of IPOs are equity carve-outs (ECOs), spin-offs, reverse LBOs and tracking stocks.

An **equity carve-out (ECO)** occurs when a parent company sells shares of a subsidiary corporation to the public through an initial public offering. The parent company may sell some of the subsidiary shares it already owns, or the subsidiary may issue new shares. In either event, the parent company almost always retains a controlling stake in the newly public company.

A **spin-off** occurs when a public parent company spins off a subsidiary to the parent's shareholders by distributing shares on a pro rata basis. Thus, after the spin-off, there will be two public companies rather than one. Conceptually, the total share price of the parent should drop by approximately the amount that the market values the shares of the newly public spin-off. Researchers document significantly positive price reactions for the shares of divesting parent companies at the time of spin-off announcements, perhaps indicating that the market expects the two independent companies will be managed more effectively than they would have been had they remained together. An Australian example was the Shopping Centres Australasia Property Group, which was spun off from Woolworths Ltd in November 2012 and raised \$472 million in new capital.⁶

In a **reverse LBO (or second IPO)**, a formerly public company that had previously gone private through a leveraged buyout goes public again. Reverse LBOs are easier to price than traditional IPOs because information exists about how the market valued the company when it was publicly traded. Empirical research indicates the private equity partners earn very high returns on these transactions. One reason for this is obvious: only the most successful LBOs can subsequently go public again. These are discussed further in Chapter 17, section 17.4b.

equity carve-out (ECO)
Occurs when a parent company sells shares of a subsidiary corporation to the public through an initial public offering

spin-off
A parent company creates a new company with its own shares to form a division or subsidiary, and existing shareholders receive a pro rata distribution of shares in the new company

reverse LBO (or second IPO)
A formerly public company that has previously gone private through a leveraged buyout and then goes public again. Also called a *second IPO*

6 'Woolworths Spin-off SCA Property Group Rises on ASX Debut', *The Australian*, 27 November 2012.

Just Jeans provides an example of a reverse LBO. It was the first major listed Australian company to undergo a transition from public to private ownership. This occurred through a \$108 million management buyout in 2001, led by British-based private investment group Catalyst Investment Managers. In 2004, the group was renamed the Just Group and re-listed on the ASX. In 2008, it was taken over by Premier Investments and de-listed.

tracking stocks

Equity claims based on (and designed to mirror, or track) the earnings of wholly owned subsidiaries of diversified firms

The final type of specialised equity offering, **tracking stocks**, is a recent innovation that may well have already run its course. These are equity claims based on (and designed to mirror, or *track*) the earnings of wholly owned subsidiaries of diversified firms. They are hybrid securities because the tracking stock firm is not separated from the parent company in any way, instead remaining integrated with the parent both legally and operationally. In contrast, both carve-outs and spin-offs result in legally separate firms. AT&T conducted the largest common stock offering in US history when it issued US\$10.6 billion in AT&T Wireless tracking stock in April 2000. AT&T's stock rose significantly when it announced the wireless offering. Unfortunately, both parent and tracking stock performed horribly during the months after the issue, and in July 2001, AT&T Wireless became an independent company; it was acquired by Cingular Wireless in October 2004.

LO12.3

CONCEPT REVIEW QUESTIONS

- 4 What patterns have been observed in the types of firms going public in the United States? Why do you think that certain industries become popular with investors at different times?
- 5 In what ways are non-US (private-sector) initial public offerings similar to US IPOs, and in what ways are they different?
- 6 What are American depositary receipts (ADRs), and how are these created? Why do you think ADRs have proven to be so popular with US investors? Why do you think these have proved popular with Australian companies?
- 7 In what key ways do share issue privatisations (SIPs) differ from private-sector share offerings? Why do you think governments deliberately underprice SIPs?
- 8 What are the principal benefits of going public? What are the key drawbacks?
- 9 Distinguish between an equity carve-out and a spin-off. How might a spin-off create value for shareholders?
- 10 To what does the term underpricing refer? If the average IPO is underpriced by about 15%, how might an unsophisticated investor who regularly invests in IPOs earn an average return of less than 15%?
- 11 How does underpricing add to the cost of going public?

THINKING CAP QUESTION

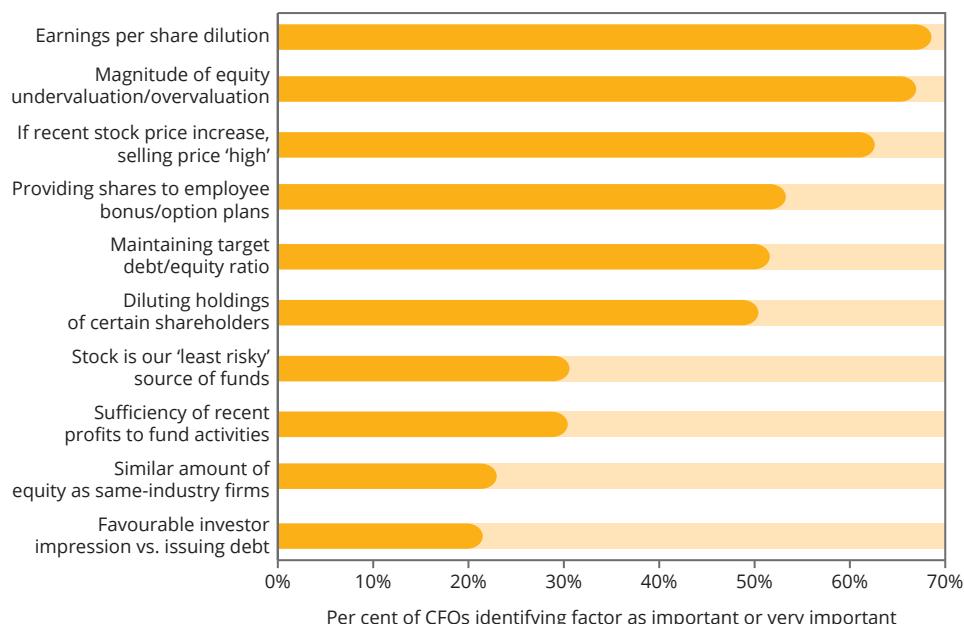
- 1 What are the pros and cons of doing an IPO?

LO12.4

12.4 SEASONED EQUITY OFFERINGS

Seasoned equity offerings (SEOs) are surprisingly rare for both US and non-US companies, including those in Australia. In fact, the typical large US company will not sell new ordinary equity even once per decade, though when an SEO is launched it tends to be much larger than the typical IPO. So, what factors do managers feel are most important to consider when issuing seasoned equity? The results of a survey aimed at identifying these factors are shown in **Figure 12.12**. The figure shows that nearly two-thirds (64%) of the respondents expressed concern that a SEO will dilute earnings per share, and half of responding managers were concerned about diluting specific large shareholders. Over 60% of respondents voiced concerns regarding the size of a new issue and the likely negative effect that the announcement of such an offering would have on the current price of outstanding shares. Further, about 50% stated they were considering a new equity issue to provide shares for employee share option programs and to maintain the firm's debt-to-equity ratio near the targeted level. Far fewer managers believed that recent firm profits would be insufficient to fund company activities, that the firm should issue equity to move towards an industry-standard leverage ratio or that investors would prefer the company to issue shares rather than bonds.

FIGURE 12.12 FACTORS THAT AFFECT SEO ISSUANCE DECISIONS – CFO SURVEY EVIDENCE



Source: Reprinted from John R. Graham and Campbell Harvey, 'The Theory and Practice of Corporate Finance: Evidence from the Field', *Journal of Financial Economics*, 60, pp. 187–243, copyright © 2001, with permission of Elsevier.

Seasoned ordinary equity issues must generally follow the same regulatory and underwriting procedures as unseasoned offerings. Seasoned offerings differ from unseasoned ones not just because of the former's large average size but also, and principally, because seasoned securities have an observable market value when the offering is priced, which obviously makes pricing much easier. Studies show that American SEOs tend to be priced very near the current market price. However, ease of pricing does not mean that investors welcome new equity offering announcements, as we now discuss.

12.4a SHARE PRICE REACTIONS TO SEASONED EQUITY OFFERINGS

One reason why corporations issue seasoned equity very rarely is that share prices usually fall when firms announce plans to conduct SEOs. On average, the price decline is about 3%. In the US, the average dollar value of this price decline is equal to almost one-third of the dollar value of the issue itself. Clearly, the announcement of seasoned equity issues conveys negative information to investors overall, though precisely what information is transmitted is not always clear. The message may be that management, which is presumably better informed about a company's true prospects than are outside investors, believes the firm's current share price is too high. Alternatively, the message may be that the firm's earnings will be lower than expected in the future and management is issuing equity to make up for the internal cash flow shortfall.

There is some evidence that SEOs are bad news for shareholders, not only at the time they are announced but also over holding periods of one to five years. Negative long-run returns following seasoned equity offerings have been documented in a variety of studies. As with long-run IPO returns, however, whether or not long-run returns following SEOs are unusually low depends on the comparison benchmark.

general cash offerings

Share offerings sold to all investors, not just existing shareholders

rights offerings

A special type of seasoned equity offering that allows the firm's existing owners to buy new shares at a bargain price or to sell that right to other investors

pre-emptive rights

These hold that shareholders have first claim on anything of value distributed by a corporation

Most equity sales in the US fall under the category of **general cash offerings**, meaning that shares are offered for sale to any and all investors. However, there is a special type of seasoned equity offering that allows firms' existing owners to buy new shares at a bargain price or to sell that right to other investors. These **rights offerings** are relatively scarce in the United States but are growing in importance internationally, and are more common in Australia.

12.4b RIGHTS OFFERINGS

One of the basic tenets of domestic commercial law is that shareholders have first claim on anything of value distributed by a corporation. These **pre-emptive rights** give ordinary shareholders the right to maintain their proportionate ownership in the corporation by purchasing shares whenever the firm sells new equity. Because this strategy keeps all the gains and losses on share issues within the family, firms usually price rights offerings well below the current market price in order to ensure that the offering sells out and the firm raises the funds needed. The laws of most jurisdictions grant shareholders the pre-emptive right to participate in new issues unless this right is removed by shareholder consent. Thus, rights offerings are still common in many countries (including Australia). In contrast, in the US, the vast majority of publicly traded US companies have removed pre-emptive rights from their corporate charter, so rights offerings by large US companies are quite rare today.

12.4c PRIVATE PLACEMENTS

private placement

Unregistered security offerings sold directly to accredited investors

accredited investors

Individuals or institutions that meet certain income and wealth requirements

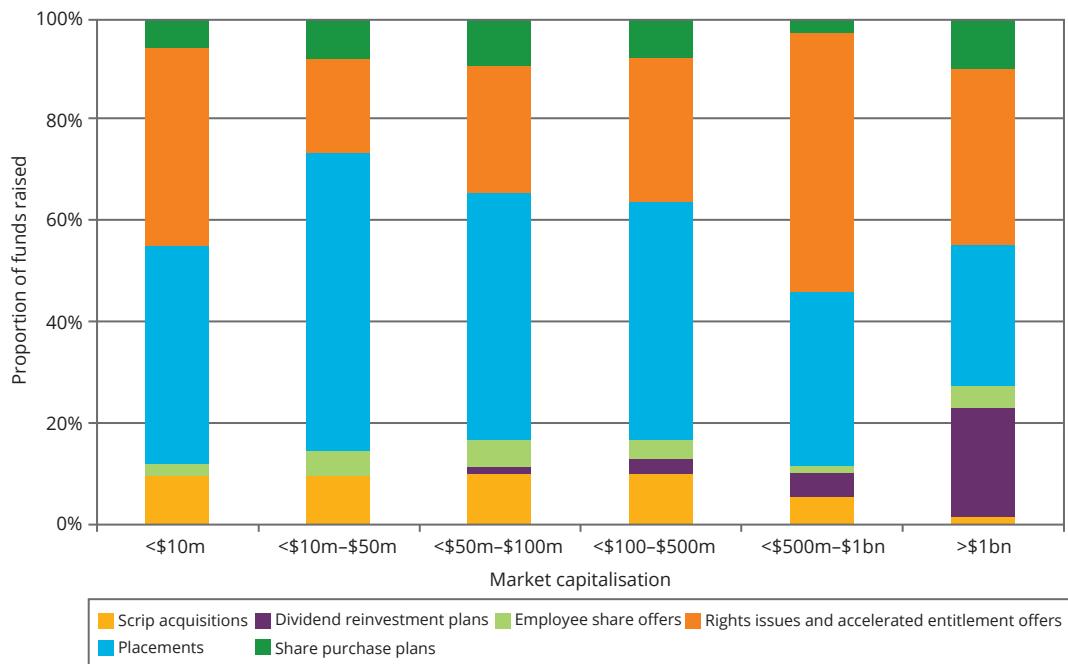
As noted earlier, a **private placement** involves the sale of securities in a transaction that is exempt from the registration requirements imposed by securities law. A private placement occurs when an investment banker arranges for the direct sale of a new security issue to an individual, several individuals, an institutional investor or a group of institutions. The investment banker is paid a commission for acting as an intermediary in the transaction. To qualify for a private-placement exemption, the sale of the securities must be restricted to a small group of **accredited investors**, individuals or institutions that meet certain income and wealth requirements. The rationale for the private-placement exemption is that accredited investors are financially sophisticated agents who do not need the protection afforded by the registration process. Typical accredited institutional investors include insurance companies, pension funds, mutual funds and venture capitalists.

Private placements have several advantages over public offerings. They are less costly in terms of time and money than registering with the market regulator, and the issuers do not have to reveal confidential information. Also, because there are typically far fewer investors, the terms of a private placement are easier to renegotiate, if

necessary. The disadvantages of private placement are that the securities have no readily available market price, they are less liquid and there is a smaller group of potential investors than in the public market.

As can be seen from **Figure 12.13**, the bulk of secondary capital raisings in Australia in 2011 (across companies of all sizes) were through placements and rights issues. However, the allocation to these two offer structures varied significantly by the size of the company. Companies with market capitalisations below \$500 million tended to favour placements, in contrast to the larger companies that raised a larger proportion of funds from rights issues.

FIGURE 12.13 AUSTRALIAN SECONDARY CAPITAL RAISINGS BY OFFER STRUCTURE AND MARKET CAPITALISATION IN 2011



Source: *Strengthening Australia's Equity Capital Markets*, ASX, April 2012, p. 11.

LO12.4

CONCEPT REVIEW QUESTIONS

- 12 What happens to a company's share price when the firm announces plans for a seasoned equity offering? What are the long-term returns to investors following an SEO?
- 13 Why do you think that rights offerings have largely disappeared in the United States?
- 14 What are the relative advantages and disadvantages of private placements compared to those of public offerings of stock and bond issues?

THINKING CAP QUESTION

- 2 Why are firms typically reluctant to use *seasoned equity offerings* (SEOs) to raise long-term funds?

STUDY TOOLS

SUMMARY

- LO12.1**
 - In almost all market economies, internally generated funds (primarily internally generated earnings) are the dominant source of funding for corporate investment. External financing is used only when needed, and then debt is almost always preferred to equity financing. The difference between a firm's total funding needs and its internally generated cash flow is referred to as its financial deficit.
- LO12.2**
 - Financial intermediaries are institutions that raise funds by selling claims on themselves (often in the form of demand deposits, which include cheque or savings accounts) and then use those funds to lend to borrowers. Intermediaries thus break, or *intermediate*, the direct link between final savers and borrowers that exists when companies sell securities directly to investors.
 - Issuing securities enables companies to access greater potential pools of funding. However, with this comes increased reporting requirements, exposure to external scrutiny and, in the case of issuing common equity, a reduction in both ownership and control. In addition, the process of raising capital, for example via an IPO, can be expensive both financially and with respect to managerial focus.
- LO12.3**
 - Companies wanting to raise capital externally must make a series of decisions, beginning with whether to issue debt or equity and whether to employ an investment bank to assist with the securities sale. This chapter focuses on ordinary equity offerings, but the decisions and issuing procedures are similar for preferred equity and debt securities.
 - Companies wanting to raise new ordinary equity can sell shares to public investors, typically with the help of an investment bank. The company must decide whether to sell shares to public investors through a general cash offering or to rely on sales to existing shareholders using a rights offering. Rights offerings are very popular in Australia, though fairly rare in the US today. They remain common in other developed countries also.
 - Ordinary equity can be sold through private placements to accredited investors, or it can be sold to the public if the securities are registered with the market regulator.
 - A company's first public offering of ordinary equity is known as its initial public offering, or IPO. The average IPO in the US is underpriced by about 15%, and this has held true for several decades. Non-US IPOs are also underpriced, as appears to be the case in Australia and New Zealand. It is unclear whether or not IPOs are poor long-term investments.
- LO12.4**
 - Subsequent offerings of ordinary equity are known as seasoned equity offerings, or SEOs. The announcement of a seasoned equity issue tends to decrease a company's share price, and there is evidence that firms issuing seasoned equity underperform over the long term.
 - Non-US firms in countries with well-functioning stock markets can raise equity capital using an IPO. Once issued, their shares can trade in the US either by directly listing on a US exchange or, more commonly, through American depositary receipts (ADRs), which are dollar-denominated claims issued by US banks against the actual foreign shares that they hold on deposit. There are numerous Australian listed companies that have listed ADRs on a US exchange. They benefit from increased exposure to non-domestic markets (especially the US) without having to conform to all the US listing rules and regulations. The largest share offerings in world history have all been share issue privatisations (SIPs), which have done as much as any other single factor to promote the development of international stock markets.

SELF-TEST PROBLEMS

Answers to these 'Self-test problems' and the 'Concept review' questions throughout the chapter appear on the Student Companion Website (<http://login.cengagebrain.com>) or via your instructor.

ST12-1 The Bloomington Company needs to raise \$20 million of new equity capital. Its ordinary equity is currently selling for \$42 per share. The investment bankers require an underwriting spread of 7% of the offering price, and the company's legal, accounting and printing expenses associated with the seasoned offering are estimated to be \$450,000. How many new shares must the company sell in order to net \$20 million?

QUESTIONS

- Q12-1** How should a corporation estimate the amount of financing that must be raised externally during a given year? Once that amount is known, what other decision must be made?
- Q12-2** What is the dominant source of capital funding in the United States? Given this result, and the fact that most corporations are net borrowers, what decisions must most managers face in order to address this financial deficit?
- Q12-3** Define the term *financial intermediary*. What role do financial intermediaries play in US corporate finance? How does this compare to the role of non-US financial intermediaries?
- Q12-4** What are the general trends regarding public security issuance by US corporations? Specifically, which security type is most often sold to the public? What is the split between initial and seasoned equity offerings?
- Q12-5** Distinguish between a *Eurobond*, a *foreign bond* and a *Yankee bond*. Which of these three represents the greatest volume of security issuance?
- Q12-6** What do you think are the most important costs and benefits of becoming a publicly traded firm? What questions would you ask before advising whether or not an entrepreneur's firm should go public?
- Q12-7** If you were an investment banker, how would you determine the offering price of an IPO?
- Q12-8** Are the significantly positive short-run returns earned by IPO shareholders compatible with market efficiency? If not, why not?
- Q12-9** List and describe briefly the key services that investment banks provide to firms before, during and after a securities offering.
- Q12-10** Explain why the underwriting spread on IPOs averages about 7% of the offering price, whereas the spread on a seasoned offering of common stock averages less than 5%.
- Q12-11** Discuss the various issues that must be considered in selecting an investment banker for an IPO. Which type of placement is usually preferred by the issuing firm?
- Q12-12** In terms of IPO investing, what does it mean to flip a stock? According to the empirical results regarding short- and long-term returns following equity offerings, is flipping a wise investment strategy?
- Q12-13** What materials are presented in an IPO prospectus? In general, what result is documented regarding sales of shares by insiders and venture capitalists?
- Q12-14** What are American depositary receipts (ADRs), and why have they proven to be so popular with Australian companies and US investors?
- Q12-15** How do you explain the highly politicised nature of share issue privatisation (SIP) pricing and share allocation policies? Are governments maximising offering proceeds, or are they primarily pursuing political and economic objectives?

PROBLEMS

INVESTMENT BANKING AND THE PUBLIC SALE OF SECURITIES

P12-1 West Coast Manufacturing Company (WCMC) is executing an initial public offering (IPO) with the following characteristics. The company will sell 10 million shares at an offer price of \$25 per share, the underwriter will charge a 7% underwriting fee, and the shares are expected to sell for \$32 per share by the end of the first day's trading. Assume that this IPO is executed as anticipated.

- a Calculate the initial return earned by investors who are allocated shares in the IPO.
- b How much will WCMC receive from this offering?
- c What is the total cost (underwriting fee and underpricing) of this issue to WCMC?

P12-2 Suppose you purchase shares of Engel Pty Ltd (EPL), which recently executed an IPO at the post-offering market price of \$22 per share, and you hold the shares for one year. You then sell your EPL shares for \$25 per share. EPL does not pay dividends, and you are not subject to capital gains taxation. During this year, the return on the overall stock market was 11%. What net return did you earn on your EPL share investment? Assess this return in light of the overall market return.

P12-3 Norman Internet Service Company (NISC) is interested in selling common stock to raise capital for capacity expansion. The firm has consulted First Tulsa Company, a large underwriting firm, which believes that the stock can be sold for \$50 per share. The underwriter's investigation found that its administrative costs will be 2.5% of the sale price and its selling costs will be 2.0% of the sale price. If the underwriter requires a profit equal to 1% of the sale price, how much spread (in dollars) is necessary to cover the underwriter's costs and profit?

P12-4 The Mitchell Company needs to raise \$50 million of new equity capital. Its ordinary equity is currently selling for \$50 per share. The investment bankers require an underwriting spread of 3% of the offering price, and the company's legal, accounting and printing expenses associated with the seasoned offering are estimated to be \$750,000. How many new shares must the Mitchell Company sell in order to net \$50 million?

P12-5 La Jolla Securities specialises in the underwriting of small companies. The terms of a recent offering were as follows:

NUMBER OF SHARES	2 MILLION
Offering price	\$25 per share
Net proceeds	\$45 million

La Jolla Securities' expenses associated with the offering were \$500,000. Determine La Jolla Securities' profit on the offering if the secondary market price of the shares immediately after the offering began were as follows:

- a \$23 per share
- b \$25 per share
- c \$28 per share.

THE MARKET FOR INITIAL PUBLIC OFFERINGS (IPOS)

P12-6 Find an Internet site that provides data on recent IPOs, and pick four companies that conducted an IPO in recent weeks. Write down the ticker symbols and offer prices for the firms you select; then go to Yahoo! and download daily price quotes since the IPO date. For each firm, calculate the following:

- a the percentage return measured from the offer price to the closing price on the first day
- b the percentage return measured from the opening price to the closing price on the first day.

P12-7 Four companies conducted IPOs last month: Hot.Com; Biotech Pipe Dreams Corp.; Sleepy Tyme Pty Ltd; and Bricks N Mortar International. All four companies went public at an offer price of \$10 per share. The first-day performance of each share (measured as the percentage difference between the IPO offer price and the first-day closing price) was as follows:

COMPANY	FIRST-DAY RETURN
Hot.Com	40%
Biotech Pipe Dreams	30%
Sleepy Tyme	10%
Bricks N Mortar	0%

- a If you submitted a bid through your broker for 100 shares of each company, if your orders were filled completely, and if you cashed out of each deal after one day, what was your average return on these investments?
- b Next, suppose that your orders were not all filled completely because of excess demand for hot IPOs. Specifically, after ordering 100 shares of each company, you were able to buy only 10 shares of Hot.Com, 20 shares of Biotech Pipe Dreams, 50 shares of Sleepy Tyme and 100 shares of Bricks N Mortar. Recalculate your average return, taking into account that your orders were only partially filled.

SEASONED EQUITY OFFERINGS

P12-8 GSM Company sold 20 million shares of ordinary equity in a seasoned offering. The market price of the company's shares immediately before the offering was \$14.75. The shares were offered to the public at \$14.50, and the underwriting spread was 4%. The company's expenses associated with the offering were \$7.5 million. How much new cash did the company receive?

P12-9 After a banner year of rising profits and positive share returns, the managers of Raptor Pharmaceuticals (RP) have decided to launch a seasoned equity offering to raise new equity capital. RP currently has 10 million shares outstanding, and yesterday's closing market price was \$75.00 per RP share. The company plans to sell 1 million newly issued shares in its seasoned offering. The investment banking firm Robbum and Blindum (R&B) has agreed to underwrite the new share issue for a 2.5% discount from the offering price, which RP and R&B have agreed should be \$0.75 per share lower than RP's closing price the day before the offering is sold.

- a What is likely to happen to RP's share price when the plan for this seasoned offering is publicly announced?
- b Assume that RP's share price closes at \$72.75 per share the day before the seasoned offering is launched. What net proceeds will RP receive from this offering?
- c Calculate the return earned by RP's existing shareholders on their shares from the time before the seasoned offering was announced until it was actually sold for \$72.75 per share.
- d Calculate the total cost of the seasoned equity offering to RP's existing shareholders as a percentage of the offering proceeds.

CASE STUDY

RAISING LONG-TERM FINANCING

Since graduation from university, you have worked at Precision Manufacturing Pty Ltd as a financial analyst. You have recently been promoted to the position of senior financial manager, with responsibilities that include capital budgeting decisions and the raising of long-term financing. Therefore, you decide to investigate the various alternatives for raising funds. Your goal is to make sure that the benefits from undertaking long-term projects are greater than the costs of raising the long-term funds needed to finance those projects. With this goal in mind, you decide to answer the following questions.

ASSIGNMENT

- 1 What should managers consider when making the decision whether to finance internally or externally?
- 2 What services does an investment banker offer to businesses that choose to raise funds in the capital market?
- 3 What are the benefits to the company of going public?
- 4 What are the drawbacks to the corporation of going public?
- 5 What returns can investors in the ordinary equity expect on the first day of trading if they commit to purchase shares through the IPO issue? What factors may affect the relative amount of these first-day returns?
- 6 Describe the following offers: (a) seasoned equity offer, (b) rights offer and (c) private placement. In what circumstances would a company use each of these offerings to raise funds?
- 7 Discuss the differences between international public offerings and domestic (US) public offerings.



13

CAPITAL STRUCTURE

WHAT COMPANIES DO

CAPITAL STRUCTURES IN THE PRC

When companies decide how to finance their activities and investments, they choose between issuing shares (i.e. selling part of their value to external parties) or borrowing. This equity-debt choice is an important one in imperfect capital markets – those in which there are costs of changing capital structure, and where the markets are imperfectly informed about companies' plans. For instance, the markets may hear about a company's plans, but may not believe they will be achieved and so be hesitant about investing. If the external capital markets are confident that a company's plans are achievable, capital in the form of equity or debt will be provided, for a price.

The extract below from a research article about firms in the People's Republic of China (PRC) and their capital structures reflects the continuing need for companies and regulators to review the impacts of capital structures on corporate value, especially as the external economic environment changes.

'Ever since the Government of the PRC chose to implement a large stimulus to support the economy in the wake of the financial crisis of 2008/2009, corporate leverage

has experienced a steep and sustained increase. The ratios of total debt and of credit to GDP have increased at the same time as corporate returns and interest coverage ratios have been weakening, raising concerns about growing systemic vulnerability within the Chinese financial system. Based on the analysis of aggregate data, there is no clear evidence yet of weakening corporate performance onto the Chinese financial sector. To an extent, this reflects the predominance of SOEs [state-owned enterprises] in the Chinese corporate landscape, and authorities' control over the financial system and its major players and institutions. Such a controlled environment has the ability to contain or delay the spillover of financial distress from the corporate to the financial sector for some period of time, but not indefinitely. Ultimately, growing systemic pressure constitutes a contingent liability to the state, and its realization would come to bear heavily on the public budget and debt ratios.

...





'In sum, the findings in this paper seem to confirm our hypothesis that financial sector based on aggregate indicators tend to overlook the increased vulnerability of the marginal nonfinancial [sic] firms in the Chinese corporate sector. The fragility of the system tends to be underestimated as a result, and may

provide a sense of complacency about the stability of the Chinese financial system which is unwarranted in view of continuing weakness in the corporate system.'

Source: Benno Ferrarini, Marthe Hinojales and Pasquale Scaramozzino, 'Leverage and Other Capital Structure Determinants of Chinese Listed Companies'. Manila: Asian Development Bank. © ADB. <https://www.adb.org/sites/default/files/publication/225086/ewp-509.pdf> CC BY 3.0 IGO.

LEARNING OBJECTIVES

After studying this chapter, you should be able to:

- LO13.1 explain financial leverage and its effects
- LO13.2 understand the basic Modigliani–Miller (M&M) model and its propositions
- LO13.3 understand the M&M model implications when taxes are levied
- LO13.4 explain the trade-off model of capital structure and how it is an extension of the M&M model
- LO13.5 explain the pecking-order model and how it differs from the M&M models and their predictions
- LO13.6 be able to compare the capital structure models and identify the most appropriate one for given empirical conditions.

The chapter-opening 'What Companies Do' demonstrates that corporate investing and financing decisions are influenced by the state of the economy and in turn affect that state. What are the patterns of these interactions, and why do some companies choose to finance their operations largely with debt, while other companies issue little or no debt?

For an international comparison of corporate capital structures, **Figure 13.1** compares debt-equity ratios for several countries, allowing for company size. It is notable how the large companies tend to carry a higher ratio of debt to equity. For Australia, Canada and South Korea, the debt tends to be more bank lending than corporate bond issues. As we explore models of capital structure in this chapter, we shall discover reasons why these outcomes can be anticipated.

FIGURE 13.1 AVERAGE DEBT-EQUITY RATIOS FOR INTERNATIONAL COMPANIES, 2013

	LARGE	MEDIUM	SMALL
Australia	1.147	0.927	0.459
Canada	1.181	0.963	0.152
UK	1.246	0.796	0.220
South Korea	3.746	0.710	0.676

Source: Lepone, Andrew, and Wright, Danika, *Report for the Financial Services Council (FSC) Capital Market Structure Comparisons*, Capital Markets Consulting Services Pty Ltd, 19 March 2014.

This chapter describes the key influences on managers' decisions to finance with debt or with-equity. We begin by showing why companies may choose to substitute debt for equity capital, even in a world without corporate income taxes. We then show that the common practice of allowing companies to deduct interest payments from taxable income provides a strong incentive for corporations to substitute debt for equity, although other taxes on investors may further adjust the optimal leverage ratio for specific companies. We use an extended case to help explain the various (complex) issues that arise in this topic, and also provide some summaries of actual practice by real companies.

LO13.1 13.1 FINANCIAL LEVERAGE AND ITS EFFECTS

When companies use debt in their capital structures, we say that they are using financial leverage. Similarly, a company with debt on its balance sheet is a levered company, and a company that finances its operations entirely with equity is an unlevered company. The term leverage implies that debt magnifies a company's financial performance. That effect can be either positive or negative, depending on the returns a company earns on the money it borrows. A simple example illustrates this principle.

Consider the decision facing Susan Kelly, chief financial officer of High-Tech Manufacturing Company (HTMC), a publicly traded company with no debt and 200,000 outstanding ordinary shares. Analysts expect HTMC to generate \$1,000,000 of total profits each year for the foreseeable future. Given HTMC's risk, shareholders require a 10% return on their investment. Using the present value formula for a perpetuity (see [Equation 3.10](#)), we find the company's value equals \$10,000,000 ($\$1,000,000 \div 0.10$). By dividing total company value by the number of shares outstanding, we see that HTMC's share price is \$50 ($\$10,000,000 \div 200,000$).

A shareholder suggests to Ms Kelly that, by issuing bonds and retiring some of its outstanding shares, HTMC could increase earnings per share (EPS) and thereby increase its share price. To be more specific, the shareholder proposes that HTMC should issue \$5,000,000 in long-term debt, at an interest rate of 6.0%, and use the proceeds to repurchase half the company's ordinary shares (100,000 shares). This **recapitalisation** would result in a dramatic shift in the company's financing mix. Ignoring, for the time being, any effects of this transaction on the company's equity value, HTMC's capital structure would change from 100% equity to 50% debt and 50% equity. In other words, this strategy would convert HTMC's debt-to-equity ratio from 0 to 1.0. [Figure 13.2](#) summarises HTMC's current and proposed capital structures.

recapitalisation
Alteration of a company's capital structure to change the relative mix of debt and equity financing

FIGURE 13.2 CURRENT AND PROPOSED CAPITAL STRUCTURES FOR HIGH-TECH MANUFACTURING COMPANY (HTMC)

	CURRENT	PROPOSED
Assets	\$10,000,000	\$10,000,000
Equity	\$10,000,000	\$5,000,000
Debt	\$0	\$5,000,000
Debt-to-equity ratio	0	1.0
Shares outstanding	200,000	100,000
Share price	\$50.00	\$50.00
Interest rate on debt	–	6.0%

The shareholder suggests that this strategy will increase the expected return to HTMC's shareholders, as measured by EPS. Though initially dubious about this proposal, Ms Kelly creates [Figure 13.2](#) and [13.3](#) to test the shareholder's prediction. As noted, she thinks that HTMC's *earnings before interest and taxes* (EBIT)

will be \$1,000,000 next year, if the economy continues to grow at a normal rate.¹ However, if the country falls into a recession next year, High-Tech's sales will fall, and EBIT will be only \$500,000. On the other hand, if the economy booms, HTMC will enjoy rising sales, and EBIT will be \$1,500,000. Ms Kelly believes that the probability of each outcome is one-third, and that any change of capital structure will not affect earnings from operations, so the expected value of *EBIT* equals \$1,000,000:

$$\text{Expected } EBIT = \left(\frac{1}{3}\right) \$1,500,000 + \left(\frac{1}{3}\right) \$1,000,000 + \left(\frac{1}{3}\right) \$500,000 = \$1,000,000$$

Figure 13.3 summarises HTMC's current and proposed capital structures, assuming that the economy grows at a normal rate and that EBIT equals \$1,000,000. If the current capital structure is retained, *earnings per share (EPS)* will be \$5.00. Because HTMC shares are currently worth \$50 per share and the company pays out all net profits as dividends, HTMC's shareholders will earn a return on equity of 10% ($\$5.00 \div \50.00) over the coming year. If HTMC instead adopts the proposed recapitalisation, the company will have to pay \$300,000 interest on the \$5,000,000 debt ($0.06 \times \$5,000,000$), leaving \$700,000 in net income ($\$1,000,000 \text{ EBIT} - \$300,000 \text{ interest}$). Only 100,000 shares remain outstanding after the recapitalisation, so EPS will be \$7.00. In this scenario, the return on equity enjoyed by shareholders is 14% ($\$7 \div \50).

FIGURE 13.3 EXPECTED CASH FLOWS TO SHAREHOLDERS AND BONDHOLDERS UNDER THE CURRENT AND PROPOSED CAPITAL STRUCTURES FOR HTMC

Assuming EBIT = \$1,000,000

	CURRENT CAPITAL STRUCTURE: ALL-EQUITY FINANCING	PROPOSED CAPITAL STRUCTURE: 50% DEBT, 50% EQUITY
EBIT	\$1,000,000	\$1,000,000
– Interest (6.0%)	\$0	\$(300,000)
Net income	\$1,000,000	\$700,000
Shares outstanding	200,000	100,000
EPS	\$5.00	\$7.00
Return on equity ($P_0 = \$50.00/\text{share}$)	10.0%	14.0%

So far, the recapitalisation plan seems to look rather attractive. But what happens if a recession or a boom occurs? **Figure 13.4** shows the payoffs to HTMC's investors under those economic scenarios. If the economy booms, High-Tech's EBIT will be \$1,500,000. With the existing capital structure, EPS will be \$7.50 and ROE will be 15.0%. If the economy booms and HTMC recapitalises, EPS will be \$12.00 and ROE will be an impressive 24.0%! It would seem that the recapitalisation is particularly good for shareholders in this scenario.

1 For now, we assume that there are no taxes. Therefore, there is no difference between EBIT and net income for an unlevered company like HTMC. We relax this no-tax assumption in section 13.3.

FIGURE 13.4 EXPECTED CASH FLOWS TO SHAREHOLDERS AND BONDHOLDERS UNDER THE CURRENT AND PROPOSED CAPITAL STRUCTURES FOR HTMC FOR THREE EQUALLY LIKELY OUTCOMES

	RECESSION		NORMAL GROWTH		BOOM	
	\$500,000		\$1,000,000		\$1,500,000	
EBIT	ALL-EQUITY FINANCING	50% DEBT, 50% EQUITY	ALL-EQUITY FINANCING	50% DEBT, 50% EQUITY	ALL-EQUITY FINANCING	50% DEBT: 50% EQUITY
– Interest (6.0%)	\$0	(\$300,000)	\$0	(\$300,000)	\$0	(\$300,000)
Net income	\$500,000	\$200,000	\$1,000,000	\$700,000	\$1,500,000	\$1,200,00
Shares outstanding	200,000	100,000	200,000	100,000	200,000	100,000
Earnings per share (EPS)	\$2.50	\$2.00	\$5.00	\$7.00	\$7.50	\$12.00
Return on shares (%) ($P_0 = \$50.00/\text{share}$)	5.0%	4.0%	10.0%	14.0%	15.0%	24.0%

So, what's the catch? What could possibly argue against HTMC adopting the recapitalisation plan and increasing EPS and ROE? The answer is that the economy may well fall into a recession next year, in which case High-Tech's EBIT will only be \$500,000. With the existing all-equity capital structure, the company would achieve an EPS of \$2.50, yielding a 5.0% ROE for shareholders. However, if HTMC recapitalises and the economy falls into a recession, net income will only be \$200,000, after paying \$300,000 in interest. Thus, EPS will be \$2.00 and ROE only 4.0%. In other words, whether the recapitalisation plan increases or decreases returns for shareholders depends on the state of the economy.

Recall that Ms Kelly believes that each of the three economic scenarios is equally likely. Based on that view, we already calculated the expected level of EBIT. But what about expected EPS and expected ROE? As HTMC's major shareholder claimed, the expected return to shareholders rises if HTMC adds debt to its capital structure.

$$\text{Expected EPS(no debt)} = \left(\frac{1}{3}\right) \$7.50 + \left(\frac{1}{3}\right) \$5 + \left(\frac{1}{3}\right) \$2.50 = \$5$$

$$\text{Expected EPS(with debt)} = \left(\frac{1}{3}\right) \$12 + \left(\frac{1}{3}\right) \$7 + \left(\frac{1}{3}\right) \$2 = \$7$$

$$\text{Expected ROE(no debt)} = \left(\frac{1}{3}\right) 15\% + \left(\frac{1}{3}\right) 10\% + \left(\frac{1}{3}\right) 5\% = 10\%$$

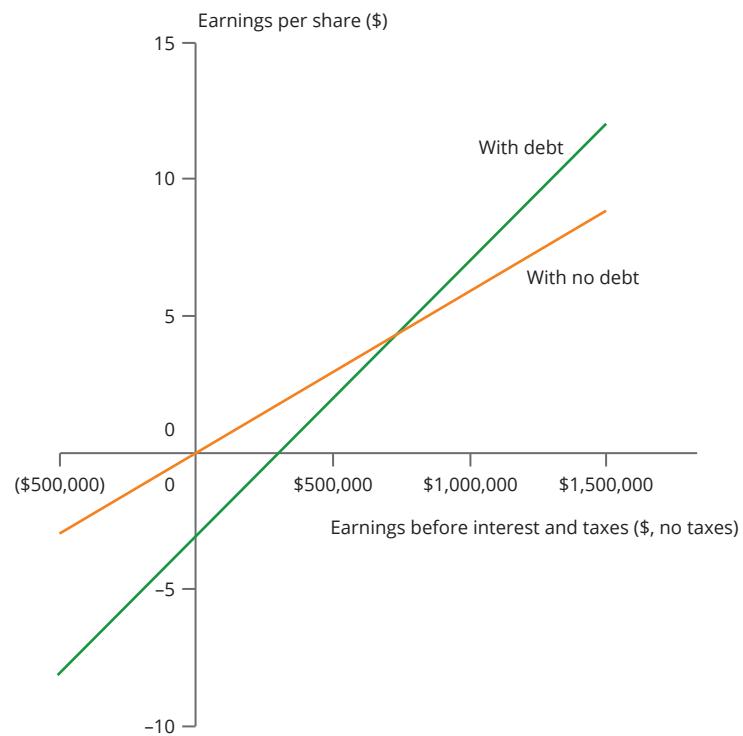
$$\text{Expected ROE(with debt)} = \left(\frac{1}{3}\right) 24\% + \left(\frac{1}{3}\right) 14\% + \left(\frac{1}{3}\right) 4\% = 14\%$$

13.1a HOW LEVERAGE INCREASES THE RISK OF EXPECTED EARNINGS PER SHARE

Figure 13.5 illustrates how High-Tech's capital structure affects the relationship between EBIT and EPS. In good economic times, the company enjoys higher EPS with the 50% debt/50% equity capital structure than with the all-equity capital structure. However, in a recession, HTMC's shareholders earn more under the old all-equity capital structure. Now you can see how the term *leverage* applies to the decision to borrow money: relative to the all-equity capital structure, borrowing money makes shareholders better off when times are good and worse off when times are bad. Leverage magnifies both the good outcomes and the bad ones.

FIGURE 13.5 THE EFFECT OF DEBT ON THE VOLATILITY OF EARNINGS

When the company uses debt, it magnifies both upside gains and downside losses, as shown by the steeper, 'with debt' line. Earnings thus become riskier with leverage.



The lines in [Figure 13.5](#) cross when EBIT equals \$600,000. When EBIT exceeds \$600,000, HTMC's shareholders earn more with the 50% debt/50% equity mix than with the current all-equity structure. If EBIT is below \$600,000, then the reverse is true: shareholders earn higher EPS with all-equity financing than they would if HTMC were to borrow money.

For the proposed recapitalisation, the *breakeven level of operating profits* – the level of EBIT yielding the same ROE for both capital structures – occurs when EBIT equals \$600,000. It is no accident that \$600,000 defines the breakeven point here. Notice that if HTMC earns \$600,000 on assets of \$10 million, then its return on assets equals 6%, the same rate that it pays on borrowed funds. If the company can earn more on its assets than it pays on its debt, then EPS goes up relative to the all-equity case. If EBIT falls short of \$600,000, then the company earns less on its investments than it pays in interest; hence EPS goes down relative to the all-equity case. The slopes of the lines in the figure indicate that debt magnifies the effect on EPS of any change in EBIT. When EBIT changes, EPS changes faster if the company is levered than if it is unlevered.

13.1b THE FUNDAMENTAL PRINCIPLE OF FINANCIAL LEVERAGE

The simple example using High-Tech Manufacturing Company shows why employing long-term debt financing is called applying *financial leverage*. Just as a lever magnifies the effect of a given force on an object, debt financing magnifies the impact of a change in EBIT on earnings per share. If High-Tech's realised EBIT comes in next year above \$600,000, employing debt financing will increase earnings per share for the company's shareholders. However, the reverse also holds true. If EBIT falls below \$600,000, HTMC's earnings per share will be lower than they would have been with an all-equity capital structure. This yields a basic and

important result, the **fundamental principle of financial leverage**: substituting debt for equity increases expected returns to shareholders, but also increases the risk that equity investors bear.

Because adding debt to the capital structure makes shareholders' claims more risky, they should demand a higher return. Therefore, whether the addition of debt to HTMC's capital structure increases the company's share price depends on the relative importance of two offsetting effects: (1) the increase in expected EPS as opposed to (2) the increased discount rate that shareholders will apply to these earnings. In one special (but important) case, these forces offset each other exactly, which would mean that changing a company's capital structure neither raises nor lowers its value.

fundamental principle of financial leverage

Substituting debt for equity increases expected returns to shareholders, but also increases the risk that equity investors bear

13.1c LEVERAGE INCREASES EXPECTED RETURN – BUT DOES IT INCREASE VALUE?

Though we have demonstrated the effect that financial leverage should have on HTMC's shareholders, we have not yet helped Ms Kelly decide whether to adopt the 50% debt/50% equity recapitalisation or retain the company's existing all-equity capital structure. In **Figures 13.1**, **13.2** and **13.5**, she documents that employing debt can increase expected EPS and ROE for HTMC's shareholders, but the added risk associated with debt makes her uncertain about the net benefit of the recapitalisation (change of debt-equity ratio).

In creating **Figure 13.2**, we assumed that immediately after HTMC's recapitalisation, the remaining shares would still sell for \$50. If that assumption is valid, then the total market value of HTMC equals \$10 million, whether the company finances with all equity or with some debt and some equity. Recall that if HTMC recapitalises, its expected EPS increases from \$5 to \$7. Likewise, expected ROE increases from 10% to 14%. Because of the added risk that they must bear, suppose HTMC shareholders increase their required return from 10% to 14%. If shareholders believe that HTMC's earnings will be \$7 per share in perpetuity, then the share price will remain at \$50 and the recapitalisation will have no net impact on HTMC's total value:

$$P = \frac{\$7}{0.14} = \$50$$

From this analysis, Ms Kelly concludes that there is no unique *optimal capital structure* for her company that maximises company value. Substituting debt for equity will increase expected EPS, but only at the cost of higher variability. With higher EPS volatility, shareholders will expect a higher return, meaning that they will discount future earnings at a higher rate. These two effects essentially cancel each other out, so shareholders are just as happy with a capital structure that includes no debt as they are with one that consists of equal proportions of debt and equity.²

LO13.1

CONCEPT REVIEW QUESTIONS

- 1 What is a recapitalisation?
- 2 What is the fundamental principle of financial leverage?
- 3 What trade-offs do managers face when they consider changing a company's capital structure?

THINKING CAP QUESTION

- 1 What impact would you expect on a company's earnings if it raises its debt-to-equity ratio?

² This result holds for any other mix of debt and equity under the assumptions used in this example. The total market value of HTMC is the same whether the company uses 100% equity, 75% equity and 25% debt, or any other capital structure.

LO13.2

13.2 THE MODIGLIANI AND MILLER PROPOSITIONS

Susan Kelly (in the preceding section) has reached the same capital structure irrelevance conclusion proposed by two economists more than 60 years ago. In 1958, Franco Modigliani and Merton Miller (hereafter, M&M) published a path-breaking study that challenged conventional thinking about capital structure.³ They demonstrated that changes in the mix of debt and equity merely altered the division of a company's cash flows between its shareholders and bondholders, but did not fundamentally affect company value. This conclusion was predicated on several important assumptions:

- 1 Capital markets are perfect, meaning that investors and companies face no market frictions such as taxes or transactions costs.
- 2 Investors can borrow and lend at the same rate that corporations can.
- 3 Managers and investors have identical information regarding the company's operations and plans.

Underpinning these ideas are two powerful assumptions about the behaviour of companies and managers in markets. One assumption is the idea that individuals will always work for the best interests of those who employ them. This means that we do not have to address 'principal–agent problems'. A principal–agent problem is when a person working for someone else (an agent) may act on the basis of personal interests that do not fit with the interests of her employer (or principal). This can apply for any interaction between individuals in which one, the principal, is asking the other, the agent – with an incentive that may be financial or non-financial – to do something: for example, a manager being expected to take actions to maximise the value of the company on behalf of the shareholders of the company.

A crucial element of this relationship in the real world, and the reason why much research in corporate finance has examined this issue, is that the principal may not be able to examine or understand the work of the manager, and hence not be able to confirm that the manager is indeed working for the principal. We discussed this issue in Chapter 1's section on agency costs. The principal–agent issue is sometimes also called the *hidden action problem* because the agent's actions are hidden from the view of the principal, who cannot check on whether or how the agent has undertaken their actions.

The other key assumption that is part of the Modigliani–Miller framework is that information is not 'asymmetric' in its distribution; that is, all individuals in the market possess or can obtain the same information as any others. Further, if given the same information, each individual will draw the same conclusions from it. In reality, information is asymmetric: we do not all share the same knowledge, and even if we did, our interpretations of it often varies from person to person. The asymmetric information problem is sometimes also called the *hidden information problem* because a given piece of information may be hidden from some of the market participants.

Although these assumptions – forbidding the principal–agent problem and information asymmetry, eliminating all market frictions such as taxes and asserting that investors can borrow and lend at the corporate rate – clearly do not correspond to conditions in real markets, M&M's conclusions remain significant. Collectively, these assumptions provide us with a concept of an 'efficient' market, one in which the actions of agents and principals will work to ensure that the value of a company is maximised as far as possible within the competitive constraints of the market.

The value of the M&M result is that it provides a benchmark against which we can compare real markets. If a change of capital structure does in fact change the value of the company, then at least one of the key assumptions must have been violated; and this insight gives us a way to identify the reason for capital

³ See Franco Modigliani and Merton Miller, 'The Cost of Capital, Corporation Finance and the Theory of Investment', *American Economic Review*, vol. 48, no. 3 (1958), pp. 261–97.

structure having an effect on company value – we just need to check which of the assumptions has been broken in the real market.

M&M made an important distinction between a company's *business risk* and its *financial risk*. **Business risk** refers to the variability of a company's cash flows, whereas **financial risk** refers to how a company's financing choices affect how this risk is distributed to its shareholders and bondholders. HTMC's business risk is determined by how its earnings, before interest and taxes, fluctuate with the state of the economy. Notice that, in the example of HTMC, the volatility of EBIT is the same whether HTMC recapitalises or finances with 100% equity. In either case, its EBIT will be \$500,000, \$1,000,000 or \$1,500,000, depending on the state of the economy.

If HTMC retains its all-equity structure, then the financial risk that shareholders bear equals HTMC's underlying business risk. With no debt, the variations in EBIT translate directly into variations in EPS. However, under the 50–50 recapitalisation, HTMC's leverage magnifies the financial risk borne by shareholders. With debt, HTMC issues a claim to bondholders that insulates them entirely from the company's business risk. Whether the economy booms, grows normally or falls into a recession, bondholders receive the \$300,000 interest payment they are promised. In this example, because bondholders bear no risk, even though HTMC's business risk has not changed, the shareholders remaining after the recapitalisation must shoulder even more risk than they did before.

business risk
The variability of a company's cash flows, as measured by the variability of EBIT

financial risk
How a company's financing choices affect how its *business risk* is distributed to its shareholders and bondholders

13.2a M&M PROPOSITION I: CAPITAL STRUCTURE IRRELEVANCE

Modigliani and Miller's **Proposition I** asserts the following: *the market value of any company equals the value of its assets and is independent of the company's capital structure*. The value of the assets, in turn, equals the present value of the cash flows generated by the assets. Because the proposition leads to the conclusion that the company's capital structure does not matter, it is popularly known as the *irrelevance proposition*.

We can develop a simple, mathematical expression of this idea as follows. Assume that investors expect a company to generate a constant EBIT (assumed equal to *net operating income*) stream each year for the foreseeable future. The company may have outstanding debt with market value equal to D and/or equity with a market value equal to E . By definition, the total value of the company's outstanding securities is V , where $V = D + E$. This expression states a company's value equals the combined value of all the securities the company issues and is invariant to the amount of debt or equity used.⁴ Finally, the cash flows generated by the company's assets are risky, and investors discount them at the rate r_a . *M&M's Proposition I claims the following:*

$$(Eq. 13.1) \quad V = (D + E) = \frac{EBIT}{r}$$

Proposition I
The famous 'irrelevance proposition', which asserts that the market value of any company equals the value of its assets and is independent of the company's capital structure. Company value is calculated by discounting the company's expected *EBIT* at the rate r_a , appropriate for the company's business risk

In terms of the company's capital structure, **Equation 13.1** indicates that *the company's market value equals the present value of the EBIT it generates regardless of the capital structure it chooses*. The market value of any company is independent of its capital structure and is calculated by discounting expected EBIT at the rate r_a , appropriate for the company's business risk. The discount rate r_a is the required return on assets, and is based on the variability of expected EBIT. This is exactly what Ms Kelly did for HTMC. She generated an expected level of operating profits for HTMC (\$1,000,000 EBIT per year), and then discounted this stream of expected earnings, using a discount rate ($r_a = 10\%$) appropriate to the business risk that HTMC faces. Company value is thus determined by the level of HTMC's net operating income and by the company's degree of business risk, not by whether the EBIT stream is then allocated entirely to shareholders in the all-equity capital structure or split between debt-and-equity security holders under the proposed capitalisation.

4 We are not speaking of just the value of the company's equity here. By 'value of the company', we mean the market value of the company's assets, not just the value of the shareholders' residual claim. Note that Equation 13.1 assumes the company's EBIT is a perpetuity.

Under HTMC's current, all-equity capital structure, the return on equity is the same as the return on the company's assets: both ROA and ROE are 10%. But what happens if HTMC issues low-risk debt and uses the proceeds to repurchase half the company's outstanding equity? The company's business risk (the variability of expected EBIT) is unchanged by this transaction, and all this risk is still borne by shareholders. However, the risk for shareholders is now magnified because there is only half as much equity outstanding as before. By how much will the risk to HTMC's shareholders be magnified if the company adopts the proposed 50% debt/50% equity capital structure? It turns out that M&M also provided an answer to this question with their Proposition II.

13.2b M&M PROPOSITION II: HOW INCREASING LEVERAGE AFFECTS THE COST OF EQUITY

Proposition II

Asserts that if we hold the required return on assets (r_a) and the required return on debt (r_d) constant, the expected return on levered equity (r_l) increases with the debt-to-equity ratio

Modigliani and Miller's **Proposition II** asserts the following: if we hold the required return on assets (r_a) and the required return on debt (r_d) constant, the expected return on levered equity (r_l) increases with the debt-to-equity ratio. **Equation 13.2** expresses this relationship mathematically:

$$(Eq. 13.2) \quad r_l = r_a + (r_a - r_d) \left[\frac{D}{E} \right]$$

Does this formula yield the same expected returns on equity for HTMC's shareholders that Susan Kelly had calculated earlier under the current all-equity and the proposed 50% debt/50% equity capital structures? Remember that the company's underlying business risk justifies a return, r_a , of 10% and that its cost of debt, r_d , is 6%. Clearly, under the current all-equity structure, there is no debt outstanding, and the D/E ratio is zero. Therefore, the term to the right of the plus sign in **Equation 13.2** is also zero. **Equation 13.2** says that the return on equity equals the return on assets, or 10%:

$$r_l = 0.10 + (0.10 - 0.06) \times \frac{\$0}{\$10,000,000} = 0.10 = 10\%$$

The proposed 50% debt/50% equity capital structure yields a debt-to-equity ratio of 1.0. We can use **Equation 13.2** to calculate that the return on levered equity must be 14%, just as Ms Kelly had calculated previously:

$$r_l = 0.10 + (0.10 - 0.06) \times \frac{\$5,000,000}{\$5,000,000} = 0.10 + 0.04 = 0.14 = 14\%$$

Proposition II has another important interpretation. Let's rearrange the equation so that r , the return on assets, appears by itself, on the left-hand side. This results in the following expression:

$$r_a = r_l \left(\frac{E}{D+E} \right) + r_d \left(\frac{D}{D+E} \right)$$

Does this look familiar? It should. It's the expression introduced in Chapter 11 for a company's *weighted average cost of capital (WACC)*, if we ignore the tax deductibility of interest on debt. We have already said the value of r_a depends on a company's business risk and is independent of the company's capital structure. This equation might appear to contradict that claim because it might seem that changing the values of E and D on the right-hand side might change r_a . But remember, Proposition II says that as leverage increases, the required return on equity also increases. If a company replaces equity with debt in its capital structure, the term $E \div (D + E)$ falls and the term $D \div (D + E)$ rises. However, r_l goes up because of the added financial risk borne by

shareholders. The net effect of all this is to leave the WACC unchanged. For example, when HTMC uses all equity, we know that the required return on equity is 10%, so the WACC is 10%, too:

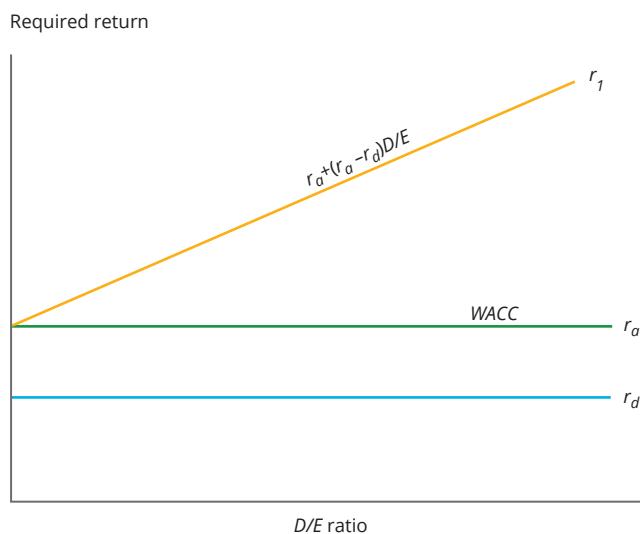
$$r_a = 10\%(1.0) + 6\%(0) = 10\%$$

If HTMC recapitalises, then pays 6% to bondholders, shareholders demand a 14% return and the WACC remains unchanged at 10%:

$$r_a = 14\%(0.50) + 6\%(0.50) = 10\%$$

If capital structure is irrelevant (i.e. if Proposition I holds), Proposition II tells us what the required return on levered equity must be to maintain the same total company value (or the same WACC). As [Figure 13.6](#) shows, the cost of equity will rise continuously as companies substitute debt for equity, but the WACC remains the same.

FIGURE 13.6 M&M PROPOSITION II ILLUSTRATED: THE COST OF EQUITY, COST OF DEBT AND WACC FOR A COMPANY IN A WORLD WITHOUT TAXES



Where: $r_a + (r_a - r_d) \frac{D}{E} = \text{cost of equity}$

r_d = cost of debt

$\text{WACC} = r_a$ = weighted average cost of capital

D = market value of debt outstanding

E = market value of shares outstanding

Remember that the value of a company equals all of its future cash flows discounted by its cost of capital. If managers could adjust capital structure to achieve a lower overall WACC (while leaving cash flows unchanged), then that would also increase the value of the company. Propositions I and II illustrate why this can't happen in perfect markets. Proposition I says that there is no capital structure that maximises the value of a company, while Proposition II says that there is no capital structure that minimises the WACC.

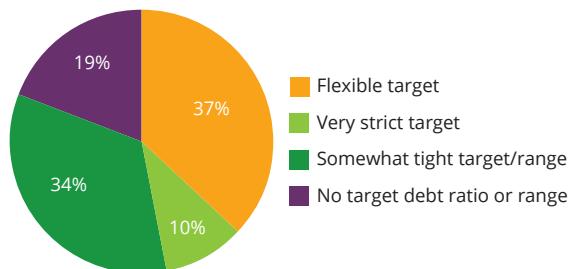
13.2c DOES DEBT POLICY MATTER?

In the previous section we learned that, in a perfect market, companies' capital structure choices do not matter. That finding stands at odds with what CFOs tell us – namely, that capital structure decisions are extremely important and can have as much influence on the value of a company as investment decisions. If financial managers believe that capital structure is important, it must be because markets are imperfect in

some important way. One of our goals in this chapter is to understand how market imperfections influence capital structure choices and affect company value.

Is there an optimal capital structure for a particular company? **Figure 13.7** shows that, in the US, most companies operate with target capital structures in mind. Of the 392 CFOs surveyed by Graham and Harvey (2001), 44% said that their company had either a ‘very strict’ or ‘somewhat tight’ capital structure target, and another 37% said that their companies had flexible targets. Fewer than one-fifth of CFOs said that their company had no target debt ratio or range. Less formal surveys in Australia indicate similar patterns in the setting of capital structure targets; and a summary of some more recent surveys support these findings by Graham and Harvey.⁵

FIGURE 13.7 DO COMPANIES HAVE TARGET CAPITAL STRUCTURES?



Source: Graham and Harvey (2001), 'The Theory and Practice of Corporate Finance: Evidence From the Field', *Journal of Financial Economics*, 60, pp. 187–243, copyright © 2001, with permission from Elsevier.

In other words, most managers behave as if they believe that some capital structures are better than others, and they try to manage towards a particular target. But what factors determine the optimal capital structure, and how do managers decide what leverage policy will maximise value for their companies? One of the most important factors is the tax code.

LO13.2

CONCEPT REVIEW QUESTIONS

- 4 Explain how Propositions I and II differ, as well as what they have in common.
- 5 What is the difference between levered and unlevered equity? What effect does substituting debt for equity have on the required return on (levered) equity?

THINKING CAP QUESTION

- 2 Our company's cost of equity is 15%, but we can borrow money at 7%. If we need to raise money to fund a new investment, should we borrow money because it's cheaper?

LO13.3

13.3 THE M&M CAPITAL STRUCTURE MODEL WITH TAXES

M&M derived their propositions by assuming that companies operate in markets without taxes or transactions costs. In this section, we look at what happens when we introduce corporate income taxes and interest deductibility into the M&M framework.

⁵ Cotei, Carmen, and Joseph Farhat, 'Worldwide Patterns in Capital Structure', in Baker, H. Kent, and Gerald S. Martin, *Capital Structure and Corporate Financing Decisions Theory, Evidence, and Practice*. New Jersey: John Wiley & Sons, 2011, pp. 111–26.

13.3a THE M&M MODEL WITH CORPORATE TAXES

In Australia and many other countries, companies can deduct interest payments to lenders as a business expense. (Dividends paid to shareholders receive no similar tax advantage for the company.) The interest deduction thus reduces the amount of taxes the company must pay to the government. Intuitively, this should lead to a tax advantage for debt, meaning that managers can increase company value by issuing debt. So, returning to our High-Tech Manufacturing Company (HTMC) example, we now demonstrate how, with interest deductibility, adding debt to the company's capital structure could increase the company's value by reducing the government's tax claim on the company's cash flow.

Let's begin our demonstration by assuming, as before, that the HTMC's EBIT will be \$1,000,000 next year, and that we are trying to decide whether to retain the company's existing, all-equity capital structure or adopt a proposed 50% debt/50% equity capitalisation. Assume that investors still require a 10% return on the company's assets, so $r_a = 0.10$, as before. However, we now propose that HTMC faces a 35% corporate tax rate on earnings ($T_c = 0.35$). In computing taxable earnings, HTMC can deduct interest expense.⁶

Figure 13.8 shows the after-tax cash flows to HTMC's shareholders and debtholders under the current and proposed capital structure if EBIT is \$1,000,000, as expected. Company taxes reduce the amount of money that can be distributed to security holders under both capital structures, but the effect is greater under the all-equity plan. In this case, HTMC pays taxes of \$350,000, leaving only \$650,000 available for distribution to shareholders. EPS thus drops to \$3.25 from \$5.00 under the no-tax scenario. Under the proposed capital structure, tax-deductible interest payments of \$300,000 reduce taxable profits to \$700,000, and HTMC only pays \$245,000 in corporate taxes. This leaves \$455,000 in net income that can be distributed to shareholders, yielding an EPS of \$4.55 from \$7.00 under the no-tax scenario. Note that under the proposed capital structure, HTMC is able to distribute \$755,000 to investors (\$300,000 interest to debtholders and \$455,000 in dividends to shareholders). Under the all-equity capitalisation, HTMC can only distribute \$650,000 to investors (dividends to shareholders).

FIGURE 13.8 CASH FLOWS TO SHAREHOLDERS AND BONDHOLDERS UNDER THE CURRENT AND PROPOSED CAPITAL STRUCTURE FOR HTMC – WITH CORPORATE TAXATION (ASSUMING EBIT = \$1,000,000 AND $T_c = 0.35$)

	CURRENT CAPITAL STRUCTURE: ALL-EQUITY FINANCING	PROPOSED CAPITAL STRUCTURE: 50% DEBT, 50% EQUITY
EBIT	\$1,000,000	\$1,000,000
Interest (6.0%)	\$0	\$(300,000)
Taxable income	\$1,000,000	\$700,000
Corporate taxes ($T_c = 0.35$)	\$(350,000)	\$(245,000)
Net income	\$650,000	\$455,000
Shares outstanding	200,000	100,000
EPS	\$3.25	\$4.55

We can now compute the value of both the unlevered and levered versions of HTMC, and define these values as V_u and V_l , respectively. The basic valuation formula (Equation 13.1) used in the absence of taxes to

6 This is the same logic Modigliani and Miller used in their 1963 'modified' capital structure model, which explicitly incorporated a tax on corporate profits and interest deductibility. See Franco Modigliani and Merton Miller, 'Corporate Income Taxes and the Cost of Capital', *American Economic Review*, 53 (June 1963), pp. 433–43.

discount EBIT must now be modified to discount after-tax net income (NI), yielding the following formula for the value of HTMC if it uses no debt (its unlevered value V_u):

$$(Eq. 13.3) \quad V_u = \frac{EBIT(1-T_c)}{r_a} = \frac{NI}{r_a} = \frac{\$650,000}{0.10} = \$6,500,000$$

The introduction of a 35% corporate profits tax causes an immediate \$3,500,000 reduction (from \$10,000,000 to \$6,500,000) in the market value of the current all-equity structure of HTMC.

13.3b DETERMINING THE PRESENT VALUE OF INTEREST TAX SHIELDS

Equation 13.3 reveals that corporate taxes cause a reduction in the value of an unlevered company, compared with its value in a zero-tax environment. Now let's consider how HTMC can increase company value by using debt financing to fund some of its investment. Remember, this increase in value occurs directly because the company can deduct interest on debt and reduce what it owes the government in taxes.

If the new debt that HTMC will issue under the proposed 50% debt/50% equity plan is assumed to be *permanent* – meaning the company will always reissue maturing debt – the interest expense the company pays creates a perpetual tax shield of \$105,000 per year. The annual tax shield equals the tax rate times the amount of interest paid ($T_c \times r_d \times D = 0.35 \times 0.06 \times \$5,000,000 = \$105,000$). To find the present value of this perpetuity, capitalise this stream of benefits at r_d , the 6% rate of interest charged on HTMC's debt. With these assumptions, the present value of HTMC's interest tax shields is:

$$(Eq. 13.4) \quad PV(\text{Interest tax shields}) = \frac{(T_c \times r_d \times D)}{r_d} = T_c \times D = 0.35 \times (\$5,000,000) = \$1,750,000$$

In other words, the present value of interest tax shields on (perpetual) debt is equal to the tax rate times the face value of the debt outstanding. Therefore, the value of the levered version of HTMC, V_l , is equal to the value of the unlevered company plus the present value of the interest tax shields:

$$(Eq. 13.5) \quad V_l = V_u + PV(\text{Interest tax shields}) = V_u + T_c D = \$6,500,000 + \$1,750,000 = \$8,250,000$$

What a deal! In essence, the government has given HTMC's shareholders a \$1,750,000 subsidy to employ debt financing rather than equity.

Figure 13.9 illustrates the impact of taxes on company value. Panel A represents the situation in the original, no-tax case: there, the size of the pie – the value of the company – does not depend on how you divide the pie between debt and equity claims. With a corporate income tax, though, a company's capital structure influences its value: debt determines how much of the pie goes to the government. The more the company borrows, the smaller is the government's claim, and thus the larger are the claims held by private investors. Panel B of **Figure 13.9** illustrates this point. At the limit, the government's slice (its tax claim) disappears when the company finances its operations entirely through debt and pays all its earnings in tax-deductible interest.

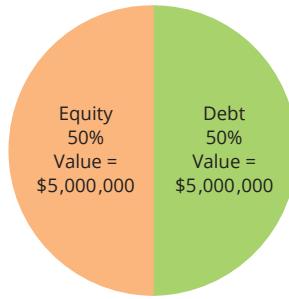
FIGURE 13.9 PIE CHART MODELS OF CAPITAL STRUCTURE WITH AND WITHOUT CORPORATE INCOME TAXES

Panel A

With no taxes, the size of the pie, or the value of the firm, does not depend on the mix of debt and equity that the firm chooses. Proposition I holds, and capital structure is irrelevant.



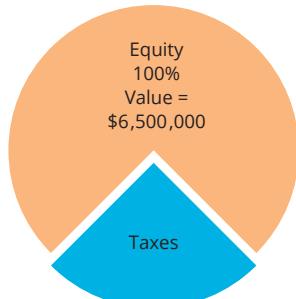
Unlevered value = \$10,000,000



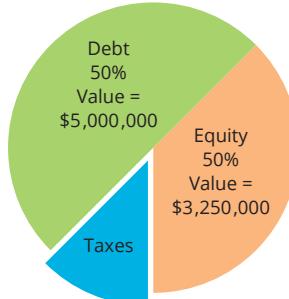
Levered value = \$10,000,000

Panel B

With a corporate income tax, a portion of the firm's cash flows goes to the government, diminishing the value of claims held by private investors. The government's slice of the pie shrinks the more debt a firm uses because the government allows a deduction for interest payments. A company could shelter nearly all of its cash flows by financing its operations almost entirely with debt. Therefore, capital structure matters because firm value is larger if the firm uses more debt.



Unlevered value = \$6,500,000



Levered value = \$8,250,000

EXAMPLE

Facebook Valuation

By 1 July 2019, Facebook was using essentially no long-term debt, and its equity had a market value of US\$550.82 billion. In the absence of debt, this implies that Facebook's assets were also worth US\$550.82 billion. What would happen to the total value of Facebook if the company issued

\$US275.41 billion in long-term debt and used the proceeds to retire half of its equity? According to **Equation 13.4**, if Facebook faced a US corporate tax rate of 21%, then the recapitalisation would create an additional \$US57.84 billion ($0.21 \times \$US275.41$ billion) in value for Facebook investors!

Source: Data from https://ycharts.com/companies/FB/market_cap. Accessed 9 August 2019.

13.3c THE M&M MODEL WITH CORPORATE AND PERSONAL TAXES

Clearly, accounting for corporate income taxes leads us to favour the proposed 50% debt/50% equity capital structure for HTMC. However, this isn't the best possible outcome. If a 50% debt-to-capital ratio increases HTMC's total company value by \$1,750,000 more than that of the unlevered version of HTMC, and if each additional dollar of debt increases the value by \$0.35, then shouldn't the *optimal* leverage ratio for the company be 100% debt? This implication, more than any other, lessened the initial acceptance of the M&M propositions. How could the theory be correct if it predicted that all companies should be highly levered, and yet, in the real world, many companies use little or no debt? Part of the answer to this question is that non-tax factors partly offset the tax benefits of debt usage. Another part of the answer is that personal income taxes can cancel out some or all of the corporate-level tax benefits of debt usage.

To illustrate this, in 1977, Merton Miller published a valuation model that incorporated both corporate and personal taxes.⁷ Rather than using **Equation 13.4**, Miller provided a formula for computing the gains from using leverage, G_l , both for individual companies and for the corporate sector as a whole:

$$(Eq. 13.6) \quad G_l = \left[1 - \frac{(1-T_c)(1-T_{ps})}{(1-T_{pd})} \right] \times D$$

where:

T_c = tax rate on corporate profits, as before

T_{ps} = personal tax rate on income from equity (dividends and capital gains)

T_{pd} = personal tax rate on income from debt (interest income)

D = market value of a company's outstanding debt.

This is, in fact, a very general formulation. In a no-tax world ($T_c = T_{ps} = T_{pd} = 0$), the gains from leverage equal zero, and the original M&M irrelevance proposition holds. In a world with only corporate income taxes ($T_c = 0.35$; $T_{ps} = T_{pd} = 0$), $G_l = [1 - (1 - T_c)] \times D = T_c D$, and the 100% optimal debt result again emerges. That is, with the imposition of corporate income tax, the issuing corporation is able to increase its value by the size of the tax shield on debt because it can deduct the interest payment on debt from its income before tax is levied.

If, however, personal tax rates on interest income T_{pd} are sufficiently high, and personal tax rates on equity income T_{ps} are sufficiently low, the gains to corporate leverage can be dramatically reduced, or even offset entirely. In effect, the term in square brackets becomes negative and the value of the corporation is actually diminished. Clearly a company in such a case would not wish to issue debt due to its wealth-reducing impact on its potential lenders.

Here is an alternative outcome. In Australia and a number of other countries, the rate T_{ps} for Australian tax residents is set by formula to equal $[(T_{pd} - T_c)/(1 - T_c)]$, by the *dividend imputation tax scheme*. That is, the personal tax rate on income from equity is not a fixed number, but a formula with a value that changes as the corporate profit tax rate and the debt income tax rate change. In other words, the impact of the dividend imputation tax regime is a scheme in which some or all of the tax paid by a company may be attributed to shareholders in the form of a tax credit to reduce income tax payable on the income distribution (dividend).

If the value of T_{ps} is given by the formula in the previous paragraph, then the term in square brackets in **Equation 13.6** is $[1 - 1]$ (check the algebraic effect by substitution); so no gain occurs from using leverage. Several countries, such as the UK, Canada and New Zealand, use a form of this dividend imputation scheme, and similarly can reduce the impact of leverage on the value of a company.

⁷ See Merton Miller, 'Debt and Taxes', *Journal of Finance*, 32 (May 1977), pp. 261–76.

LO13.3

CONCEPT REVIEW QUESTIONS

- 6 What effect does incorporating corporate income taxation have on the M&M capital structure irrelevance hypothesis? Why?
- 7 What share price effects do you think resulted from the 1987 introduction of the dividend imputation tax for Australian companies?

THINKING CAP QUESTION

- 3 If we issue \$10 billion in long-term debt and use the proceeds to repurchase shares, what effect (qualitative and quantitative) will this have on our share price?

LO13.4

13.4 THE TRADE-OFF MODEL OF CAPITAL STRUCTURE

We have now seen that the corporate capital structure choice is irrelevant in a world without taxes or other market frictions. We have learned not only that corporate income taxes, by themselves, give companies a strong incentive to employ financial leverage, but also that things are much less clear-cut when personal income taxes are considered. On balance, corporate and personal taxes seem to influence the decisions that companies make regarding their capital structures, but some companies that are subject to the same tax code often employ very different amounts of leverage. Therefore, there must be other costs and benefits of leverage that managers trade off when they make capital structure choices. One important factor is that companies with higher debt face a greater risk of financial distress, and the costs of financial distress may be sufficiently high to discourage some companies from using debt.

13.4a COSTS OF INSOLVENCY AND FINANCIAL DISTRESS

A company is **insolvent** when it cannot meet its debt obligations, and the insolvency process describes the legal process through which creditors' claims are handled. The threat of insolvency may well discourage debt financing. High leverage makes it more likely that companies will be unable to make interest and principal payments when cash flows are low. This could cause companies to default on their debts, which in turn could force them into insolvency. In principle, when a company fails to pay its debts, creditors can force the company into administration. In Australia, a company in such a situation appoints an administrator who takes charge of the organisation. If he or she decides that declaring insolvency is the prudent use of the company resources in terms of maximising its value, the administrator may choose to liquidate the company's assets or to propose a plan to restructure the company so that it can emerge from insolvency as a viable business. The company's original shareholders generally lose their entire investment either way, and the ownership of the company (or the company's remaining assets) passes to bondholders and other creditors. However, the process of transferring a company's assets from shareholders to creditors is time-consuming and expensive. **Insolvency costs** are the direct and indirect costs of the insolvency process.

Direct insolvency costs include fees paid to lawyers, accountants, investment bankers and other professionals involved in insolvency proceedings, in addition to other expenses directly tied to insolvency filing and administration. Although direct insolvency costs can run into the millions of dollars, they are usually small relative to the assets of the company, especially in high-profile cases involving large,

insolvent

The situation that exists when a company cannot meet its debt obligations

insolvency costs

The direct and indirect costs of the insolvency process

direct insolvency costs

Include fees paid to lawyers, accountants, investment bankers and other professionals involved in insolvency proceedings in addition to other expenses directly tied to insolvency filing and administration

indirect insolvency costs

Include the loss of customers and key suppliers, the time that managers spend managing the insolvency process rather than focusing on their business, the loss of key employees and missed opportunities to invest in positive-NPV projects

well-known companies. **Indirect insolvency costs**, as the name implies, are economic losses that result from insolvency but are not cash outlays spent on the legal process. Indirect costs include the loss of customers and key suppliers, the time that top managers spend managing the insolvency process rather than focusing on their business, the loss of key employees, and missed opportunities to invest in positive-NPV projects. Even though indirect insolvency costs are inherently difficult to measure, research clearly suggests that they are significant – significant enough, in many cases, to lessen the incentive for corporate managers to employ financial leverage.

Although issuing more debt creates a larger tax shield, the more debt a company uses, the higher is the probability that the company will declare itself insolvent and incur costs in the process. At low debt levels, the probability of insolvency is very low, so debt's tax advantages outweigh the prospect of insolvency costs. At higher debt levels, however, the risk of insolvency rises, and some companies may find that the tax advantages of debt are not sufficient to risk the costs of going bankrupt. This leads to the *trade-off model of capital structure* in which managers try to find the optimal balance between debt's various costs and benefits. The optimal balance is the one that maximises the value of the company. Recognition of insolvency costs allows us to expand the basic valuation formula first presented in section 13.3 to express the value of a levered company, V_l , relative to the value of an unlevered company, V_u , the present value of the benefits from debt tax shields and the present value of expected insolvency costs:

(Eq. 13.7)

$$V_l = V_u + PV(\text{Tax shields}) - PV(\text{Insolvency costs})$$

Asset Characteristics and Insolvency Costs

Intuitively, it seems that insolvency will be very costly for some types of companies and less costly for others. For example, consider a company that sells durable goods like appliances or automobiles. Customers may hesitate to buy the company's products if the company is at risk of becoming insolvent because an insolvent company might not be able to service the products that it sells. For such a company, the loss of customers could be a very significant indirect cost of becoming insolvent, so the company has an incentive to be very careful about the amount of debt that it issues. On the other hand, few customers would worry about the long-term consequences of their local grocery store becoming insolvent because not much service after the sale is required in that business. As a general rule, producers of sophisticated products or services have an incentive to use less debt than companies producing simple goods or basic services.

Companies with mostly tangible assets that have well-established secondary markets should be more willing to use debt than companies with mostly intangible assets. Companies can use tangible assets as collateral for loans, which may reduce the cost of borrowing, and companies can sell those assets for cash if and when financial distress occurs. Therefore, trucking companies, airlines, construction companies, pipeline companies and railways can all employ more debt than can companies with fewer tangible assets, such as pharmaceutical manufacturers, food distributors (what is the collateral value of week-old tomatoes?) and pure service companies.

Financial distress may provide managers with perverse yet rational incentives to play a variety of games, mostly at bondholders' expense. Two such games – *asset substitution* and *underinvestment* – are especially damaging. Both games begin when managers realise that the company will probably not fulfil its obligations to creditors.

asset substitution

When shareholders choose risky projects that benefit themselves but reduce the value of bondholders

The Asset Substitution Problem

To illustrate how **asset substitution** works, assume that a company has bonds with a face value of \$10 million outstanding that mature in 30 days. These bonds were issued years ago when the company was prospering, but since then the company has fallen on hard times. In spite of its difficulties, the company still

has \$8 million in cash on hand, and the company's managers still control its investment policy. The company can invest this cash in either of two available projects, both of which require a cash investment of \$8 million. Alternatively, the company can simply hold the cash in reserve to partially repay the bond issue in 30 days. The first investment opportunity is a low-risk project (code-named '*Boring*' by company insiders) that will return a near-certain \$8.15 million in 30 days. This is a monthly return of 1.88%, or an annual return of almost 25%. In other words, it is a positive-NPV project that will increase company value, but it does not earn enough to fully pay off the maturing bonds.

The second investment opportunity (called 'project *Hot Bali*') is basically a gamble. It offers a 40% chance of a \$12 million payoff and a 60% chance of a \$4 million payoff. Because its expected value is only \$7.2 million [$(0.4 \times \$12,000,000) + (0.6 \times \$4,000,000)$], project *Hot Bali* is a negative-NPV 'investment' that the company's managers would reject if the company did not have debt outstanding. However, if *Hot Bali* is successful, the project's \$12 million payoff will allow the company to fully pay off the bonds and pocket a \$2 million profit.

Consider the incentives facing this company's managers. Clearly, bondholders want the managers to either select the low-risk project or retain the company's cash in reserve. But because shareholders will lose control of the company unless they can pay off the bonds in full when they mature, shareholders want the company's managers to accept project *Hot Bali*. If successful, the project will yield enough for shareholders to pay off the creditors and retain ownership of the company. However, if *Hot Bali* is unsuccessful, the shareholders will simply hand over the company and any remaining assets to bondholders, after defaulting on the maturing bonds. (Because of limited liability, the corporation's shareholders do not have to repay the bonds themselves.) This is also what will happen if the company plays it safe by either retaining cash in the company or accepting project *Boring*. Shareholders therefore have everything to gain and nothing to lose from accepting project *Hot Bali*, and their agents (the managers) control the company's investment policy until default actually occurs.

The Underinvestment Problem

The second game related to financial distress is **underinvestment**. To demonstrate this, assume that the company described above gains access to a very profitable, but short-lived investment opportunity. A long-time supplier offers to sell its excess inventory to the company at a sharply discounted price, but only if the company will pay for the inventory immediately with cash. The additional supplies will cost \$9 million today, but will allow the company to increase production and profitability dramatically over the next 30 days. In fact, the company will be able to sell the additional product so profitably that in 30 days it will build up the \$10 million cash needed to pay off the maturing bond issue. However, because the company has only \$8 million in cash on hand today, the company's shareholders must contribute the additional \$1 million needed to buy the supplier's inventory. Accepting this project would maximise overall company value and would clearly benefit the bondholders. But the shareholders would rationally choose *not* to accept the project because the shareholders would have to finance the investment and all the investment's payoff would accrue to the bondholders.

underinvestment
When shareholders decide not to invest in a positive NPV project, and therefore 'underinvest' relative to choosing all positive NPV projects

We can place the analysis of asset substitution and underinvestment effects in a wider context. It has been pointed out that, in a well-functioning capital market, investors who anticipate an increased incidence of either asset substitution or underinvestment or both by a company will demand a higher yield *ex ante* from that corporation. This increased cost of borrowing will lead the investor to trade-off tax shield gains with the costs of debt financing at *lower* levels of debt when anticipated agency and bankruptcy costs are high. In other words, the company should be aware that a perception by investors that its agency and bankruptcy costs are high may induce the investors to provide less cheap capital (lend less) to the company than it may have otherwise planned.

An all-equity company is not vulnerable to either of these two games associated with financial distress. Managers acting in the interests of shareholders have the incentive to choose the project that maximises company value, in the first example, and shareholders have the incentive to choose to contribute cash for positive-NPV projects, in the second example. Because these costs of financial distress are related to conflicts of interest between the two groups of security holders, they are also referred to as *agency costs* of the relationship between bondholders and shareholders.

13.4b AGENCY COSTS AND CAPITAL STRUCTURE

In addition to taxes and the costs of financial distress, several other forces influence the corporate capital structure choice. In 1976, Michael Jensen and William Meckling proposed an *agency cost model of financial structure*.⁸ Jensen and Meckling observed that when entrepreneurs own 100% of the shares of a company, there is no separation between corporate ownership and control. Entrepreneurs bear all the costs and reap all the benefits of their actions. Once entrepreneurs sell a fraction of their shares to outside investors, they bear only a fraction of the cost of any actions they take that reduce the value of the company. This gives entrepreneurs a clear incentive to, in Jensen and Meckling's tactful phrasing, 'consume perquisites' (for instance, take extensive time off, purchase a corporate jet, frequently tour the company's plant at Langkawi or become a regular business commentator on television).

By selling a stake in the company to outside investors, entrepreneurs lower the cost of consuming perquisites (or 'perks'), but this does not come free of charge. In an efficient market, investors expect entrepreneurs' performance to change after they sell stakes in their companies, so investors reduce the price they will pay for these shares. In other words, entrepreneurs are charged *in advance* for the perks they are expected to consume after the equity sale, so entrepreneurs bear the full costs of their actions. Society also suffers because these **agency costs of (outside) equity** reduce the market value of corporate assets. We are therefore at an impasse. Selling shares to outside investors creates agency costs of equity, which are borne solely by the entrepreneur, but which also harm society by reducing the value of corporate assets and discouraging additional entrepreneurship. On the other hand, selling external equity is vital for entrepreneurs and for society at large because this allows companies to make investments that exceed an entrepreneur's personal wealth.

agency costs of (outside) equity
The value-reducing actions that managers take when ownership (by shareholders) is separated from control by managers

Using Debt to Overcome the Agency Costs of Outside Equity

The research of Jensen and Meckling shows how using debt financing can help overcome the agency costs of external equity in two ways. First, using debt, by definition, means that less external equity must be sold to raise a given dollar amount of external financing. Second, and more important, employing outside debt rather than equity financing reduces the amount and value of perquisites that managers can consume. The burden of having to make regular debt-service payments serves as an effective tool for disciplining corporate managers. With debt outstanding, excessive perk consumption may cost managers control of their companies if they were to default. Because taking on debt shows a manager's willingness to risk losing control of her company if she fails to perform effectively, shareholders are willing to pay a higher price for a company's shares.

agency costs of debt
Costs that arise because shareholders and bondholders have different objectives

Agency Costs of Outside Debt

If debt is such an effective disciplining device, then why don't companies use maximum debt financing? The answer is that there are also **agency costs of debt**. To understand these, keep in mind that, as the fraction of debt in a company's capital structure increases, bondholders begin taking on more of the company's

⁸ See Michael C. Jensen and William H. Meckling, 'Theory of the Firm: Managerial Behavior, Agency Costs, and Ownership Structure', *Journal of Financial Economics*, 3 (October 1976), pp. 305–60.

business and operating risk. However, shareholders and managers still control the company's investment and operating decisions. This gives managers a variety of incentives effectively to steal bondholder wealth for themselves and other shareholders. The easiest way to do this is to float a bond issue and then pay out the money raised to shareholders as a dividend. After default, the bondholders are left with an empty corporate shell, and limited liability prevents them from trying to collect directly from shareholders.

FINANCE IN THE REAL WORLD



THE HIDDEN COST OF PERSONAL DEBT

Many students use borrowed money to finance their education and pay for necessities while they are in university, just as companies borrow money to finance capital investments and smooth out their working capital needs over time. For Australian citizens and residents, the Australian government provides an effective lending function for university students, so that students can borrow from the government to pay their fees and then repay the funds once they have graduated and their own earnings are above a critical figure. There are important measures of personal indebtedness that are very similar to the measures of corporate leverage.

Unfortunately, some students can become all too familiar with personal debt while they are in university. Today, many graduating university students have loan repayments outstanding, and the total amount of student loan debt is rising. Furthermore, many graduates ran up significant credit-card debt as students, so they are beginning their careers with potentially high debt. Some governments have offered financial assistance. For example, Australian government loan arrangements are intended to help students. Called the FEE-HELP scheme, this is a loan arrangement that assists eligible fee-paying students to pay all or part of their university tuition fees by lending the money up to a limit. Of course, graduates who do not repay the funds borrowed then incur a bad debt record, and the Australian taxpayer effectively pays the cost of the loan shortfall.

In the corporate world, bondholders are generally sophisticated enough to take steps to prevent managers from playing these games with their money. The most effective, preventive step that bond investors can take is to write very detailed **loan covenants** into bond contracts, which are contractual clauses that limit a borrower's ability to expropriate the bondholders' wealth. The downside of loan covenants is that they make bond agreements costly to negotiate and to enforce. In any case, the agency costs of debt are real, and they become more important as a company's leverage ratio increases.

loan covenants
Contractual clauses that limit the actions that a borrower can take, protecting the lender's wealth from being expropriated

13.4c THE TRADE-OFF MODEL REVISITED

Our discussion thus far has shown that certain real-world factors – such as corporate income taxes and agency costs of outside equity – give corporate managers an incentive to substitute debt for equity in their company's capital structure. Other factors, such as personal income taxes, insolvency and agency costs of outside debt, give managers an incentive to favour equity financing. We are now ready to tie together all these influences and present the **trade-off model of corporate leverage**. This model expresses the value of a levered company as the value of an unlevered company, plus the present values of tax shields and the agency costs of outside equity, minus the present value of insolvency costs and the agency costs of debt, as follows:

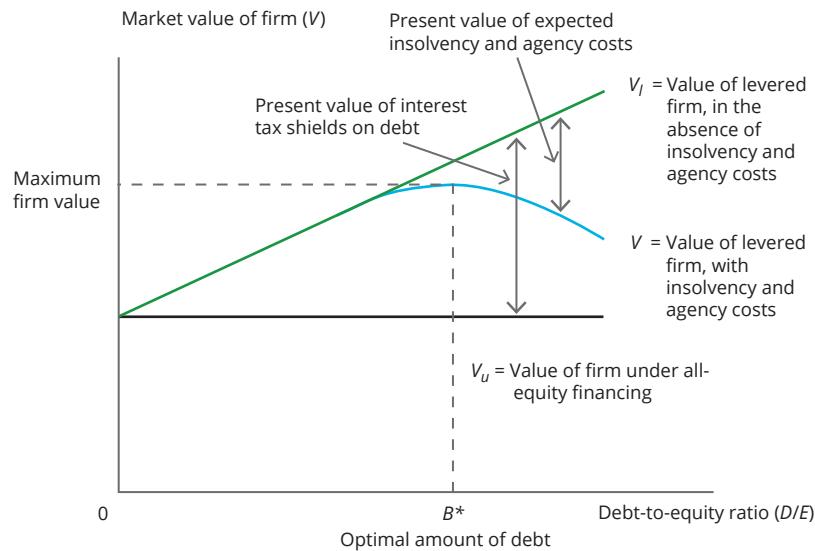
trade-off model of corporate leverage
According to this model, managers trade off the costs and benefits of using debt to choose the amount of debt that maximises company value as expressed in **Equation 13.7b**

$$(Eq. 13.7b) \quad V_t = V_u + PV(\text{Tax shields}) - PV(\text{Insolvency costs}) - PV(\text{Agency costs of outside equity}) - PV(\text{Agency costs of outside debt})$$

Figure 13.10 describes how agency costs, insolvency costs and tax benefits of leverage interact to determine a typical company's optimal debt level. Starting from a capital structure with no debt, managers can increase company value by replacing equity with debt, thus shielding more cash flow from taxation. In the absence of insolvency costs and the agency costs of debt, managers would maximise company value by borrowing as much as possible, a situation represented by the straight line in **Figure 13.10**. The curving line shows how insolvency and agency costs alter this conclusion. As a company borrows more, it increases the probability that it will go bankrupt. Therefore, expected insolvency costs and agency costs of debt rise with leverage. At some point, the additional tax benefit from issuing more debt is exactly offset by the increase in expected insolvency and agency costs. When that occurs, the purple line reaches a maximum, and managers have found the mix of debt and equity that maximises the value of the company.

FIGURE 13.10 THE TRADE-OFF MODEL OF CORPORATE LEVERAGE

This model describes the optimal level of debt for a given company as a trade-off between the benefits of corporate borrowing and the increasing agency and insolvency costs that come from additional borrowing. The optimal debt B is chosen to maximise company value.



13.4d DOES THE TRADE-OFF MODEL GUIDE PRACTICE?

As we noted, the impact of the M&M results is to identify what variables may be most important in explaining deviations from the basic result that a firm's capital structure does not affect the overall value of the firm. Research by analysts over the years since the original M&M result has shown some interesting and important results. These are comprehensively summarised by Graham and Leary.⁹ For example:

- If large firms tend to be more stable in value over time, it is less likely that they will go bankrupt, and so they will seek a higher leverage ratio.
- In the same vein, we may expect that leverage is positively correlated with asset tangibility – on the grounds that tangible assets are easier for investors to recover in cases of bankruptcy than are intangible assets such as patents, copyrights and trademarks.

⁹ Graham, John R., and Mark T. Leary, 'A Review of Empirical Capital Structure Research and Directions for the Future', *Annual Review of Financial Economics*, vol. 3, 2011, pp.309–45. Accessed 10 August 2019.

- If we make comparisons of leverage ratios within firms and across firms in the same industry, market data show more variations here than there are variations between industries. Many of the cross-sectional and within-firm patterns in leverage fit the traditional trade-off model implications.

There are, however, inconsistencies that endure in the data over the past few decades. We may expect from the trade-off model that profitability and leverage are positively related because more profitable firms should value more highly the tax-shield benefits of debt. Empirically, the relationship of profitability and leverage is usually negative. Further, although the directional trade-off predictions are consistent with leverage patterns – companies with higher research and development (intangible assets) have lower leverage – there is still much unexplained variation within firms: the direction of effect fits the trade-off model, but only weakly. In addition, firms with leverage ratios that do not fit predictions of the trade-off model are slow to adjust their leverage to model predictions, suggesting leverage may not be a first-order consideration for many companies.

Does this mean we should abandon the static trade-off model when advising firms' CFOs on their leverage decisions? It would be too hasty just to drop the model, but ongoing research is seeing if there are adjustments to the model which may improve its description of actual leverage ratios. Following Graham and Leary, we list below some specific further areas of research on additional variables that may help the model; but while the additional variables may offer greater precision in prediction, they also add complexity to the model:

- Mismeasurement*: are we measuring the data correctly? The theoretical model focuses on *marginal* tax rates (those applying just to new investments and debt contracts), and *expected* bankruptcy costs, both of which are challenging to estimate in the real world.
- Labour contracting*: some empirical research shows that interactions of a firm with its investors and with its non-financial stakeholders such as employees may have an impact on how much debt the firm can support. The real-world issue is that such impacts tend to be concentrated in certain industries, such as those with high rates of unionisation. We do not have a comprehensive view about which industries are generally most affected.
- Supply side*: we can ask under what conditions do capital supply shocks – unexpected changes to the availability of capital for a firm – have the largest impacts on capital structure. The M&M model implicitly assumes capital flows immediately to the highest return investment for a given level of risk, but macroeconomic effects may limit capital availability in a given country or region at various times.
- Financial contracting*: contracts that are agreed between companies and their capital suppliers are often very complex in the real world, with many subtle characteristics (see Chapter 14 for some examples). Can we capture these features in a fundamental model of debt provision, or can we model only general features of debt such as maturity and average cost? This is a busy area of ongoing research.
- Speed of adjustment*: we note below an interesting example of some results from India relating to the typical speed of adjustment of leverage ratios within companies. Further research is needed on this topic.
- Dynamic trade-off models*: related to the analyses of speed of adjustment to static leverage target ratios are more complex models that seek to describe how companies adjust the target ratios themselves, as well as the velocity at which the firms approach a given target.
- Value-relevance of capital structure choices*: some research quoted by Graham and Leary indicates that firms may not react to deviations of their values from optimal target ratios unless the deviations are at least 25% of the target values. This suggests that capital structure choices may not be 'first-order' problems for many firms. The analytical issue then becomes one of trying to judge when capital structure will become a first-order problem for the firm, and how quickly the firm responds to this change of priorities.

LO13.4

CONCEPT REVIEW QUESTIONS

- 8 What are the important direct costs of insolvency and indirect insolvency costs? Which of these, do you think, are the most important for discouraging maximum debt use by corporate managers?
- 9 Suppose someone borrows from a bank to buy a new car. A few months later, the borrower realises that he will have to default on this loan in a few more months, after which the bank will repossess the car. What kind of underinvestment problem might occur here?
- 10 Suppose a commercial bank suffers loan losses so severe that it approaches insolvency, as happened for several banks in different countries during the global financial crisis of 2007–2011. What kinds of asset substitution problems might arise? How might bank regulators act to prevent these problems?
- 11 Think of the gaudy corporate perks given to managers, such as a plush office, a company jet or luxury box seats at professional sporting events. How can managers justify these as value-maximising corporate expenditures that benefit the shareholders?

THINKING CAP QUESTIONS

- 4 Our company is thinking of issuing bonds and using the proceeds to buy back shares. What issues should we consider in evaluating this move?
- 5 Looking at listed company annual reports, can you find examples of companies discussing their preferred or optimal mix of debt and equity? Why may this be a difficult topic for the companies to consider publicly?

LO13.5

13.5 THE PECKING-ORDER THEORY

There are three empirical regularities that seem inconsistent with companies' choice of an optimal capital structure according to the trade-off model:

- 1 The most profitable companies in some industries have the lowest debt ratios.
- 2 Leverage-increasing events – such as share repurchases and debt-for-equity exchange offers – almost always increase share prices, whereas leverage-decreasing events reduce share prices. These facts suggest that companies systematically use too little leverage and do not operate at or near the optimal target debt ratio.
- 3 Companies issue debt frequently, but equity issues are rare. Announcements of new seasoned equity issues are invariably greeted with a large decline in the company's share price, a decline that is often equal to a third or more of the new offering's value.
How can we account for these perplexing facts? One answer was put forward in 1984 by Stewart Myers and Nicholas Majluf, who proposed the **pecking-order theory**.

pecking-order theory

A hypothesis that assumes managers are better informed about investment opportunities faced by their companies than are outside investors

13.5a ASSUMPTIONS UNDERLYING THE PECKING-ORDER THEORY

The pecking-order theory is based on four facts that Myers and Majluf observed about corporate financial behaviour. First, dividend policy is ‘sticky’. Managers tend to maintain a stable dividend payment, neither increasing nor decreasing dividends in response to temporary fluctuations in profits. Second, companies prefer internal financing (retained earnings and depreciation) to external financing of any sort, debt or equity. Third, if a company must obtain external financing, it will issue the safest security first. Finally, as a company requires more external financing, it will work down the ‘pecking order’ of securities, beginning with safe debt, then progressing through risky debt, convertible securities, preferred shares and, as a last resort, ordinary shares.

Myers and Majluf (1984) provide additional justification for the pecking order that is based on asymmetric information. The authors make two plausible assumptions about managers: (1) a company’s managers know more about the company’s current earnings and investment opportunities than do outside investors; and (2) managers act in the interest of *existing* shareholders.

Why are these two assumptions crucial? The one about asymmetric information implies that managers who develop or discover a marvellous new positive-NPV investment opportunity cannot convey that information to the market because outside investors don’t believe the managers’ statements. After all, every management team has an incentive to announce wondrous new projects, and investors cannot immediately verify these claims. Sceptical investors will buy new equity issues only at a large discount from what the share price would be without informational asymmetries. Corporate managers understand these problems, and in certain cases they will reject positive-NPV investments simply to avoid selling equity to new investors at a discount, which would have the effect of transferring wealth from old to new shareholders.

What a dilemma! Investors cannot trust managers, so investors place a low value on new issues of ordinary shares. Managers forgo valuable projects because they cannot credibly convey their private information to existing shareholders. Endemic information problems in financial markets do not have easy solutions.

What, then, must managers do? According to Myers and Majluf, corporations should retain sufficient financial slack, or flexibility, to fund positive-NPV projects *internally*. **Financial slack** includes a company’s cash and marketable securities holdings in addition to its unused debt capacity. Companies with sufficient financial slack can finesse the information problem because they need never issue equity to finance investment projects. In addition, the optimal investment rule is once again in force because managers can accept all positive-NPV projects without harming existing shareholders. This theory also explains why highly profitable companies might retain earnings. (Apple and Google are classic examples.) Such companies are building both financial slack and financial flexibility.

financial slack

Large cash and marketable security holdings in addition to a company’s unused debt capacity

The pecking-order theory also explains share-market reactions to leverage-increasing and leverage-decreasing events. Companies with valuable investment opportunities find a way to finance their projects internally, or they use the least risky securities possible (debt) if financing must be obtained externally. Therefore, only managers who consider the company’s shares to be overvalued will issue equity. Investors understand these incentives, and also realise that managers are better informed about a company’s prospects. Hence, investors always greet the announcement of a new equity issue as bad news: a sign that management considers the company’s shares to be overvalued.¹⁰

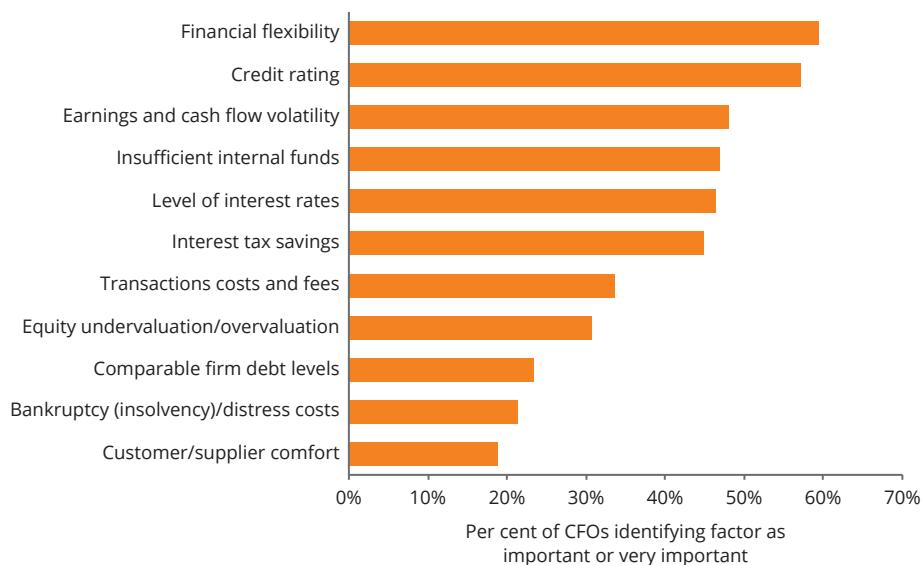
¹⁰ This works in reverse, too. The CFO of a Fortune 500 company with billions in cash reserves has been quoted as saying that his company wanted to distribute some of the cash to investors, but management did not want to force investors to pay taxes on high dividend payments and were reluctant to repurchase shares because they thought the company’s stock was overvalued.



DECISIONS BY CFOs

Graham and Harvey (2001) asked US CFOs to rate the importance of several factors in setting capital structures. **Figure 13.11** shows their findings. Number one on the list is financial flexibility, which at first glance seems to support the pecking-order theory. However, Graham and Harvey find that the types of companies that value financial flexibility are not necessarily the ones predicted by the pecking-order theory – namely, companies with severe asymmetric information issues. The authors also asked CFOs if they issued equity only when issuing debt was not an option (as the pecking-order theory predicts), but CFOs did not indicate that inability to issue debt was the reason they issued equity.

FIGURE 13.11 WHAT FACTORS DO US COMPANIES CONSIDER WHEN CHOOSING DEBT POLICY?



Source: Reprinted from Graham and Harvey, 'The Theory and Practice of Corporate Finance: Evidence From the Field', *Journal of Financial Economics*, Vol. 60, no. 2–3, May/June, pp. 187–243, Copyright 2001, with permission from Elsevier.

13.5b EVIDENCE ON PECKING-ORDER AND TRADE-OFF THEORIES

The pecking-order theory is consistent with the fact that the majority (roughly 70%) of corporate investments in Australia, New Zealand, Canada, Singapore and a number of other countries with Anglo-Saxon legal structures are funded internally through retained earnings. It also explains why profitable companies (which have lots of financial slack) borrow less than unprofitable companies: because they rely on internal funds rather than debt. But the pecking-order theory implies that companies have no target capital structure, and that the debt ratios observed in the real world ought to fluctuate randomly.

The theory also seems at odds with some other empirical evidence: larger companies tend to borrow more than smaller ones; companies owning more tangible assets typically use more leverage, as noted with the trade-off theory; and smaller and younger firms fill their financing deficits largely with equity.



Capital Structure Choices in India

In a paper published in 2017, two researchers examined asymmetries in capital structure adjustment speed for 2001 non-financial companies in India over the period of 2005–2013. The research confirmed the relevance of the static trade-off theory and shows that the Indian firms annually adjust 37% of their deviation from target leverage. At this rate, it would take around 2.7 years to make 100% adjustment. Both group and stand-alone firms adjust their capital structure faster when they are over-levered. This suggests there are higher costs of deviation from target leverage for over-levered firms than the under-levered firms, possibly due to financial distress and bankruptcy risks. In the words of the authors:

'[T]he findings of the study establish that Indian firms follow trade-off theory of capital structure and the relative influence of the theory seems to be more on stand-alone firms than group firms ... [T]he study indicates that the Indian firms (both group and stand-alone firms) are more concerned about financial distress and bankruptcy risk than the tax and agency benefits of debt ... [T]hese findings are expected to prove helpful for financial managers in designing their capital structure based on ownership structure, and the nature and extent of deviation from the target leverage.'

Source: Biswajit Ghose and Kailash Chandra Kabra, 'Dynamic Capital Structure Adjustments and Business Group Affiliations: Indian Evidence', *Business Perspectives and Research*, 6(1) 27–41, 2017. <https://journals.sagepub.com/doi/10.1177/2278533717722656>. Accessed 13 August 2019.

LO13.5

CONCEPT REVIEW QUESTIONS

- 12 If you were to ask senior corporate executives whether their companies' share prices are overvalued, undervalued or fairly valued, which do you think would be the most common response? What does this have to do with the pecking-order theory?
- 13 What happens to share prices when corporate managers announce leverage-increasing transactions such as debt-for-equity exchange offers? What happens to share prices in response to leverage-decreasing announcements? How do you interpret these findings?

LO13.6

13.6 DO WE HAVE A WINNING MODEL?

Does this diversity of empirical results mean that the models we have been proposing are not helpful to CFOs seeking the 'best' capital structures for their organisations? Recall the example given in the 'What Companies Do' box at the start of this chapter. We see there that the outcomes of capital structure decisions are influenced not only by direct perceived costs of funds, but also by trends in the market and what competitor firms are doing in the market. Models such as the pecking-order framework may capture some critical determinants of capital structures for companies, but there are other influential variables that affect funding decisions. These are examined in the next chapters.

STUDY TOOLS

SUMMARY

- LO13.1**
 - Financial leverage means using debt financing to increase expected earnings per share. Unfortunately, financial leverage also increases the risk that equity investors bear.
- LO13.2**
 - Franco Modigliani and Merton Miller (M&M) showed that capital structure is irrelevant in a world of perfect capital markets where investors can borrow and lend at the same rate and managers and investors have identical information about the company. Their Proposition I states that the leverage choice does not affect a company's value. M&M's Proposition II says that, even though the cost of debt is less than the cost of equity, the WACC does not decrease when a company reduces equity and adds debt to its capital structure. This is because more debt increases the cost of equity, which exactly offsets the advantage of replacing some equity with debt.
- LO13.3**
 - In a world with tax-deductible interest payments and only company-level taxation of operating profits, the optimal corporate strategy is to use the maximum possible leverage. This minimises the government's claim on profits and maximises income flowing to private investors.
 - When governments impose taxes at both the corporate and personal level, debt's tax advantage usually is lower than when there is a corporate income tax only; in some cases, higher personal taxes on interest income may lead to a net tax disadvantage for debt.
- LO13.4**
 - If insolvency resulted in a costless transfer of ownership from shareholders to creditors, then insolvency would have no important consequence for a company's capital structure. It is because the insolvency process triggers large direct and indirect costs that insolvency creates a cost to using debt.
 - Creditors know that corporate managers, who operate their companies in the interests of shareholders, have incentives to expropriate creditor wealth by playing certain games with the company's investment policy. Asset substitution is one such game, and underinvestment is another. Creditors protect themselves from these games in several ways, especially by inserting loan covenants into bond contracts.
- LO13.5**
 - There are several important agency costs inherent in the relationship between corporate managers and outside investors and creditors. In some cases, using financial leverage can help overcome these agency problems; in others, using leverage introduces other agency problems. The modern trade-off model of corporate leverage predicts that a company's optimal debt level is set by trading off the tax benefits of increasing leverage against the increasingly severe insolvency costs and agency costs of heavy debt usage.
 - The pecking-order theory predicts that managers will operate their companies in such a way as to minimise the need to secure outside financing – for example, by retaining profits to build up financial slack. These same managers will use the safest source of funding, usually senior debt, when they must secure outside financing.
- LO13.6**
 - We can compare the capital structure models such as the M&M models and the pecking-order model, and identify the most appropriate one for given empirical conditions. We see that capital structure decisions are influenced not only by direct perceived costs of funds, but also by trends in the market and what competitor firms are doing in the market.

IMPORTANT EQUATIONS

TABLE OF IMPORTANT EQUATIONS

$$13.1 \quad V = (D+E) = \frac{EBIT}{r}$$

$$13.2 \quad r_I = r_a + (r_a - r_d) \left[\frac{D}{E} \right]$$

$$13.3 \quad V_u \frac{[EBIT(1-T_c)]}{r_a} = \frac{NI}{r_a}$$

$$13.4 \quad PV(\text{Interest tax shields}) = \frac{(T_c \times r_d D)}{r_d} = T_c \times D$$

$$13.5 \quad V_I = V_u + PV(\text{Interest tax shields}) = V_u + T_c D$$

$$13.6 \quad G_I = \left[1 - \frac{(1-T_c)(1-T_{pd})}{(1-T_{pd})} \right] \times D$$

$$13.7 \quad V_I = V_u + PV(\text{Tax shields}) - PV(\text{Insolvency costs})$$

$$13.7b \quad V_t = V_u + PV(\text{Tax shields}) - PV(\text{Insolvency costs}) - PV(\text{Agency costs of outside equity}) - PV(\text{Agency costs of outside debt})$$

SELF-TEST PROBLEMS

Answers to these 'Self-test problems' and the 'Concept review' questions throughout the chapter appear on the Student Companion Website (<http://login.cengagebrain.com>) or via your instructor.

ST13-1 As chief financial officer (CFO) of the Uptown Service Corporation (USC), you are considering a recapitalisation plan that would convert USC from its current all-equity capital structure to one including substantial financial leverage. USC now has 150,000 ordinary shares outstanding, which are selling for \$80.00 each.

The recapitalisation proposal is to issue \$6,000,000 worth of long-term debt, at an interest rate of 7.0%, and use the proceeds to repurchase 75,000 ordinary shares worth \$6,000,000. USC's earnings in the next year will depend on the state of the economy. If there is normal growth, *EBIT* will be \$1,200,000. *EBIT* will be \$600,000 if there is a recession, and it will be \$1,800,000 if there is an economic boom. You believe that each economic outcome is equally likely. Assume there are no market frictions such as corporate or personal income taxes.

- a If the proposed recapitalisation is adopted, calculate the number of shares outstanding, the per-share price and the debt-to-equity ratio for USC.
- b Calculate the *earnings per share (EPS)* and the *return on equity (ROE)* for USC shareholders, under all three economic outcomes (recession, normal growth and boom), for both the current all-equity capitalisation and the proposed mixed (debt/equity) capital structure.
- c Calculate the breakeven level of *EBIT* where earnings per share for USC shareholders are the same under the current and proposed capital structures.
- d At what level of *EBIT* will USC shareholders earn zero *EPS* under the current and the proposed capital structures?

ST13-2 The *EBIT* of Westside Manufacturing is \$10 million. The company has \$60 million of debt outstanding with a required rate of return of 6.5%. The required rate of return on the industry is 10%, and the corporate tax rate is 30%. Assume there are corporate taxes but no personal taxes.

- a Determine the present value of the interest tax shield of Westside Manufacturing, and also the company's total value.
- b Determine the gain from leverage if there are personal taxes of 10% on share income and 35% on debt income.

ST13-3 You are the manager of a financially distressed corporation with \$10 million in debt outstanding that will mature in one month. Your company currently has \$7 million cash on hand. Assume that you are offered the opportunity to invest in either of the following two projects.

Project 1: The opportunity to invest \$7 million in risk-free Australian Government Treasury notes with a 4% annual interest rate (or a 0.333% monthly interest rate)

Project 2: A high-risk gamble that will pay \$12 million in one month if it is successful (probability = 0.25), but will pay only \$4,000,000 if it is unsuccessful (probability = 0.75).

- a Compute the expected payoff for each project. Which one would you adopt if you were operating the company in the shareholders' best interests? Why?
- b Which project would you accept if the company were unlevered? Why?
- c Which project would you accept if the company were organised as a partnership rather than a corporation? Why?

QUESTIONS

- Q13-1** Why is the use of long-term debt financing referred to as using financial leverage?
- Q13-2** What is the fundamental principle of financial leverage?
- Q13-3** Following from the conclusion of Proposition I, what is the crux of M&M's Proposition II? What is the natural relationship between the required returns on debt and equity that results from Proposition II?
- Q13-4** By introducing personal taxes into the model for capital structure choice, how did Miller alter the previous M&M conclusion that 100% debt is optimal? What happens to the gains from leverage if personal tax rates on interest income are significantly higher than those on share-related income?
- Q13-5** Why do a firm's shareholders hold a valuable 'default option'? How could this option induce shareholders to employ high levels of financial leverage?
- Q13-6** All else being equal, which company would face higher costs of financial distress: a software development company or a hotel chain? Why would financial distress costs affect these companies so differently?
- Q13-7** Describe how managers of companies that have debt outstanding and face financial distress might jeopardise the investments of creditors with the games of asset substitution and underinvestment.
- Q13-8** What are the trade-offs in the agency cost/tax shield trade-off model? How is a company's optimal capital structure determined under the assumptions of this model? Does research evidence support this model?
- Q13-9** How influential are corporate and personal taxes on capital structure?
- Q13-10** What is the pecking-order theory, and what facts does it seem to explain better than the trade-off model does?

PROBLEMS

WHAT IS FINANCIAL LEVERAGE AND WHAT ARE ITS EFFECTS?

P13-1 As CFO of the Magnificent Electronics Company (MEC), you are considering a recapitalisation plan that would convert MEC from its current all-equity capital structure to one that includes substantial financial leverage. MEC now has 1,000,000 ordinary shares outstanding, which are selling for \$30 each. You expect the company's earnings before interest and taxes (EBIT) to be \$3,600,000 per year for the foreseeable future.

The recapitalisation proposal is to issue \$15,000,000 worth of long-term debt, at an interest rate of 6.0%, and then use the proceeds to repurchase 500,000 ordinary shares worth \$15,000,000. Assuming there are no market frictions such as corporate or personal income taxes, calculate the expected return on equity for MEC shareholders under the current all-equity capital structure, and also under the proposed recapitalisation.

P13-2 As CFO of the Campus Supply Corporation (CSC), you are considering a recapitalisation plan that would convert CSC from its current all-equity capital structure to one that includes substantial financial leverage. CSC now has 250,000 ordinary shares outstanding that are selling for \$60.00 each. The recapitalisation proposal is to issue \$7,500,000 of long-term debt at an interest rate of 6.0% and use the proceeds to repurchase 125,000 ordinary shares worth \$7,500,000. USC's earnings next year will depend on the state of the economy. If there is normal growth, EBIT will be \$2,000,000; EBIT will be \$1,000,000 if there is a recession, and \$3,000,000 if there is an economic boom. You believe that each economic outcome is equally likely. Assume there are no market frictions such as corporate or personal income taxes.

- a Calculate the number of shares outstanding, the per-share price and the debt-to-equity ratio for CSC if the proposed recapitalisation is adopted.
- b Calculate the expected earnings per share (EPS) and return on equity (ROE) for CSC shareholders under all three economic outcomes (recession, normal growth and boom) for both the current all-equity capitalisation and the proposed mixed debt/equity capital structure.
- c Calculate the breakeven level of EBIT where earnings per share for CSC shareholders are the same under the current and proposed capital structures.
- d At what level of EBIT will CSC shareholders earn zero EPS under the current and the proposed capital structures?

THE M&M PROPOSITIONS

P13-3 An unlevered company operates in perfect markets and has earnings before interest and taxes (EBIT) of \$500,000. Assume that the required return on assets for companies in this industry is 12.5%. Suppose that the company issues \$2 million worth of debt with a required return of 5% and uses the proceeds to repurchase outstanding shares.

- a What is the market value and required return of this company's shares before the repurchase transaction?
- b What is the market value and required return of this company's remaining shares after the repurchase transaction?

P13-4 Assume that capital markets are perfect. A company finances its operations via \$50 million in shares with a required return of 15% and \$40 million in bonds with a required return of 9%. Assuming that the company could issue \$10 million in additional bonds at 9% and use the proceeds to retire \$10 million worth of equity, what would happen to the company's WACC? What would happen to the required return on the company's shares?

P13-5 Assume that two companies, U and L, are identical in all respects except one: Company U is debt-free, whereas Company L has a capital structure that is 50% debt and 50% equity by market value. Further suppose that the assumptions of M&M's 'irrelevance' Proposition I hold (no taxes or transactions costs, no insolvency costs, etc.) and that each company will have earnings before interest and taxes (EBIT) of \$1,200,000.

If the required return on assets, r_o , for these companies is 11.5% and the risk-free debt yields 5%, calculate the following values for both Company U and Company L:

- a total company value
- b market value of debt and equity
- c required return on equity.

P13-6 In the mid-1980s, Michael Milken and his US company, Drexel Burnham Lambert, popularised the use of junk bonds: bonds with low credit ratings. Many of Drexel's clients issued junk bonds to the public to raise money to conduct a leveraged buyout (LBO) of a target company. After the LBO, the target company would have an extremely high debt-to-equity ratio, with only a small portion of equity financing remaining. Many politicians and members of the financial press worried that the increase in junk bonds would bring about an increase in the risk to the economy because so many large companies had become highly leveraged. Merton Miller disagreed. See if you can follow his argument by assessing whether each of the statements below is true or false.

- a The junk bonds issued by acquiring companies were riskier than investment-grade bonds.
- b The remaining equity in highly leveraged companies was more risky than it had been before the LBO.
- c After an LBO, the target company's capital structure would consist of very risky junk bonds and very risky equity. Therefore, the risk of the company would increase after the LBO.
- d The junk bonds issued to conduct the LBO were less risky than the equity they replaced.

THE M&M CAPITAL STRUCTURE MODEL WITH TAXES

P13-7 An all-equity company is subject to a 30% tax rate. Its total market value is initially \$5,500,000, and there are 175,000 shares outstanding. The company announces a program to issue \$2 million worth of bonds at 10% interest, and to use the proceeds to buy back ordinary shares.

- a What is the value of the tax shield that the company acquires through the bond issue?
- b According to M&M, what is the likely increase in market value per share of the company after the announcement (assuming efficient markets)?
- c How many shares will the company be able to repurchase?

P13-8 Intel Corp., the global computer chip manufacturing company, is an organisation that uses almost no debt and had a total market capitalisation of about \$159 billion in December 2014. Assume that Intel faces a 35% tax rate on corporate earnings. Ignore all elements of the decision except the corporate tax savings.

- a By how much could Intel managers increase the value of the company by issuing \$75 billion in bonds (which would be rolled over in perpetuity) and simultaneously repurchasing \$75 billion in shares? Why do you think that Intel has not taken advantage of this opportunity?
- b Suppose the personal tax rate on equity income, as faced by Intel shareholders, is 10%, and that the personal tax rate on interest income is 40%. Recalculate the gains to Intel from replacing \$75 billion of equity with debt.

THE TRADE-OFF MODEL

- P13-9** Assume that you are the manager of a financially distressed corporation with \$1.5 million in debt outstanding that will mature in two months. The company currently has \$1 million cash on hand. Assuming that you are operating the company in the shareholders' best interests and that loan covenants prevent you from simply paying out the cash to shareholders as cash dividends, what should you do?
- P13-10** You are the manager of a financially distressed corporation with \$3 million in debt outstanding that will mature in three months. The company currently has \$2 million cash on hand. Assume that you are offered the opportunity to invest in either of the following two projects:
- Project 1: The opportunity to invest \$2 million in risk-free Australian Government Treasury notes with a 4% annual interest rate (a quarterly interest rate of $1\% = 4\% \text{ per year} / 4 \div \text{quarters per year}$)
- Project 2: A high-risk gamble that will pay \$2.4 million in two months if it is successful (probability = 0.4), but will only pay \$400,000 if it is unsuccessful (probability = 0.6).
- Compute the expected payoff for each project. If you were operating the company in the shareholders' best interests, which one would you adopt, and why?
 - Which project would you accept if the company were unlevered? Why?
 - Which project would you accept if the company were organised as a partnership rather than a corporation? Why?
- P13-11** You are the manager of a financially distressed company that has \$7 million in loans coming due in 30 days. Your company has \$6 million cash on hand. Suppose that a long-time supplier of materials to your company is planning to exit the business but has offered to sell your company a large supply of material at the bargain price of \$6.5 million – but only if payment is made immediately in cash. If you choose not to acquire this material, then the supplier will offer it to a competitor, and your company will have to acquire the material at market prices totalling \$7 million over the next few months.
- Assuming that you are operating the company in shareholders' best interests, would you accept the project? Why or why not?
 - Would you accept this project if the company were unlevered? Why or why not?
 - Would you accept this project if the company were organised as a partnership? Why or why not?
- P13-12** Slash and Burn Construction Company currently has no debt, and expects to earn \$10 million in EBIT each year for the foreseeable future. The required return on assets for construction companies of this type is 12.5%, and the corporate tax rate is 40%. There are no taxes on dividends or interest at the personal level. Slash and Burn calculates that there is a 10% chance the company will fall into insolvency in any given year and that, if insolvency does occur, it will impose direct and indirect costs totalling \$12 million. If necessary, use the industry required return for discounting insolvency costs.
- Compute the present value of insolvency costs for Slash and Burn.
 - Compute the overall value of the company.
 - Recalculate the value of the company, assuming that the company's shareholders face a 25% personal tax rate on equity income.
- P13-13** Worldwide Contractors currently has no debt, and expects to earn \$10 million in EBIT each year for the foreseeable future. The required return on assets for contractors of this type is 12.5%, and the corporate tax rate is 40%. There are no taxes on dividends or interest at the personal level. Worldwide calculates that there is a 10% chance the company will become insolvent in any

given year and that, if insolvency does occur, it will impose direct and indirect costs totalling \$12 million. If necessary, use the industry required return for discounting insolvency costs. Assume that the managers of Worldwide are weighing two capital structure alteration proposals.

Proposal 1: Borrow \$20 million at an interest rate of 6% and use the proceeds to repurchase an equal amount of outstanding shares. With this level of debt, the likelihood that Worldwide will become insolvent in any given year increases to 15%, and if insolvency occurs then it will impose direct and indirect costs totalling \$12 million.

Proposal 2: Borrow \$30 million at an interest rate of 8% and use the proceeds to repurchase an equal amount of outstanding shares. With this level of debt, the likelihood of Worldwide becoming insolvent in any given year rises to 25%, and the associated direct and indirect costs of insolvency, should it occur, increase to \$20 million.

For each proposal, calculate both the present value of the interest tax shields and the overall value of the company, assuming that there are no personal taxes on debt or equity income.

THE PECKING-ORDER THEORY

P13-14 Go to <http://finance.yahoo.com> and download recent balance sheets for Microsoft, BHP Billiton, Archer Daniels Midland and Woolworths. Calculate several debt ratios for each company and comment on the differences that you observe in the use of leverage. What factors do you think account for these differences?

CASE STUDY

ADDING VALUE WITH CAPITAL STRUCTURE

Two firms, L and U, are the same in all respects except capital structure. Firm L is levered and has a total market value of \$400 million (equity is \$200 million and debt is \$200 million), and interest on its perpetual bonds is 3%. Firm U is unlevered and has a total market value of \$240 million. Its income before interest is \$40 million and the corporate tax rate is 36%.

ASSIGNMENT

- 1 Can costless arbitrage profits be earned in this case?
- 2 What financial decisions would you take in order to earn any costless arbitrage profits in this case? (Hint: the value of the levered company is equal to the unlevered value plus the value of the tax shield for perpetual debt, calculated as the tax rate multiplied by the amount of debt.)

14

LONG-TERM DEBT AND LEASING

WHAT COMPANIES DO

CORPORATE DEBT MARKET INSIGHTS FOR SOUTH KOREA

Corporations seek new funds for investment expansion, takeovers and mergers with other companies, and general fund-raising to meet ongoing cashflows. In Chapter 13 we examined how companies work to balance the level of debt and equity they hold, but we did not examine in any detail the types of debt in which these entities may invest. As this chapter outlines, there are many dimensions of corporate debt issuance, and navigation of the markets for funds both domestic and international can seem extremely complicated. There are, however, some basic insights that governmental authorities often identify as crucial. Professor Paul Choi of the Korea Economic Institute offers a useful summary of what debt market insights are determined for South Korea by the central authorities:

To address the potential risk and current problem of the corporate bond market, four major plans for market stabilisation are suggested in the 2016 policy announcement of the Financial Services Commission, as follows.

'First, financially distressed companies can maintain liquidity through debt

rollovers. Second, it is crucial to alleviate the aforementioned polarisation that is now prevalent in the Korean corporate debt market by supporting high-yield bond taxation, encouraging qualified institutional buyers (QIBs), and promoting the issuance of collateralised bonds. Third, reforming the market infrastructure can stabilise the corporate bond market. It is necessary to overhaul both the credit-rating system and the debt-financing demand forecast system and to enhance efficiency and transparency in the secondary bond market. Lastly, it is necessary to implement programs that support the issuance of corporate bonds for SMEs. Currently, SMEs with credit ratings below BB find debt financing unfeasible without external debt guarantees. To prevent these marginalised SMEs from being outcast from the capital markets, proactive policy supports are necessary. There has been a weakening sign in the market sentiment with shortfalls in SME debt issues, with credit ratings in the range of BBB and A.'

Source: Choi, Paul Moon Sub, 'Corporate Debt Market in Korea', *Korea's Economy*, Korean Economic Institute, http://www.keia.org/sites/default/files/publications/kei_koreas_economy_choi.pdf. Accessed 30 August 2019.

LEARNING OBJECTIVES

After studying this chapter, you should be able to:

- LO14.1 describe important characteristics of long-term debt financing, such as the factors that influence its cost and the covenants lenders include to protect their investment
- LO14.2 discuss the types of corporate loans and explain why syndicated loans have become such an attractive source of debt financing
- LO14.3 describe the most important types of corporate bonds issued by domestic corporations and compare these to bonds issued by international borrowers
- LO14.4 explain the concept of leasing, the different types of leases and whether to acquire an asset through a lease or by borrowing the money required to purchase the lease.

Corporations and governments around the world issue long-term debt in order to finance capital investments or to fund current operations. As we saw in Chapter 12, more external capital is raised by companies worldwide each year in the form of debt rather than equity, and most debt is long-term.¹ This chapter examines the key features, costs, advantages and disadvantages of two sources of capital for business: long-term debt and leasing.

14.1 CHARACTERISTICS OF LONG-TERM DEBT FINANCING

We observe that debt is the dominant form of long-term, external financing in most developed economies. On the balance sheet, accountants classify debt as 'long-term' if it matures in more than one year. Companies obtain long-term debt by negotiating to borrow from a financial institution (or a syndicate consisting of several institutions) for a term loan, or by selling bonds. We begin by analysing the choice between public and private debt offerings, and then we discuss long-term debt covenants and costs.

14.1a THE CHOICE BETWEEN PUBLIC AND PRIVATE DEBT ISSUES

Once a company's managers decide to employ long-term debt financing, they face a series of practical choices regarding how to structure the debt. The first decision managers make is whether to issue public or private debt. Public long-term debt offerings involve selling securities (bonds and notes) directly to investors, usually with the help of investment bankers. In many countries, such as Australia, New Zealand or Singapore, companies must register these offerings with governmental authorities. Most long-term corporate bond offerings take the form of secured bonds. Most public debt offerings are **fixed-rate offerings**, meaning they have a coupon interest rate that remains constant.

Private debt issues usually take one of two forms. **Loans** are private debt agreements arranged between corporate borrowers and financial institutions, especially commercial banks, whereas *private placements* are unregistered security offerings sold directly to *accredited investors*. The best-known and most common form of loan is a *term loan* arranged between a borrower and a single bank. However, very large volume funding is raised through *syndicated loans* that are arranged for a single borrower but funded by multiple banks, because no single bank is willing and able to supply the full volume of lending. The overwhelming majority

fixed-rate offerings
Debt issues that have a coupon interest rate that remains constant throughout the issue's life

loans
Private debt agreements arranged between corporate borrowers and financial institutions, especially commercial banks

¹ By definition, governments can raise funds only by issuing debt because few investors would wish to purchase government equity even if such a financial creature existed. Although government debt issuance is an extremely important and interesting topic, we henceforth focus exclusively on corporate debt issuance.

of both term loans and syndicated loans extended are **floating-rate issues**, where the loan is priced at a fixed spread above a base interest rate, such as the Australian Bank Bill Swap Rate (BBSW), the Reformed Sterling Overnight Index Average (SONIA, from the UK), the Secured Overnight Financing Rate (SOFR, from the US) or other equivalent benchmark interest rates on very short-term funds made available among major banks. The interest rate paid by issuers of floating-rate debt thus moves as the base interest rate changes.

floating-rate issues
Debt issues with an interest (coupon) rate that is a fixed spread above a base rate that periodically changes

14.1b LOAN COVENANTS

Most debt agreements include certain *loan covenants*. These are contractual clauses that place specific operating and financial constraints on the borrower. Loan covenants typically remain in force for the life of the debt agreement, but do not normally place a burden on a financially sound business. Covenants allow the lender to monitor and control the borrower's activities to protect itself against the *agency problem* created by the differing objectives of owners and lenders. Without these provisions, the borrower could take advantage of the lender by investing in riskier projects or by distributing cash to shareholders without compensating lenders with a higher interest rate on their loans.

There are two types of covenants. *Positive covenants* require the borrower to take a specific action, and *negative covenants* prohibit certain actions.

Positive Covenants

Positive covenants specify things that a borrower must do. Some of the most common positive covenants include the following:

- 1 The borrower must maintain satisfactory accounting records in accordance with the standard accounting requirements of the country, such as the International Financial Reporting Standards (IFRS) of the International Accounting Standards Board (IASB), which have been adopted by more than 160 countries worldwide.
- 2 The borrower must supply audited financial statements.
- 3 The borrower must pay taxes and other liabilities when due.
- 4 The borrower must maintain all facilities in good working order.
- 5 The borrower must maintain a minimum level of net working capital. Inadequate liquidity is a common precursor to default.
- 6 The borrower must maintain life insurance policies on certain key employees without whom the company's future would be in doubt (so-called 'key-man insurance').
- 7 The borrower is often considered to be in default on all debts if it is in default on any debt to any lender. This is known as a **cross-default covenant**.
- 8 Occasionally, a covenant specifically requires the borrower to spend the borrowed funds on a specific project or financial need.

cross-default covenant
A positive debt covenant in which the borrower is considered to be in default on all debts if it is in default on any debt

Negative Covenants

Negative covenants specify what a borrower must not do. Common negative covenants include the following:

- 1 Borrowers may not sell receivables because doing so could cause a long-run cash shortage if the borrower uses the proceeds to meet current obligations.
- 2 Long-term lenders often impose fixed asset restrictions. These constrain the company with respect to the liquidation, acquisition and encumbrance of fixed assets because any of these actions could damage the company's ability to repay its debt.

subordination

Agreement by all subsequent or more junior creditors to wait until all claims of the senior debt are satisfied in full before having their own claims satisfied

- 3 Many debt agreements prohibit borrowing additional long-term debt or require that additional borrowing be subordinated to the original loan. **Subordination** means that junior creditors must wait until all claims of the senior debt are satisfied in full before having their own claims satisfied.
- 4 Borrowers are prohibited from entering into certain types of leases to limit their additional fixed-payment obligations.
- 5 Occasionally, the lender prohibits business combinations by requiring the borrower to agree not to consolidate, merge or combine in any way with another company because such action could significantly change the borrower's operating and financial risk.

FINANCE IN THE REAL WORLD



ISLAMIC FINANCE: HOW DO YOU SELL BONDS WHEN YOU CANNOT CHARGE INTEREST?

The past two decades have witnessed a dramatic increase in the issuance of financial securities that fulfil the principles of Islamic law, or sharia. While there are many nuances, three fundamental features of compliance with sharia stand out. First, interest cannot be charged or earned. In place of interest, loans are structured as investment partnerships – where the bank's or bondholder's return comes in the form of a share of profits – or by structuring loan payments as fees or dividends rather than interest. Second, to earn a return, lenders (such as banks) must bear ownership risk in real assets (that is, not purely financial assets). Ownership risk means that the lender cannot just benefit on the upside, but must also be exposed to risk that an asset can decline in value. Third, Islamic loans cannot be used to fund prohibited activities, such as gambling or adult entertainment.

In the Western world, when a company wants to buy a machine or other asset, it often first borrows the needed funds from a bank in a purely financial transaction, paying interest on the loan. Under the rules of Islamic finance, rather than charge interest, the bank would instead (at least partially) own the machine, and charge the company to use it. This approach is akin to leasing, where a lender (lessor) buys an asset and allows a lessee to use the asset in exchange for a rental fee. The lessor earns a return via this usage fee, rather than by charging financial interest. Interestingly, Islamic finance usage fees are often pegged to a market interest rate (such as LIBOR +1%), though the fee is not considered interest

because the entire deal is structured to meet approval of the appropriate sharia board.

Islamic structured loans are known as *sukuk*, and are often traded on public markets. The volume of *sukuk* issuance has been growing. *Sukuk* issuance in 2017 increased by 45.3%, reaching US\$97.9 billion, up from US\$67.4 billion in 2016; this contrasts with US\$14 billion for the whole of 2009. *Sukuk* are structured so that the investor is a partial owner in the underlying asset the bond is used to finance, and the investor's return is considered profit sharing.

Many Islamic financial institutions fared better than Western banks during the 2007–2011 global financial crisis. Western banks encountered problems in part by buying or selling loans that were originated elsewhere, and by trading derivative securities. Both of these practices are forbidden under sharia (because they are purely financial in nature), and thus many Islamic financial institutions avoided the riskiest of the practices that later haunted Western banks.

Islamic financial markets are likely to grow rapidly in coming decades, as Islamic nations and companies continue to grow and seek financial capital, and as Islamic investors seek to buy securities that satisfy Islamic law.

Sources: John Burton, 'Islamic Bond Issues Seen Dropping Further', *Financial Times*, 22 January 2009; Delphine Strauss, 'Islamic-Style Turkish Bonds Fail to Appeal', *Financial Times*, 29 January 2009; and <http://ifirk.isra.my/documents/10180/16168/Q1%202015%20SUKUK%20REVIEW08-06-2015-19.pdf>. Accessed on 6 September 2015.

RatingsDirect, 'Global Sukuk Market Outlook: Another Strong Performance in 2018?', S&P Global Ratings, 7 January 2018, <https://www.spratings.com/documents/20184/86957/Global+Sukuk+Market+Outlook+2018/d1b1aa9b-187f-44c0-8d9c-c1109f5c6890>. Accessed 5 September 2019.

To prevent liquidation of assets through large salary payments, the lender may prohibit or limit salary increases for specified employees. A relatively common provision prohibits the company's annual cash dividend payments from exceeding 50% to 70% of net earnings or a specified dollar amount.

In the process of negotiating the terms of long-term debt, the borrower and lender must agree to an acceptable set of covenants. If a borrower violates a covenant, the lender may demand immediate repayment of the entire loan, waive the violation and continue the loan, or waive the violation but alter the terms of the original agreement.

14.1c COST OF LONG-TERM DEBT

In addition to specifying positive and negative covenants, the long-term debt agreement specifies the interest rate, the timing of interest payments and the size of principal repayment. The major factors affecting the cost, or interest rate, of long-term debt are loan maturity, loan size, borrower risk and the underlying cost of money.

Loan Maturity

Generally, the *yield curve* is upward-sloping, which implies that long-term loans have higher interest rates than short-term loans. Factors that can cause an upward-sloping yield curve include: (1) the general expectation of higher future inflation or interest rates; (2) lender preferences for shorter-term, more liquid loans; and (3) greater demand for long-term rather than short-term loans relative to the supply of such loans. In a practical sense, the longer the term, the greater the default risk associated with the loan; therefore, to compensate for all these factors, the lender typically charges a higher interest rate on long-term loans.

Loan Size

The size of the loan can affect the interest cost of borrowing in an inverse manner because of economies of scale. Loan administration costs per dollar borrowed are likely to decrease with increasing loan size. However, the risk to the lender increases, since larger loans result in less diversification. The size of the loan sought by each borrower must therefore be evaluated to determine the net administrative cost versus risk trade-off.

Borrower Risk

The higher the company's operating leverage, the greater the volatility of its operating cash flows. Also, the higher the borrower's financial leverage, conveniently reflected in a high financial *debt ratio* or a low *times interest earned ratio*, the greater the volatility of the shareholders' cash flows. The lender's main concern is with the borrower's ability to fully repay the loan as prescribed in the debt agreement. A lender uses an overall assessment of the borrower's operating and financial risk, along with information on past payment patterns, when setting the interest rate on a loan.

Cost of Money

The cost of money is the basis for determining the actual interest rate charged. Generally, the rate on Australian government bonds with equivalent maturities is considered the basic (lowest-risk) cost of money. To determine the actual interest rate to be charged, the lender will add premiums for borrower risk and other factors to this basic cost of money for the given maturity. Alternatively, some lenders determine a prospective borrower's risk class and find the rates charged on loans with similar maturities and terms to companies in the same risk class. Instead of having to determine a risk premium, the lender can use the risk premium prevailing in the marketplace for similar loans.

LO14.1

CONCEPT REVIEW QUESTIONS

- 1 What factors should a manager consider when deciding on the amount and type of long-term debt to be used to finance a business?
- 2 What factors should a manager consider when negotiating the loan covenants in a long-term debt agreement?
- 3 How can managers estimate their companies' cost of long-term debt before meeting with a lender?

THINKING CAP QUESTION

- 1 What are negative covenants, and how do they benefit lenders?

LO14.2

14.2 CORPORATE LOANS

Corporations can acquire debt financing by borrowing money as a loan from a financial or non-financial institution, or by selling debt securities (like bonds). Here we describe the two most important types of corporate borrowing: term loans and syndicated loans.

14.2a TERM LOANS

term loan

A loan made by an institution to a business, with an initial maturity of more than one year, generally three to seven years

A **term loan** is made by a financial institution to a business, and has an initial maturity of more than one year, but may run up to seven to 10 years. Term loans are often made to finance permanent working capital needs, to pay for machinery and equipment or to liquidate other loans.

Term loans are essentially private placements of debt. Companies typically negotiate term loans directly with the lender instead of using an investment banker as an intermediary. An advantage of term loans over publicly traded debt is their flexibility. The securities (bonds or notes) in a public debt issue are usually purchased by many different investors, so it is almost impossible to alter the terms of the borrowing agreement should new business conditions make such changes desirable. With a term loan, the borrower can negotiate with a single lender for modifications to the borrowing agreement.²

Characteristics of Term Loan Agreements

The actual term loan agreement is a formal contract ranging from a few to a few hundred pages. The following items commonly appear in the document: the amount and maturity of the loan; payment dates; interest rate; positive and negative covenants; collateral (if any); purpose of the loan; action to be taken in the event the agreement is violated; and share purchase warrants. Of these, payment dates, collateral requirements and share purchase warrants require some discussion.

² Companies typically arrange loans with commercial banks as part of a larger, ongoing banking relationship. Large companies often have dozens of these banking relationships, but a critical decision for smaller companies is whether to maintain one large banking relationship or several smaller ones in order to minimize the risk of being unable to arrange financing during an emergency.

Payment Dates

Term loan agreements usually specify whether the loan payments are made monthly, quarterly or annually. Generally, these equal payments fully repay the interest and principal over the life of the loan. Occasionally, a term loan agreement will require periodic interest payments over the life of the loan followed by a large lump-sum payment at maturity. This so-called **balloon payment** pays back the entire loan principal if the periodic payments represent only interest.

balloon payment
A large lump-sum payment that pays back the entire loan principal at the maturity of a term loan that during its life requires only periodic interest payments

Collateral Requirements

Term lending arrangements may be unsecured or secured. Secured loans have specific assets pledged as collateral. The collateral often takes the form of an asset such as machinery and equipment, plant, inventory, pledges of accounts receivable and pledges of securities. Unsecured loans are obtained without pledging specific assets as collateral. Whether lenders require collateral depends in part on the lender's evaluation of the borrower's financial condition.

Term lending is often referred to as *asset-backed lending*, although term lenders, in reality, are primarily cash flow lenders. They hope and expect to be repaid out of cash flow, but require collateral both as an alternative source of repayment and as ransom to decrease the incentive of borrowing companies to default (because a defaulting borrower would lose the use of valuable corporate assets). Most pledged assets are secured by a **lien**, which is a legal contract specifying under what conditions the lender can take title to the asset if the loan is not repaid, and prohibiting the borrowing company from selling or disposing of the asset without the lender's consent. Liens serve two purposes: to establish clearly the lender's right to seize and liquidate collateral if the borrower defaults; and to serve notice to subsequent lenders of a prior claim on the asset(s). Not all assets can be readily used as collateral, of course. For an asset to be useful as collateral, it should: (1) be non-perishable; (2) be relatively homogeneous in quality; (3) have a high value relative to its physical size; and (4) have a well-established secondary market where seized assets can be turned into cash without a severe price penalty.

lien
A legal contract specifying under what conditions a lender can take title to an asset if a loan is not repaid and prohibiting the borrowing company from selling or disposing of the asset without the lender's consent

Share Purchase Warrants

The corporate borrower sometimes gives the lender certain financial benefits, usually **share purchase warrants**, in addition to the payment of interest and repayment of principal. Warrants are instruments that give their holder the right to purchase a certain number of the company's ordinary shares at a specified price during a certain period of time. They are designed to entice institutional lenders to make long-term loans, possibly under relatively favourable terms. Warrants are also frequently used as sweeteners for corporate bond issues.

share purchase warrants
Instruments that give their holder the right to purchase a certain number of a company's ordinary shares at a specified price during a certain period of time

Term Lenders

There is a wide array of sources for term loans. The primary lenders making term loans to businesses are commercial banks, insurance companies, superannuation funds, regional development companies, small business investment companies, commercial finance companies and equipment manufacturers' financing subsidiaries.

14.2b SYNDICATED LOANS

A **syndicated loan** is a large-denomination credit arranged by a group (a *syndicate*) of institutional lenders, commonly commercial banks, for a single borrower. Although syndicated lending has been a fixture of finance for over three decades, syndicated loans have increased dramatically in size, volume and importance during the past 20 years.

syndicated loan
A large-denomination credit arranged by a group (a syndicate) of institutional lenders, commonly commercial banks, for a single borrower

The syndicated loan market appeals to borrowers who need to arrange very large loans quickly. Loans for top-tier corporate borrowers are floating-rate credits with very narrow spreads (10–75 basis points) over the BBSW or SOFR. Typically, lenders structure these loans as *overdrafts* or *lines of credit* that borrowers can draw down as needed over several years. After that time, the loans generally convert to term credits that companies must repay on a set schedule. One increasingly important use of syndicated lending is to fund debt-financed acquisitions by corporate borrowers, where the ability to borrow large sums quickly and (relatively) discreetly is especially valuable.

Though syndicated loans are used for virtually all types of corporate finance, there are two uses that merit special discussion: Eurocurrency lending and project finance.

Eurocurrency loan market

A large number of international banks that stand ready to make floating-rate, hard-currency loans to international corporate and government borrowers

The **Eurocurrency loan market** consists of a large number of international banks that stand ready to make floating-rate loans (typically, US-dollar denominated) to international corporate and government borrowers. For example, a British bank that accepts a dollar-denominated deposit in London is creating a *Eurodollar deposit*, and by then re-lending that deposit to another bank or corporate borrower, it is making a *Eurodollar loan*. These loans are often structured as *lines of credit* on which borrowers can draw. Most large loans (over \$500 million) are syndicated, thereby providing a measure of diversification to the lenders. Eurocurrency syndicated loans sometimes exceed \$10 billion, and loans of \$1 billion or more are quite common. Furthermore, in total size, the Eurocurrency market dwarfs all other international corporate financial markets.



Asia Pacific Loan Market Association

The Asia Pacific Loan Market Association provides an opportunity for banks and other financial enterprises involved with loans to meet and discuss common issues. According to a recent press release:

'The Asia Pacific Loan Market Association (APLMA) is a pan-Asian association that is dedicated to promoting growth and liquidity in the primary and secondary loan markets of the Asia-Pacific region. The APLMA represents the common interests of the many different institutions active in the syndicated loan markets of the Asia Pacific region. Among the Association's main objectives are:

- Promote growth and liquidity in Asia's primary and secondary loan markets
- Provide leadership in the industry and act as the collective voice of the members
- Standardise primary and secondary loan documentation
- Establish and advocate best practices in the syndicated loan market

- Develop and promote standard trading, settlement and valuation procedures
- Actively develop the secondary market for loan sales and trading
- Monitor legislative, regulatory and market changes for impact on the syndicated loan market
- Serve as the principal liaison between loan market players and regional regulators
- Enhance industry education through seminars, conferences and training courses
- Provide a dynamic pan-Asian professional networking forum for the syndicated loan market

Founded in 1998, the APLMA is headquartered in Hong Kong with a branch in Australia and a management committee in Singapore, and is active throughout Asia through offshore committees across Asia Pacific. The APLMA organises over 100 seminars, conferences and networking events each year for its members, most of





which are free of charge. The Association currently has 317 members including banks, financial institutions, law firms, hedge

funds, brokerages, rating agencies, financial information service providers and online trading platforms.'

Source: 'APLMA Names Winners of 8th Asia Pacific Syndicated Loan Market Awards', Press Release, 30 January 2019,

Project Finance

Project finance (PF) loans are typically arranged for infrastructure projects – such as toll roads, bridges, power plants, seaports, tunnels and airports – that require large sums to construct but that, once built, generate significant amounts of free cash flow for many years. Although project finance lending almost always involves the use of syndicated loans, project finance differs from other types of syndicated credits in two vital ways.

First, PF loans are made to **stand-alone companies**, sometimes called *vehicle companies*, created for the sole purpose of constructing and operating a single project. If these companies are jointly owned in a partnership arrangement by the private sector and government, they are known as public–private partnerships (PPPs).

Second, PF loans are almost always limited or *non-recourse loans*, backed only by the assets and cash flows of the project, so the parent company that sponsors the project does not guarantee payment of the loan. Project finance loans have been employed in many very large projects, such as the Eurotunnel under the English Channel, Euro Disneyland in France, the Gyeongbu High Speed Railway in Korea and the Australia–Japan undersea cable.

In some transport cases, such as tunnels and bridges, a government will invite, by tender, a private company to build the project and operate it for many years, then hand it back to the government for operation. The company would borrow the funds to build the project, then charge users for access to the transport link while operating it. This sort of project is called a Build–own–operate–transfer (BOOT) project. The funding arrangements for the company are usually channelled through a vehicle company, and the borrowing by this company is non-recourse.

project finance (PF) loans

Loans usually arranged for infrastructure projects such as toll roads, bridges and power plants

stand-alone companies

Companies created for the sole purpose of constructing and operating a single project

LO14.2

CONCEPT REVIEW QUESTIONS

- 4 Suppose that a specialty retail company takes out a term loan from a bank. Which do you think the bank would prefer to receive as collateral: a claim on the company's inventory or on its receivables?
- 5 A problem with collateral is that its value is positively correlated with the borrower's ability to repay. Explain.
- 6 What aspect of syndicated lending is most attractive to the lenders?
- 7 Why are syndicated loans especially useful for financing takeovers?
- 8 How do project finance (PF) loans differ from other types of syndicated loans?

THINKING CAP QUESTION

- 2 What types of long-term debt might be used by a mature company compared with one that is recently started?

LO14.3

14.3 CORPORATE BONDS

A *corporate bond* is a debt instrument that allows a corporation to borrow money from institutions or individuals and promises to repay it in the future under clearly defined terms. Companies issue bonds with maturities of one to more than three years (debt securities with an original maturity of one to 10 years are called *notes*). The face value (par value) of the bonds may vary among countries depending on market size and the units of currency: in Australia or New Zealand it is usually A\$100 for corporate bonds, whereas in international markets the face value may more likely be US\$1,000. The coupon interest rate on a bond represents the percentage of the bond's face value that the company will pay to investors each year. Companies typically pay interest quarterly in four equal coupon payments. Bondholders receive the face value back when the bonds mature.

14.3a POPULAR TYPES OF BONDS

Bonds can be classified in a variety of ways. Here, we break them into traditional bonds, the basic types that have been around for years, and new, innovative bonds. **Figure 14.1** summarises the traditional types of bonds issued by corporations in terms of their key characteristics and priority of lender's claim in the event of default. A special type of corporate bond is a debenture, which is a corporate bond usually secured against property. Corporate bonds secured against other assets such as loans are known as secured bonds.

FIGURE 14.1 CHARACTERISTICS AND PRIORITY OF LENDER'S CLAIMS OF TRADITIONAL TYPES OF BONDS

BOND TYPE	CHARACTERISTICS	PRIORITY OF LENDER'S CLAIM
Debentures	Bonds that only creditworthy companies can issue; usually secured over property.	Seniority is the same as that of any general creditor. May have other secured bonds subordinate to them.
Subordinated bonds	Claims are not satisfied until those of the creditors holding senior debts have been fully satisfied.	Claim is that of a general creditor, but not as high as a senior debt claim.
Income bonds	Income bonds are a type of life insurance policy only friendly societies issue.	Seniority is that of a general creditor. Regular bonuses issued to lenders.
Covered bonds	Secured by a direct claim on assets that are owned by the issuer.	Rank with unsecured debt of borrower.

bank-accepted commercial bill

A short-term bond issued at a discount by a company, paying no interest but repayment of the face value at maturity, with bank support

subordinated bond

A secured bond on which the creditors' claims are not satisfied until the senior bondholders' claims have been fully satisfied

income bonds

A type of life insurance policy only friendly societies issue. They are like a savings investment account, and distribute regular bonuses to the lenders

A popular type of short-term debt in many developed capital markets is the **bank-accepted commercial bill**. This is a discount bill – that is, it pays no interest and has to sell for less than the face value (which is payable at a specified maturity date in the future). There are three parties to this bill: the drawer, who issues the bill; the acceptor, who undertakes to pay the face value when the bill is presented at the maturity date (the acceptor is typically a bank); and the payee, who is the party that receives the borrowed funds (the payee is also usually the drawer).

A *debenture* issued by an Australian company in Australia is a fixed interest rate investment, whereas some other sorts of corporate bonds may have floating rates, with their coupon rates being adjusted on a regular basis against some index such as the Reformed SONIA from the UK or the US prime rate.

Subordinated bonds are those that are junior to senior bonds: creditors' claims on subordinated bonds are not satisfied until the senior bondholders' claims have been fully satisfied.

There are some other categories of bonds available in the capital markets of different countries. For example, **income bonds** are a type of life insurance policy only mutual insurance companies issue. They are sometimes marketed as 'bonus bonds' or 'savings bonds'. Unlike other life insurance policies, which pay

bonuses on maturity or surrender, an income bond is like a savings investment account, and distributes regular bonuses.

Australian banks are allowed to issue **covered bonds**. These bonds are direct, unconditional obligations of the issuer. In the event of issuer insolvency or default, investors are entitled to be repaid from the pool of 'cover assets', and they have a claim on the issuer – one subordinate to that of statutorily protected depositors of the bank, but on the same footing as that of unsecured creditors. The cover assets are held in a bankruptcy-remote special purpose entity, the guarantor, which provides an unconditional and irrevocable guarantee of the issuer's obligations under the covered bonds. A security trustee holds security over the cover pool assets for the benefit of covered bondholders and service providers.

covered bonds
These bonds are direct, unconditional obligations of the issuer

Over the years, corporations have developed many other new debt instruments designed to attract a unique clientele of bond investors who, it is presumed, would be willing to pay a higher price for a given special feature. A detailed discussion of these new offerings is beyond the scope of an overview chapter, but **Figure 14.2** surveys the characteristics of a few of them.

FIGURE 14.2 CHARACTERISTICS OF SOME NEWER TYPES OF DEBT INSTRUMENTS

BOND TYPE	CHARACTERISTICS ^a
Zero (or low) coupon bonds	Issued with no (zero) or very low coupon (stated interest) rate and sold at a large discount from par. A significant portion (or all) of the investor's return therefore comes from gain in value – face value minus purchase price – and is paid at maturity. Generally callable at face value. Because the issuer can deduct the current year's interest accrual without having to actually pay the interest until the bond matures (or is called), its cash flow each year is increased by the amount of the tax shield provided by the interest deduction. Although interest is not actually paid, the investor must pay taxes on the implicit interest payments.
Junk (or high-yield) bonds	Debt rated Ba or lower by Moody's or below BBB– by Standard & Poor's. Beginning in the mid-1980s; commonly used by rapidly growing companies to obtain growth capital, most often as a way to finance mergers and takeovers of other companies. High-risk bonds with high yields – typically yielding at least 3 percentage points more than high-quality corporate debt.
Floating-rate bonds	Stated interest rate is adjusted periodically within stated limits in response to change in specified money or capital market rates. Popular when future inflation and interest rates are uncertain. Tend to sell at close to par as a result of the automatic adjustment to changing market conditions. Some issues provide for annual redemption at par at the option of the bondholder.
Extendible notes	Debt instruments with short maturities, typically one to five years, which can be redeemed or renewed for a similar period at the option of the holders. Similar to a floating-rate bond. An issue might be a series of three-year renewable notes over a period of 15 years; every three years, the notes could be extended for another three years at a new rate that is competitive with market interest rates prevailing at the time of renewal.
Putable bonds	Bonds that can be redeemed at par (typically, \$100 in Australia, but may more commonly be \$1,000 in the US) at the option of their holder either at specified dates, such as three to five years after the date of issue and every one to five years thereafter, or when and if the company takes specified actions such as being acquired, acquiring another company or issuing a large amount of additional debt. In return for the right to put the bond at specified times or actions by the company, the bond's yield is lower than that of a non-putable bond.

^aThe claims of lenders – bondholders – against issuers of each of these types of bonds vary, depending on their other features. Each of these bonds can be unsecured or secured.

14.3b LEGAL ASPECTS OF CORPORATE BONDS

When they issue bonds, corporations typically raise hundreds of millions of dollars from many unrelated investors. The dispersion in the investor base creates a need for special legal arrangements to protect lenders.

Bond Indenture

A bond indenture is a complex and lengthy legal document stating the conditions under which a bond has been issued. It specifies both the rights of the bondholders and the duties of the issuing corporation. In addition to specifying the interest and principal payment dates and containing various positive and

negative covenants, the indenture frequently contains *sinking fund requirements* and, if the bond is secured, provisions with respect to a security interest.

Sinking Fund Requirements

A positive covenant often included in a bond indenture is a *sinking fund* requirement. Its objective is to provide for the systematic retirement of bonds before their maturity. To carry out this requirement, the corporation makes annual or more frequent payments to a trustee, who uses the payments to retire bonds by purchasing them in the marketplace. This process is simplified by the inclusion of a limited *call feature*, which permits the issuer to repurchase a fraction of outstanding bonds each year at a call price. The trustee will exercise this option only when sufficient bonds cannot be purchased in the marketplace or when the bond's market price exceeds its call price.

The typical life of a corporate bond may be shorter than its stated maturity implies. The reasons for this are the ability of companies to call (and then refinance) bonds and the pervasiveness of mandated sinking funds in long-term (more than one year) debt security issues. Sinking funds work in such a way that the typical bond issue with, say, a \$100 million principal amount and a 15-year maturity will probably have only a few million dollars' worth of bonds still outstanding when the last bonds are redeemed 15 years after issuance. Depending on the terms of the sinking fund, the actual average maturity of this issue (the weighted average years outstanding) will probably be less than 10 years, not the 15 years originally stated.

Because sinking funds force corporations to redeem some bonds early, they reduce the risk of default for two reasons. First, sinking funds increase the likelihood that investors will become aware of any financial difficulties encountered by the issuing company early (when it misses a sinking fund payment) rather than late. This will trigger the demand for effective corrective action, up to and including the removal of the issuing company's incumbent management team. Second, because at maturity only a fraction of a given bond issue will remain outstanding, the issuing company's managers will have less incentive to default on the issue or attempt to expropriate bondholder wealth by filing for bankruptcy protection.

Security Interest

The bond indenture is similar to a loan agreement, in that any collateral pledged against the bond, the lenders' *security interest*, is specifically identified in the document. Usually, the title to the collateral is attached to the indenture, which also describes the collateral's disposition under various circumstances. The protection of bond collateral is crucial to increasing the safety – and thus to enhancing the marketability – of a bond issue.

Trustee

trustee (bond)

A third party to a bond *indenture* that acts as a watchdog on behalf of the bondholders, making sure that the issuer does not default on its contractual responsibilities

A **trustee** is a third party to a bond *indenture*, and can be an individual, a corporation or, most often, a commercial bank trust department. The trustee, whose services are paid for by the issuer, acts as a watchdog on behalf of the bondholders, making sure that the issuer does not default on its contractual responsibilities. The trustee is empowered to take specified actions on behalf of bondholders if the borrower violates any indenture terms.

14.3c METHODS OF ISSUING CORPORATE BONDS

Corporate bond markets have grown in many countries during the period from 1970. For example, the Australian corporate bond market is small relative to the size of the markets for Australian government and state government bonds, but has been increasing in scale as bank lending to companies has relatively decreased. There has been increasing encouragement from regulators, such as the Australian Securities Exchange (ASX) and the Australian Federal Treasurer, to make it easier for companies to issue bonds in Australia. In May 2010, the Australian Securities and Investments Commission (ASIC) provided

conditional relief from many of the more onerous prospectus requirements for issuers of vanilla (plain) corporate bonds. The ASIC initiatives simplified the disclosure requirements for certain offers of listed vanilla bonds by allowing such offers to be made with reduced disclosure under a short-form prospectus. The measures also allowed vanilla bonds to be offered under a two-part prospectus, comprising a base prospectus (which may be used for a number of different offers) and a second part prospectus (which can relate to a particular offer).

Large offerings of corporate bonds are generally underwritten by an investment banking syndicate because no single bank is willing and able to support the risk inherent in the full funding. However, there is tremendous variation in actual offering procedures, and these differences have increased over time as new debt securities have developed. There is clearly international competition among capital markets to offer conditions that encourage bond issuance. For example, in the US, two financial and regulatory innovations transformed bond-issuance patterns and took business away from other national bond markets. First, the introduction of *shelf registration* in the early 1980s allowed corporations issuing debt in the US to register large blocks of debt securities, and then sell these in discrete pieces over the subsequent two years as market conditions warranted. Shelf registration can be used for both debt and equity offerings, but not all companies use this technique for selling shares. In contrast, most companies that can use shelf registration for debt offerings do so.

The second major innovation occurred in 1990, when the US Securities and Exchange Commission (SEC) created a new private-placement market by implementing *Rule 144A*. This allowed qualified institutional investors (those with assets exceeding US\$100 million) to trade non-registered securities among themselves, and corporate issuers soon found this was an attractive market for new equity and, especially, new debt issues. International investors can participate in this market. Because Rule 144A issues offer investors much greater liquidity than do traditional private placements and are less costly than traditional public offerings, US and international corporations sell a total of between US\$400 billion and US\$500 billion in securities most years under this rule.

14.3d GENERAL CHARACTERISTICS OF A BOND ISSUE

Three characteristics that may be observed in a bond issue are: (1) a call feature; (2) a conversion feature; and (3) share purchase warrants. Each of these features grants an option, either to the issuer or the investor, that can have a significant impact on a bond's value.

Call Feature

The call feature is included in many corporate bond issues, especially in the US, and gives the issuer the opportunity to repurchase bonds prior to maturity. The *call price* is the stated price at which bonds may be repurchased. Sometimes the call privilege is exercisable only during a certain period, and usually bonds are not callable in the first few years. Typically, the initial call price exceeds the face value of a bond by an amount equal to one year's interest. For example, a \$100 bond with a 10% coupon interest rate would be callable for around \$110 [$\$100 + (0.10 \times \$100)$]. The amount by which the call price exceeds the bond's face value is commonly referred to as the *call premium*. This premium compensates bondholders for having the bond called away from them and is the cost to the issuer of calling the bonds.

The call feature is generally advantageous to the issuer because it enables the issuer to retire outstanding debt prior to maturity. Thus, when interest rates fall, an issuer can call an outstanding bond and reissue a new bond at a lower interest rate. When interest rates rise, the call privilege will not be exercised, except possibly to meet sinking fund requirements. Of course, to issue a callable bond, the company must pay a higher coupon interest rate than that on non-callable bonds of equal risk in order to compensate bondholders for the risk of having the bonds called away.

Conversion Feature

The conversion feature of convertible bonds allows bondholders to exchange each bond for a stated number of ordinary shares. Bondholders will convert their bonds only when the market price of the shares is greater than the *conversion price*, hence providing a profit to the bondholder. Because the option to convert into shares is valuable, the interest rate paid on convertible bonds is usually lower than the rate on traditional bonds, all else being equal. (The valuation of convertible bonds is discussed in detail in Chapter 8.)

Share Purchase Warrants

Like term loans, bonds occasionally have warrants attached as sweeteners to make them more attractive to prospective investors. As we noted previously, a *share purchase warrant* gives its holder the right to purchase a certain number of ordinary shares at a specified price during a certain period of time.

14.3e HIGH-YIELD BONDS

investment-grade bonds

Bonds rated Baa or higher by Moody's (BBB– or higher by S&P)

high-yield bonds

Bonds rated below investment grade (also known as *junk bonds* or *speculative bonds*)

speculative bonds

Bonds rated below investment grade (also known as *high-yield bonds* or *junk bonds*)

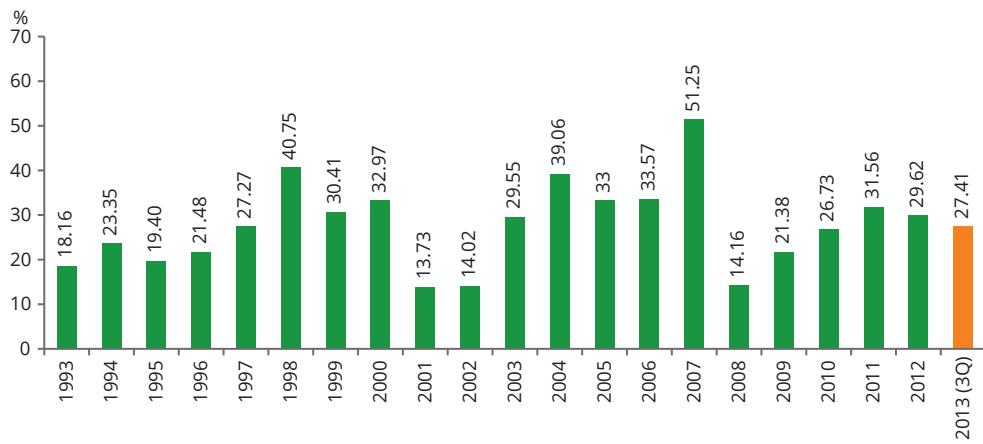
fallen angels

Bonds that received investment-grade ratings when first issued but later fell to junk status

The risk of publicly traded bond issues is assessed by independent agencies such as Moody's and Standard & Poor's (S&P). Both agencies have 10 major *bond ratings* derived by using financial ratio and cash flow analyses. Bonds rated Baa or higher by Moody's (BBB– or higher by S&P) are known as **investment-grade bonds**. Bonds rated below investment-grade are known as **junk bonds**, **high-yield bonds** or **speculative bonds**. As the name suggests, junk bonds carry a much higher default risk than do investment-grade bonds, but they also offer higher yields. Until the late 1970s, such issues were quite rare. Historically, most of these speculative bonds trading in the market were **fallen angels**, bonds that received investment-grade ratings when they were first issued but later fell to junk status.

Junk bond default rates typically peak during recessions. When junk bond default rates rose sharply during the 1990–91 recession, many commentators wrote off high-yield debt as a viable financing tool. As **Figure 14.3** shows, concentrating on the period from the recession to the end of the global financial crisis by 2013, the percentage of bonds issued in the US with ratings B or below (i.e. junk bond status) did not disappear during the global financial crisis, when they were most under stress; but their importance in the market has fluctuated. Following times of sharp market decline (2000 and 2008), the junk bond market fell as a fraction of all bonds issued, but the issuance rates recovered in both instances. Junk bond investors recognise that they

FIGURE 14.3 PERCENTAGE OF NEW HIGH-YIELD ISSUANCE RATED B OR BELOW, 1993–3Q 2013, BASED ON AMOUNT OF ISSUANCE



Source: S&P Capital IQ LCD.

are assuming much of the issuing company's operating (business) risk when they purchase high-yield debt, but they are willing to do so in return for promised yields that approach the returns earned by shareholders. Of course, a higher *promised* yield may or may not result in a higher *realised* return because the higher yield reflects a higher likelihood that the borrower will default (in whole or in part) on the bond some time during its life. In other words, owing to the risk of default and the probability that investors experience losses when default occurs, the expected return on junk bonds is generally well below the promised return (the yield to maturity).

Bonds are essentially unmarketable without a rating. After a bond is rated, the rating is not changed unless the likelihood of the company's defaulting on the bond issue changes. It is perhaps surprising that bond issuers themselves pay the ratings companies to issue ratings on newly issued bonds. Additionally, in its discussions with the rating agency the issuing company can communicate sensitive information privately to the rating agency. This information can then be usefully reflected via the bond rating without being directly disclosed to competitors.

14.3f INTERNATIONAL CORPORATE BOND FINANCING

Companies can sell bonds internationally by tapping the *Eurobond* or *foreign bond* markets. Both of these provide established, creditworthy borrowers the opportunity to obtain large amounts of long-term debt financing quickly and efficiently, in their choice of currency and with flexible repayment terms.

Eurobonds

A *Eurobond* is issued by an international borrower and sold to investors in countries with currencies other than the currency in which the bond is denominated. A US dollar-denominated bond issued by an Australian company and sold to European investors is an example of a Eurobond. Australian and New Zealand banks have been very active in this market during the period 2000–2020. The Eurobond market first developed in the early 1960s, when several European and US borrowers discovered that many European investors wanted to hold US dollar-denominated **bearer bonds**. Investors wanted bearer bonds because they would both shelter investment income from taxation – because coupon interest payments were made to the bearer of the bond and names were not reported to tax authorities – and provide protection against exchange-rate risk.

Until the mid 1980s, blue-chip US corporations were the largest single class of Eurobond issuers, and many of these companies were able to borrow in this market at interest rates below those the US government paid on Treasury bonds. As the market matured, issuers were able to choose the currency in which they borrowed. Later, the Eurobond market became much more balanced in terms of the mix of borrowers, total issue volume and currency of denomination. For example, Australian currency bonds grew in volume, to rank in some years as the second-most common currency for Eurobond issues; but the volume was still well below that of the US dollar. Most Eurobond issues, in fact, were executed as part of a complicated financial engineering transaction known as a *currency swap*, wherein companies headquartered in different countries issue bonds in their home-country currencies and then exchange principal and interest payments with each other.

bearer bonds
Bonds that pay interest to the bearer and both shelter investment income from taxation and provide protection against exchange rate risk

Foreign Bonds

In contrast to a Eurobond, which is issued by an international borrower in a single currency (frequently dollars) in many countries, a *foreign bond* is issued by a foreign borrower in a host country's financial market and in the host country's currency. An Australian dollar-denominated bond issued in Australia by a Korean company is an example of a foreign bond, sometimes called a *Kangaroo bond*. Other examples are a US dollar-denominated bond issued in the US by a German company (a *Yankee bond*) and a yen-denominated bond issued by an American company in Japan (a *Samurai bond*). In recent years, the three largest foreign bond markets have been Japan, Switzerland and the United States.

14.3g BOND REFUNDING OPTIONS

refund

To refinance a debt with new bonds

serial bonds

Bonds of which a certain portion mature each year

In the absence of a sinking-fund requirement, a company that wishes to avoid a large single repayment of principal in the future or to **refund** (refinance) a bond before maturity has two options. Both require foresight and careful analysis on the part of the issuer.

Serial Issues

The borrower can issue **serial bonds**, a certain proportion of which mature each year. When companies issue serial bonds, they attach different interest rates to bonds maturing at different times. Although serial bonds cannot necessarily be retired at the option of the issuer, they do permit the issuer to retire the debt systematically.

Exercising a Call

If interest rates drop following the issuance of a bond, the issuer may wish to refund the debt with new bonds at the lower interest rate. If a call feature has been included in the issue, then the issuer can easily retire it. In an accounting sense, bond refinancing will increase earnings per share by lowering interest expense. Of course, the desirability of refunding a bond through exercise of a call is not necessarily obvious, and assessing its long-term consequences requires the use of present value techniques. This bond refunding decision is another application of the capital budgeting techniques described in Chapters 10 and 11 of this text.

Here the company must find the net present value (NPV) of the bond-refunding cash flows. The initial investment is the incremental after-tax cash outflows associated with calling the old bonds and issuing new bonds, and the annual cash flow savings are the after-tax cash savings that are expected from the reduced debt payments on the new lower-interest bond. These cash flows are the same each year. The resulting cash flow pattern surrounding this decision is typical: an outflow followed by a series of inflows. The bond-refunding decision can be made using the following three-step procedure.

- *Step 1:* Find the initial investment by estimating the incremental after-tax cash outflow required at time 0 to call the old bond and issue a new bond in its place. Any overlapping interest resulting from the need to pay interest on both the old and new bonds is treated as part of the initial investment.
- *Step 2:* Find the annual cash flow savings, which is the difference between the annual after-tax debt payments with the old and new bonds. This cash flow stream will be an annuity, with a life equal to the maturity of the old bond.
- *Step 3:* Use the after-tax cost of the new debt (as the discount rate) to find the NPV by subtracting the initial investment from the present value of the annual cash flow savings. The annual cash flow savings is a contractually fixed cash flow stream that represents the difference between two contractual debt-service streams, the old bond and the new bond. Therefore, the appropriate discount rate should reflect the risk of the company's debt (which is tied to these same contractually fixed cash flows). That is, we discount these cash flows at the company's cost of debt. Moreover, we follow convention and use the after-tax cost of debt as the discount rate. If NPV is positive, then the proposed refunding is recommended; otherwise, the bonds should not be refunded. Application of this bond refunding decision procedure is illustrated in the 'Example' that follows. First, however, a few tax-related points must be clarified.

call premium

The amount by which the call price exceeds the face value of a bond. Paid by corporations to buy back outstanding bonds prior to maturity

Call Premiums

The amount by which the call price exceeds the face value of the bond is the **call premium**. It is paid by the issuer to the bondholder to buy back outstanding bonds prior to maturity. The call premium is treated as a tax-deductible expense in the year of the call.

Bond Discounts and Premiums

When bonds are sold at a discount or at a premium, the company is required to amortise (write off) the discount or premium in equal portions over the life of the bond. The amortised discount is treated as a tax-deductible expenditure, whereas the amortised premium is treated as taxable income. If a bond is retired prior to maturity, any unamortised portion of a discount or premium is deducted from or added to pre-tax income at that time.



Should Davis Refund Its Bonds?

The Davis Company, a manufacturer of industrial piping, is contemplating calling \$50 million of 30-year, \$1,000 face value bonds (50,000 bonds) issued five years ago with a coupon interest rate of 9%. The bonds have a call price of \$1,090, and initially netted proceeds of \$48.5 million due to a discount of \$30 per bond (50,000 bonds x \$970 net per bond). The initial flotation cost was \$400,000. The company intends to sell \$50 million of 25-year, \$1,000 face value bonds with a 7% (coupon) interest rate to raise funds for retiring the old bonds. The flotation costs on the new issue are estimated to be \$450,000. The company is currently in the 30% tax bracket, and estimates its after-tax cost of debt to be 4.9% $[0.07 \times (1 - 0.30)]$. Because the new bonds must first be sold, and their proceeds then used to retire the old bonds, the company expects a two-month period of overlapping interest, during which interest must be paid on both the old and the new bonds.

- **Step 1:** Find the initial investment. Finding the initial investment requires a number of calculations.
- Call premium.* The call premium per bond is \$90 (\$1,090 call price – \$1,000 face value). Because the total call premium is deductible in the year of the call, its after-tax cost is calculated as follows:

Before tax ($\$90 \times \$50,000$ bonds)	\$4,500,000
Less: Taxes ($0.30 \times \$4,500,000$)	\$1,350,000
After-tax cost of call premium	\$3,150,000

- Flotation cost of new bond.* This cost was given as \$450,000.

- c *Overlapping interest.*³ The after-tax cost of the overlapping interest on the old bond is treated as part of the initial investment and calculated as follows:

Before tax ($0.09 \times (2 \div 12) \times \$50,000,000$)	\$750,000
Less: Tax shield ($0.3 \times \$750,000$)	\$225,000
After-tax cost of overlapping interest	\$525,000

- d *Unamortised discount on old bond.* The company was amortising the \$1,500,000 discount (\$50,000,000 face value – \$48,500,000 net proceeds from sale) on the old bond over 30 years. Because only five of the 30 years' amortisation of the discount have been applied, the company can deduct the remaining 25 years of unamortised discount as a lump sum, thereby reducing taxes by $\$375,000 [(25 \div 30) \times \$1,500,000 \times 0.30]$.

- e *Unamortised flotation cost of old bond.* The company was amortising the \$400,000 initial flotation cost on the old bond over 30 years. Because only five of the 30 years' amortisation of this cost have been applied, the company can deduct the remaining 25 years of unamortised flotation cost as a lump sum, thereby reducing taxes by $\$100,000 [(25 \div 30) \times \$400,000 \times 0.30]$.

Summarising these calculations in Figure 14.4, we find the initial investment to be \$3,650,000. This means that the Davis Company must pay out \$3,650,000 now to implement the proposed bond refunding.

³ Technically, the after-tax amount of overlapping interest could be reduced by the after-tax interest earnings from investment of the average proceeds available from the sale of the new bonds during the interest overlap period. To simplify, we ignore any interest earned on the proceeds from sale of the new bonds during the overlap period.



FIGURE 14.4 FINDING THE INITIAL INVESTMENT FOR THE DAVIS COMPANY'S BOND REFUNDING DECISION

a Call premium		
Before tax $[(\$1,090 - \$1,000) \times 50,000 \text{ bonds}]$	\$4,500,000	
Less: Taxes $(0.30 \times \$4,500,000)$	(1,350,000)	
After-tax cost of call premium		\$3,150,000
b Flotation cost of new bond		450,000
c Overlapping interest		
Before tax $[0.09 \times (2 \div 12) \times \$50,000,000]$	\$ 750,000	
Less: Taxes $(0.30 \times \$750,000)$	(225,000)	
After-tax cost of overlapping interest		525,000
d Tax savings from unamortised discount on old bond		
$[(25 \div 30) \times (\$50,000,000 - \$48,500,000) \times 0.30]$		(375,000)
e Tax savings from unamortised flotation cost of old bond		
$[(25 \div 30) \times \$400,000 \times 0.30]$		(100,000)
Initial investment		<u>\$3,650,000</u>

Step 2: Find the annual cash flow savings.
Finding the annual cash flow savings requires a number of calculations.

- a *Interest cost of old bond.* The after-tax annual interest of the old bond is calculated as follows:

Before tax $(0.09 \times \$50,000,000)$	\$4,500,000
Less: Taxes $(0.30 \times \$4,500,000)$	\$1,350,000
After-tax interest cost	\$3,150,000

- b *Amortisation of discount on old bond.* The company was amortising the \$1,500,000 discount (\$50,000,000 face value – \$48,500,000 net proceeds from sale) on the old bond over 30 years, resulting in an annual write-off of \$50,000 ($\$1,500,000 \div 30$). Because it is a tax-deductible non-cash charge, the amortisation of this discount results in an annual tax savings of \$15,000 ($0.30 \times \$50,000$).

- c *Amortisation of flotation cost on old bond.* The company was amortising the \$400,000 flotation cost on the old bond over 30 years, resulting in an annual write-off of \$13,333 ($\$400,000 \div 30$). Because it is a tax-deductible non-cash charge, the

amortisation of the flotation cost results in an annual tax saving of \$4,000 ($0.30 \times \$13,333$).

- d *Interest cost of new bond.* The after-tax annual interest cost of the new bond is calculated as follows:

Before tax $(0.07 \times \$50,000,000)$	\$3,500,000
Less: Taxes $(0.30 \times \$3,500,000)$	\$1,050,000
After-tax interest cost	\$2,450,000

- e *Amortisation of flotation cost on the new bond.* The company will amortise the \$450,000 flotation cost on the new bond over 25 years, resulting in an annual write-off of \$18,000 ($\$450,000 \div 25$). Because it is a tax-deductible non-cash charge, the amortisation of the flotation cost results in an annual tax savings of \$5,400 ($0.30 \times \$18,000$).

Figure 14.5 summarises these calculations.

Combining the first three values [(a), (b) and (c)] yields the annual after-tax debt payment for the old bond of \$3,131,000. When the values for the new bond [(d) and (e)] are combined, the annual after-tax debt payment for the new bond is \$2,444,600.





FIGURE 14.5 FINDING THE ANNUAL CASH FLOW SAVINGS FOR THE DAVIS COMPANY'S BOND REFUNDING DECISION

Old bond		
a Interest cost		
Before tax ($0.09 \times \$50,000,000$)	\$4,500,000	
Less: Taxes ($0.30 \times \$4,500,000$)	(1,350,000)	
After-tax interest cost		\$3,150,000
b Tax savings from amortisation of discount		
$[(\$1,500,000 \div 30) \times 0.30]$		(15,000)
c Tax savings from amortisation of flotation cost		
$[(\$400,000 \div 30) \times 0.30]$		(4,000)
(1) Annual after-tax debt payment		\$3,131,000
New bond		
d Interest cost		
Before tax ($0.07 \times \$50,000,000$)	\$3,500,000	
Less: Taxes ($0.30 \times \$3,500,000$)	(1,050,000)	
After-tax interest cost		\$2,450,000
e Tax savings from amortisation of flotation cost		
$[(\$450,000 \div 25) \times 0.30]$		(5,400)
(2) Annual after-tax debt payment		\$2,444,600
Annual cash flow savings [(1) – (2)]		\$ 686,400

Subtracting the new bond's annual after-tax debt payment from that of the old bond, we find that implementation of the proposed bond refunding will result in an annual cash flow savings of \$686,400 ($\$3,131,000 - \$2,444,600$).

■ **Step 3:** Find the net present value (NPV).

Figure 14.6 shows the calculations for determining the NPV of the proposed bond refunding. The present value of the annual cash flow savings of \$686,400 at the

4.9% after-tax cost of debt over 25 years is computed (using **Equation 3.7**) to be \$9,771,792. Subtracting the initial investment of \$3,650,000 from the present value of the annual cash flow savings results in a NPV of \$6,121,792. Because a positive NPV results, the proposed bond refunding is recommended.

Decision: The proposed refunding is recommended because the NPV of refunding of \$6,121,792 is greater than \$0.

FIGURE 14.6 FINDING THE NET PRESENT VALUE (NPV) OF THE DAVIS COMPANY'S BOND REFUNDING DECISION

Present value of annual cash flow^a

Less: Initial investment (from Figure 14.4)	(3,650,000)
Net present value (NPV) of refunding	\$6,121,792

^a Annual cash flow savings from Figure 14.5 multiplied by a 25-year, 4.9% annuity (Equation 3.7).

Flotation or Issuance Costs

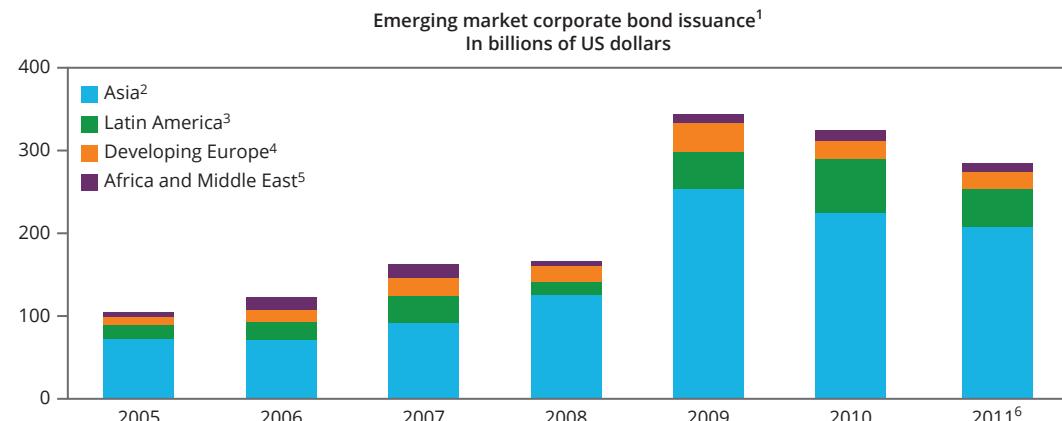
Any costs incurred in the process of issuing a bond must be amortised over the life of the bond. The annual write-off is therefore a tax-deductible expenditure. If a bond is retired before maturity, then any unamortised portion of this cost is deducted from pre-tax income at that time.



Global Financial Crisis (GFC) and Asia-Pacific Bond Markets

In section 14.3e 'High-Yield Bonds', we briefly mentioned the impact of the global financial crisis of 2007–2011, with **Figure 14.3** showing that there was a sudden drop in the issuance of such bonds in the US in 2008, and a similar plunge of new issues of high-yield bonds occurred in 2000–2001 when the 'dot.com' crash took

place. These observations prompt us to ask if we can understand more systematically how bond markets react to unexpected changes in macroeconomic conditions. Given the focus of this text, we look specifically at corporate bonds in the Asia-Pacific region over the period 2005–2011.



¹Includes bonds issued by non-financial corporates residing in the economies in respective regions. Includes both bonds rated by at least one of the three major international credit rating agencies and other bonds either rated by other rating agencies or not rated. ²Azerbaijan, Bangladesh, China, Chinese Taipei, Hong Kong SAR, India, Indonesia, Korea, Kyrgyz Republic, Malaysia, Pakistan, the Philippines, Singapore, Thailand, Uzbekistan and Vietnam. ³Argentina, Brazil, Chile, Colombia, Dominican Republic, Jamaica, Mexico, Peru, Trinidad and Tobago, Uruguay and Venezuela. ⁴Belarus, Bulgaria, the Czech Republic, Croatia, Hungary, Latvia, Lithuania, Poland, Russia, Turkey and Ukraine.

⁵Botswana, Egypt, Ghana, Iran, Israel, Liberia, Morocco, Nigeria, Qatar, Saudi Arabia, South Africa and the United Arab Emirates. ⁶Up to the end of September 2011.

Source: Bank for International Settlements.

A key element to note here is that, despite the negative impact of the global financial crisis on bond markets in the US and other developed economies, the amount of emerging Asian corporate bond issuances which were not rated or were rated only by local credit rating agencies increased from 2005 to 2009 (see the table below, bottom two rows). This suggests that the

corporate bond market in the region, supported by local rating agencies as well as local investors, may have fulfilled a "spare tyre" function for corporate financing during the crisis, insuring against fluctuating sentiment in global markets as well as slowing banking credit' (Bank for International Settlements).





ISSUANCE OF CORPORATE BONDS BY RATING FOR EMERGING ASIA ¹							
	TOTAL AMOUNT IN MILLIONS OF US DOLLARS						
	2005	2006	2007	2008	2009	2010	2011 ²
AAA	0.2%	0.0%	0.7%	0.0%	8.5%	8.1%	1.9%
AA	9.2%	8.4%	0.8%	12.3%	18.8%	12.5%	1.2%
A	15.9%	51.5%	22.2%	50.6%	46.3%	43.7%	43.8%
BBB	43.4%	20.6%	41.4%	34.2%	2.1%	18.5%	21.5%
BB	17.2%	9.8%	21.1%	3.0%	24.2%	11.5%	26.9%
B	10.9%	9.0%	13.8%	0.0%	0.0%	5.8%	4.7%
CCC	3.3%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
D	0.0%	0.7%	0.0%	0.0%	0.0%	0.0%	0.0%
Total (internationally rated) ³	15,266	13,378	6,206	4,147	11,628	10,455	12,451
Total (locally rated/unrated) ⁴	56,150	57,591	84,423	121,940	241,850	215,177	194,571

¹China, Chinese Taipei, Hong Kong SAR, India, Indonesia, Korea, Malaysia, Pakistan, the Philippines, Singapore, Thailand and Vietnam. ²Up to the end of September 2011. ³Includes bonds rated by at least one of the three major international rating agencies. ⁴Includes bonds rated only by local credit rating agencies or not rated.

Source: Bank for International Settlements.

We need to exercise some caution in interpreting the apparent success of the corporate bond markets in the Asia-Pacific region during the 2005–2011 period. Certainly, Asian corporations used the local currency markets for raising funds through bond issues during this period to an extent that they had not previously done; but [f]or the most part, the secondary markets for corporate bonds in the region have yet to develop adequate depth and liquidity. Typically, a large new corporate issue would be traded only for a few days after issuance, with the underwriter of the issue serving as the only market maker until its inventory runs out. Compared to government bonds, it is much

more difficult to provide liquidity for corporate bonds because of the highly heterogeneous nature of the borrowers and the many special covenants that typically characterise individual bond contracts. Liquidity would arise more easily in a market with large issues, credible credit ratings and a degree of standardisation with respect to bond covenants' (Source: Bank for International Settlements). In the view of many commentators, the Asia-Pacific markets have yet to develop these features which would support greater liquidity, therefore a deeper secondary market, and hence lower overall costs of funds.

Source: Ilhyok Shim, 'Development of Asia-Pacific Corporate Bond and Securitisation Markets', Bank for International Settlements, BIS Papers No 63, *Weathering Financial Crises: Bond Markets in Asia and the Pacific*, a joint BOJ-BIS high-level Seminar on 'The Development of Regional Capital Markets', 21–22 November 2011. Accessed 2 September 2019; Philip Turner, 'Weathering Financial Crisis: Domestic Bond Markets in EMEs' (Emerging Market Economies), Bank for International Settlements, BIS Papers No 63, *Weathering Financial Crisis: Domestic Bond Markets in Asia and the Pacific*, a joint BOJ-BIS high-level Seminar on 'The Development of Regional Capital Markets', 21–22 November 2011. Accessed 2 September 2019.

LO14.3

CONCEPT REVIEW QUESTIONS

- 9 What factors should a manager consider when choosing between a term loan and a bond issue for raising long-term debt?
- 10 What factors might influence the choice between a serial bond issue and an issue with a sinking fund requirement?
- 11 What factors, other than the current interest rate at which new debt could be sold, should a manager consider when deciding to refund a bond issue?

THINKING CAP QUESTIONS

- 3 Should a callable bond have a lower or higher yield than a similar non-callable bond? Why would a company want to issue callable bonds?
- 4 Can the yield to maturity on a company's junk bonds be higher than the expected rate of return on its shares?

LO14.4

14.4 LEASING

leasing

Acquiring use of an asset by agreeing to make a series of periodic, tax-deductible payments

lessee

Under a lease, the user of the underlying asset who makes regular payments to the *lessor*

lessor

Under a lease, the owner of the asset who receives regular payments for its use from the *lessee*

Leasing, like long-term debt, obliges a company to make a series of periodic, tax-deductible payments that may be fixed or variable. You can think of a lease as being comparable to secured long-term debt because in both cases there is an underlying asset tied to the company's financial obligation. The **lessee** uses the underlying asset and makes regular payments to the **lessor**, who retains ownership of the asset. For example, many companies (lessees) lease photocopying machines from companies like Fujitsu or Lexmark (lessors), which legally own the machines residing with the lessees. Leasing can take a number of forms. Here we discuss the concept of a lease, lease arrangements, the lease contract, the lease-versus-purchase decision, the effects of leasing on future financing, and the advantages and disadvantages of leasing. We outline the new standard provided by the International Accounting Standards Board in 2016 as IFRS 16 for leases. This standard has been adopted in most countries for the future valuation of leases, where it has had a significant impact on how leases may be registered in a company's financial records. It replaces the earlier methods of characterising leases as being operating (typically short-term) or financial (longer-term) leases.



Raising the Ethical Standard by Changing Lease Measurement

In anticipation of the new International Accounting Standard for Leasing, Hans Hoogervorst, Chairman, International Accounting Standards Board, wrote in March 2016:

Leasing is a common form of finance for many businesses, especially in sectors like the airline industry, retail and shipping. Currently, listed companies around the world have around US\$3.3 trillion worth of leases. Under current accounting requirements, over 85% of these leases are labelled as "operating leases" and are not recorded on the balance sheet.

Despite being off-balance sheet, there can be no doubt that operating leases create real liabilities. During the financial crisis, some major retail chains went bankrupt because they were unable to adjust quickly to the new economic reality.

They had significant long-term operating lease commitments on their stores and yet had deceptively lean balance sheets. In fact, their off-balance sheet lease liabilities were up to 66 times greater than their reported debt. Clearly, the accounting does not reflect economic reality.

To compensate for this "missing information", many investors use various techniques to add operating leases back onto the balance sheet. However, these adjustments are often rough calculations, which may be way off the mark.

Moreover, not all investors are able to do this "add-back" and the prevalence of operating leases indicates that companies are aware of that. In some cases companies go to great pains to structure their lease obligations so that they remain





off-balance sheet, probably to look better in the eyes of the unwitting investor.

Finally, the current accounting for leases leads to a lack of comparability. An airline that leases most of its airplane fleet looks very different from its competitor that borrows to buy most of its fleet, even when in reality their financing obligations may be very similar. There is no level playing field between these companies.

To address these problems, the International Accounting Standards Board, which sets the IFRS Standards for financial reporting around the world, has issued a new standard on lease accounting, IFRS 16.

When IFRS 16 becomes effective in 2019, it will result in a substantial change to many companies' balance sheets. All leases will be recognised as assets and liabilities by lessees, better reflecting the underlying economics.

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14.4a THE BASIC LEASE

Lease Concepts

A lease is a contractual arrangement whereby the lessee agrees to make periodic payments to the lessor, over a nominated period of time to obtain an asset's services. The lease may or may not transfer all the risks and rewards associated with ownership of the asset. The lessee may have the option to cancel the lease by paying a cancellation fee. An asset that is leased under short-term lease has a useful life that is longer than the lease's term, although (as with most assets) the economic usefulness of an asset declines over time. Computer systems are prime examples of assets whose relative efficiency diminishes with new technological developments. A lease is a common arrangement for obtaining such systems, as well as for other relatively short-lived assets, such as copiers or cars. When such a lease expires, the lessee returns the asset to the lessor, who may lease it again or sell it. In some instances, the lease contract will give the lessee the option to purchase the asset when the contract ends. In these sorts of leases, the underlying asset usually has significant market value when the lease ends, and the lessor's original cost generally exceeds the total value of the initial lessee's payments.

A **non-cancellable lease** is a lease in which the lessee makes payments over a predefined period or *lease term*. These sorts of leases are cancellable only:

- 1 upon the occurrence of some remote contingency
- 2 with the permission of the lessor
- 3 if the lessee enters into a new lease for the same or an equivalent asset with the same lessor; or
- 4 upon payment by the lessee of such an additional amount that, at inception of the lease, continuation of the lease is reasonably certain.

non-cancellable lease

A lease in which the lessee makes payments over a predefined period or *lease term*. These can only be cancelled under certain conditions

Even if the lessee no longer needs the asset, payments must continue until the lease expires. Non-cancellable leases are commonly used for leasing land, buildings and large pieces of equipment. As noted below, under IFRS 16 *Leases*, almost all leases are now capitalised and shown as debt on the lessee's balance sheet. As is the case with debt, failure to make the contractual lease payments can result in bankruptcy for the lessee.

A characteristic of long-term lease is that the total payments over the lease period are greater than the lessor's initial cost. In other words, the lessor earns a return by receiving more than the asset's purchase price.

IFRS 16 Leases

On 13 January 2016, the International Accounting Standards Board (IASB) issued IFRS 16 *Leases*, which essentially simplifies the treatment of leases and, subject to limited exceptions, requires all leases to be capitalised on the balance sheet. IFRS 16 includes a single accounting model for all leases by lessees. It came into effect on 1 January 2019.

The main implications of the new standard on current practice for lessees include:⁴

- All leases (subject to the exceptions described below) will be capitalised on the balance sheet by recognising a ‘right-of-use’ asset and a lease liability for the present value of the obligation.
- No rental expense, which means no more straight-line expenses for costs. All leases will incur a front-end loaded expense, comprising depreciation on the right-of-use asset and interest on the lease liability.
- When initially measuring the right-of-use asset and lease liability, non-cancellable lease payments (including inflation-linked payments), as well as payments for option periods which the entity is reasonably certain to exercise, must be included in the present value calculation.

Overall, the IASB observes that ‘IFRS 16 will result in a more faithful representation of a company’s assets and liabilities and greater transparency about the company’s financial leverage and capital employed’.⁵ This is important because of the widespread adoption of IFRS standards around the world.⁶

14.4b LEASE ARRANGEMENTS

direct lease

A lessor acquires the assets that are leased to a given lessee

sale-leaseback arrangement

One company sells an asset to another for cash, then leases the asset back from its new owner

leveraged lease

A lease under which the lessor acts as an equity participant, supplying part of the cost of the asset, and borrowing the balance of the funds

maintenance clause

A clause in a lease that specifies who is to maintain the assets and make insurance and tax payments

renewal option

An option that allows the lessee to renew the lease at its expiration

purchase option

An option allowing the lessee to purchase the leased asset when the lease expires

Lessors use three primary techniques for obtaining assets for leasing. The method selected depends largely on the desires of the prospective lessee. A **direct lease** results when a lessor acquires the assets to lease out. In other words, the lessee did not previously own the assets that it is leasing. In a **sale-leaseback arrangement**, one company sells an asset to another for cash and then leases the asset back from its new owner. You can see the resemblance of this arrangement to a collateralised loan. In such a loan, the lender gives the company cash up-front in exchange for a stream of future payments. If the borrower defaults on those payments, the lender keeps the collateral. In a sale-leaseback, the lessee receives cash immediately (by giving up ownership of the asset) and effectively repays this loan by leasing back the underlying asset. Sale-leaseback arrangements are therefore akin to borrowing, and are attractive to companies that need cash for operations.

Leasing arrangements that include one or more third-party lenders are **leveraged leases**. Unlike in direct and sale-leaseback arrangements, the lessor in a leveraged lease acts as an equity participant, supplying on average about one-fifth of the asset’s cost and borrowing the balance of the funds. In recent years, leveraged leases have become especially popular in connection with very expensive assets.

A lease agreement usually specifies whether or not the lessee is responsible for maintenance of the leased assets. Leasing arrangements generally include **maintenance clauses** specifying who is to maintain the assets and make insurance and tax payments. The lessee often has the option to renew a lease at its expiration. **Renewal options** are especially common in short-term leases. **Purchase options** allow the lessee to purchase the leased asset when the lease expires.

4 Source: BDO Australia, ‘New Leases Standard Requires Virtually All Leases to be Capitalised on the Balance Sheet’, <https://www.bdo.com.au/en-au/accounting-news/accounting-news-february-2016/new-leases-standard>. Accessed 3 September 2019.

5 IFRS, ‘Effects Analysis: IFRS 16 Leases’, International Financial Reporting Standard, January 2016, p. 5, <https://www.ifrs.org/-/media/project/leases/ifrs/published-documents/ifrs16-effects-analysis.pdf>. Accessed 3 September 2019.

6 IFRS Foundation, ‘Use of IFRS Standards around the World 2018’, International Financial Reporting Standard, <https://www.ifrs.org/-/media/feature/around-the-world/adoption/use-of-ifrs-around-the-world-overview-sept-2018.pdf>. Accessed 3 September 2019.

14.4c THE LEASE CONTRACT

The key items in a lease contract generally include a description of the leased assets, the term or duration of the lease, provisions for cancellation, lease payment amounts and dates, provisions for maintenance and associated costs, renewal options, purchase options and other provisions specified in the lease negotiation process. Furthermore, lease contracts spell out the consequences of the violation of any lease provision by either the lessee or the lessor.

14.4d THE LEASE-VERSUS-PURCHASE DECISION

Companies often have to make the **lease-versus-purchase (or lease-versus-buy) decision** when contemplating the acquisition of new assets. The alternatives available are to: (1) lease the assets; (2) borrow funds to purchase the assets; or (3) purchase the assets using available liquid resources. Similar financial analysis applies to alternatives (2) and (3). Even if the company has the liquid resources with which to purchase the assets, using these resources is viewed as equivalent to borrowing. Therefore, we will compare only the leasing and purchasing alternatives.

The lease-versus-purchase decision involves application of the capital budgeting methods presented in Chapters 10 and 11. The analysis can be framed in two different ways, but both approaches yield the same answer if done correctly. In one approach, we first list the cash flows associated with the purchase option and the lease option; then we take the differences in cash flows between the two options and calculate the NPV of the incremental cash flow stream discounting at the after-tax cost of debt. The alternative approach is simply to calculate the NPVs of the purchase and lease options separately (discounting each at the after-tax cost of debt) and then compare them. Note that either method can be used to determine whether the lease option or the purchase option is better, but neither method addresses whether leasing or purchasing is worthwhile in the first place. That is, the lease-versus-purchase analysis merely allows us to make statements about the *relative merits* of leasing versus buying.

The following 'Example' demonstrates application of both approaches: (1) calculating the NPV of the incremental lease-versus-purchase cash flows; and (2) separately calculating the NPVs of the lease and purchase option cash flows and comparing them.

lease-versus-purchase (or lease-versus-buy) decision

The alternatives available are to: (1) lease the assets; (2) borrow funds to purchase the assets; or (3) purchase the assets using available liquid resources. Even if the company has the liquid resources with which to purchase the assets, the use of these funds is viewed as equivalent to borrowing



Buy versus Lease? The Calculations

FastTrak Movers has already conducted a standard NPV analysis and determined that acquiring a new delivery truck would increase company value. Now, FastTrak needs to decide whether to lease or purchase the truck.

The truck costs \$25,000, and will reduce operating costs by \$4,500 annually over its five-year life. If FastTrak buys the truck, then it will be depreciated on a straight-line basis and the truck will have no resale value after five years. Alternatively, the company can lease the truck for \$6,300 per year (with payments at the end of each year). The lease payments are tax-deductible. FastTrak faces a 35% tax rate, and its pre-tax cost of debt is 8%.

Figure 14.7 shows the cash flows for both the lease and the purchase option. Under either scenario, the company realises \$4,500 in savings each year, or \$2,925 after taxes [$\$4,500 \times (1 - 35\%)$]. Under the purchase option, the company has a large initial cash outflow, but it can deduct \$5,000 per year in depreciation, saving \$1,750 in taxes each year ($\$5,000 \times 35\%$). With the lease option, the company pays \$6,300 per year before taxes, or \$4,095 after taxes [$\$6,300 \times (1 - 35\%)$]. Subtracting the net cash flows associated with the purchase option from those tied to the leasing decision and then discounting them at the after-tax cost of debt of 5.2% [$8\% \times (1 - 35\%)$], we obtain the following incremental NPV of leasing versus purchasing:



$$NPV = \$25,000 - \frac{\$5,845}{(1.052)^1} - \frac{\$5,845}{(1.052)^2} - \frac{\$5,845}{(1.052)^3} - \frac{\$5,845}{(1.052)^4} - \frac{\$5,845}{(1.052)^5} = -\$166$$

The NPV is negative, so the incremental benefits of purchasing exceed those of leasing.

Therefore, FastTrak should purchase the truck it needs.

FIGURE 14.7 LEASE VS. PURCHASE ANALYSIS FOR FASTTRAK MOVERS: AFTER-TAX CASH FLOWS (\$)

YEAR	LEASE OPTION		PURCHASE OPTION					LEASE-PURCHASE OPTION
	COST SAVINGS	LEASE PAYMENT	NET CASH FLOW	PURCHASE PRICE	COST SAVINGS	DEPRECIATION TAX SHIELD	NET CASH FLOW	
0	\$ 0	\$ 0	\$ 0	-\$25,000	\$ 0	\$ 0	-\$25,000	\$25,000
1	\$2,925	-\$4,095	-\$1,170		\$2,925	\$1,750	\$ 4,675	-\$ 5,845
2	\$2,925	-\$4,095	-\$1,170		\$2,925	\$1,750	\$ 4,675	-\$ 5,845
3	\$2,925	-\$4,095	-\$1,170		\$2,925	\$1,750	\$ 4,675	-\$ 5,845
4	\$2,925	-\$4,095	-\$1,170		\$2,925	\$1,750	\$ 4,675	-\$ 5,845
5	\$2,925	-\$4,095	-\$1,170		\$2,925	\$1,750	\$ 4,675	-\$ 5,845

We could reach the same decision by calculating the NPVs of the lease option and the

purchase option separately and choosing the one with the higher NPV.

$$NPV(\text{Lease}) = \frac{\$1,170}{(1.052)^1} - \frac{\$1,170}{(1.052)^2} - \dots - \frac{\$1,170}{(1.052)^5} = -\$5,037$$

$$NPV(\text{Purchase}) = -25,000 + \frac{\$4,675}{(1.052)^1} + \frac{\$4,675}{(1.052)^2} + \dots + \frac{\$4,675}{(1.052)^5} = -\$4,871$$

The purchase option is \$166 [−\$5,037 − (−\$4,871)] less expensive than the lease option. Because the purchase option's NPV is \$166 larger and the benefits are the same for both options, the purchase option is less costly, and therefore FastTrak should purchase the truck

rather than lease it. (Note: FastTrak initially stated that acquiring the new delivery truck would increase company value, so here the company has merely determined the less expensive method of financing the purchase.)

FINANCE IN THE REAL WORLD

SHOULD I LEASE OR BUY THE CAR?

Once you have done the necessary research, found the best car to buy and negotiated the lowest purchase price, you must decide how best to pay for it. For most buyers, this financing decision involves a choice between: (1) leasing the car; or (2) borrowing to buy the car. Let us assume that you

are buying a new car, have no trade-in, have negotiated an out-the-door price of \$24,500 and that you can safely earn 5% annual interest net of taxes paid on that interest. In addition, you have gathered the following data on the lease and the purchase alternatives.



Lease		
Down payment	\$2,000	
Lease term	48 months	
Lease payment	\$375 per month	
Purchase		
Down payment		\$3,000
Loan maturity		48 months
Loan payment		\$525 per month
Estimated trade-in value of car at end of 48 months		\$10,750

Using the above data, we can perform a lease-versus-purchase analysis for the car. To simplify, we ignore sales tax differences and explicit consideration of the time value of money, and we assume that under the purchase alternative the car will be sold at the end of four years (48 months).

Comparing the total lease and total purchase costs, we see that the purchase cost of \$18,050 is well below the lease cost

of \$20,400. Therefore, you should purchase the car; as a result, you will save about \$2,350 (\$20,400 lease cost – \$18,050 purchase cost) over the four years.

Lease cost	
Down payment	\$2,000
Total lease payments (48 months × \$375 per month)	18,000
Opportunity cost of down payment (0.05 × \$2,000 × 4 years)	400
Total cost of lease	\$20,400
Purchase cost	
Down payment	\$3,000
Total loan payments (48 months × \$525 per month)	25,200
Opportunity cost of down payment (0.05 × \$3,000 × 4 years)	600
Estimated trade-in value of car at end of 48 months	-10,750
Total cost of purchase	\$18,050

It is worth noting that if the lessee and lessor have the same discount rate and same tax rates, then leasing strictly for financial reasons is a zero-sum game between lessee and lessor. Cash outflows for the lessee represent inflows for the lessor, and vice-versa. Only when the two parties have different tax rates or costs of capital can leasing increase aggregate value purely for financial reasons. Therefore, the lower cost of leasing or buying results from factors such as the differing tax brackets of the lessor and the lessee, different tax treatments for leases versus purchases and differing risks and borrowing costs for the lessor and the lessee. Moreover, when making a lease-versus-purchase decision, the company will find that inexpensive borrowing opportunities and high required lessor returns increase the attractiveness of purchasing. Likewise, leasing decisions are affected by many non-financial factors, such as the risk of obsolescence and the experience and expertise of the lessor. Subjective factors like these must be included in the decision-making process. Like most financial decisions, the lease-versus-purchase decision requires a certain degree of judgement and consideration of qualitative factors.

14.4e EFFECTS OF LEASING ON FUTURE FINANCING

Because leasing is considered a type of debt financing, it affects a company's future financing ability. Lease payments are shown as a tax-deductible expense on the company's income statement. Anyone analysing the income statement would probably recognise that assets are being leased, although the actual details of the amounts and terms of the leases might be unclear.

Leasing and Financial Ratios

Because the consequences of missing a lease payment are the same as those for missing an interest or principal payment on debt, a financial analyst must view the lease as a long-term financial commitment of

the lessee, analogous to debt. Under standard accounting rules, the inclusion of each (capital) lease as an asset and corresponding liability (long-term debt) provides for a balance sheet that more accurately reflects the company's financial status. It thereby permits various types of financial ratio analyses to be performed directly on the statement in a way that captures all of the company's fixed obligations and indebtedness. Note also that because \$1 of leasing commitment is very similar to \$1 of debt financing, we can think of lease financing as being similar to using 100% debt to finance the acquisition of a given asset. The cost of capital associated with 100% debt financing is the after-tax cost of debt (to see this, consider the weighted average cost of capital (WACC) formula found in [Equation 11.4](#) in Chapter 11, when only debt is used). Therefore, because of this similarity between leasing and using 100% debt financing, the after-tax cost of debt is often used as the discount rate when calculating present values in lease analysis, as was shown in our analysis of section 14.4d above.

14.4f ADVANTAGES AND DISADVANTAGES OF LEASING

Leasing has several commonly cited advantages and disadvantages which should be considered when making a lease-versus-purchase decision. Although not all these advantages and disadvantages hold in every case, several of them may apply in any given situation.

Frequently Cited Advantages

- 1 The use of sale-leaseback arrangements may permit the company to increase its liquidity by converting an asset into cash, which can then be used as working capital. A company short of working capital or in a liquidity bind can sell an owned asset to a lessor and then lease the asset back for a specified number of years.
- 2 Leasing provides 100% financing. Most loan agreements for the purchase of fixed assets require the borrower to pay a portion of the purchase price as a down payment. Therefore, the borrower is able to borrow (at most) only 90% to 95% of the purchase price of most assets, and often less. Of course, this extra borrowing through leasing may reduce the company's remaining borrowing capacity.
- 3 When a company becomes insolvent or is reorganised, the maximum claim of lessors against the corporation is a small fixed number of years of lease payments – and the lessor, of course, reclaims the asset. If debt is used to purchase an asset, the creditors have a claim that is equal to the total outstanding loan balance. The lessor also has higher priority in bankruptcy than do most of the lessee's other creditors and, therefore, the lessor can initially charge a little bit less for bankruptcy risk than other creditors would have to charge.
- 4 In a lease arrangement, the company may avoid the cost of obsolescence if the lessor fails to anticipate accurately the obsolescence of assets and sets the lease payment too low. Of course, the lessee may pay for this expected benefit in the form of a higher lease payment.
- 5 A lessee avoids many of the negative covenants that are usually included as part of a long-term loan. Requirements with respect to the sale of accounts receivable, subsequent borrowing, business combinations and so on are not generally found in lease agreements.
- 6 In the case of low-cost assets that are infrequently acquired, leasing may provide the company with needed financing flexibility. That is, the company does not have to arrange other financing for these assets and can obtain them with relative convenience through a lease.

Frequently Cited Disadvantages

- 1 A lease does not have a stated interest cost. In cases where the return to the lessor is quite high, the company might be better off borrowing to purchase the asset.

- 2 At the end of the term of the lease agreement, the lessor realises the asset's salvage value, if any. If the lessee had purchased the asset, it could have claimed the asset's salvage value. Of course, in a competitive leasing market, if the lessor expects a higher salvage value, then the lease payments would be lower.
- 3 Under a lease, the lessee is generally prohibited from making improvements to the leased property or asset without the lessor's approval. If the property were owned outright, this difficulty would not arise. Of course, lessors generally encourage leasehold improvements that are expected to enhance the asset's salvage value.
- 4 If a lessee leases an asset that subsequently becomes obsolete, it still must make lease payments over the remaining term of the lease. This is true even if the asset is unusable.

LO14.4

CONCEPT REVIEW QUESTIONS

- 12 What factors should be considered when deciding between leasing an asset or borrowing funds to purchase the asset?

THINKING CAP QUESTION

- 5 What information do you need to be able to make a reliable decision to lease rather than buy a fixed asset?

STUDY TOOLS

SUMMARY

LO14.1

- Long-term debt and leasing are important sources of capital for businesses. Long-term debt can take the form of term loans or bonds. The characteristics of each can be tailored to meet the needs of both the borrower and the lender.
- The conditions of a term loan are specified in the loan agreement. This agreement specifies the rights and responsibilities of both lender and borrower, and the agreement typically lists several positive and negative covenants that the borrower must not violate.

LO14.2

- Syndicated loans are large-denomination credits arranged for a single borrower by a syndicate of institutional lenders, primarily commercial banks. These have been increasing in importance in recent years because very large loans can be arranged quickly and inexpensively and can have flexible borrowing terms.

LO14.3

- The **Figure 14.6e** conditions of a bond issue are specified in the bond indenture and are enforced by a trustee. These legal agreements are highly detailed and not easily modified because bonds are held by many investors.

- In contrast, privately placed loan terms can be modified rather easily because the borrower can negotiate directly with one creditor or a relatively small number of creditors.
 - When interest rates drop, bond issuers frequently make refunding decisions, which involve determining the NPV associated with calling outstanding bonds and issuing new bonds with lower-interest-coupons to replace the refunded bonds.
- LO14.4**
- Leasing serves as an alternative to borrowing funds to purchase an asset. Companies often make lease-versus-purchase decisions, which involve choosing the alternative with the lower present value of cash outflows.
 - Leasing affects a company's future financing ability. Financial analysts view leases as financial commitments. A variety of advantages and disadvantages of leasing are commonly cited.

SELF-TEST PROBLEMS

Answers to these 'Self-test problems' and the 'Concept review' questions throughout the chapter appear on the Student Companion Website (<http://login.cengagebrain.com>) or via your instructor.

ST14-1 The initial proceeds per bond, the size of the issue, the initial maturity of the bond and the years remaining to maturity are shown in the following table for several bonds. Each bond has a \$1,000 face value, and the issuing company is in the 35% tax bracket.

BOND	PROCEEDS PER BOND	SIZE OF ISSUE	INITIAL MATURITY OF BOND	YEARS REMAINING TO MATURITY
A	\$ 975	50,000 bonds	10 years	5 years
B	1,020	25,000	20	15
C	1,000	100,000	25	12

- Indicate whether each bond was sold at a discount, at a premium or at its face value.
- Determine the total discount or premium for each issue.
- Determine the annual amount of discount or premium amortised for each bond.
- Calculate the unamortised discount or premium for each bond.
- Determine the after-tax cash flow associated with the retirement now of each of these bonds, using the values developed in part (d).

ST14-2 The principal, coupon interest rate and interest overlap period are shown in the following table for several different bonds:

BOND	PRINCIPAL	COUPON INTEREST RATE	INTEREST OVERLAP PERIOD
A	\$ 15,000,000	6.5%	2 months
B	20,000,000	7.0	3
C	15,000,000	6.0	4
D	100,000,000	8.0	6

- Calculate the dollar amount of interest that must be paid for each bond during the interest overlap period.
- Calculate the after-tax cost of overlapping interest for each bond if the company is in the 40% tax bracket.

ST14-3 Well-Sprung Pty Ltd, a US company, is considering offering a new \$100 million bond issue to replace an outstanding \$100 million bond issue. The company wishes to take advantage of the decline in interest rates that has occurred since the original issue. The two bond issues are described in what follows. The company is in the 30% tax bracket.

Old bonds. The outstanding bonds have a \$1,000 face value and an 8.5% coupon interest rate. They were issued five years ago with a 20-year maturity. They were initially sold at a \$30 per bond discount, and a \$750,000 flotation cost was incurred. They are callable at \$1,085.

New bonds. The new bonds would have a 15-year maturity, a face value of \$1,000, and a 7.0% coupon interest rate. It is expected that these bonds could be sold at par for a flotation cost of \$600,000. The company expects a three-month period of overlapping interest while it retires the old bonds.

- a Calculate the initial investment that is required to call the old bonds and issue the new bonds.
- b Calculate the annual cash flow savings, if any, expected from the proposed bond-refunding decision.
- c If the company uses its 4.9% after-tax cost of debt to evaluate low-risk decisions, find the net present value (NPV) of the bond-refunding decision. Would you recommend the proposed refunding? Explain your answer.

ST14-4 The Strident Company is attempting to determine whether to lease or purchase a new telephone system. The company is in the 40% tax bracket, and its after-tax cost of debt is currently 4.5%. The terms of the lease and the purchase are as follows:

Lease. Annual beginning-of-year lease payments of \$22,000 are required over the five-year life of the lease. The lessee will exercise its option to purchase the asset for \$30,000, to be paid along with the final lease payment.

Purchase. The \$100,000 cost of the telephone system can be financed entirely with a 7.5% loan (pre-tax) requiring annual end-of-year payments of \$24,716 for five years. The company in this case will depreciate the equipment using the straight-line method over five years. The company plans to keep the equipment and use it beyond its five-year recovery period.

- a Calculate the after-tax cash outflows associated with each alternative.
- b Calculate the present value of each cash outflow stream using the after-tax cost of debt.
- c Which alternative – lease or purchase – would you recommend? Why?

QUESTIONS

- Q14-1** Comment on the following proposition: The use of floating-rate debt eliminates interest rate risk (the risk that interest payment amounts will change in the future) for both the borrower and the lender.
- Q14-2** What purpose do loan covenants serve in a debt agreement? What factors should a manager consider when negotiating covenants?
- Q14-3** List and briefly discuss the key features that distinguish long-term debt issues from each other.
- Q14-4** Define the following: term loan, balloon payment and share purchase warrants.
- Q14-5** What is a *syndicated loan*? Why have these loans proven so popular with corporate borrowers?
- Q14-6** What is a *project finance (PF) loan*? What role does a stand-alone company play in the typical project finance deal?
- Q14-7** What is a *debenture*?
- Q14-8** How do sinking funds reduce default risk?

- Q14-9** What is a *trustee*? Why do bondholders insist that a trustee be included in all public bond offerings? Why are these less necessary in private debt placements?
- Q14-10** What is a bank-accepted commercial bill?
- Q14-11** Why are most corporate bonds callable? Who benefits from this feature, and what is the cost of adopting a call provision in a public bond issue?
- Q14-12** Why do corporations have their debt rated? Compare the role played by rating agencies and a company's outside auditors.
- Q14-13** What does investment grade mean in the context of corporate bond issues? How do these bonds differ from *junk bonds*, and why have the latter proven so popular with investors?
- Q14-14** What is a *Eurobond*? Why did these bonds come into existence? Why do Eurobond investors like the fact that these are typically 'bearer bonds'? What risk does an investor run from holding bearer bonds rather than registered bonds?
- Q14-15** Explain how uncertainty concerning future interest rates would affect the decision to refund a bond issue.
- Q14-16** How would the availability of floating-rate debt affect the lease-versus-purchase decision?
- Q14-17** For acquiring an asset, what are the key advantages of leasing as compared to borrowing? What are the key disadvantages of leasing?

PROBLEMS

CORPORATE BONDS

- P14-1** The initial proceeds per bond, the size of the issue, the initial maturity of the bond and the years remaining to maturity are shown in the following table for a number of bonds. In each case the bond has a \$100 face value, and the issuing company is in the 40% tax bracket.

BOND	PROCEEDS PER BOND	SIZE OF ISSUE	INITIAL MATURITY OF BOND	YEARS REMAINING TO MATURITY
A	\$ 98.50	10,000 bonds	20 years	15 years
B	102.50	20,000	25	16
C	100.00	22,500	12	9
D	96.00	5,000	25	15
E	103.50	10,000	30	16

- a** Indicate whether each bond was sold at a discount, at a premium or at its face value.
- b** Determine the total discount or premium for each issue.
- c** Determine the annual amount of discount or premium amortised for each bond.
- d** Calculate the unamortised discount or premium for each bond.
- e** Determine the after-tax cash flow associated with the retirement now of each of these bonds, using the values developed in part (d).

- P14-2** For each of the callable bond issues in the following table, calculate the after-tax cost of calling the issue. Each bond has a \$100 face value, and the various issue sizes and call prices are shown in the following table. The issuing company is in the 40% tax bracket.

BOND	SIZE OF ISSUE	CALL PRICE
A	12,000 bonds	\$105.00
B	20,000	103.00
C	30,000	101.50
D	50,000	105.00
E	100,000	104.50
F	500,000	106.00

- P14-3** The principal, coupon interest rate and interest overlap period are shown in the following table for five different bonds.

BOND	PRINCIPAL	COUPON INTEREST RATE	INTEREST OVERLAP PERIOD
A	\$ 5,000,000	8.0%	3 months
B	40,000,000	7.0	2
C	50,000,000	6.5	3
D	100,000,000	9.0	6
E	20,000,000	5.5	1

- a Calculate the dollar amount of interest that must be paid for each bond during the interest overlap period.
- b Calculate the after-tax cost of overlapping interest for each bond if the company is in the 40% tax bracket.

- P14-4** Web Tools Company is considering using the proceeds from a new \$50 million bond issue to call and retire its outstanding \$50 million bond issue. The details of both bond issues are outlined in what follows. The company is in the 40% tax bracket.

Old bonds. The company's old issue has a coupon interest rate of 10%, was issued four years ago, and had a 20-year maturity. The bonds sold at a \$10 discount from their \$1,000 face value, flotation costs were \$420,000, and their call price is \$1,100.

New bonds. The new bonds are expected to sell at par (\$1,000), have a 16-year maturity, and have flotation costs of \$520,000. The company will have a two-month period of overlapping interest while it retires the old bonds.

- a What is the initial investment that is required to call the old bonds and issue the new bonds?
- b What are the annual cash flow savings, if any, from the proposed bond refunding decision if the new bonds have an 8% coupon interest rate? If the new bonds have a 9% coupon interest rate?
- c Construct a table showing the net present value (NPV) of refunding under the two circumstances given in part (b) when (i) the company's after-tax cost of debt is $4.8\% [0.08 \times (1 - 0.40)]$ and (ii) this cost is $5.4\% [0.09 \times (1 - 0.40)]$.
- d Given the circumstances described in part (c), discuss when refunding would be favourable and when it would not.
- e If the two circumstances summarised in your answer to part (d) were equally probable (each had a probability of 25%), would you recommend refunding? Explain your answer.

LEASING

- P14-5** Given the lease payments and terms shown in the following table, determine the yearly after-tax cash outflows for each company. Assume that lease payments are made at the *beginning of each year*, that the company is in the 40% tax bracket, and that no purchase option exists.

COMPANY	ANNUAL LEASE PAYMENT	TERM OF LEASE (YEARS)
A	\$ 250,000	5
B	160,000	12
C	500,000	8
D	1,000,000	20
E	25,000	6

- P14-6** Eastern Transport Company needs to expand its facilities. In order to do so, the company must acquire a machine costing \$80,000. The machine can be leased or purchased. The company is in the 40% tax bracket, and its after-tax cost of debt is 5.4%. The terms of the lease and purchase plans are as follows:

Lease. The leasing arrangement requires beginning-of-year payments of \$16,900 over five years. The lessee will exercise its option to purchase the asset for \$20,000, to be paid along with the final lease payment.

Purchase. If the company purchases the machine, its cost of \$80,000 will be financed with a five-year, 9% loan (pre-tax) requiring equal end-of-year payments of \$20,567. The machine will be depreciated on a straight-line basis for five years. The company plans to keep the equipment and use it beyond its five-year recovery period.

- a Determine the after-tax cash outflows of Eastern Transport under each alternative.
- b Find the present value of the after-tax cash outflows for each alternative using the after-tax cost of debt.
- c Which alternative – lease or purchase – would you recommend? Why?

- P14-7** Given the lease payments, years remaining until the leases expire and discount rates shown in the following table, calculate the capitalised value of each lease. Assume that lease payments are made at the beginning of each year.

LEASE	LEASE PAYMENT	REMAINING TERM (YEARS)	DISCOUNT RATE (%)
A	\$ 40,000	12	10
B	120,000	8	12
C	9,000	18	14
D	16,000	3	9
E	47,000	20	11

CASE STUDY



LONG-TERM DEBT AND LEASING

The CFO of your company asks you to review the long-term debt position of the company to decide if it should make any changes in its borrowing arrangements. Before conducting this review, you decide to bring yourself up to date on terminology and types of long-term borrowing arrangements. Therefore, as a start, you decide to answer the following questions.

ASSIGNMENT

- 1 What types of debt covenants might managers consider?
- 2 What are the major factors that affect the cost or interest rate of a debt instrument?
- 3 What are *term loans*, and what are their characteristics?

- 4 What are *syndicated loans*, and what are their primary applications?
- 5 What are some of the legal arrangements used to protect lenders related to corporate bonds?
- 6 What are some of the general features of corporate bonds?
- 7 What options are available for a company that wishes to avoid a large single repayment of principal in the future or to refund a bond prior to maturity?
- 8 In what ways are leases similar to long-term debt?
- 9 What are the advantages and disadvantages of leasing?

15

PAYOUT POLICY

WHAT COMPANIES DO

DIVIDEND PAYOUTS GROWTH: STARBUCKS ANNOUNCES ITS FIRST DIVIDEND

In the first quarter of 2010, companies included in the Standard & Poor's (S&P) 500 Index posted the biggest gain in dividend rates in over two years. The gain was attributed to improving confidence following the economy's big downturn in 2008 and 2009. During the quarter, the S&P companies announced planned dividend payments in excess of US\$4.4 billion, the largest amount since they announced US\$6.7 billion in the fourth quarter of 2007. One cause of the increased payouts was believed to be that a build-up of cash relative to the market values of many companies had led them to return a portion of profits to their shareholders.

Starbucks is a good example of one of these dividend payers. After two years of layoffs and store closings, in the first quarter of 2010, it issued its first-ever dividend. Howard Schultz, company founder and, at the time, CEO, announced that the company's ambitious turnaround had sliced US\$580 million from its expenses, and that the turnaround was

taking hold. He also indicated that, beyond the announced 10% share dividend, the company planned to ultimately boost that payment to as much as 40% of its annual profit and expand its effort to buy back its own shares. As many analysts suggested, it appeared that Starbucks had matured beyond the fast-growth stage, and as a result would be likely to implement plans to distribute cash to its shareholders through both dividends and share repurchases. In fact, in the four years to December 2019, the company's dividend payout ratio ranged from 38.5% to 50.36%. This behaviour exemplifies that of a long-term profitable company that has matured.

Sources: 'S&P 500 Dividend Rates Post Biggest Gain in Over Two Years', *Wall Street Journal*, 19 March 2010, WSJ.com, <http://www.blogs.wsj.com/marketbeat/2010/03/19/sp-500-dividend-rates-post-biggest-gain-in-over-two-years/tab/print/>; 'After Starbucks Dividend, Who's Next?', *Wall Street Journal*, 24 March 2010, WSJ.com, <http://www.blogs.wsj.com/marketbeat/2010/03/24/after-starbucks-dividend-whos-next/>; Ashley M. Heher, 'Starbucks to Pay First Dividend, Expands Buyback', Associated Press, 24 March 2010, <http://www.finance.yahoo.com/news/Starbucks-to-pay-first-apf-954916568.html?x=0&v=6>; CSIMarket.com, Starbucks's yearly dividend payout ratio 5 years, https://csimarket.com/stocks/single_dividendpry.php?code=SBUX. Accessed 4 January 2020.

LEARNING OBJECTIVES

After studying this chapter, you should be able to:

- LO15.1 discuss the fundamentals of payout policy, including cash dividend payment procedures, types of policies and share repurchases
- LO15.2 describe some of the key factors affecting dividend and share repurchase decisions
- LO15.3 understand why payout policy is irrelevant in a world with perfect capital markets,

and review the arguments for dividend relevance in the imperfect (real) world, including agency and signalling models

- LO15.4 review real-world influences on payout policy such as taxes, transactions costs and uncertainty

- LO15.5 summarise key lessons regarding payout policy.

A company's **payout policy** describes the choices its managers make about distributing cash to shareholders. These choices include whether to pay shareholders a regular (recurring) dividend or a one-time 'special' dividend, whether to repurchase outstanding shares and what size the cash distribution should be. In companies with a history of paying dividends, managers must decide if the company should maintain its current payouts or change them. Managers tend to increase regular dividends only when they expect that future cash flow will be sufficient to pay the dividends and to meet their company's other financial needs. Companies must also weigh the share market's reaction to changes in dividend policy. Influencing that reaction are factors such as the current level of a company's dividends, the volatility of the dividend stream over time and the income taxes investors must pay when they receive dividends. As you can see, the many dimensions of this problem can make payout policy decisions quite difficult.

In recent years, phenomenal growth has been observed in both the number of companies implementing **share repurchase programs** and the total value of these programs. Companies that announce a share repurchase program state that they will buy some of their own shares over a period of time. Companies usually repurchase shares through purchases on the open market, though targeted repurchases directly from large shareholders are also possible. In executing a repurchase program, companies distribute some of the cash they have accumulated to investors who want to sell their shares. Therefore, dividends and share repurchases are alternative means by which companies pay out cash to investors.

It is important to keep in mind that a company's dividend policy is not independent from its other financing and investment decisions. For example, for a company that has at least some debt, paying a dividend decreases the company's equity, and therefore raises its debt ratio. A company that decides to distribute cash to shareholders via a dividend or share repurchase may increase the likelihood that it will have to raise external financing in the future. In fact, it is not unusual for the same company to pay a dividend, repurchase shares, borrow money and issue new ordinary shares all in the same year. It should be no surprise, then, that some of the same issues that arise when we think about capital structure decisions are also important in setting dividend policy.

Our objective in this chapter is to answer two basic questions. First, does payout policy matter? (Can managers increase or decrease the total market value of a company's securities by changing its payouts?) Second, if payout policy does matter, how should managers set payouts to maximise the company's value? Before attacking these questions, in section 15.1 we provide a brief overview of payout policy fundamentals, and in section 15.2 we discuss the factors affecting dividend and share repurchase decisions. Section 15.3 shows that payouts are irrelevant in a world of perfect (frictionless) capital markets, which suggests that dividends and share repurchases exist because of some imperfection in markets or human nature. Section 15.4 describes various real-world market imperfections that affect actual payout policy decisions. Finally, section 15.5 presents a payout policy checklist and summarises key payout policy lessons.

payout policy
The choices managers make about distributing a company's cash, including whether to pay shareholders a regular or a 'special' dividend, whether to repurchase shares and what size the cash distribution should be

share repurchase programs
Programs in which companies will buy some of their own shares over a period of time, usually on the open market

THINKING CAP QUESTION

- 1 What happens to a company's dividend yield as its share price declines?

LO15.1 ➤ 15.1 PAYOUT POLICY FUNDAMENTALS

In Chapter 5, we argued that the value of a share equals the present value of the cash flows the shareholder receives over time. Even though a company is not paying dividends or repurchasing shares today, its market value reflects the likelihood that the company will either pay dividends or repurchase shares in the future or be acquired by another company, at a price that reflects a higher stream of cash payments. To provide an understanding of the fundamentals of payout policy, we begin with a discussion of the procedures for paying cash dividends and the factors affecting dividend policy.

15.1a CASH DIVIDEND PAYMENT PROCEDURES

In Australia, as in most countries, shareholders do not have a legal right to receive dividends for every earning period. Instead, a company's board of directors must decide whether to pay dividends. The directors usually meet to evaluate the company's recent financial performance and future outlook, and to determine whether, and in what amount, dividends should be paid. The payment date of the cash dividend, if one is declared, must also be established.

Payment Patterns and Measures

In Australia, most companies that pay dividends do so twice a year. These dividends are usually known as the *interim dividend* and the *final dividend*. Companies can also pay *special dividends* related to a particular event. In the US, companies that pay dividends usually do so once every quarter. Companies adjust the size of their dividends periodically, but not necessarily every quarter. **Figure 15.1** provides evidence suggesting that most companies adjust their dividends infrequently, 'smoothing' dividends over time rather than adjusting them up or down each quarter as earnings fluctuate. The figure plots average earnings, dividends and share repurchases for US non-financial companies from 1990–2009.¹ Observe that the earnings and repurchases lines dip significantly during the recessions in the early 1990s and in 2001–2002, but in both cases the change in dividends was muted. However, a modest reduction in dividends occurred as earnings fell dramatically during the recession that began with the global financial crisis in 2007.

Investors closely track two ratios related to corporate dividend payments. The first is the **dividend yield**, which equals the annual cash dividend divided by the current share price. The second ratio related to dividend payments is the **dividend payout ratio**, which equals dividends paid per share divided by earnings per share in a given period.

dividend yield

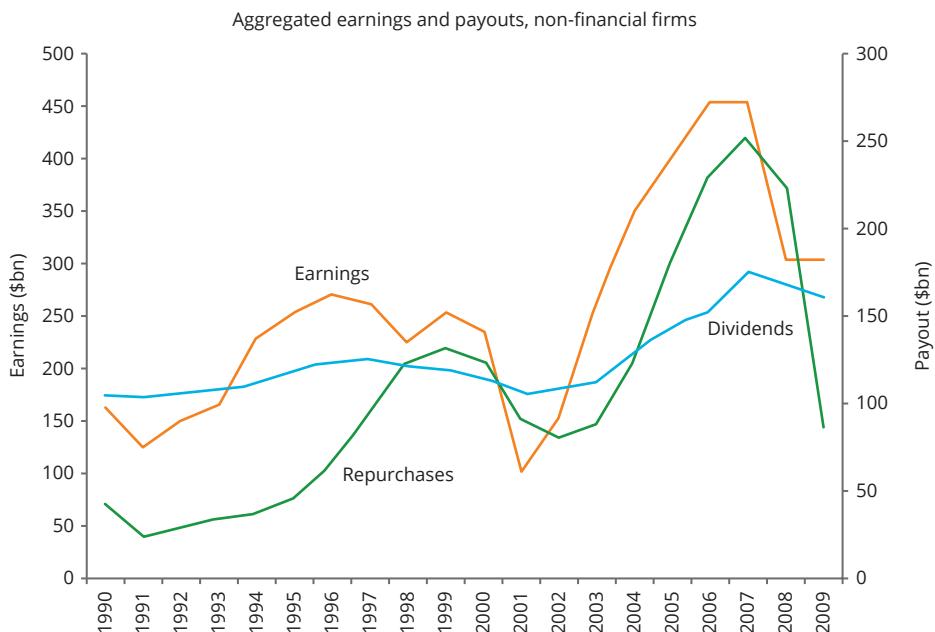
Annual cash dividend per share divided by the current share price

dividend payout ratio

The percentage of current earnings available for ordinary shareholders paid out as dividends. Calculated by dividing the company's cash dividend paid per share by its *earnings per share* in a given period

¹ We thank Mark T. Leary of Washington University in St Louis for providing data for the figure.

FIGURE 15.1 US PAYOUTS 1990–2009: DIVIDENDS, REPURCHASES AND EARNINGS



Note: Two scales. Dividends decreased a small amount for non-financial companies during the 2008–2009 recession, while repurchases decreased much more.

EXAMPLE

Calculating Dividend Yield and Dividend Payout Ratio

On 18 May 2011, US company Intel Corp. (INTC) announced a 16% increase in its quarterly dividend to US\$0.21 per share (US\$0.84 annually). On the day of that announcement, Intel's shares traded for US\$23.50, so its *dividend yield* was 3.6%

$[(\$0.21 \times 4) \div \text{US\$}23.50]$. Intel's earnings during the prior quarter were US\$0.56 per share, which implies a *dividend payout ratio* of about 37.5% $(\$0.21 \div \$0.56)$.

announcement date
The day a company declares the amount of the dividend, plus the dividend record and payment dates to the public

record date
The date on which the names of all persons who appear as shareholders are entitled to receive a dividend (which will be distributed on the date payable)

Relevant Dates

When companies announce dividends, they also establish certain dates that determine which shareholders receive the dividends. The day on which companies release this information to the public is the **announcement date**. Shareholders of record, all persons whose names appear as shareholders on the **record date**, are entitled to the dividend. The ASX defines the record date as '5.00 p.m. on the date a company closes its share register to determine which shareholders are entitled to receive the current dividend'.² However, because it takes time to make bookkeeping entries after shares trade, investors who

² Information on this and other aspects of dividend payments are provided on the ASX website: <http://www.asx.com.au/prices/dividends.htm>.

ex-dividend date

The date on or after which a purchaser of a share does not receive the current dividend, usually two business days before the record date

date payable

The actual date on which the company makes the dividend payment to the holders of record entitled to receive dividends

cum dividend

Between the *announcement date* and *ex-dividend date*, shares are said to be *cum dividend*, meaning that current or new shareholders are entitled to receive dividends

buy shares on the record date will miss the dividend payment. To receive the dividend, an investor must own the share before the **ex-dividend date**, usually two business days before the record date. Companies distribute dividends on the **date payable**, which usually comes a few weeks after the record date. Prior to the ex-dividend date, after the announcement date, shares are said to be **cum dividend**, indicating that current shareholders are entitled to receive the dividends. **Figure 15.2** shows a timeline illustrating these events.

FIGURE 15.2 A TIME LINE ILLUSTRATING IMPORTANT DATES IN THE DIVIDEND PROCESS



In a perfect market (no taxes and transactions costs) and in the absence of any new information, when a share ‘goes ex-dividend’, its price should drop by the amount of the dividend. To see why, consider that an investor who buys a share just before the ex-dividend date will receive the dividend a few days later, whereas an investor who buys on the ex-dividend date misses this payment. Therefore, investors who buy on the ex-dividend date will pay less for the share. For example, suppose a share that pays a \$1 dividend sells for \$51 just before going ex-dividend. Once the ex-dividend date passes, the price should drop to \$50 (ignoring market imperfections like income taxes).

EXAMPLE

Going Ex-Dividend

On 26 April 2011, the warehouse club retailer, Costco, announced a US\$0.24 quarterly dividend to be paid on 27 May to shareholders of record as of Friday 13 May. The ex-dividend date was set two business days before the record date, on Wednesday 11 May. Investors who purchased Costco shares on or before 10 May received the dividend, and those who purchased on

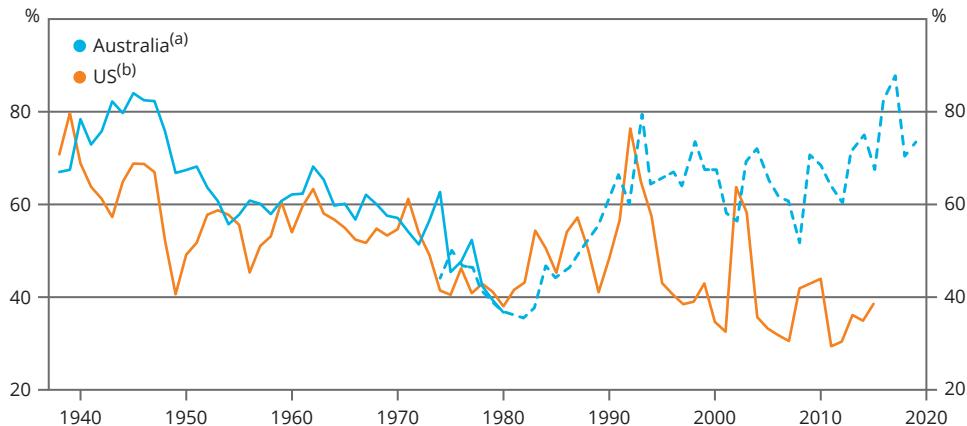
11 May or later missed it. Costco’s shares closed at US\$82.23 on the afternoon of 10 May, and opened the next morning US\$0.20 lower at US\$82.03. As anticipated, the share price fell after the shares went ex-dividend, although the price decline was slightly less than the amount of the dividend payment.

Research shows that, in the United States and many other countries, the ex-dividend price drop tends to be less than the dividend payment. One explanation for this pattern is related to investor taxes. If a share priced at \$51 falls to \$50.30 when the company pays a \$1 dividend, then this may indicate that the investor faces a 30% dividend tax rate and so valued the dividend at only 70 cents in the first place. That is, the \$51 represented \$50.30 in long-run value plus the after-tax proceeds from the \$1 dividend. After the dividend is paid, the \$50.30 in remaining long-run value dictates the company’s share price.

In Australia, the dividend imputation system means that companies are able to frank their dividends. If their dividends are fully franked, then investors receive a franking credit that reflects the corporate tax paid by the company, meaning that they only need to pay (or receive) the net difference between the franking credits and the dividend income tax they would pay using their marginal tax rate. This factor should reduce the negative impact of taxation on ex-dividend prices in Australia that is typically seen in the US (as described above).

As [Figure 15.3](#) shows, until the introduction of franking credits in the 1980s, Australian dividend payout ratios were similar to those in the US. However, after the introduction of the dividend imputation system, and franking credits, dividend payout ratios have been significantly higher. As [Figure 15.4](#) shows, Australia has had the highest average dividend payout ratio among similar major equity markets.

FIGURE 15.3 COMPARISON OF US AND AUSTRALIAN DIVIDEND PAYOUT RATIOS 1940–2019



Notes: (a) Solid line shows series calculated from RBA dataset, dashed line shows implied ratio from Datastream data
(b) Excluding 2008

Source: Thomas Mathews (2019), 'History of Australian Equities', RBA Research Discussion Paper No 2019-04, Figure 4, June 2019, <https://www.rba.gov.au/publications/rdp/2019/pdf/rdp2019-04.pdf>. Accessed 4 January 2020.

15.1b TYPES OF DIVIDEND PAYOUT POLICIES

Before discussing the basic types of dividend policies, we should briefly consider some of the practical issues related to formulating a value-maximising policy. (Theoretical issues are discussed in later sections.) These include legal constraints, contractual constraints, internal constraints, the company's growth prospects and owner considerations.

For example, negative covenants in loan agreements sometimes constrain a company's ability to pay cash dividends. Generally, these constraints prohibit cash dividends until the company achieves a certain level of earnings, or they may limit dividends to a certain dollar amount or percentage of earnings. Constraints on dividend payments help protect creditors from losses due to insolvency. If a company violates one of these contractual restrictions, creditors generally have the right to demand immediate repayment of their loans. The case of Keybridge Capital Limited (discussed in section 16.1d of

FIGURE 15.4 COMPARISON OF AVERAGE DIVIDEND PAYOUT RATIOS ACROSS MAJOR EQUITY MARKETS 2005–2015

AVERAGE OVER 2005 TO 2015	
Australia	67
United Kingdom	60
Japan	57
Europe	55
Canada	52
United States	48

Source: Michelle Bergmann (2016), 'The Rise in Dividend Payments', RBA *Bulletin* March Quarter 2016, Table 1 2016, <https://rba.gov.au/publications/bulletin/2016/mar/pdf/bu-0316-6.pdf>. Accessed 4 January 2020.

Chapter 16) provides an example of such a situation; because of its debt obligation, the company was required to sweep all of its cash into making debt repayments, and was not allowed to make any dividend payments to equity shareholders.

The following sections describe three basic payout dividend policies, but bear in mind that the constant dollar payout dividend policy dominates in every major economy. A particular company's cash dividend payout policy may incorporate elements of each policy type.

constant payout ratio policy

Dividend policy in which a company establishes that a certain percentage of earnings is paid to owners in each dividend period

constant dollar payment policy

Dividend policy based on the payment of a fixed-dollar dividend in each period

target dividend payout ratio

A policy under which a company attempts to pay out a specified percentage of earnings by paying a stated dollar dividend adjusted slowly towards the target payout as proven earnings increase

low-regular and extra payout policy

Policy of a company paying a low regular dividend supplemented by an additional cash dividend when earnings warrant it

extra dividend, or special dividend

An additional dividend that a company may pay if earnings are higher than normal in a given period

Constant Payout Ratio Policy

One type of dividend policy rarely adopted by companies is a constant payout ratio. As noted earlier, the *dividend payout ratio* indicates the percentage of each dollar earned that is distributed to the owners. With a **constant payout ratio dividend policy**, the company establishes that a certain percentage of earnings is paid to shareholders in each dividend period. The problem with this policy is that, if the company's earnings drop or if a loss occurs in a given period, the dividends may be low or even non-existent, making them as volatile as the company's earnings.

Constant Dollar Payout Policy

Another type of dividend policy, the **constant dollar payout dividend policy**, is based on the payment of a fixed-dollar dividend in each period. Using this policy, companies often increase the regular dividend once a *proven* increase in long-term earnings has occurred. Under this policy, companies almost never cut dividends unless they face a true crisis.

Companies that pay a steady dividend may build their policy around a **target dividend payout ratio**. Under this policy, the company attempts to pay out a specified percentage of earnings. Rather than let dividends fluctuate, however, it pays out a stated dollar dividend and slowly adjusts it towards the target payout as proven earnings increase occur. This is known as a *partial-adjustment strategy*, and it implies that at any given time, companies may be in a transition between two dividend payout levels.

Low-Regular and Extra Payout Policy

Some companies establish a **low-regular and extra payout policy** that pays out a low regular dividend, supplemented by an additional cash dividend when earnings warrant it. If earnings are higher than normal in a given period, the company may pay out this additional dividend, which is designated an **extra dividend, or special dividend**. By designating the amount – by which the current dividend exceeds the regular payment – as an extra dividend, the company avoids giving shareholders false hopes. The use of the 'extra' or the 'special' designation is more common among companies that experience temporary shifts in earnings.



Special Dividend Payout

An exception is National Presto Industries (NPI) in the US, primarily a housewares and small appliance manufacturer with an unbroken 66-year dividend history, which regularly pays 'extra' dividends. Every year, NPI pays a base US\$1 per share dividend plus an extra dividend based

on profits. In 2011, NPI announced its US\$1.00 per share regular dividend plus an extra dividend of US\$7.25 per share, resulting in a total annual dividend of US\$8.25 per share. Its resulting *dividend yield* for 2011 was a very attractive 7.4%.

15.1c BONUS SHARES AND SHARE SPLITS

In addition to paying cash dividends, companies sometimes issue *bonus shares* (in the US, these are referred to as *stock dividends*). A transaction that is essentially identical to issuing a bonus share is a *share split*.

Bonus Shares

Issuing bonus shares involves the payment to existing shareholders of a dividend in the form of extra shares. For example, if a company declares a 20% **bonus share issue**, it will issue 20 new shares for every 100 shares that an investor owns. Companies often issue bonus shares as a replacement for, or a supplement to, cash dividends. However, bonus shares do not necessarily increase a shareholder's wealth. If a company completes a 20% bonus share issue, and nothing else about the company changes, then the number of outstanding shares increases by 20%, and the share price drops by about 16.7% to 83.3% of its original price ($100\% \div 120\% = 83.3\%$). Thus, the net effect on shareholder wealth is neutral; the bonus shares neither increase nor decrease the value of investors' shareholdings – that is, $120\% \text{ shares} \times 83.3\% \text{ price} = 100\% \text{ of original value}$. In other words, shareholders receiving bonus shares maintain a constant proportional share of the company's equity.

bonus share issue
The payment to existing shareholders of a dividend in the form of shares

Share Splits

Share splits, like bonus shares, should have mostly cosmetic effects on a company. When a company executes a **share split** (referred to as *stock splits* in the US), its share price declines because the number of outstanding shares increases. For example, in a 2-for-1 split, the company doubles the number of shares outstanding, but the share price falls to approximately half its previous level. Managers who implement share splits generally say they are trying to restore the per-share price of the company's equity to within a 'preferred' trading range that individual investors desire. Such managers believe that they can achieve a higher overall company value by keeping the share price low enough to appeal to retail investors.

share split
A transaction in which a company increases the number of outstanding shares by issuing new shares to existing shareholders

Intuition suggests that share splits should not create value for shareholders. After all, if someone gives you two \$5 bills in exchange for one \$10 bill, you are no better off. A share split should also have no effect on the company's capital structure because it changes the number rather than the value of outstanding shares. In spite of this logic, research shows that share splits increase the market value of a company's equity by about 2.5%. In other words, if a company whose shares trade for \$100 announces a 2-for-1 split, research shows that the share price will fall to roughly \$51.25 (so two shares are worth \$102.50).



Share Splits and Share Prices

Most established US public companies routinely split their shares to keep the price within a perceived optimal range. General Electric (GE), a company that has paid a cash dividend each quarter for over 100 years, is perhaps the best example of this policy. GE's shares were first offered for sale at US\$108 per share in 1892.

Had GE not split its shares repeatedly over the years, the price per share would have been over US\$92,000 by 2011. The price of the voting shares (A shares) of the most famous company that refuses to split its voting shares, Berkshire Hathaway, was US\$119,164 on 18 May 2011 and had risen to US\$224,880 by 7 February 2015.

Most share splits increase the number of shares outstanding, but companies sometimes conduct **reverse share splits**, replacing a number of outstanding shares with just one new share. For example, in a 1-for-2 split, one new share replaces two old shares; in a 2-for-3 split, two new shares replace three old shares; and so on. A company whose shares sell at a very low price may initiate a reverse share split to increase its share price and avoid being delisted due to any minimum share price requirement of the exchange where the share trades.

reverse share splits
Occur when a company replaces a certain number of outstanding shares with just one new share to increase the share price

15.1d SHARE REPURCHASES

Companies can also pay out cash to shareholders by repurchasing some of their outstanding shares. Comparing the dividend and share repurchase values in [Figure 15.1](#), we can see that share repurchases have grown in importance relative to dividends, and that in many recent years, aggregate repurchases have exceeded aggregate dividends.

In addition to paying out cash to shareholders, the practical motives for share repurchases include obtaining shares to be used in acquisitions, having shares available for employee share-option plans and retiring shares. From a broader perspective, the rising importance of share repurchases suggests that they may enhance shareholder value, perhaps because they have traditionally been a tax-advantaged method of paying out cash. Although it is not clear exactly what managers are trying to achieve through repurchases, one frequently mentioned rationale is to send a positive signal to investors in the marketplace that management believes the shares are undervalued, thus reducing the number of shares outstanding and raising earnings per share (EPS). Recall the discussions around capital budgeting decision criteria from Chapter 10. In theory, if the managers of a company cannot find investment opportunities that will produce a higher return on investment than their cost of capital, they should return this capital to shareholders. This is another rationale for share repurchases.

A study by Weston and Siu suggested that share repurchases have grown rapidly since the early 1990s, largely to offset the dilution effects of the exercise of share options.³ According to the study, as the number and the value of options granted to (and exercised by) top executives have increased in importance, companies have been buying back shares to keep the total number outstanding from rising too sharply, reducing EPS.

Taxes

Today, both dividends and capital gains are taxed, but share repurchases still give investors the option to participate or not (i.e. to sell or to retain their shares). Therefore, capital gains taxes can be deferred, whereas taxes on cash dividends must be paid in the year the dividends are received.

Repurchase Methods

Companies can use several methods to repurchase shares. In the most common approach, an *open-market share repurchase*, companies buy back their shares in the open market. In a *tender offer*, or *self-tender*, companies offer to buy back a certain number of shares, usually at a premium above the current market price. In a *Dutch auction repurchase*, companies ask investors to submit prices at which they are willing to sell their shares. If the company wants to buy back two million shares, it reviews the offers submitted by shareholders and determines the lowest price at which shareholders will tender a total of two million shares. In a Dutch auction, all investors receive the same price when they sell back their shares, even if they expressed a willingness to sell at a lower price in their original offer. When companies announce plans to repurchase shares, their share prices typically rise, and the positive reaction is much greater for tender offers and Dutch auctions than for open-market share repurchases.

Having reviewed the basic mechanics and issues surrounding payout policy, we can now look more closely at the factors affecting dividend and share repurchase decisions.

³ See J. Fred Weston and Juan A. Siu, 'Changing Motives for Share Repurchases', *Finance*, Paper 3 (2003), Anderson Graduate School of Management, UCLA.

LO15.1

CONCEPT REVIEW QUESTIONS

- 1 What policies and payments comprise a company's payout policy? Why is determining payout policy more difficult today than in decades past?
- 2 Why should we expect a company's share price to decline by approximately the amount of the dividend payment on the ex-dividend date? Define and differentiate between issuing bonus shares and conducting share splits. Are they both forms of payout by the company? Explain.
- 3 Why is a share repurchase considered to be an alternative to a cash dividend payment? Compare the tax consequences to the recipient of a cash dividend versus an equal-dollar share repurchase.

THINKING CAP QUESTION

- 2 Why might a company choose to maintain its dividend per share even if its profits have fallen significantly?

LO15.2

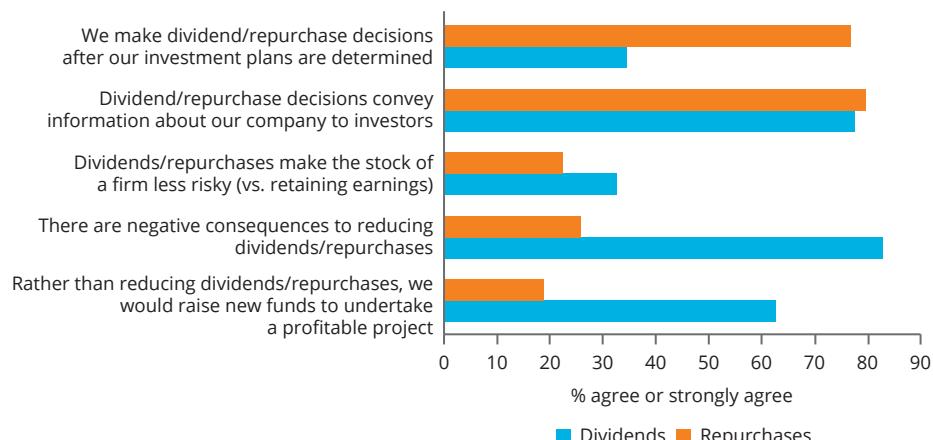
15.2 FACTORS AFFECTING DIVIDEND AND SHARE REPURCHASE DECISIONS

Here we begin with a look at some survey evidence on the views of CFOs on dividends and share repurchases in order to better understand payout policy practices. In addition, we consider some other important evidence regarding dividend and share repurchase decisions.

15.2a CFO VIEWS ON DIVIDENDS AND REPURCHASES

The findings from a 2005 survey of 384 CFOs and treasurers, along with extensive one-on-one interviews with two dozen additional CFOs and treasurers, provide insight into how financial executives approach payout policy decisions. [Figure 15.5](#) compares and contrasts executive views on dividends and repurchases. For example, an overwhelming percentage of CFOs agree with the statement that 'there are negative consequences to reducing dividends', but fewer than 30% agree with that statement when applied to share repurchases. In other words, CFOs believe that investors view dividends as a commitment made by the company that must be fulfilled, whereas share repurchases are more discretionary. In that spirit, nearly 80% of CFOs say that they make repurchase decisions *after* investment plans are in place, but fewer than 35% make the same claim about dividends. Apparently, dividend decisions are as important as (or perhaps more important than) at least some investment decisions for these executives. This view is confirmed by the question asking whether CFOs would raise external capital to fund a new investment rather than cutting payouts to shareholders. More than 60% of the CFOs say that they would raise external funds rather than cut dividends to finance a profitable new investment, but fewer than 20% say that they would raise capital to avoid cutting repurchases.

FIGURE 15.5 CFO'S VIEWS ON DIVIDENDS AND REPURCHASES

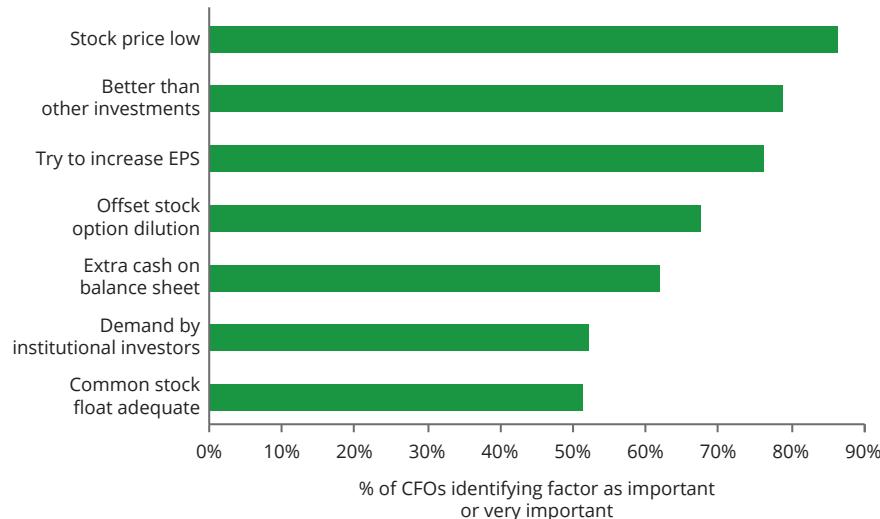


Source: Reprinted from Brav, Graham, Harvey and Michaely, 'Payout Policy in the 21st Century', *Journal of Financial Economics*, Vol. 77, pp. 483–527, © 2005, with permission from Elsevier.

15.2b FURTHER EVIDENCE ON DIVIDEND AND SHARE REPURCHASE PRACTICES

A key advantage of share repurchases is their flexibility as a form of payout. Managers don't feel that their company is penalised if repurchases are reduced from one year to the next; they curtail repurchases in order to pursue attractive investments, and they are not generally inclined to raise external funds to maintain repurchase programs. **Figure 15.6** reports CFO responses to a set of questions that address separate issues related to corporate share repurchase policy. An overwhelming majority of CFOs (87%) said that they repurchased shares when their shares were good value – when the share price was relatively low. Similarly, CFOs said they repurchased shares when buying their own shares was a better investment than other alternatives available to them at the time. But several other factors were important in repurchase decisions, such as trying to increase EPS, offsetting dilution from share option programs and having excess cash on the balance sheet.

FIGURE 15.6 CFO'S VIEWS ON WHY COMPANIES REPURCHASE SHARES



Source: Reprinted from Brav, Graham, Harvey, Michaely, "Payout Policy in the 21st Century," *Journal of Financial Economics*, Vol. 77, pp. 483–527, © 2005, with permission from Elsevier.

Repurchase Effects

When a company buys back shares, it reduces the denominator in the earnings per share (*EPS*) calculation, and more than 75% of the CFOs reported in **Figure 15.6** that raising *EPS* was an important part of their thinking on share repurchases. So, does increasing *EPS* by decreasing shares outstanding sound like an easy way to create value? After all, won't shareholders place a higher value on a company's shares if its earnings are higher? The answer is no: value will not necessarily increase due solely to an increase in *EPS*. Why? Because as the company distributes cash to shareholders, not only does the number of outstanding shares fall, but the mix of assets held by the company also changes. For simplicity, assume that a company owns just two kinds of assets, low-risk cash and high-risk plant and equipment. When the company distributes some of its cash to investors, its subsequent asset mix is riskier than it was before the repurchase, so shareholders will demand a higher rate of return. Moreover, as equity is retired through share repurchases, the company's ratio of debt to equity increases, and so financial risk increases as well. The effect of increasing the risk borne by shareholders offsets the reduction in shares outstanding, so even though *EPS* rises after a share repurchase, that alone does not lead to an increase in company value because the earnings are riskier.

Dividend Effects

The evidence presented above indicates that dividend decisions are made very conservatively. That is, companies are hesitant to start paying dividends (or to increase the amount of dividends they pay) in part because they know they'll be reluctant to reduce them in the future. In one of the earliest research studies on dividends, John Lintner⁴ documented several patterns with respect to companies' dividend policies, patterns that are roughly consistent with this conservative view of dividends. In particular:

- 1 Companies have long-run target dividend payout ratios.
- 2 Dividend changes follow shifts in long-run, sustainable earnings (not short-run changes in earnings).
- 3 Managers are reluctant to increase dividends if they might have to be cut later.
- 4 Managers focus on dividend changes rather than on dividend levels.

Lintner developed a simple model that captured these patterns and estimated companies' target payout ratios as well as the speed with which companies adjusted to those ratios. A slower adjustment speed simply means that companies smooth dividends more as earnings change. You might guess – because companies are placing more importance in recent years on share repurchases, and because managers view them as a more flexible tool than dividends for paying cash to shareholders – that companies' target dividend payouts are now lower (and that adjustments to the target now occur more slowly) than when Lintner published his findings. Indeed, more recent research by Leary and Michaely⁵ finds that, for the period 1950–83, companies that paid dividends had a target of distributing a little more than one-third of their earnings as dividends; moreover, when their dividend payouts deviated from the desired target, companies made adjustments to close about one-third of that gap each year. But from 1984–2002, the target payout ratio appears to have fallen to just 20% of earnings, and likewise the speed of adjustment to that target is much slower. In other words, dividend smoothing increased in more recent years.

4 See John Lintner, 'The Distribution of Incomes of Corporations among Dividends, Retained Earnings, and Taxes', *American Economic Review*, 46 (May 1956), pp. 97–113.

5 See Mark T. Leary and Roni Michaely, 'Why Firms Smooth Dividends: Empirical Evidence', working paper (17 February 2009), Johnson Graduate School of Management, Cornell University, Ithaca, NY.

LO15.2

CONCEPT REVIEW QUESTIONS

- 4 Describe some of the key survey findings regarding dividend and share repurchase decisions. What is the key advantage of share repurchases over dividend payouts?
- 5 Well-diversified investors are willing to tolerate great volatility in the prices of shares they own. Why do you think they might value a constant dividend payment even though the underlying corporate profits on which dividends are ultimately based are highly variable?
- 6 What appears to have happened to dividend payout ratios and the speed of dividend smoothing during recent years? How has management's use of share repurchases affected these behaviours?

LO15.3

15.3 DIVIDENDS IN PERFECT AND IMPERFECT WORLDS

Just as they did with capital structure, Miller and Modigliani demonstrated that – in a world of perfect and frictionless capital markets – payout policy does not affect a company's market value. Value derives solely from the profitability of the company's assets and the competence of its management team. If payout policy does affect the company's value, then it must be because markets are imperfect. In this section, we examine these issues by first understanding Modigliani and Miller's explanation of irrelevance in a perfect world. We then expand this to examine the impact of the real world – in particular, the impact of agency and signalling models.

15.3a PAYOUT POLICY IRRELEVANCE IN A WORLD WITH PERFECT CAPITAL MARKETS

The notion that dividends are irrelevant appears to be a contradiction. After all, we argued in Chapter 5 that a share's value equals the present value of all its future dividend payments. How, then, do we arrive at a dividend 'irrelevance' result? As with capital structure, the answer emerges that a company's value derives solely from its current and expected future operating profits. As long as the company accepts all positive-NPV investment projects and has *costless* access to capital markets, it can pay any level of dividends it desires. But if a company pays out its earnings as a dividend, then it must issue new shares to raise the cash required to finance its ongoing investments. So a company can either retain its profits and finance its investments with internally generated cash flow, or pay out its earnings as dividends and raise the cash needed for investment by selling new shares. This dividend irrelevance is best explained with an example.

Consider two companies, Retention and Payout, which are the same size today (1 January 2021), are in the same industry and have access to the same investment opportunities. Suppose both companies have assets worth \$20 million that will generate a net cash inflow of \$2 million by 31 December 2021. Each company thus earns a 10% return on investment. Furthermore, assume investors require a return, r , of 10% per year and that, at the end of this year, each company will have the opportunity to invest \$2 million in a positive-NPV project. Each company currently has 1 million shares outstanding, implying a share price of \$20 ($P_{Jan2021} = \20). Payout's managers want to pay out the company's earnings as dividends and finance the \$2 million investment by issuing new shares. Retention's managers prefer to retain the company's earnings to fund the \$2 million investment program. If each management team pursues its preferred strategy, assuming perfect and frictionless capital markets, will the two companies still have identical values next year?

Yes. To see how, we first examine Retention's strategy. Retention's managers finance the \$2 million investment project by retaining \$2 million in profits. Retention's market value on 31 December 2021 equals the \$20 million beginning value, plus the \$2 million (\$2 per share) in reinvested earnings, plus the investment's net present value. For simplicity, assume that the project's NPV is positive, but small enough to be ignored. Retention's year-end 2021 value is \$22 million (\$20 million + \$2 million), or \$22 per share ($P_{Dec2021} = \$22$), because the company did not have to issue any new shares in order to finance its investments. Plugging these data into our basic valuation equation from Chapter 5 verifies that Retention's shareholders indeed earn their required 10% return on investment:

$$r = \frac{D_{2021} + P_{Dec2021} - P_{Jan2021}}{P_{Jan2021}} = \frac{\$0 + \$22 - \$20}{\$20} = 10\%$$

We can extend this example indefinitely into the future. In each period, Retention commits to reinvesting all its annual profits (10% return on assets), and shareholders earn an acceptable return because their share values increase 10% each year. Retention never issues new shares, so the number of outstanding shares remains fixed at 1 million.

So far, so good. But what about company Payout? This company's managers decide to pay a \$2 million dividend at the end of the year, so they must raise the \$2 million needed for investment by selling new shares. But how many shares must they sell? To answer that, we must deduce what the price of Payout's shares will be on 31 December 2021. After it distributes the dividend, Payout will have assets worth \$20 million, exactly what it started with on 1 January. With 1 million shares outstanding, the share price will still be \$20, so Payout must issue 100,000 new shares to raise the \$2 million it needs to undertake its investment project. After the company issues new shares and invests the proceeds, Payout's total market value will equal \$22 million (\$20 per share \times 1.1 million shares outstanding). Payout's market value of \$22 million on 31 December 2021 matches Retention's value. We can verify that Payout's original shareholders earn the same 10% return earned by Retention's investors:

$$r = \frac{D_{2021} + P_{Dec2021} - P_{Jan2021}}{P_{Jan2021}} = \frac{\$0 + \$22 - \$20}{\$20} = 10\%$$

Once again, we can repeat this process indefinitely. Each year, Payout distributes all of its net cash flow as a dividend, issuing new shares to finance new investments.

We have shown that the market values of Retention and Payout are equal on 31 December 2021, even though they follow radically different dividend policies. Retention has 1 million shares outstanding worth \$22 each, while Payout has 1.1 million shares outstanding worth \$20 each. Because both companies have a total value of \$22 million, we can say that dividend policy is irrelevant to valuing a company, at least when markets are frictionless. But what if Retention's investors prefer that the company pay out earnings rather than reinvest them, or if Payout's shareholders prefer that the company reinvest earnings rather than issue new shares? We reinforce dividend policy irrelevance by demonstrating in the following 'Example' that investors can unwind companies' dividend policy decisions. In the end, what is true for the company as a whole is true for each investor: *dividend policy is irrelevant when capital markets are perfect*.

 **EXAMPLE****Dividend Yields in Perfect (Muppet) Capital Markets**

Consider two investors, Bert and Ernie. On 1 January 2021, Bert owns an 11% stake (110,000 shares) in Retention, whereas Ernie holds an 11% stake (also 110,000 shares) in Payout. By the end of 2021, Bert has received no dividend, but he still owns 11% of Retention's outstanding shares, which are now worth \$22 each. In contrast, Ernie receives a \$220,000 dividend during 2021 but, because Payout issues 100,000 shares to finance its investment opportunity, the shares Ernie owns now represent only a 10% stake in payout ($110,000 \div 1,100,000$).

If either Bert or Ernie is unhappy with the dividend policy of the company in which he has invested, he can unwind that policy. For example, suppose Bert wishes to receive cash as he would from a dividend. At the end of 2021, Bert can sell

10,000 of his shares for \$22 each, generating a cash inflow of \$220,000, exactly equal to the dividend that Ernie receives on his investment. In selling some of his shares, Bert creates homemade dividends. By the end of the year, Bert owns just 10% of Retention's equity, but that's exactly equal to the ownership stake that Ernie holds in Payout.

Conversely, suppose that Ernie prefers that Payout did not pay dividends. The solution to Ernie's problem is simple. When he receives the \$220,000 dividend, he simply reinvests the money by purchasing 11,000 new Payout shares. That would bring his total ownership to 121,000, or 11%, of Payout's shares ($121,000 \div 1,100,000$). In other words, Ernie's position is just like Bert's.

This may seem complex, but the essential points of these examples are simple. If there were no frictions or imperfections in capital markets, then investors would not care whether the company: (1) retains earnings to fund positive-NPV investments or (2) pays dividends and sells new shares to finance investments. In either case, cash flows from the company's investments – not dividend decisions – determine shareholders' returns.

15.3b MILLER AND MODIGLIANI MEET THE (IMPERFECT) REAL WORLD

In the previous section, we saw that when capital markets are perfect and frictionless, payout decisions do not affect company value. The core of the idea behind Miller and Modigliani's argument is that operational and investment decisions, not financial policies, are what create value. However, in [Figure 15.4](#) we saw that corporate managers say that maintaining the existing dividend payment ranks *ahead of* investment decisions at many companies. This is the starker possible rejection of the Miller and Modigliani irrelevance argument because it implies that a financial decision (of maintaining dividends) is more important than the investment decision.

How can this be the case? Here we discuss several academic theories that explain why payout decisions do matter. Each of these theories describes why a certain market imperfection (such as taxes or agency costs) affects payout decisions in general or the choice between dividends and repurchases.

Agency Cost and Signalling Models of Payout

There are several non-tax market imperfections that may make corporate payout decisions relevant. This section begins by describing how agency costs (misaligned incentives between managers and stakeholders) can lead to a positive role for payout activities. We concentrate on the *agency cost/contracting model* of dividends (or, more simply, the *agency cost model*).

Agency Cost/Contracting Model

The **agency cost/contracting model** assumes that companies begin paying dividends in order to overcome the *agency problems* resulting from a separation of corporate ownership and control. In privately held companies with tight ownership structures, there is little separation between ownership and control. Because agency problems in these companies are minimal, dividends are not very important. Even after a company goes public, it rarely begins paying dividends immediately because ownership remains concentrated for several years after an IPO. Eventually, ownership becomes more widely dispersed as companies raise new equity capital and as the original owners diversify their holdings. With dispersed ownership, few investors have the incentive or the ability to monitor corporate managers, so agency problems can become severe in large, mature companies that generate substantial *free cash flow*. Managers naturally face temptation to hoard this cash, possibly even spending it on perquisites or negative-NPV projects. Investors understand these temptations and will pay a low price for management-controlled companies that hoard excessive amounts of cash. In contrast, shareholders pay higher prices for companies with more responsive managers who commit to pay out free cash flow by initiating dividend payments (or by aggressively repurchasing shares). This model thus explains why initiating or increasing dividend payments also increases share prices, at least among companies otherwise subject to agency issues.

The agency cost model predicts that dividend-paying companies are older, larger and generate more cash than non-paying companies. It also predicts that dividend payers have fewer growth opportunities. The data for US companies is consistent with these predictions. If we compare US companies that pay dividends with companies that do not, we find that: (1) the average market value of dividend payers is much greater than that of non-payers; and (2) payers grow much more slowly. The average age of dividend payers is more than twice the average age of non-payers.

agency cost/contracting model

A theoretical model that explains empirical patterns in dividend payment and share repurchase data based on the belief that paying dividends allows a company to overcome agency problems between managers and shareholders

FINANCE IN THE REAL WORLD



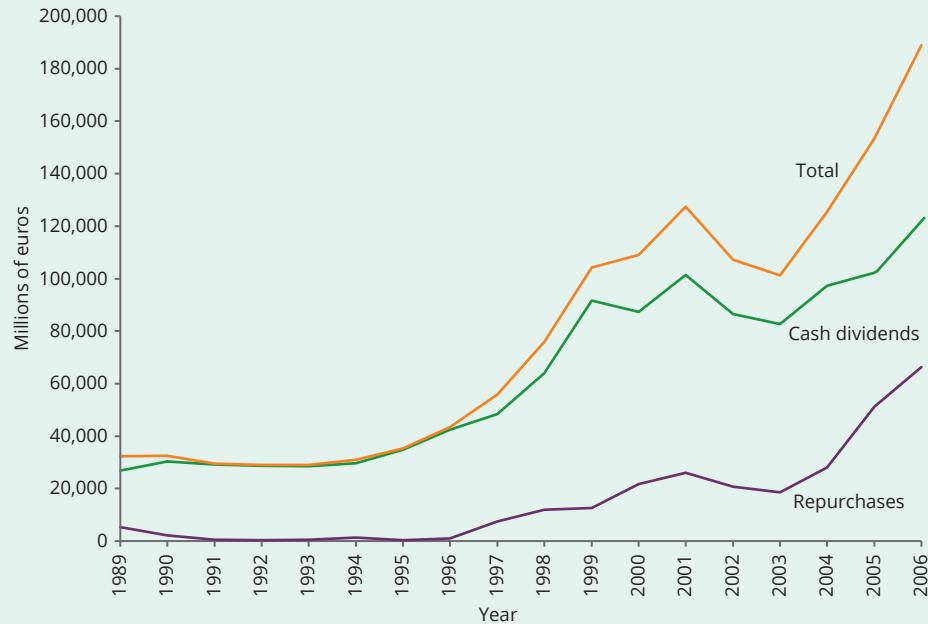
EU COMPANY PAYOUT POLICY SURVEY EVIDENCE

Von Eije and Megginson (2008) studied the payout policies of companies in the 15 nations of the European Union (EU) for the period 1989–2006. They found that the fraction of European companies paying dividends declined during this period, whereas the total value of dividends and repurchases increased. Those patterns mirror what happened in the United States during the same period. The figure below also shows that in Europe (as in the US), share repurchases grew more rapidly than dividends, although repurchases in Europe accelerated much later than they did in the US.



DIVIDENDS AND REPURCHASES IN THE EUROPEAN UNION, 1989–2006

As a percentage of total cash payouts to shareholders, from 1989 through 2006 share repurchases rose relative to dividends in Europe, just as they did in the United States.



Source: Henk von Eije and William Megginson, 'Dividends and Share Repurchases in the European Union', *Journal of Financial Economics*, 89 (2), pp. 347–374, 2008.

Signalling Model

signalling model

Assumes that managers use dividends to convey positive information to poorly informed shareholders

asymmetric information

The situation that exists when managers of the company have more information about the company and its prospects than do investors

The **signalling model** of dividends addresses another market imperfection that makes payout policy relevant: **asymmetric information** – the situation in which managers of the company have more information about the company and its prospects than do investors. If managers know that their company is strong when investors, for some reason, do not know this, then managers can pay dividends (or aggressively repurchase shares) in hopes of signalling their company's quality to the marketplace. For a signal to effectively separate strong companies from weak companies (so that a strong company can signal its type to the market), it must be costly for a weak company to mimic the action taken by the strong company.

According to the signalling model, it is costly for a company (especially a weak company) to initiate or increase dividends. For example, a company that pays out will likely face greater scrutiny from the capital markets if it needs to raise capital in the future, or the company must expect positive internal cash flow in the near future (as did Starbucks in the chapter-opening 'What Companies Do' feature); in both of these scenarios, the strong company has an advantage over the weak company.

An alternative signalling story is based on investors having to pay higher taxes on dividend income, with the weak company being less able to withstand this cost to its investors. Thus, dividends help investors solve the asymmetric information problem of distinguishing between high-quality and low-quality companies because high-quality companies are more able to pay dividends. Like the agency cost model, the signalling model predicts that share prices should rise in response to dividend increases (and fall in response to dividend decreases). However, the signalling model also predicts that companies with high-growth opportunities will pay higher dividends, contrary to the empirical evidence.

There is some evidence supporting the agency and signalling theories; however, the views of corporate managers don't line up too closely with these theories. Recall that the agency cost theory says that dividends solve the agency problems that arise between shareholders and managers because of the separation of ownership and control. In a 2005 survey of CFOs by Brav and colleagues,⁶ fewer than 15% of the CFOs responding agreed that these agency-related issues influence dividend policy. Of course, the crux of agency theory is that managers do not always behave in shareholders' best interests, so it may not be surprising that CFOs do not acknowledge the importance of the agency theory in surveys. Our view is that signalling probably does play a role in explaining some payout decisions (such as, perhaps, Starbucks' first-ever dividend in 2010), but is less relevant in many cases, so, averaged across all companies, the survey support for signalling is modest.

LO15.3

CONCEPT REVIEW QUESTIONS

- 7 Imagine a company that has an intermediate dividend policy compared to Payout and Retention. This company pays out half its earnings to shareholders and finances new investment partially through new share issues and partially through retained profits. Describe how dissatisfied shareholders in this company could unwind the dividend policy if they preferred either higher or lower dividends.
- 8 Managers of slow-growing but profitable companies (such as tobacco companies) may pay out earnings as dividends. What can they choose to do instead?
- 9 How do Miller and Modigliani arrive at their conclusion that dividend policy is irrelevant in a world of perfect and frictionless capital markets?
- 10 What effect would it have on a company's decision with regard to paying out cash to its shareholders if, for the recipient, dividends were taxed at higher rates than gains made on share sales?
- 11 Why are both the agency model and the signalling model consistent with the observation that share prices fall for companies that decrease dividends?

THINKING CAP QUESTION

- 3 Would you recommend that a company establishes a payout policy by initiating a dividend or by starting a share repurchase program?

LO15.4

15.4 REAL-WORLD INFLUENCES ON PAYOUT POLICY

Few of us have ever traded in perfect and frictionless capital markets, so our next task is to examine whether dividend policy continues to be irrelevant when we account for real-world factors such as taxes, trading costs and information differences between managers and investors. Our final goal for this section is to determine whether a given company has an optimal (value-maximising) payout policy and, if so, how that policy should be set. As we proceed, you may notice a puzzling fact. Almost all the real-world issues we incorporate – such as taxes, transactions costs for issuing new securities and uncertainty about a company's investment opportunities – argue *against* the payment of cash dividends. Yet the majority of established companies make dividend payments in most years.

6 See Alon Brav, John R. Graham, Campbell R. Harvey and Roni Michaely, 'Payout Policy in the 21st Century', *Journal of Financial Economics*, 77, pp. 483–527.

15.4a PERSONAL INCOME TAXES

When the personal tax rate on dividends is higher than the tax rate on capital gains, the result is clear cut: companies wishing to distribute cash to shareholders should not pay cash dividends, but instead should repurchase shares. This offers investors the choice of either receiving cash in a tax-favoured form (as a capital gain) or forgoing the cash altogether by not selling shares, and thus seeing their share values increase as their fractional ownership increases.

Why don't we see more companies substituting share repurchase programs for cash dividend payments? There are a few answers to this question. First, as we have seen, many Australian companies *have* been repurchasing their shares during the past 10 years. Second, the companies that initiate share repurchase programs are the same companies that also make large cash dividend payments. In some countries, legislation can be a key factor. For example, in the US, the Internal Revenue Service (IRS) has the power to rule that a given company's share repurchase program is merely an attempt to avoid taxes. The IRS can impose the higher personal income tax rates on all income received by investors. The actual importance of this rule in deterring repurchases is questionable, however, because the IRS almost never invokes it.

In Australia, the dividend imputation system reduces the impact of taxation of dividend income in comparison to countries where this is not available. (Investors only pay, or receive, the net difference between the franking credits and their personal income tax attributable to a dividend payment.) Furthermore, although there are various exemptions in place, the tax rate applied to capital gains in Australia is simply the marginal income tax rate applicable to the investor at the time the capital gain is crystallised. Thus, although there may be timing differences and a few exemptions in place, in Australia, the tax rates applicable to cash dividends or share repurchases are the same. However, it is important to note that the actual tax payable may differ significantly for different shareholders. This is because the capital gains tax applied to share repurchases would be applied to the difference between the share buyback price and the price of the original share purchase (which could vary substantially over time, depending on the volatility of the share price).

On balance, incorporating personal taxes into our model does not help us understand why companies pay dividends. However, tax effects may account for some of the patterns we observe, such as the rise in share repurchase programs in Australia, the US and other industrialised countries.

15.4b TRADING AND OTHER TRANSACTIONS COSTS

If personal taxes cannot explain observed dividend payments, what about transaction costs of issuing and trading shares? Trading costs affect expected dividend payouts in two potentially offsetting ways. First, if investors find it costly to sell just a few shares to generate cash – to create homemade dividends – then they may be willing to pay a premium for shares that regularly pay dividends. Regular cash dividend payments are a costless way to receive a cash return on an investor's share portfolio. This cash could be used either for consumption or for rebalancing the investor's portfolio. In spite of this, a transaction cost argument cannot easily explain why aggregate dividend payouts have remained fairly high, even as share markets have become vastly more efficient and the costs of trading have declined dramatically.

The second effect of transactions costs on dividend payments is completely negative. This relates to a company's need to replace cash paid out as dividends with cash obtained through new share sales. Remember that dividend irrelevance depends critically on a company being able to fund its investment either by retaining corporate profits or by paying out profits as dividends and replacing the cash by issuing new shares. As long as share issues are costless, investors are indifferent as to whether they receive returns in the form of capital gains (on non-dividend-paying shares) or as cash dividends on shares. If issuing securities entails large costs, however, all parties should prefer a full-retention strategy. In theory, a company should never both pay dividends and raise funds for investment by issuing new shares. Because many large companies do just that, it is obvious that transactions costs alone do not explain observed dividend policy.



TO DIVIDEND OR NOT TO DIVIDEND?

Like many business students, you may be an active investor already or plan to become one soon. You may have wondered whether it is better to buy the shares of companies that pay cash dividends or to purchase shares of similar companies that do not pay dividends, but instead reinvest all profits in the company. So: should you buy dividends or not?

To show how taxes have an impact on your investment decision, let's assume that you invest \$10,000 today into either of two shares that are very similar, except that one company, High Pay (or HP) pays out all its earnings as dividends, while the second company, No Pay (or NP) reinvests all profits and pays no dividends. Further assume that you plan to hold these shares for five years, that each share currently sells for \$10 per share (so you buy 1,000 shares of either company that you choose), and that the expected annual, pre-tax return on each share will be 7% per year over your five-year holding period. Finally, assume that your personal income tax rate on dividends and capital gains is currently 5%, but will jump to 15% in two years and remain at 15% for the final three years of your investment horizon. Which investment will yield the most money in five years, when you are ready to buy your first dream home?

Computing the net payoff 10 years from now for the non-dividend-paying shares of NP is very easy – you will make only one investment (today) and will only pay (capital gains) tax once, at a 15% rate, five years from now on the investment's appreciation.

Pre-tax payoff for NP in five years:

$$\begin{aligned} &= \$10,000.00 \times (1.07)^5 \\ &= \$14,025.52 \end{aligned}$$

After-tax payoff for NP in five years:

$$\begin{aligned} &= \$14,025.52 - [(\$4,025.52) \times (0.15)] \\ &= \$13,421.69 \end{aligned}$$

Computing the net payoff five years from now for the dividend-paying shares of HP is mechanically more difficult because each year you will receive a cash dividend that will be taxed at your personal tax rate of 5% for years 1 and 2, and then 15% for years 3–5. For simplicity, assume that dividends are paid once per year, at year end, and that you reinvest all after-tax net dividends received in new shares of HP at \$10 per share (assume you can buy fractional shares). The equations below detail the end-of-year (EOY) after-tax value of your HP investment for years 1–5.

$$\begin{aligned} \text{EOY1 after-tax value} &= \$10,000.00 + \$700.00 \times (0.95) \\ &= \$10,665.00 \end{aligned}$$

$$\begin{aligned} \text{EOY2 after-tax value} &= \$10,665.00 + \$746.55 \times (0.95) \\ &= \$11,374.22 \end{aligned}$$

$$\begin{aligned} \text{EOY3 after-tax value} &= \$11,374.22 + \$796.20 \times (0.85) \\ &= \$12,050.99 \end{aligned}$$

$$\begin{aligned} \text{EOY4 after-tax value} &= \$12,050.99 + \$843.57 \times (0.85) \\ &= \$12,768.02 \end{aligned}$$



$$\begin{aligned}\text{EOY5 after-tax value of HP investment} &= \$12,768.02 + \$893.76 \times (0.85) \\ &= \$13,527.72\end{aligned}$$

This process shows that you would have \$106.03 (\$13,527.72 – \$13,421.69) more in total after-tax value at the end of five years from investing in the high-pay-dividend shares than you would if you invested in the no-pay-dividend shares, if all the assumptions are valid. So HP is the preferred investment.

15.4c THE RESIDUAL THEORY OF DIVIDENDS

The previous discussion suggests another possible explanation of observed dividend payments. Might dividends simply be a residual, the cash left over after companies have funded all their positive-NPV projects? If that's the case, it would help explain why companies in rapidly growing industries retain almost all their profits, whereas companies in mature, slow-growing industries tend to have very high dividend payouts. It would also explain the 'lifecycle' pattern of dividend payments for individual companies, where young, fast-growing companies rarely pay any dividends. But those same companies typically transition to a high-payout strategy as they mature and their growth rate slows.

residual theory of dividends

Observed dividend payments are simply a residual, the cash left over after companies have funded all their positive-NPV investments

This **residual theory of dividends** probably has some merit, but it suffers from one problem. Actual dividend payments are not as variable as they would be if companies treated them strictly as residual cash flows. In fact, over time, dividend payments exhibit very stable patterns of cash flow. As noted earlier, evidence suggests that company managers smooth dividends, and that they are very cautious about changing established dividend payout levels. Clearly, the residual theory does not fully explain how companies make their dividend policy decisions.

15.4d PAYING DIVIDENDS AS A MEANS OF COMMUNICATING INFORMATION

Sooner or later, most people who study the dividend puzzle recognise that companies may pay dividends to convey information to investors. Managers, who have a better understanding of the company's true financial condition than do shareholders, can convey this information to shareholders through the dividend policy they select. Dividend payments have what accountants call 'cash validity', meaning that dividend payments are believable and are hard for weaker companies to duplicate. Phrased in economic terms, in a world characterised by *asymmetric information* between managers and investors, cash dividend payments serve as credible information sent from corporate insiders (officers and directors) to the company's shareholders. Viewed in this way, every aspect of a company's dividend policy conveys significant new information.

15.4e WHAT TYPE OF INFORMATION IS BEING COMMUNICATED?

When a company begins paying dividends (a dividend initiation), it is conveying management's confidence that the company is now profitable enough to both fund its investment projects and pay out cash. Investors and managers know that reducing or eliminating dividend payments after they have begun results in negative market reaction. Therefore, dividend initiations send a strong signal to the market about management's assessment of the company's long-term ability to generate cash.

The same logic applies to dividend increases. Because everyone understands that dividend decreases should be avoided, management's willingness to increase dividend payments clearly implies confidence that its profits will remain high enough to support the new payment level. Dividend increases suggest a *permanent*

increase in a company's normal level of profitability. In other words, dividends change only when the level of *permanent earnings* changes. Unfortunately, this logic applies even more strongly to dividend decreases. Dividend cuts are viewed as very bad news. Managers reduce dividend payments only when they have no choice, such as when there is a cash flow crisis or when the financial health of the company is declining and no turnaround is in sight. Therefore, it is no surprise that when managers decrease dividends, the market reaction is often severe.

15.4f DIVIDEND PAYMENTS AS SOLUTIONS TO AGENCY PROBLEMS

When companies are small and growing rapidly, they not only have tight ownership structures, but they also tend to have many profitable investment opportunities. These growth companies can profitably use all the cash flow that they generate internally. Thus, they have no reason to pay cash dividends. In time, successful growth companies establish secure, often dominant, market positions. They begin to generate operating cash flows that are much larger than the amounts needed to invest in the remaining positive-NPV investment opportunities open to them. Managers of companies with cash flow in excess of that needed to fund all positive-NPV projects *should* begin to pay dividends to ensure that they will not invest that cash flow in negative-NPV projects. However, managers may prefer to retain cash and spend it because of the increased status attained from running a larger (though not necessarily more valuable) company.

If managers are given the proper incentives, it is believed that they will initiate dividend payments as soon as the company begins generating excess cash flow. Managerial contracts that tie compensation to the company's share price performance are designed to ensure that managers pay out excess cash flow rather than invest it unwisely. The larger the excess cash flow generated, the larger the dividend payout should be. This is the essential prediction of what is known as the agency cost/contracting model of dividend payments, which was introduced in section 15.3b. The central predictions of this model are threefold. First, it predicts that dividend initiations and increases should be viewed as good news by investors, and thus should lead to share price increases upon announcement. Second, the agency cost model predicts that companies (and industries) that generate the largest amounts of excess cash flow should also have the highest dividend payout ratios. Finally, this model predicts that managerial compensation contracts will not only be designed to entice managers to pursue a value-maximising dividend policy, but will also be effective.

LO15.4

CONCEPT REVIEW QUESTIONS

- 12 In what way can managers use dividends to convey pertinent information about their companies in a world of asymmetric information? Why would a manager choose to convey information via a dividend policy? Is there evidence supporting or refuting the informational role of dividends?
- 13 Why is it difficult for a company with weaker cash flows to mimic a dividend increase undertaken by a company with stronger cash flows?
- 14 According to the residual theory of dividends, how does a company set its dividend? With which dividend policy is this theory most compatible? Does it appear to be validated by actual corporate dividend payment data?

LO15.5

15.5 PAYOUT POLICY: KEY LESSONS

In this chapter, we have learned that companies take a conservative approach to paying dividends. The key factor driving dividend payments is the stability of long-run cash flows. Dividends are smoothed, and do not vary as much as earnings from year to year, and once companies start paying dividends they are reluctant to reduce them. Companies that pay dividends tend to be older and larger and to produce ample cash flows, and they grow more slowly than companies that do not pay dividends.

Share repurchases, on the other hand, are viewed by managers as being more flexible. Managers say that they are willing to cut back on share repurchases if necessary to finance new investments, whereas managers say that they would raise external capital to fund new investments before cutting dividends.

Not surprisingly, as a percentage of total cash paid to shareholders, repurchases have been gaining ground for many years. In addition to valuing the flexibility of share repurchases, managers appear to engage in repurchases most actively when they perceive their shares to be undervalued.

We also learned that taxes have some influence on dividend decisions, but changes in tax rates do not generally bring about radical and widespread changes in dividend payouts. The agency and signalling payout theories help explain payout decisions at some companies, but research findings so far do not offer a lot of support for these theories explaining payout policies for the broad cross-section of companies.

STUDY TOOLS

SUMMARY

LO15.1

- Large publicly traded corporations almost invariably choose to pay regular cash dividends to their shareholders. These payments are generally a fairly stable dollar amount per period, rather than a constant fraction of the company's earnings. In Australia, dividends are usually paid on a semiannual basis.

LO15.2

- Share repurchases have grown relative to dividends for several decades. In most tax jurisdictions, share repurchases and dividends are subject to the same tax rates. The appeal of share repurchase programs is that they are much more flexible than dividend payout commitments.
- Dividend payout decisions are made conservatively. Companies do not initiate or increase dividend payments until they are comfortable that long-run earnings will be stable and reliable. Repurchases may be paid out of stable earnings or when a company has a temporary increase in cash flows or cash on the balance sheet.
- Bonus share issues and share splits are used by companies that want to reduce the per-share price of their equity in the open market. In a 2-for-1 share split, for example, two new shares are distributed for every existing share an investor holds, and the price of the share falls by roughly half.
- CFOs believe that investors view dividends as a commitment made by the company that must be fulfilled, whereas share repurchases are more discretionary. Most CFOs would raise external funds rather than cut dividends to finance a profitable new investment, but most would not raise capital to avoid cutting repurchases. Dividend decisions are typically made very conservatively. Companies are hesitant to start paying dividends (or to increase the amount of dividends they pay), in part because they will be reluctant to reduce them in the future.

LO15.3

- In a perfect and frictionless world (one without market imperfections), dividend policy is irrelevant, in the sense that it does not affect the value of a company. However, the fact that many companies pay dividends is something of a puzzle because most real market imperfections (such as taxes) argue against paying cash dividends.

LO15.4

- One theory of dividend policy assumes that dividend payments serve to reduce agency costs between corporate managers and external investors by committing the company to pay out excess profits. Managers are prevented from spending the profits on perquisites or wasting them on unwise capital investments. Most of the empirical evidence supports this agency cost model over the competing signalling model, which predicts that managers use dividend payments to convey information to investors about the company's expected future earnings.
- In addition to ownership considerations, several other aspects of a company's operating and regulatory environment seem to influence dividend payouts. Other things being equal, closely held corporations, which operate in a high-growth industry where large ongoing capital investments are needed to compete, have lower dividend payouts than do widely held companies in slow-growing or highly regulated industries.
- In countries where personal income tax rates on dividend payments are higher than capital gains tax rates, companies may prefer to distribute cash to shareholders via share repurchases.
- High transaction costs can affect potential shareholders' share purchases, since it may be more cost effective to hold shares with regular dividend payments than to try to sell shares to receive income. This can influence companies (wishing to attract shareholders and boost their share price) to maintain regular dividend payments.

LO15.5

- The residual theory of dividends suggests that dividends are simply a residual, the cash left over after corporations have funded all positive-NPV projects. This theory explains why high-growth companies retain most of their profits and pay no or low dividends, whereas mature, slow-growing companies tend to have high dividend payouts. Although appealing, actual dividend payments are not as variable as they would be if companies viewed them purely as residuals from cash flow.
- Companies tend to take a conservative approach to dividend payments, generally preferring a long-term, dividend-smoothing approach over an approach that fluctuates greatly with earning cycles. In contrast, share repurchases tend to be more flexible.

SELF-TEST PROBLEMS

Answers to these 'Self-test problems' and the 'Concept review' questions throughout the chapter appear on the Student Companion Website (<http://login.cengagebrain.com>) or via your instructor.

- ST15-1** What do *record date*, *ex-dividend date* and *payment date* mean in relation to dividends? Why would you expect the price of a share to drop by the amount of the dividend on the ex-dividend date? What rationale has been offered for why this may not actually occur?
- ST15-2** What does it mean to say that corporate managers 'smooth' cash dividend payments? Why do managers do this?
- ST15-3** What are the key assumptions and predictions of the signalling model of dividends? Are these predictions supported by empirical research findings?
- ST15-4** What is the expected relationship between dividend payout levels and the growth rate and availability of positive-NPV projects under the agency cost model of dividends? What about the expected relationship between dividend payout and the diverseness of the company's shareholders? Consider a company, such as Microsoft, awash in excess cash flow and available positive-NPV projects, and having a relatively diverse shareholder base in an industry with increasing competition. Does either the agency model or the signalling model adequately predict the dividend policy of Microsoft? Which does the better job?

QUESTIONS

- Q15-1** What is a company's *dividend yield*? How does it compare to that company's *dividend payout ratio*?
- Q15-2** Compare and contrast the following dividend policies: the constant payout ratio dividend policy and the constant dollar payout dividend policy. Which policy do most public companies actually follow? Why?
- Q15-3** What is a low-regular and extra payout policy? Why do companies pursuing this policy explicitly label some cash dividend payments as 'extra'?
- Q15-4** What is a bonus share issue? How does this differ from a share split?
- Q15-5** What factors have contributed to the growth in share repurchase programs?
- Q15-6** What is the average share-market reaction to: (a) a dividend initiation; (b) a dividend increase; (c) a dividend termination; and (d) a dividend decrease? Are these reactions logically consistent?
- Q15-7** What are the key assumptions and predictions of the agency cost/contracting model of dividend payments? Are these predictions supported by research findings?
- Q15-8** Around the world, utilities generally have the highest dividend payouts of any industry, yet they also tend to have massive investment programs, which they finance using external sources. How do you reconcile high payouts and large-scale security issuance?
- Q15-9** Why do companies with diverse shareholder bases typically pay higher dividends than private companies or public companies with concentrated ownership structures? How are fixed dividends used as a bonding (commitment) mechanism by managers of companies with dispersed ownership structures and large amounts of excess cash flow?
- Q15-10** How is the residual theory of dividends used to explain observed dividend payments? How is this theory in conflict with evidence suggesting that corporate managers smooth dividends?

PROBLEMS

PAYOUT POLICY FUNDAMENTALS

- P15-1** What are alternative ways in which investors can receive a cash return from their investment in the equity of a company? From a tax standpoint, which of these would be preferred, assuming that investors face the same 30% tax on income and capital gains? What are the pros and cons of paying out cash dividends?
- P15-2** Delta Corporation earned \$2.50 per share during fiscal year 2020 and paid cash dividends of \$1.00 per share. During the fiscal year that just ended on 30 June 2021, Delta earned \$3.00 per share, and the company's managers expect to earn this amount per share during fiscal years 2022 and 2023, as well.
- a** What was Delta's payout ratio for fiscal year 2020?
 - b** If Delta's managers want to follow a *constant dollar payout dividend policy*, what dividend per share will they declare for fiscal year 2021?
 - c** If Delta's managers want to follow a *constant payout ratio dividend policy*, what dividend per share will they declare for fiscal year 2021?
 - d** If Delta's managers want to follow a partial-adjustment strategy, with a target payout ratio equal to fiscal year 2020's, how could they change dividend payments during 2021, 2022 and 2023?

- P15-3** Advanced Vehicle Enterprises (AVE) follows a policy of paying out 50% of its net income as cash dividends to its shareholders each year. The company plans to do so again this year, during which AVE earned \$100 million in net profits after tax. The company has 40 million shares outstanding and pays dividends annually.
- a What is the company's dollar dividend payment per share each year?
 - b Assuming that AVE's share price is \$54 per share immediately before its ex-dividend date, what is the expected price of AVE shares on the ex-dividend date if there are no personal taxes on dividend income received?
- P15-4** General Manufacturing Company (GMC) follows a policy of paying out 50% of its net income as cash dividends to its shareholders each year. The company plans to do so again this year, during which GMC earned \$100 million in net profits after tax. The company has 40 million shares outstanding and pays dividends annually. Assume that an investor purchased GMC shares a year ago at \$45 per share. The investor, who faces a personal tax rate of 15% on both dividend income and on capital gains, plans to sell the shares soon. Transaction costs are negligible.
- a Calculate the after-tax return this investor will earn if she sells GMC shares at the current \$54 share price before the ex-dividend date.
 - b Calculate the after-tax return the investor will earn if she sells GMC shares on the ex-dividend date, assuming that the price of GMC shares falls by the dividend amount on the ex-dividend date.
 - c Calculate the after-tax return the investor will earn if she sells GMC shares on the ex-dividend date, assuming that the price of GMC shares falls by one half the dividend amount on the ex-dividend date.
- P15-5** Specialty Chemicals Company (SCC) pays out 40% of its net income as cash dividends to its shareholders once each quarter. The company plans to do so again this year, during which SCC earned \$200 million in net profits after tax. If the company has 40 million shares outstanding and pays dividends quarterly, what is the company's dollar dividend payment per share each quarter?
- P15-6** Twilight Company's shares are selling for \$60.25 per share, and the company's managers have just announced a \$1.50 per share dividend payment.
- a What should happen to Twilight Company's share price on the ex-dividend date, assuming that investors do not have to pay taxes on dividends or capital gains and do not incur any transaction costs in trading shares?
 - b What should happen to Twilight Company's share price on the ex-dividend date, assuming that it follows the historical performance of US share prices on ex-dividend days and is not subject to the Australian dividend imputation system?
- P15-7** Global Financial Corporation (GFC) has 10 million shares outstanding, each currently worth \$100 per share. The company's managers are considering a plan to split the company's shares 2 for 1, but they are concerned about the impact this split announcement will have on the company's share price.
- a If GFC's managers announce a 2-for-1 share split, what exactly will the company do, and what will GFC's share price likely be after the split?
 - b How many total shares of GFC will be outstanding after the share split?
 - c If GFC's managers believe that the ideal share price for the company's shares is \$20 per share, what should they do? How many shares would be outstanding after this action?
 - d Why do you think GFC's managers are considering a share split?
- P15-8** The net income for a company is currently \$1,000,000 and is projected to grow annually for the next four years as follows: \$1,200,000; \$1,300,000; \$1,500,000; and \$1,700,000. Assuming the

dividend payout ratio is 20% and there are 1,000,000 shares outstanding, what is the current dividend per share? Further assuming that the company does not change its stated dividend, what is the dividend payout ratio for the next four years?

- P15-9** A company's shares currently sell for \$32.48, with 5 million shares outstanding. The company is considering a 20% bonus share issue in which 100 shares become 120 shares. After the bonus share issue, at what price will the shareholders' value be unchanged? (Hint: Consider shareholder value to be the market capitalisation, which equals the number of shares outstanding multiplied by the share price.) If the share price became \$27.50 after the bonus issue, do the shareholders benefit?
- P15-10** A company's shares currently sell for \$4.00 with 4 million shares outstanding. The company plans to reverse split its shares by combining two shares into one share. If the price after this reverse split is \$6.52, have shareholders gained or lost value? How much value is gained or lost? (Hint: Consider shareholder value to be the market capitalisation, which equals the number of shares outstanding multiplied by the share price.)
- P15-11** Sunshine Pageants decides that it will use a Dutch auction to repurchase 2 million shares. Investors have submitted the following bids on the price and quantity of shares they are willing to sell to the company:

PRICE (\$)	SHARES
24.45	100,000
24.50	200,000
24.60	600,000
24.75	1,100,000
24.95	2,000,000
25.15	2,500,000
25.50	5,000,000

Determine the lowest price at which the company is able to purchase 2 million shares. (Note: If the company is willing to purchase shares for \$25.50, then it must purchase all shares at this price; the goal is to find the lowest price at which the company can purchase the 2 million shares.) Given the purchase price of the shares, how much extra money do the shareholders receive compared to the schedule of acceptable bids?

- P15-12** Investor A recognises \$100 in dividend income, which is taxed at a rate of 20%. Investor B also wants to recognise the same after-tax revenue as investor A, but investor B owns shares that do not pay dividends. If investor B's shares sell for \$12 a share (originally purchased for \$7 a share) and if the capital gains tax is 40%, then how many shares must investor B sell?
- P15-13** Maggie Fiduciary is a shareholder in the Superior Service Company (SSC). The current price of SSC's shares is \$33 per share, and there are 1 million shares outstanding. Maggie owns 10,000 shares, or 1% of the equity, which she purchased one year ago for \$30 per share. Assume that SSC makes a surprise announcement that it plans to repurchase 100,000 of its own shares, at a price of \$35 per share. In response to this announcement, SSC's share price increases \$1 per share, from \$33 to \$34, but this price is expected to fall back to \$33.50 per share after the repurchase is completed. Assume that Maggie faces marginal personal tax rates of 15% on both dividend income and capital gains.
- a Calculate Maggie's (realised) after-tax return from her investment in SSC shares, assuming that she chooses to participate in the repurchase program and that all of the shares she tenders are purchased at \$35 per share.

- b** How many shares will Maggie be able to sell if all SSC's shareholders tender their shares to the company as part of this repurchase program and the company purchases shares on a pro rata basis?
- c** What fraction of SSC's total ordinary equity will Maggie own after the repurchase program is completed if she chooses not to tender her shares?

P15-14 Go to the home page for Dogs of the Dow (<http://www.dogsofthedow.com>), look at the year-to-date figures and observe the dividend yields of the 30 shares of the Dow Jones Industrial Average. Which industries contain the higher-dividend-yielding shares, and which contain the lower-yielding shares? Are there differences in the growth prospects between the high- and low-yielding shares? Is this what you expected? Explain.

P15-15 Stately Building Company's shares are selling for \$75 each, and its dividend yield is 2.0%. What is the amount of Stately's dividend per share?

P15-16 The shares of Up-and-Away Pty Ltd are selling for \$80 per share and are currently paying a quarterly dividend of \$0.25 per share. What is the dividend yield on Up-and-Away shares?

P15-17 Well-Bred Service Company earned \$50,000,000 during 2021 and paid \$20,000,000 in dividends to the holders of its 40 million shares. If the current market price of Well-Bred's shares is \$31.25, calculate the following: (a) the company's dividend payout ratio; (b) the stated dividend per share, assuming Well-Bred pays dividends annually; (c) the stated dividend per share, assuming Well-Bred pays dividends in four equal quarterly payments; and (d) the current dividend yield on Well-Bred shares.

DIVIDENDS IN PERFECT AND IMPERFECT WORLDS

P15-18 It is 1 January 2021, and Boomer Equipment Company (BEC) currently has assets of \$250 million and expects to earn a return of 10% during 2021. There are 20 million BEC shares outstanding. The company has an opportunity to invest in a positive-NPV (minimal) project that will cost \$25 million over the course of 2021, and is trying to determine if it should finance this investment by retaining profits over the course of the year or by issuing new shares while paying the profits earned as dividends. Show that the decision is irrelevant in a world of perfect and frictionless markets.

P15-19 Swelter Manufacturing Company (SMC) currently has assets of \$200 million and a required return of 10% on its 10 million shares outstanding. The company has an opportunity to invest in positive-NPV (minimal) projects that will cost \$20 million and is trying to determine if it should withhold this amount from dividends payable to finance the investments or if it should pay out the dividends and issue new shares to finance the investments. Show that the decision is irrelevant in a world of perfect and frictionless markets. How is the result affected if a personal income tax of 15% is introduced into the model?

P15-20 Assume that it is now 1 January 2021, and you are examining two unlevered companies that operate in the same industry, that have identical assets worth \$80 million that yield a net profit of 12.5% per year, and that have 10 million shares outstanding. During 2021, and all subsequent years, each company has the opportunity to invest an amount equal to its net income in (slightly) positive-NPV investment projects. The Beta Company wants to finance its capital spending through retained earnings. The Gamma Company wants to pay out 100% of its annual earnings as cash dividends and to finance its investments with a new share offering each year. There are no taxes or transaction costs to issuing securities.

- a** Calculate the overall and per-share market value of the Beta Company at the end of 2021 and each of the two following years (2022 and 2023). What return on investment will this company's shareholders earn?

- b** Describe the specific steps that the Gamma Company must take today (1/1/2021), and at the end of each of the next three years (year-end 2021, 2022 and 2023), if it pays out all of its net income as dividends and still grows its assets at the same rate as that of the Beta Company.
- c** Calculate the number and per-share price of shares that the Gamma Company must sell today, and at the end of 2021, 2022 and 2023, if it pays out all of its net income as dividends and still grows its assets at the same rate as that of the Beta Company.
- d** Assuming that you currently own 100,000 shares (1%) of Gamma Company, compute the fraction of the company's total outstanding equity that you will own three years from now if you do not participate in any of the share offerings the company will make during this holding period.

P15-21 Investors anticipate that Sweetwater Manufacturing's next dividend, due in one year, will be \$4 per share. Investors also expect earnings to grow at 5% in perpetuity, and they require a return of 10% on their shares. Use the Gordon growth model (see [Equation 5.4](#)) to calculate Sweetwater's share price today.

P15-22 Super-Thrift Pharmaceuticals Company traditionally pays an annual dividend equal to 40% of its earnings. Earnings this year are \$30,000,000. The company has 15 million shares outstanding. Investors expect earnings to grow at a 5% annual rate in perpetuity, and they require a return of 12% on their shares.

- a** What is Super-Thrift's current dividend per share? What is it expected to be next year?
- b** Use the Gordon growth model (see [Equation 5.4](#)) to calculate Super-Thrift's share price today.

P15-23 Casual Construction Corporation (CCC) earned \$60,000,000 during 2021. The company expects to earn \$63,000,000 during 2022, in line with its long-term earnings growth rate. There are 20 million CCC shares outstanding, and the company has a policy of paying out 40% of its earnings as cash dividends. Investors require a 10% return on CCC shares.

- a** What is CCC's current dividend per share? What is it expected to be next year?
- b** Use the Gordon growth model (see [Equation 5.4](#)) to calculate CCC's share price today.

P15-24 Hole Foods Doughnuts has generated profits of \$2 per share for many years and has consistently paid 100% of those profits to shareholders via a dividend. Investors do not expect Hole Foods Doughnuts to grow in the future. The company has 200,000 shares outstanding worth \$20 per share. Suppose the company decides to eliminate its dividend and instead use the money to repurchase shares.

- a** Assuming that there are no taxes and that the repurchase announcement conveys no new information to investors about the profitability or risk of Hole Foods Doughnuts, how do you think the share price will react to the announcement?
- b** How many shares will Hole Foods Doughnuts repurchase?
- c** What share price would you expect for Hole Foods Doughnuts one and two years after this announcement? What would the share price have been in the next two years if the company had simply maintained its old dividend policy?

P15-25 Jasper Metals Pty Ltd just announced that it will pay its regular quarterly dividend of \$3.50 per share.

- a** Does the share price fall to reflect this payment on the announcement date, the record date, the ex-dividend date or the payment date?
- b** Assume that there are no market imperfections. By how much will the share price fall?
- c** Suppose investors must pay a 38% tax on dividends received but pay nothing on capital gains. How would this change your answer to part (b)?
- d** Now suppose that investors must pay 38% in taxes on both dividends and capital gains. In this case, how much would you expect the share price to fall in response to the dividend?

- e** Suppose that, just before the dividend announcement, Jasper Metals shares were worth \$175 per share. Assume once again that there are no taxes. If you own 50 shares, then what is the value of your investment? How does the dividend payment affect your wealth? If Jasper Metals cancels the dividend and announces that it will repurchase 2% of its outstanding shares, what effect does that have on your wealth?
- P15-26** Go to the home page of Cisco Systems, Inc. (<http://www.cisco.com>) and navigate to its investor relations section. Download the most recent annual report and observe the capital investment and dividend policies of Cisco Systems. Now, do the same for Chevron (<http://www.chevron.com>). Which of the two companies appears to have more high-growth, positive-NPV investment opportunities? Which pays the higher relative dividend? Do these results support the agency cost/contracting model? Do they support the signalling model?

REAL-WORLD INFLUENCES ON PAYOUT POLICY

- P15-27** Universal Windmill Company (UWC) currently has assets worth \$50 million and a required return of 10% on its 2 million shares outstanding. The company has an opportunity to invest in (minimally) positive-NPV projects that will cost \$5 million. UWC needs to determine whether it should withhold this amount from dividends payable to finance the investments or pay out the dividends and issue new shares to finance the investments. Show that the decision is irrelevant in a world of perfect and frictionless markets. What happens if a personal income tax of 15% on dividends (but not capital gains) is introduced into the model?
- P15-28** A publicly traded company announces an increase in its dividend, with no other material information accompanying the announcement. What information is this announcement likely to convey, and what is the expected share-price effect, as the market assimilates this information?
- P15-29** Sam Sharp purchased 100 shares of Electric Lighting Inc. (ELI) one year ago for \$62 per share, and he has also received cash dividends of \$5 per share since then. Now that ELI's share price has increased to \$64.50, Sam has decided to sell his holdings. What is Sam's gross (pre-tax) and after-tax return on this investment, assuming that he faces a 30% tax rate on dividends and capital gains?

CASE STUDY

DIVIDEND POLICY

After working for the past four years as a financial analyst for Nevada Power Corporation, you receive a well-deserved promotion. You have been appointed to work on special projects for Mr Watkins, the chief financial officer (CFO). Your first assignment is to gather information on dividend theory and policy because the CFO wants to reassess the company's current dividend policy.

ASSIGNMENT

- 1 What are the different types of dividend policies? Provide examples of situations in which each of these dividend policies could be used.

- 2 Describe the difference between cash dividends, bonus share issues, share splits and share repurchases. Provide examples of when each of these forms of dividends can be used.
- 3 Discuss the theory of dividend irrelevance. How do taxes affect the dividend irrelevance theory?
- 4 How do managers use dividend policy to convey information to the marketplace? Why is dividend policy, instead of a press release, used to communicate information?

16

EXCHANGE RATES AND INTERNATIONAL INVESTMENT DECISIONS

WHAT COMPANIES DO

WHICH YUAN IS GOOD FOR BUSINESS?

For many years, China controlled the value of its currency, the yuan, by imposing strict controls on how the yuan could be traded. On 19 June 2010, the People's Bank of China (PBOC) announced that it would relax some of these controls to allow more movement in the value of the yuan against foreign currencies. As a result, the yuan rose against the US dollar throughout the second half of 2010. On average, in June of that year, one yuan was worth about US\$0.1464; but by the end of the year, the yuan's average monthly value had appreciated to US\$0.1501, a gain of roughly 2.5%.

Other signs that China was loosening its grip on the yuan gradually emerged. Later in 2010, McDonald's became the first non-financial international corporation to sell bonds denominated in yuan, and in January 2011, the Bank of China opened trading in yuan to US customers through its branches in New York and Los Angeles.

Is a rising yuan good for business?
Increases in the yuan's value would make goods

imported from China more expensive, but would also make US exports more attractive to Chinese consumers. Fluctuations in the yuan could also create risk for companies doing business in China.

In contrast, over the same time period, the yuan depreciated against the Australian dollar, falling from an average value of Australian \$0.1716 in June 2010 to Australian \$0.1514 in December 2010 – a fall of roughly 11.8% [see **Figure 16.1**]. Thus, Australian exports became more expensive to Chinese consumers, while Chinese imports became more attractive to Australian consumers over this time frame.

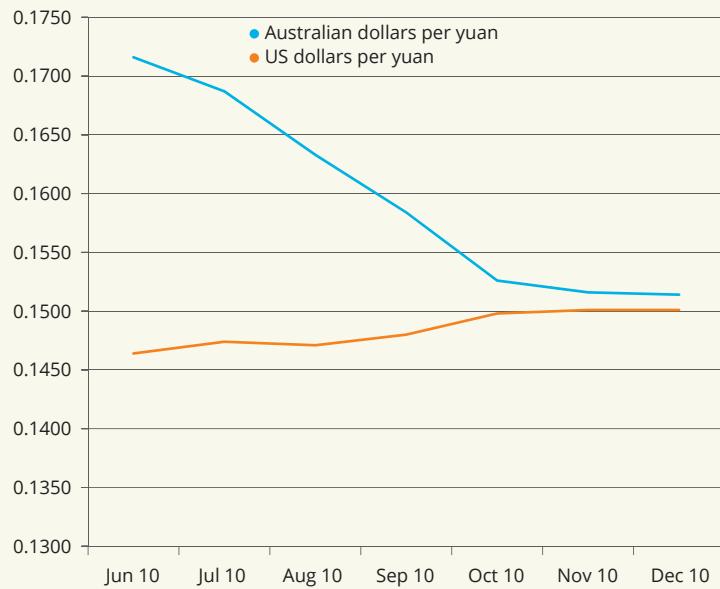
Nine years later, on 2 January 2020, the Chinese Yuan Renminbi was worth Australian \$0.20462 and US \$0.14359.

Sources: <http://www.efinancialnews.com/story/2011-01-12/yuan-trading-us>; www.businessweek.com/news/2010-09-06/d06/d06/deripaska-follows-mcdonald-s-to-yuanbond-market-russia-credit.html; <http://www.oanda.com/currency/historical-rates>; and <https://www1.oanda.com/currency/converter>. Accessed 2 January 2020.





FIGURE 16.1 AVERAGE MONTHLY YUAN EXCHANGE RATES AGAINST THE US DOLLAR AND AUSTRALIAN DOLLAR (JUNE–DECEMBER 2010)



Source: Oanda Corporation, <http://www.oanda.com/currency/historical-rates/>.

LEARNING OBJECTIVES

After studying this chapter, you should be able to:

- LO16.1** describe the difference between fixed and floating exchange rates, and interpret exchange rate quotes taken from the internet or financial newspapers
- LO16.2** revise the NPV decision rule for capital budgeting analysis to incorporate the added complexity that arises when an investment is undertaken in a foreign currency.

Walk down the aisle of a grocery store, visit a shopping mall, go hunting for a new car or check the outstanding balance of your credit card. In each of these activities, chances are that you will be dealing with products and services provided by **multinational corporations (MNCs)**, businesses that operate in many countries around the world. In recent decades, international trade in goods and services has expanded dramatically, and so too have the size and scope of MNCs. Although all the financial principles covered in this text thus far apply to MNCs, companies operating across national borders also face unique challenges. Primary among them is coping with exchange rate risk. An **exchange rate** is simply the price of one currency in terms of another, and for the past 30 years, the exchange rates of most of the world's major currencies have fluctuated daily. These movements create uncertainty for companies that earn revenues and pay operating costs in more than one currency. Currency movements also add to the pressures faced by wholly domestic companies that face competition from foreign companies.

This chapter focuses on the problems and opportunities companies face as a result of globalisation, with special emphasis on currency-related issues. We explain the rudimentary features of currency markets, including how and why currencies are traded and the rules governments impose on trading in their currencies. We conclude by illustrating how operating across national borders affects capital budgeting analysis.

multinational corporations (MNCs)
Businesses that operate in many different countries

exchange rate
The price of one currency in terms of another currency

LO16.1

16.1 EXCHANGE RATE FUNDAMENTALS

We begin our coverage of exchange rate fundamentals by describing the ‘rules of the game’ as dictated by national governments.

16.1a FIXED VERSUS FLOATING EXCHANGE RATES

floating exchange rate

An exchange rate system in which a currency's value is allowed to fluctuate in response to market forces

fixed exchange rate

An exchange rate system in which the price of one currency is fixed relative to another currency by government authorities

managed floating rate system

A hybrid currency system in which a government loosely fixes the value of the national currency relative to one or more other currencies

currency board arrangement

An exchange rate system in which each unit of the domestic currency is backed by a unit of some foreign currency

Since the mid-1970s, most of the world’s major currencies have had a **floating exchange rate** relationship with respect to the US dollar and to one another, which means that forces of supply and demand continuously move currency values up and down (the yuan being a major exception). The opposite of a floating exchange rate regime is a **fixed exchange rate** system. Under a fixed-rate system, governments fix (or *peg*) their currency’s value, usually in terms of another currency, such as the US dollar. Once a government pegs the currency at a particular value, it must stand ready to pursue economic and financial policies necessary to maintain that value. For example, if demand for the currency increases, the government must be ready to sell currency so that the increase in demand does not cause the currency to appreciate. If demand for the currency falls, the government must buy its own currency to prevent the currency from depreciating. In many countries with fixed exchange rates, governments impose restrictions on the free flow of currencies into and out of the country. Even so, maintaining a currency peg can be quite difficult. For example, in response to mounting economic problems, the government of Argentina allowed the peso, which had been linked to the US dollar, to float freely for the first time in a decade on 11 January 2002. After one day, the peso lost more than 40% of its value relative to the dollar.

Some countries have adopted hybrid currency systems in which the currency is neither pegged nor allowed to float freely. A **managed floating rate system** is a hybrid in which a nation’s government loosely ‘fixes’ the value of the national currency in relation to that of another currency, but does not expend the effort and resources that would be required to maintain a completely fixed exchange rate regime. Other countries simply choose to use another nation’s currency as their own, and a handful of nations have adopted a **currency board arrangement**. In such an arrangement, the national currency continues to circulate, but every unit of the currency is fully backed by government holdings of another currency – usually the US dollar.

The International Monetary Fund (IMF), in its *Annual Report on Exchange Arrangements 2018*, details the exchange rate systems in place for 1889 countries and three territories. As can be seen from **Figure 16.2**, in April 2018, only 16.1% (30 countries) had independently floating exchange rates. In contrast, 6.8% (13 IMF members) used another currency as their country’s legal tender.

The Australian dollar was freely floated in December 1983, moving from a managed floating rate system, under which it was effectively pegged to the US dollar.

In terms of trading volume, the US dollar is by far the most heavily traded currency in the world. However, the Australian dollar is one of the major currencies in international finance today, and its popularity stems from the relatively high interest rates on offer in Australia compared to most other developed markets, as well as the impact of commodity prices. Other major currencies include (in no particular order) the British pound sterling (£), the Swiss franc (SF), the Japanese yen (¥), the Canadian dollar (C\$) and the euro (€). As **Figure 16.3** (see page 568) demonstrates, the Australian dollar was gradually increasing its share of global currency market turnover until 2013, to 8.6%, but it has since dropped to 6.8% in 2019, although it has maintained its rank as the fifth largest market.

16.1b EXCHANGE RATE QUOTES

The Reserve Bank of Australia (RBA) publishes daily Australian dollar exchange rates with respect to a number of currencies. These are available from the RBA website. **Figure 16.4** (see page 569) provides a snapshot for

FIGURE 16.2 GLOBAL FOREIGN EXCHANGE RATE REGIMES, 2010–18 (% OF IMF MEMBERS AS OF 30 APRIL¹)

EXCHANGE RATE ARRANGEMENT	2010 ²	2011 ³	2012 ³	2013	2014	2015	2016 ⁴	2017	2018
Hard peg	13.2	13.2	13.2	13.1	13.1	12.6	13.0	12.5	12.5
No separate legal tender	6.3	6.8	6.8	6.8	6.8	6.8	7.3	6.8	6.8
Currency board	6.9	6.3	6.3	6.3	6.3	5.8	5.7	5.7	5.7
Soft peg	39.7	43.2	39.5	42.9	43.5	47.1	39.6	42.2	46.4
Conventional peg	23.3	22.6	22.6	23.6	23.0	23.0	22.9	22.4	22.4
Stabilised arrangement	12.7	12.1	8.4	9.9	11.0	11.5	9.4	12.5	14.1
Crawling peg	1.6	1.6	1.6	1.0	1.0	1.6	1.6	1.6	1.6
Crawl-like arrangement	1.1	6.3	6.3	7.9	7.9	10.5	5.2	5.2	7.8
Pegged exchange rate within horizontal bands	1.1	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Floating	36.0	34.7	34.7	34.0	34.0	35.1	37.0	35.9	34.4
Floating	20.1	18.9	18.4	18.3	18.8	19.4	20.8	19.8	18.2
Free floating	15.9	15.8	16.3	15.7	15.2	15.7	16.1	16.1	16.1
Residual									
Other managed arrangements	11.1	8.9	12.6	9.9	9.4	5.2	10.4	9.4	6.8

¹ Includes 189 member countries and three territories: Aruba and Curaçao and Sint Maarten (all in the Kingdom of the Netherlands) and Hong Kong SAR (China).

² As published in the 2010 AREAER; does not include Tuvalu and South Sudan, which became IMF members on June 24, 2010, and April 18, 2012, respectively.

³ As published in the 2011 and 2012 AREAERs; does not include South Sudan, which became an IMF member on April 18, 2012.

⁴ Includes Nauru, which became an IMF member on April 12, 2016.

Source: AREAER. *Annual Report on Exchange Arrangements and Exchange Restrictions 2018*, International Monetary Fund, 2019, p. 8, Table 3. Used with permission. <https://www.imf.org/~/media/Files/Publications/AREAER/areaer-2018...> PDF file. Accessed 2 January 2020.

Thursday, 2 January 2020. Exchange rates, though, are not published for comparing the Australian dollar to every currency in the world. In contrast, because it is the world's most heavily traded currency, the exchange rates published for the US dollar are more comprehensive (as shown in **Figure 16.5**). As we discuss later, we can use different currency pairs to derive cross currency rates. We can use this method to calculate Australian dollar exchange rates with currencies that are not included in the RBA exchange rate table.

Figure 16.5 (see page 569) shows exchange rate values quoted in the *Wall Street Journal* for Wednesday, 1 January 2020.¹ Note that the figure states each exchange rate in two ways. The second and third columns show how much one unit of each foreign currency is worth in terms of US dollars. This type of quote is called a **direct quote**, which is simply the domestic cost of one unit of foreign currency. (Note that since we are looking at US dollar exchange rates, we are assuming the US dollar is the domestic currency.) For example, we see that one Australian dollar cost US\$0.7017. On the previous day, the *Wall Street Journal* reported that one Australian dollar cost US\$0.7018. Because the value of one Australian dollar in terms of US currency fell slightly from 1 to 2 January 2020, we say that the Australian dollar **depreciated** against the US dollar.

The last two columns of **Figure 16.5** present the same information in a slightly different way. These columns show the value of each foreign currency relative to one US dollar. That is, the numbers show how many units of a foreign currency you can buy with US\$1. This way of stating exchange rates is called an **indirect quote**. We see that on 2 January 2020, it cost 1.4251 Australian dollars to purchase one US dollar.

direct quote

An exchange rate quoted in terms of units of domestic currency per unit of foreign currency

depreciate

A currency depreciates when it buys less of another currency than it did previously

indirect quote

An exchange rate quoted in terms of foreign currency per unit of domestic currency

¹ This data is far more comprehensive, in terms of currency coverage, than RBA data, and provides forward rates, which are also required for calculations. (The RBA data do not provide this.) However, to avoid ambiguity, data taken from this table must be denoted as US\$ or USD data (rather than \$ or dollar data).

FIGURE 16.3 CURRENCY DISTRIBUTION OF GLOBAL FOREIGN EXCHANGE MARKET TURNOVER (NET-NET BASIS¹, PERCENTAGE SHARES OF AVERAGE DAILY TURNOVER IN APRIL²)

CURRENCY	2004		2007		2010		2013		2016		2019	
	SHARE	RANK										
USD	88.0	1	85.6	1	84.9	1	87.0	1	87.6	1	88.3	1
EUR	37.4	2	37.0	2	39.0	2	33.4	2	31.4	2	32.3	2
JPY	20.8	3	17.2	3	19.0	3	23.0	3	21.6	3	16.8	3
GBP	16.5	4	14.9	4	12.9	4	11.8	4	12.8	4	12.8	4
AUD	6.0	6	6.6	6	7.6	5	8.6	5	6.9	5	6.8	5
CAD	4.2	7	4.3	7	5.3	7	4.6	7	5.1	6	5.0	6
CHF	6.0	5	6.8	5	6.3	6	5.2	6	4.8	7	5.0	7
CNY ³	0.1	29	0.5	20	0.9	17	2.2	9	4.0	8	4.3	8
HKD ³	1.8	9	2.7	8	2.4	8	1.4	13	1.7	13	3.5	9
NZD ³	1.1	13	1.9	11	1.6	10	2.0	10	2.1	10	2.1	10
SEK	2.2	8	2.7	9	2.2	9	1.8	11	2.2	9	2.0	11
KRW ³	1.1	11	1.2	14	1.5	11	1.2	17	1.7	15	2.0	12
SGD ³	0.9	14	1.2	13	1.4	12	1.4	17	1.8	12	1.8	13
NOK ³	1.4	10	2.1	10	1.3	13	1.4	14	1.7	14	1.8	14
MXN ³	1.1	12	1.3	12	1.3	14	2.5	8	1.9	11	1.7	15
INR ³	0.3	20	0.7	19	0.9	15	1.0	20	1.1	18	1.7	16
RUB ³	0.6	17	0.7	18	0.9	16	1.6	12	1.1	17	1.1	17
ZAR ³	0.7	16	0.9	15	0.7	20	1.1	18	1.0	20	1.1	18
TRY ³	0.1	28	0.2	26	0.7	19	1.3	16	1.4	16	1.1	19
BRL ³	0.3	21	0.4	21	0.7	21	1.1	19	1.0	19	1.1	20
TWD ³	0.4	18	0.4	22	0.5	23	0.5	23	0.6	23	0.9	21
DKK ³	0.9	15	0.8	16	0.6	22	0.8	21	0.8	21	0.6	22
PLN ³	0.4	19	0.8	17	0.8	18	0.7	22	0.7	22	0.6	23
THB ⁴	0.2	22	0.2	25	0.2	26	0.3	27	0.4	24	0.5	24
IDR ⁴	0.1	27	0.1	29	0.2	30	0.2	30	0.2	31	0.4	25
HUF ³	0.2	23	0.3	23	0.4	24	0.4	24	0.3	27	0.4	26
CZK ⁴	0.2	24	0.2	24	0.2	27	0.4	26	0.3	28	0.4	27
ILS ⁴	0.1	26	0.2	27	0.2	31	0.2	29	0.3	29	0.3	28
CLP ⁴	0.1	25	0.1	30	0.2	29	0.3	28	0.2	30	0.3	29
PHP ⁴	0.0	32	0.1	31	0.2	28	0.1	31	0.1	33	0.3	30
AED	...	55	...	57	...	57	...	41	...	39	0.2	31
COP ⁴	0.0	34	0.1	34	0.1	32	0.1	33	0.2	32	0.2	32
SAR ⁴	0.0	33	0.1	33	0.1	33	0.1	34	0.3	26	0.2	33
MYR ⁴	0.1	30	0.1	28	0.3	25	0.4	25	0.4	25	0.1	34
RON ⁴	...	56	0.0	35	0.1	34	0.1	32	0.1	34	0.1	35
OTH	6.6		7.7		4.7		1.7		2.2		2.2	
Total	200.0		200.0		200.0		200.0		200.0		200.0	

¹Adjusted for local and cross-border inter-dealer double-counting (ie 'net-net' basis). ²Because two currencies are involved in each transaction, the sum of the percentage shares of individual currencies totals 200% instead of 100%. ³Turnover for years prior to 2013 may be underestimated owing to incomplete reporting of offshore trading in previous surveys. Methodological changes in the 2013 survey ensured more complete coverage of activity in EME and other currencies. ⁴Turnover may be underestimated owing to incomplete reporting of offshore trading.

Source: Bank for International Settlements.

FIGURE 16.4 AUSTRALIAN DOLLAR EXCHANGE RATES: RESERVE BANK SNAPSHOT FOR THURSDAY, 2 JANUARY 2020

UNITS OF FOREIGN CURRENCIES PER AUSTRALIAN DOLLAR			
	31 DEC 2019	01 JAN 2020	02 JAN 2020
United States dollar	0.7006		0.7003
Chinese renminbi	4.8876		4.8789
Japanese yen	76.16		76.15
European euro	0.6254		0.6252
South Korean won	810.07		810.63
Singapore dollar	0.9438		0.9432
New Zealand dollar	1.0412		1.0421
UK pound sterling	0.5340		0.5302
Malaysian ringgit	2.8672		2.8625
Thai baht	21.00		21.09
Indonesian rupiah	9719		9734
Indian rupee	49.94		49.93
New Taiwan dollar	21.02		21.04
Vietnamese dong	16235		16226
Hong Kong dollar	5.4541		5.4554
Papua New Guinea kina	2.3871		2.3860
Swiss franc	0.6782		0.6792
United Arab Emirates dirham	2.5730		2.5719
Canadian dollar	0.9144		0.9098
Trade-weighted Index (4pm)	60.3		60.2
Special Drawing Right	0.5067		0.5065

H O L I D A Y

Source: Reserve Bank of Australia 2020.

FIGURE 16.5 EXCHANGE RATES: NEW YORK CLOSING SNAPSHOT FOR WEDNESDAY, 1 JANUARY 2020

US-DOLLAR FOREIGN-EXCHANGE RATES IN LATE NEW YORK TRADING						
	IN US\$		US\$ VS. % CHG		PER US\$	
	WED	TUES	1-DAY	YTD	WED	TUES
Americas						
Argentina peso	0.0167	0.0167	-0.28	-0.3	59.7170	59.8851
Brazil real	0.2488	0.2488	unch	unch	4.0195	4.0195
Canada dollar	0.7700	0.7699	-0.02	-0.02	1.2988	1.2990
Chile peso	0.001352	0.001353	0.07	0.1	739.80	739.30
Colombia peso	0.000305	0.000305	0.00	unch	3281.51	3281.51
Ecuador US dollar	1	1	unch	unch	1	1
Mexico peso	0.0528	0.0528	0.01	0.01	18.9312	18.9289
Uruguay peso	0.02678	0.02693	0.54	0.5	37.3400	37.1400
Asia-Pacific						
Australian dollar	0.7017	0.7018	0.01	0.01	1.4251	1.4249
China yuan	0.1436	0.1436	unch	unch	6.9632	6.9632
Hong Kong dollar	0.1283	0.1284	7.7915	7.7912





	IN US\$		US\$ VS. % CHG		PER US\$	
	WED	TUES	1-DAY	YTD	WED	TUES
India rupee	0.01404	0.01401	-0.18	-0.2	71.22800	71.35500
Indonesia rupiah	0.0000720	0.0000720	unch	unch	13883	13883
Japan yen	0.00919	0.00920	0.11	0.1	108.76	108.64
Kazakhstan tenge	0.00262	0.00262	unch	unch	381.82	381.82
Macau pataca	0.1247256	0.1247256	unch	unch	8.018	8.018
Malaysia ringgit	0.2445	0.2445	unch	unch	4.0905	4.0905
New Zealand dollar	0.6722	0.6732	0.15	0.1	1.4877	1.4854
Pakistan rupee	0.00646	0.00645	-0.08	-0.1	154.87	155.00
Philippines peso	0.0197	0.0197	unch	unch	50.7100	50.7100
Singapore dollar	0.7436	0.7429	-0.09	-0.1	1.3448	1.3460
South Korea won	0.0008658	0.0008657	1155.02	1155.07
Sri Lanka rupee	0.0055194	0.0055145	-0.09	-0.1	181.18	181.34
Taiwan dollar	0.03343	0.03343	unch	unch	29.91	29.91
Thailand baht	0.03383	0.03360	-0.67	-0.7	29.560	29.760
Vietnam dong	0.00004315	0.00004315	unch	unch	23173	23173
Europe						
Bulgaria lev	0.57343	0.57362	0.03	0.03	1.744	1.743
Croatia kuna	0.1506	0.1506	unch	unch	6.6391	6.6391
Czech Rep. koruna	0.04412	0.04411	-0.03	-0.03	22.666	22.673
Denmark krone	0.1501	0.1501	-0.01	-0.01	6.6623	6.6628
Euro area euro	1.1265	1.1215	-0.44	-0.4	0.8877	0.8917
Hungary forint	0.00338834	0.00338627	-0.06	-0.1	295.13	295.31
Iceland krona	0.008256	0.008257	0.01	0.01	121.12	121.11
Norway krone	0.1134	0.0139	0.46	0.5	8.8196	8.7794
Poland zloty	0.2550	0.2636	3.37	3.4	3.9212	3.7933
Romania leu	0.2342	0.2342	unch	unch	4.2701	4.2701
Russia ruble	0.01616	0.01611	-0.32	-0.3	61.862	62.063
Sweden krona	0.1068	0.1068	-0.03	-0.03	9.3641	9.3668
Switzerland franc	1.0338	1.0336	-0.02	-0.02	0.9673	0.9675
Turkey lira	0.1682	0.1681	-0.04	-0.04	5.9466	5.9489
Ukraine hryvnia	0.0422	0.0422	23.6749	23.6748
UK pound	1.3250	1.3260	0.08	0.1	0.7547	0.7541
Middle East/Africa						
Bahrain dinar	2.6420	2.6522	0.39	0.4	0.3785	0.3770
Egypt pound	0.0626	0.0623	-0.40	-0.4	15.9833	16.0481
Israel shekel	0.2895	0.2895	unch	unch	3.4539	3.4539
Kuwait dinar	3.3131	3.2994	-0.41	-0.4	0.3018	0.3031
Oman sul rial	2.59737	2.59737	unch	unch	0.39	0.39
Qatar rial	0.2770	0.2745	-0.93	-0.9	3.6097	3.6436
Saudia Arabia riyal	0.2666	0.2666	3.7514	3.7513
South Africa rand	0.0714	0.0714	0.03	0.03	14.0026	13.9979

Source: Wall Street Journal, <https://www.wsj.com/market-data/currencies/exchangerates>, accessed 2 January 2020.

On the previous day, one US dollar was worth 1.4249 Australian dollars. Because the value of one US dollar in terms of Australian dollars rose from Tuesday to Wednesday, we say that the US dollar **appreciated** against the Australian dollar. Of course, the exchange rate quotes in the second and third columns reveal exactly the same information as the quotes in the last two columns. Each of these methods of quoting exchange rates is simply the reciprocal of the other:

$$\frac{\text{US dollars}}{\text{Australian dollars}} = \frac{1}{\text{Australian dollars/US dollars}} = 0.7017 = \frac{1}{1.4251}$$

appreciate
A currency appreciates when it buys more of another currency than it did previously

FINANCE IN THE REAL WORLD



PILGRIMAGE TO MATA MATA

As a devoted *Lord of the Rings* fan, you decide to make a trip to New Zealand to visit Mata Mata, the site of 'Hobbiton' from the films. After you pay for your airfare, you plan to spend 5,000 Australian dollars on hotels, food, transportation around New Zealand and souvenirs. At the time you put together your budget, one New Zealand dollar was worth about A\$0.76, meaning you could spend $A\$5,000 \div NZ\$0.76 = NZ\$6,579$ during your stay. However, by the time you actually travel to New Zealand, the exchange rate has moved up to A\$0.81/NZ\$, so if you stay true to your planned budget – to spend no more than A\$5000 – you have just NZ\$6,173 to spend on your trip.

For each currency, **Figure 16.5** lists the **spot exchange rate**. The spot exchange rate is just another term for the current exchange rate. That is, if you are going to trade currencies right now, the relevant exchange rate is the spot exchange rate. In many currencies, it is possible to enter a contract today to trade foreign currency at a fixed price at some future date. The price at which that future trade will take place is called the **forward exchange rate**. If traders choose to transact through a forward contract, no cash changes hands until the date specified by the contract.

Just as we compared movements in the spot exchange rate from one day to the next, we can also examine differences in the spot exchange rate for current transactions and the forward rate for future transactions. For example, look at the rate quotes for Japanese yen. On the spot market, one yen costs US\$0.00919, but if the exchange rate for trades that will take place six months later is, for example, US\$0.00920/¥, then one yen will buy more dollars on the forward market than on the spot market. When one currency buys more of another on the forward market than it does on the spot market, traders say that the first currency trades at a **forward premium**. The forward premium is usually expressed as a percentage relative to the spot rate, so for the yen, we can calculate the six-month forward premium as follows:

$$\frac{F - S}{S} = \frac{\text{US\$}0.00920/\text{¥} - \text{US\$}0.00919/\text{¥}}{\text{US\$}0.00919/\text{¥}} = 0.00109 = 0.11\%$$

spot exchange rate
The exchange rate that applies to immediate currency transactions

forward exchange rate
The exchange rate quoted for a transaction that will occur on a future date

forward premium
When one currency buys more of the other currency on the forward market than it buys on the spot market

where F is the symbol for the forward rate and S stands for the spot rate, both quoted in terms of US\$/¥. This calculation means that one yen buys 0.11% more US dollars on the six-month forward market than it buys on the spot market. Recognising that the yen's 0.11% forward premium refers to a six-month contract, we could restate the premium in annual terms by multiplying the premium times 2, which would yield an annualised forward premium of 0.22%.

If the yen trades at a forward premium relative to the US dollar, then the US dollar must trade at a **forward discount** relative to the yen, meaning that one US dollar buys fewer yen on the forward market than it does

forward discount
When one currency buys less of the other currency on the forward market than it buys on the spot market

on the spot market. To calculate the forward discount on the US dollar, we use the same equation as above, but we express the exchange rate in terms of yen per US dollar:²

$$\frac{F-S}{S} = \frac{\text{¥}108.64 / \text{US\$} - \text{¥}108.76 / \text{US\$}}{\text{¥}108.76 / \text{US\$}} = -0.00109 = -0.11\%$$

The US dollar trades at a -0.11% forward discount for a six-month contract, or about -0.22% per year. In other words, the forward discount on the US dollar is opposite in sign and similar in magnitude to the forward premium on the yen, though the discount is always smaller in absolute value than the premium. In general, to calculate the annualised forward premium or discount on a currency, based on a forward contract to be executed in N days, use the following equation:

(Eq. 16.1)

$$\frac{F-S}{S} \times \frac{360}{N}$$



Calculating a Forward Contract Premium

We can calculate the annualised forward discount (or premium) on the Swiss franc (SF) relative to the US dollar based on the rate for a three-month forward contract. For example, we could calculate that, if the spot rate equals US\$1.0312/SF, the three-month (or 90-day) forward rate equals US\$1.0321/SF. Notice that the franc buys more

dollars on the forward market than it does on the spot market, so it trades at a forward premium. We can determine the annualised premium as follows, given that we are using a 90-day contract:

$$\frac{\text{US\$}1.0321/\text{SF} - \text{US\$}1.0312/\text{SF}}{\text{US\$}1.0312/\text{SF}} \times \frac{360}{90} = 0.00349 \\ = 0.35\%$$

The forward discount or premium gives traders information about more than just the price of exchanging currencies at different points in time. The forward premium is tightly linked to differences in interest rates on short-term, low-risk bonds across countries.

One last lesson remains to be gleaned from **Figure 16.5**. In its daily exchange rate table, the *Wall Street Journal* quotes the value of the world's major currencies relative to the US dollar. But what if someone wants to know the exchange rate between British pounds and Canadian dollars? In fact, all the information needed to calculate this exchange rate appears in the figure. We simply need to calculate a **cross exchange rate** by dividing the US dollar exchange rate for one currency by the US dollar exchange rate for the other currency. For example, using Wednesday's US dollar spot rates, we can determine the $\text{£}/\text{C\$}$ exchange rate:

$$\frac{\text{US\$}1.3250 / \text{£}}{\text{US\$}0.7700 / \text{C\$}} = \text{C\$}1.7207 / \text{£}$$

Note that, since we divided the US dollar-British pound exchange rate (quoted as US dollars per British pound) by the US dollar-Canadian dollar exchange rate (quoted as US dollars per Canadian dollar), the resultant cross rate is quoted as Canadian dollars per British pound. If we wanted the cross rate quoted as British pounds per Canadian dollar, we would need to take the inverse of this (i.e. divide the denominator by the numerator in the preceding expression).

How can we be sure that one pound buys 1.7207 Canadian dollars simply by taking this ratio? The answer is that if the exchange rate between pounds and Canadian dollars were any other number, then currency traders could engage in **triangular arbitrage**, trading currencies simultaneously in different markets to earn a risk-free

cross exchange rate

An exchange rate between two currencies calculated by taking the ratio of the exchange rate of each currency, expressed in terms of a third currency

triangular arbitrage

A trading strategy in which traders buy a currency in a country where the value of that currency is too low and immediately sell the currency in another country where the currency value is too high, to make a risk-free profit

2 Note that although the exchange rate for Japanese yen in US dollars is usually quoted to 2 decimal places, we have included an extra decimal place in this calculation to reduce rounding errors.

profit. Because currency markets operate virtually 24 hours per day, and because currency trades take place with lightning speed and with very low transaction costs, arbitrage maintains actual currency values in different markets relatively close to this theoretical ideal. As discussed earlier, we can use this method to derive cross rates for the Australian dollar against currencies that are not included in the RBA data (shown in [Figure 16.4](#)).

EXAMPLE

How Triangular Arbitrage Works

Suppose that on Friday, 5 June 2020, a trader learns that the exchange rate offered by a London bank is C\$1.7400/£ rather than C\$1.7207/£, as calculated previously. What is the arbitrage opportunity? First, note that the figure C\$1.7400/£ is ‘too high’ relative to the theoretically correct rate. This means that in London, one pound costs too much in terms of Canadian dollars. In other words, the pound is overvalued, and the Canadian dollar is undervalued. Therefore, a trader could make a profit by executing the following steps.

- 1 Convert US dollars to British pounds in New York at the prevailing spot rate, as given in [Figure 16.5](#). Assume that the trader starts with US\$1 million, which will convert to £754,717 (US\$1,000,000 ÷ US\$1.3250/£).

- 2 Simultaneously, the trader sells £754,717 in London (because pounds are overvalued there) at the exchange rate of C\$1.7400/£. The trader will then have C\$1,313,208.
- 3 Convert the Canadian dollars back into US currency in New York. Given the spot rate of US\$0.7700/C\$ in [Figure 16.5](#), the trader will receive US\$1,011,170 (C\$1,313,208 × US\$0.7700/C\$).

After making these trades, all of which can occur with the touch of a keystroke, the trader winds up US\$11,170 richer, all without taking risk. As long as the exchange rates do not change, the trader could keep making a profit over and over again. This is an arbitrage profit, and this trading strategy is an example of triangular arbitrage.

The preceding example shows that a trader could repeatedly make a profit if the exchange rates do not change. Of course, exchange rates do change, and they change in ways that bring the market back into equilibrium. [Figure 16.6a](#) illustrates what happens as arbitrage takes place. Compare this to [Figure 16.6b](#), which illustrates how the same transaction would take place if there were no arbitrage opportunities. As traders in New York sell US currency in exchange for pounds, the pound appreciates vis-à-vis the US dollar, and the exchange rate will rise from US\$1.3250/£ to some new, higher level. Likewise, as traders in London sell pounds in exchange for Canadian dollars, the pound will depreciate against the Canadian currency, and the exchange rate will fall below C\$1.7400/£ to a lower level. Finally, as traders reap profits in New York by selling Canadian and buying US currency, the exchange rate between Canadian and US dollars will fall from US\$0.7700/C\$. Though we cannot say exactly how much each of these exchange rates will move, we can say that, collectively, they will move enough to reach a new equilibrium in which the cross exchange rate in New York and the exchange rate quoted in London will be virtually identical.

With this basic understanding of foreign exchange rates in place, let us now turn to some important institutional features of the foreign exchange market.

16.1c THE FOREIGN EXCHANGE MARKET

The foreign exchange (or forex) ‘market’ is not actually a physical exchange, but a global telecommunications market. In fact, it is the world’s largest financial market, with total volume of more than \$4 trillion *per day*! The forex market operates continuously during the business week, with trading beginning each calendar day in New Zealand, closely followed by Australia. As the day evolves, trading

FIGURE 16.6A TRIANGULAR ARBITRAGE

The exchange rates in New York imply that one British pound should buy 1.7207 Canadian dollars. If a bank in London offers to sell C\$1.7400 for one pound, then traders can make an instant profit by selling US dollars for pounds in New York, converting those to Canadian dollars in London, and then selling the Canadian dollars for US dollars back in New York. The effect of these trades in New York will be to raise the US dollar pound exchange rate above 1.3250 and to push the exchange rate between US and Canadian dollars below 0.7700. In London, the value of the pound will fall below C\$1.7400.

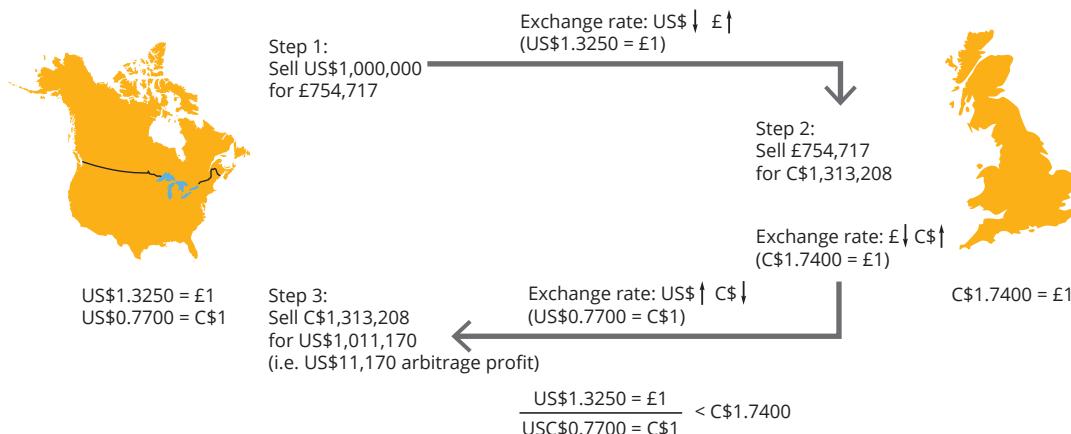
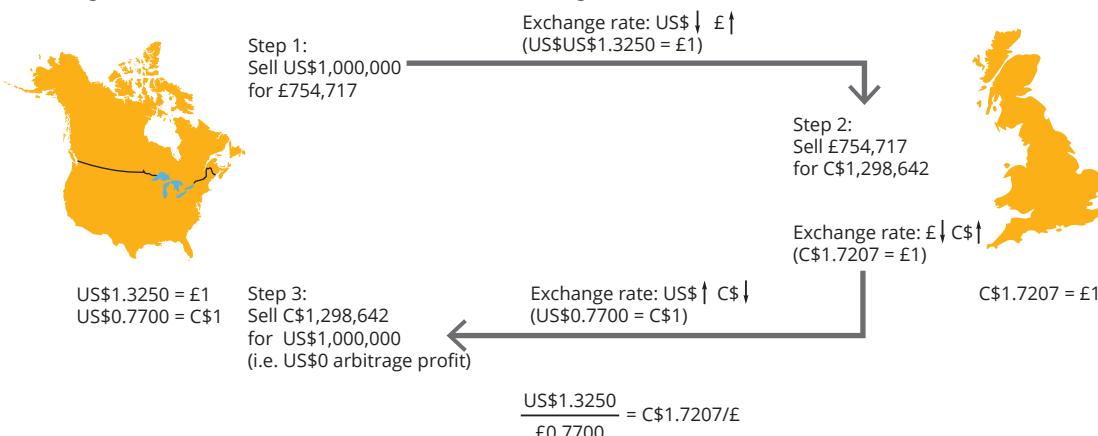


FIGURE 16.6B NO ARBITRAGE

The exchange rates in New York imply that one British pound should buy 1.7207 Canadian dollars. If a bank in London only offers to sell C\$1.7207 for one pound, then traders cannot make any profit by selling US dollars for pounds in New York, converting those to Canadian dollars in London, and then selling the Canadian dollars for US dollars back in New York.



moves westward as major dealing centres in Tokyo, Singapore, Bahrain (Persian Gulf), continental Europe, London and, finally, North America (particularly New York and Toronto) come online. Prices for all the floating currencies are set by global supply and demand. Trading in fixed-rate currencies is more constrained and regulated, and frequently involves a national government (or a state-owned bank) as the counterparty on one side of the trade.

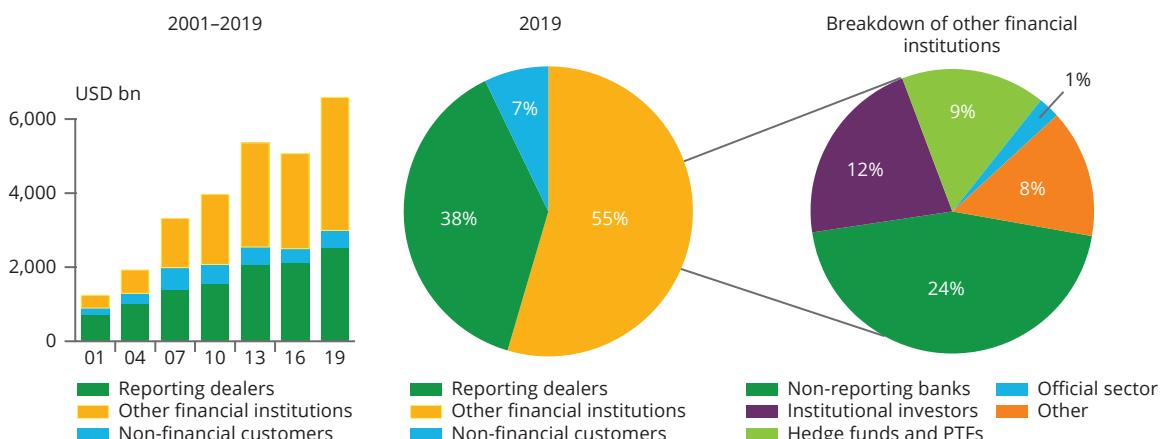
The players in the forex market are numerous, as are their motivations for participating in the market. We can break market participants into six distinct (but not mutually exclusive) groups: (1) exporters and importers; (2) investors; (3) hedgers; (4) speculators; (5) dealers; and, at times, (6) governments.

Businesses that export goods to or import goods from a foreign country need to enter the foreign exchange market to pay bills denominated in foreign currency, or to convert foreign currency revenues back into their domestic currency. Along with all the other players in the market, exporters and importers influence currency values. For instance, if Europeans develop a taste for Californian wines, then European importers will exchange euros (or perhaps pounds, Swiss francs, etc.) for dollars to purchase wine. Other factors held constant, these trades would tend to put upward pressure on the value of the dollar and downward pressure on European currencies.

Investors also trade foreign currency when they seek to buy and sell financial assets in foreign countries. For example, when foreign investors want to buy Australian shares or bonds, they must first sell their home currencies and buy dollars. Buying pressure from investors causes the dollar to appreciate against foreign currencies. In general, the pressures exerted on currencies by investors are much larger than those exerted by exporters and importers because investors account for a larger fraction of currency trading volume. For example, the total value of goods and services traded internationally each year is about \$16 trillion, which is equivalent to about four days' worth of global currency trading. **Figure 16.7** shows daily averages for foreign exchange market turnover, by counterparty. It suggests that the market share of turnover attributable to non-financial institutions is less than 10%.

FIGURE 16.7 GLOBAL FOREIGN EXCHANGE MARKET TURNOVER BY COUNTERPARTY¹

Net – net basis, daily averages in April



1 Adjusted for local and cross-border inter-dealer double-counting; i.e. 'net – net' basis.

Source: Bank for International Settlements.

EXAMPLE

Exchange Rate Responses to Interest Rate Changes

In January 2011, the central bank of Peru announced that it would raise a benchmark interest rate by 0.25%. Other things being equal, higher interest rates tend to put upward pressure

on a country's exchange rates because of capital inflows from foreign investors. On the same day that Peru announced the rate hike, Peru's currency, the sol, reached a 33-month high.

Sometimes traders in the foreign exchange market buy and sell currency to offset other risks to which they are exposed during the normal course of business. **Hedging** refers to the practice of trading an asset for the sole purpose of reducing or eliminating the risk associated with some other asset. For example, suppose

hedging

Trading an asset for the sole purpose of reducing or eliminating the risk associated with some other asset

that an Australian company expects to receive a £1,000,000 payment from a customer in the United Kingdom. The payment is due in 90 days. This receivable is risky from the Australian company's perspective because the exchange rate between dollars and pounds may fluctuate over the next 90 days. To hedge the risk of its pound-denominated receivable, the Australian company might enter a forward contract to sell pounds for dollars in 90 days. By doing so, the company essentially locks in a dollar value for the £1,000,000 payment.

Hedgers influence currency values when they take positions to offset the risks of their existing exposures to certain currencies. In contrast, speculators take positions to make a profit. Speculators sell a currency if they expect it to depreciate, and they buy if they expect it to appreciate. Some speculators, such as George Soros, have become famous for the enormous profits (or losses) they have earned by taking large positions in certain currencies. When external pressures force a country with a pegged currency to devalue its currency, speculators often take the blame. Whether or not they deserve blame for causing, accelerating or exacerbating currency crises, speculators can play a useful economic role by taking the opposite side of a transaction from that of hedgers. Speculators help make the foreign currency market more liquid and more efficient.

As in all financial markets, dealers play a crucial role in the foreign exchange business. Most foreign currency trades go through large international banks in the leading financial centres around the globe. These banks provide a means for buyers and sellers to come together, and as their reward they earn a small fee, the *bid–ask spread*, on each transaction they facilitate. The ask price is the price at which a currency dealer is willing to sell foreign currency, and the bid price is the price at which the dealer is willing to buy currency. Because the ask price is slightly higher than the bid (hence the term ‘*bid–ask spread*’), dealers make a small profit each time they buy or sell currency.

Finally, governments intervene in financial markets to put upward or downward pressure on currencies as circumstances dictate. Governments that attempt to maintain a fixed exchange rate must generally intervene more frequently than those that intervene only in times of crisis. As this chapter's ‘What Companies Do’ box illustrates, currency movements create winners and losers, not only across national boundaries but also within a given country. For example, a rise in the value of the Australian dollar makes Australian exports more expensive and foreign imports cheaper. Remember, an exchange rate is simply a price, the price of trading one currency for another. Although the financial press dramatises changes in exchange rates by attaching adjectives such as *strong* or *weak* to a given currency, this practice is rather odd when you recognise that they are just talking about a price. For instance, if the price of apples rises and the price of bananas falls, we do not refer to apples as being strong and bananas as being weak! If the price of apples is high, that is good for apple producers and bad for apple consumers. In the same way, a rise in the value of a particular currency benefits some and harms others. Therefore, at least for the major, free-floating currencies, governments are reluctant to intervene because doing so does not unambiguously improve welfare across the board.

Even when governments want to intervene in currency markets, intervention is complicated by the fact that currency values are not set in a vacuum, but are linked to other economic variables such as interest rates and inflation.

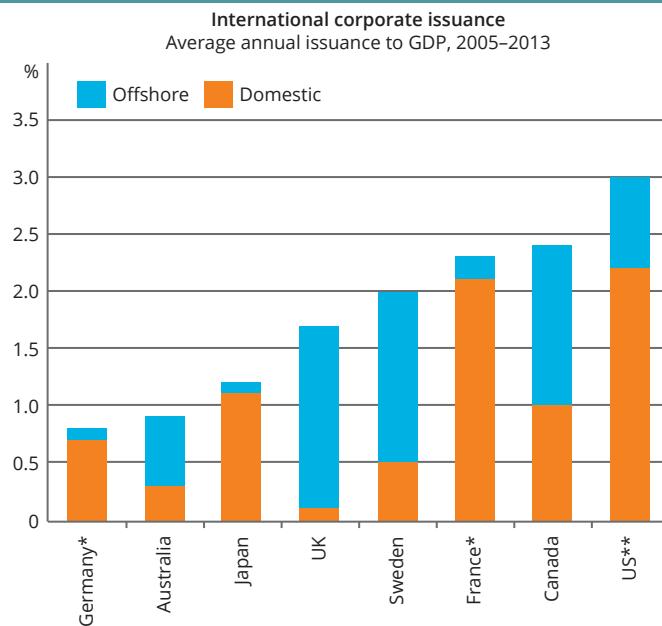
16.1d NATURAL EXCHANGE RATE RISK HEDGES

One way to mitigate the impact that currency market volatility has on profitability is to hedge this exchange rate risk. This can be done with a currency hedge trading strategy, or by using a natural hedge. For example, if a company can match its revenues and expenses, or its assets and liabilities in the same currency, this can reduce its exchange rate exposure, creating a natural hedge.

One way to match revenue and expense currency exposure is to set up production in the country that the company is hoping to supply to. This way, much of its cost base (for example, labour) will be denominated in the same currency as revenues. One way to match assets and liability currency exposure would be to issue foreign-denominated debt in the country where it will be investing in assets (such as production facilities).

Figure 16.8 shows the value of corporate bonds issued, as a percentage of GDP, for a number of countries. Compared to their international peers, Australian companies appear to be less prolific at issuing bonds (with bond issues worth less than 1% of GDP). Australian companies appear to favour issuing bonds offshore, with the proportion of debt denominated as non-Australian dollar debt surpassing domestic issuance. One explanation could be that these companies increased their use of natural hedging strategies over this time frame.

FIGURE 16.8 CORPORATE BONDS ISSUED (BY COUNTRY OF DOMICILE)



* Domestic bonds include 'eurobonds' sold in two or more countries

** Domestic bonds include securities that can be sold publicly in the US

Source: © Reserve Bank of Australia, 2001–2016. All rights reserved.

A classic example of this natural hedging strategy is provided by Keybridge Capital Limited, an Australian listed structured finance and investment management company involved in transport and infrastructure investments around the globe. The bulk of these investments comprise long-term mezzanine debt, subordinated debt or preferred equity investments, and are structured in these ways so that the assets are tied to long-term lease contracts, yielding fixed or predictable long-term cash flows. Unfortunately, since 2008, the global credit crunch, global economic slowdown and currency volatility all combined to work against this long-term investment strategy. The company was able to keep trading by entering into a special debt arrangement with its lenders, but was subject to severe restrictions. These included operating under a cash sweep whereby all cash flows in excess of minimum working capital requirements were applied to debt reduction, as well as an inability to utilise any hedging trading strategies that were perceived as risky. This made liquidity management and cost control paramount for the ongoing success of the business. Since the majority of its assets were non-Australian-dollar-denominated, cash flows from these were subject to exchange rate volatility, making Keybridge Capital very sensitive to currency volatility. The problem was exacerbated by the strengthening Australian dollar, which meant that overseas income did not cover its domestic borrowing costs.

To mitigate some of this risk, the company renegotiated its debt obligations so that its corporate borrowings were denominated in US dollars, giving it a natural hedge for about 80% of its US dollar-denominated assets.

Figure 16.9 highlights the company's currency exposures as at 31 December 2011.

FIGURE 16.9 KEYBRIDGE CAPITAL LTD'S CURRENCY EXPOSURES AS AT 31 DECEMBER 2011

CURRENCY	ASSETS	LIABILITIES	NET
US dollar	54 million	44 million	10 million
Australian dollar	28 million	1 million	27 million
Euro	6 million	0	6 million

Source: Keybridge Capital Limited December 2011 Half Year Results, <http://www.keybridge.com.au/MediaReleases/120214.php>.

FINANCE IN THE REAL WORLD

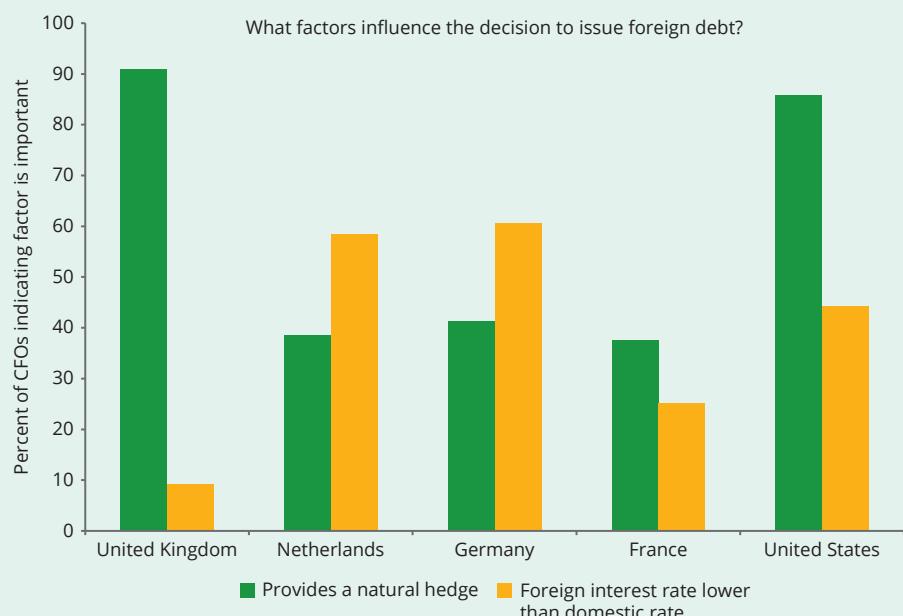


CFO SURVEY EVIDENCE

In a survey of CFOs from four European countries, Brounen, de Jong and Koedijk asked companies whether they had considered issuing debt in a foreign currency, and if so, what factors influenced that decision. A company that earns revenues in a foreign currency can offset some of that risk exposure by generating costs in the same currency, and one way to do that is by borrowing money in the foreign currency.

Apparently, the hedging motivation for issuing foreign debt is important to some companies, especially those in the UK and the US (the US figures come from Graham and Harvey, 2001).

More than 90% of British CFOs, and almost as many American CFOs, said that 'providing a natural hedge' was always or almost always an important factor in their decision to issue debt in a foreign currency. In contrast, CFOs from the Netherlands and Germany put less emphasis on the hedging motive, saying instead that they considered issuing foreign debt because foreign interest rates may be lower than domestic rates.



Source: Dirk Brounen, Abe de Jong and Kees Koedijk, 'Capital Structure Policies in Europe: Survey Evidence,' *Journal of Banking and Finance*, 30, pp. 1409–42, 2006.

LO16.1

CONCEPT REVIEW QUESTIONS

- 1 Explain how a rise in the euro might affect a French company exporting wine to Australia, and compare that with the impact on a German company importing gold from Australia.
- 2 Holding all other factors constant, how might an increase in interest rates in the UK affect the value of the pound?
- 3 If someone says, 'The exchange rate between dollars and pounds increased today', can you know with certainty which currency appreciated and which depreciated? Why or why not?
- 4 Define spot and forward exchange rates. If a trader expects to buy a foreign currency in one month, can you explain why the trader might prefer to enter into a forward contract today, rather than simply wait a month and transact at the spot rate prevailing then?

LO16.2

16.2 LONG-TERM INVESTMENT DECISIONS

In chapters 9 to 11, we emphasised the importance of sound capital budgeting practices for a corporation's long-term survival. The same lessons covered in those chapters apply to multinational corporations. Whether investing at home or abroad, MNCs should evaluate investments based on their incremental cash flows, and should discount those cash flows at a rate that is appropriate given the risk of the investment. However, when a company makes investments denominated in many different currencies, this process becomes a bit more complicated. First, in what currency should the company express a foreign project's cash flows? Second, how does one calculate the cost of capital for an MNC, or for a given project?

16.2a CAPITAL BUDGETING

Suppose that an Australian company is weighing an investment that will generate cash flow in euros. The company's financial analysts have estimated the project's cash flows in euros as follows:

INITIAL WCOST	YEAR 1	YEAR 2	YEAR 3
-2 million	900,000	850,000	800,000

To calculate the project's NPV, the Australian company can take either of two approaches. First, it can discount euro-denominated cash flows using a euro-based cost of capital. Having done this, the company can then convert the resulting NPV back to dollars at the spot rate. For example, assume that the risk-free rate in Europe is 5%, and the company estimates that the cost of capital (expressed as a euro rate) for this project is 10% (in other words, there is a 5% risk premium associated with the investment). The NPV, rounded to the nearest thousand euros, equals €122,000:

$$NPV = -2,000,000 + \frac{900,000}{1.10^1} + \frac{850,000}{1.10^2} + \frac{800,000}{1.10^3} = 121,713$$

Assume that the current spot rate equals \$0.95/€. Multiplying the spot rate times the NPV yields a dollar-based NPV of \$116,000 (rounded to the nearest thousand dollars).

In this example, we did not make specific year-by-year forecasts of the future spot rates. Doing so is unnecessary because the company can choose to hedge its currency exposure through a forward contract.

Hedging the currency exposure allows the company to separate the decision to accept or reject the project from projections of where the dollar-to-euro exchange rate might be headed. Of course, the company may have a view on the exchange rate question, but even so, it is wise to first consider the investment on its own merits. For instance, suppose that this project has a negative NPV, but managers believe that the euro will appreciate over the life of the project, increasing the project's appeal in dollar terms. Given that belief, there is no need for the company to undertake the project. Instead, it could purchase euros directly, invest them in safe financial assets in Europe and convert back to dollars several years later. That is, if the company wants to speculate on currency movements, it need not invest in physical assets to accomplish that objective.

A second approach for evaluating the investment project is to calculate the NPV in dollar terms, assuming that the company hedges the project's cash flows using forward contracts. To begin this calculation, we must know the risk-free rate in Australia. Suppose that this is 3%. Recognising that interest rate parity must hold, we can use this to calculate the one-year forward rate.

interest rate parity
An equilibrium relationship that predicts that differences in risk-free interest rates in two countries must be tied to differences in currency values on the spot and forward markets

Interest rate parity means that risk-free investments should offer the same return (after converting currencies) everywhere. We can express interest rate parity in mathematical terms. Letting R_{for} and R_{dom} represent the risk-free rate on foreign and domestic government debt; $(F)^{\text{for}/\text{dom}}$ and $(S)^{\text{for}/\text{dom}}$ represent the forward and spot rates quoted per unit of domestic currency; and n represent the number of forward periods, we obtain the following equation:^{3,4}

$$\text{(Eq. 16.2)} \quad \frac{(F_n)^{\text{for}/\text{dom}}}{(S)^{\text{for}/\text{dom}}} = \frac{(1 + R_{\text{for}})^n}{(1 + R_{\text{dom}})^n}$$

Thus, using **Equation 16.2**, but assuming that the dollar is the foreign currency, since we want the resultant forward quoted as dollars per euro:

$$\frac{(F_1)^{\$/\text{euro}}}{(S)^{\$/\text{euro}}} = \frac{(1 + R_{\text{Australia}})^1}{(1 + R_{\text{euro}})^1} \Rightarrow \frac{(F_1)^{\$/\text{euro}}}{0.95} = \frac{1.03}{1.04} \Rightarrow (F_1)^{\$/\text{euro}} = \$0.9319/\text{€}$$

Similarly, we can calculate the two-year and three-year forward rates as follows:

$$\frac{(F_2)^{\$/\text{euro}}}{0.95} = \frac{1.03^2}{1.05^2} \Rightarrow (F_2)^{\$/\text{euro}} = \$0.9142/\text{€}$$

$$\frac{(F_3)^{\$/\text{euro}}}{0.95} = \frac{1.03^3}{1.05^3} \Rightarrow (F_3)^{\$/\text{euro}} = \$0.8967/\text{€}$$

Next, multiply each period's cash flow in S times the matching spot or forward exchange rate to obtain a sequence of cash flows in dollars (rounded to the nearest thousand dollars):

CURRENCY	INITIAL INVESTMENT	YEAR 1	YEAR 2	YEAR 3
€	$2,000,000 \times 0.95$	$900,000 \times 0.9319$	$850,000 \times 0.9142$	$800,000 \times 0.8967$
\$	1,900,000	839,000	777,000	717,000

3 Be careful to match the term of the forward rate to the term of the interest rate in this expression. For example, if you are comparing interest rates on 180-day government bills, you must use a 180-day forward rate.

4 What does this expression mean? Observe that if the left-hand side of the equation is greater than 1.0, the domestic currency trades at a forward premium. If domestic investors send money abroad, when they convert back to domestic currency, they will realise an exchange loss because the foreign currency buys less domestic currency than it did at the spot rate. Domestic investors know this, so they require an incentive in the form of a higher foreign interest rate before they will send money abroad. To maintain equilibrium, the right-hand side must also be greater than 1.0, which means that the foreign interest rate must exceed the domestic rate. The bottom line is that when a nation's currency trades at a forward premium (discount), risk-free interest rates in that country should be lower (higher) than they are abroad.

All that remains is to discount this project's cash flows at an appropriate risk-adjusted Australian interest rate. But how do we determine that rate? Recall that the European discount rate used to calculate the euro-denominated NPV was 10%, 5% above the European risk-free rate. Intuitively, we might expect that the comparable Australian rate is 8%, representing a 5% risk premium over the current risk-free rate in Australia. That intuition is more or less correct. To be precise, use the following formula to solve for the project's required return in Australian dollar terms:

$$(1+r) = (1+0.10) \frac{(1+0.03)}{(1+0.05)} r = 7.9\%$$

This equation takes the project's required return in euro terms, 10%, and rescales it to dollar terms by multiplying by the ratio of risk-free interest rates in each country. We can verify that discounting the dollar-denominated cash flows using this rate results in the same NPV (again, rounding to the nearest thousand dollars) that we obtained by discounting the cash flows in euros and converting to dollars at the spot rate.

$$NPV = -\$1,900,000 + \frac{\$839,000}{1.079^1} + \frac{\$777,000}{1.079^2} + \frac{\$717,000}{1.079^3} = \$116,000$$

These calculations demonstrate that a company does not have to 'take a view' on currency movements when it invests abroad. Whether the company hedges a project's cash flows using forward contracts, or whether it calculates a project's NPV in local currency before converting to the home currency at the spot exchange rate, future exchange rate movements need not cloud the capital budgeting decision.

16.2b COST OF CAPITAL

In the preceding example, we assumed that the project's cost of capital in Europe was 10%, which translated into a dollar-based discount rate of 7.9%. But where did the 10% come from? We return to the lessons of Chapter 11, namely that the discount rate should reflect the project's risk. One way to assess that risk is to calculate a beta for the investment. How should a company calculate a beta when it makes an investment overseas?

If a company's shareholders cannot diversify internationally, when the company invests abroad it should calculate a project's beta by measuring the movement of similar European investments in relation to the Australian market, not the European market. The reason is that, from the perspective of Australian investors, the project's systematic risk depends on its relationship with the other assets that Australian investors already own. An Australian company planning to build an electronics manufacturing facility in Germany might compare the returns of existing German electronics companies with returns on an Australian equity index to estimate a project beta.

In contrast, if the company's shareholders can diversify internationally, the company should calculate the project's beta by comparing the relationship between its returns (or returns on similar investments) with returns on a worldwide share index. This generates the project's 'global beta'. Next, to estimate the project's required return, the company should apply the capital asset pricing model (CAPM), multiplying the global market risk premium times the project's beta, and adding the risk-free rate. In all likelihood, because a globally diversified portfolio is less volatile than a portfolio containing only domestic securities, the risk premium on the global market will be less than the domestic risk premium.

 **EXAMPLE****Using Different Betas in International Markets**

A Japanese car manufacturer decides to build a plant to make cars for the Australian market. The company estimates two project betas. The first calculation takes returns on Australian car shares and calculates their betas relative to those on the Nikkei share index. Based on these calculations, the Japanese company decides to apply a beta of 1.1 to the investment. The risk-free rate of interest in Japan is 2%, and the market risk premium on the Nikkei index is 8%, so the project's required return is calculated as follows:

$$R_{\text{project}} = 2\% + 1.1(8\%) = 10.8\%$$

The second calculation takes the returns on Australian car manufacturers and determines their betas relative to those on a world equity index. It turns out that Australian car shares are more sensitive to movements in the world market than they are to the Nikkei. This leads to a higher estimate of the project beta, say 1.3. However, offsetting this effect is the fact that the risk premium on the world market portfolio is just 5%. Therefore, the second estimate of the project's required return is calculated as follows:

$$R_{\text{project}} = 2\% + 1.3(5\%) = 8.5\%$$

LO16.2 **CONCEPT REVIEW QUESTIONS**

- 5 Why does discounting the cash flows of a foreign investment using the foreign cost of capital, then converting that to the home currency at the spot rate, yield the same NPV as converting the project's cash flows to domestic currency at the forward rate and then discounting them at the domestic cost of capital?
- 6 Why is it not surprising to find that the risk premium on the world market portfolio is lower than the domestic risk premium?

THINKING CAP QUESTION

- 1 Do companies use different methods to evaluate foreign as opposed to domestic investment projects?

STUDY TOOLS

SUMMARY

LO16.1

- Though the major currencies of the world float freely against each other, many countries have adopted exchange rate policies that fix the value of their currency relative to the currencies of other nations.
- A currency appreciates when it buys more of another currency over time. A currency depreciates when it buys less of another currency over time.

- The spot exchange rate applies to immediate currency transactions, whereas the forward exchange rate applies to trades that take place at some future time.
 - The foreign exchange market is the world's largest financial market, attracting many types of participants, including exporters and importers, investors, hedgers, speculators, governments and dealers.
- LO16.2**
- Companies that are exposed to a variety of currencies can experience extra volatility in profitability caused by exchange rate volatility. Hedging this exchange rate risk can reduce the impact of this.
 - Exchange rate risk hedging can be done with a currency hedge trading strategy, or by using a natural hedge. A natural hedge can be created by matching revenues and expenses, or assets and liabilities in the same currency.
 - When a company analyses a capital investment in a foreign currency, it can either discount the foreign currency cash flows using a foreign cost of capital, or it can calculate the domestic currency equivalent of those cash flows using forward rates, and discount them at the domestic cost of capital.

IMPORTANT EQUATIONS

TABLE OF IMPORTANT EQUATIONS

$$16.1 \frac{F-S}{S} \times \frac{360}{N}$$

$$16.2 \frac{(F)^{for/dom}}{(S)^{for/dom}} = \frac{(1+R_{for})^n}{(1+R_{dom})^n}$$

SELF-TEST PROBLEMS

Answers to these 'Self-test problems' and the 'Concept review' questions throughout the chapter appear on the Student Companion Website (<http://login.cengagebrain.com>) or via your instructor.

- ST16-1** Suppose the spot exchange rate equals ¥100/\$, and the six-month forward rate equals ¥101/\$. An investor can purchase a Treasury bill that matures in six months and earns an annual rate of return of 3%. What would be the annual return on a similar Japanese investment?

QUESTIONS

- Q16-1** Define a *multinational corporation (MNC)*. What additional factors must be considered by the manager of a MNC that a manager of a purely domestic company is not forced to face?
- Q16-2** Who are the major players in foreign currency markets, and what are their motivations for trading?
- Q16-3** Suppose that an exchange rate is quoted in terms of euros per pound. In what direction would this rate move if the euro appreciated against the pound?
- Q16-4** Explain how triangular arbitrage ensures that currency values are essentially the same in different markets around the world at any given moment.
- Q16-5** In what sense is it a misnomer to refer to a currency as 'weak' or 'strong'? Who benefits and who loses if the yen appreciates against the pound?
- Q16-6** What does a spot exchange rate have in common with a forward rate, and how are they different?

- Q16-7** What does it mean to say that a currency trades at a forward premium?
- Q16-8** In terms of risk, is an Australian investor indifferent as to whether to buy an Australian government bond or a British government bond? Why or why not?
- Q16-9** If the euro trades at a forward premium against the yen, explain why interest rates in Japan would have to be higher than they are in Europe.
- Q16-10** Interest rates on risk-free bonds in the United States are about 2%, whereas interest rates on Swiss government bonds are 6%. Can we conclude that investors around the world will flock to buy Swiss bonds? Why or why not?
- Q16-11** A Japanese investor decides to purchase shares in a company that trades on the London Stock Exchange (LSE). The investor's plan is to hold these shares for one year, sell them and convert the proceeds to yen at year's end. During the year, the pound appreciates against the yen. Does this enhance or diminish the investor's return on the shares?

PROBLEMS

EXCHANGE RATE FUNDAMENTALS

- P16-1** One month ago, the Mexican peso (Ps)-US dollar exchange rate was Ps9.0395/\$ (\$0.1106/Ps). This month, the exchange rate is Ps9.4805/\$ (\$0.1055/Ps). State which currency appreciated and which depreciated over the last month, then calculate both the percentage appreciation of the currency that rose in value and the percentage depreciation of the currency that declined in value.
- P16-2** Using the data presented in **Figure 16.5**, calculate the spot exchange rate on Thursday between Canadian dollars and British pounds (in pounds per Canadian dollar).
- P16-3** On Thursday, the exchange rate between the Canadian dollar and Japanese yen was C\$0.0098/¥, and on Friday the exchange rate was C\$0.0099/¥. Which currency appreciated and which depreciated?
- P16-4** Recently, a financial newspaper reported the following spot and forward rates for the Japanese yen (¥).

Spot:	\$0.007556/¥ (¥132.34/\$)
1-month:	\$0.007568/¥ (¥132.14/\$)
3-month:	\$0.007593/¥ (¥131.71/\$)

Supply the forward yen premium or discount (specify which it is) for both the one- and three-month quotes as an annual percentage rate.

- P16-5** You are quoted the following series of exchange rates for the US dollar (\$), the Canadian dollar (C\$) and the British pound (£):

US\$0.6000/C\$	C\$1.6667/US\$
US\$1.2500/£	£0.8000/US\$
C\$2.5000/£	£0.4000/C\$

Assuming that you have US\$1 million in cash, how can you take advantage of this series of exchange rates? Show the series of trades that would yield an arbitrage profit, and calculate how much profit you would make.

LONG-TERM INVESTMENT DECISIONS

P16-6 A German company manufactures a specialised piece of manufacturing equipment and leases it to a UK enterprise. The lease calls for five end-of-year payments of £1 million. The German company spent €3.5 million to produce the equipment, which is expected to have no salvage value after five years. The current spot rate is €1.5/£. The risk-free interest rate in Germany is 3%, and in the UK it is 5%. The German company reasons that the appropriate (German) discount rate for this investment is 7%. Calculate the NPV of this investment in two ways.

- a First, convert all cash flows to pounds, and discount at an appropriate (UK) cost of capital. Convert the resulting NPV to euros at the spot rate.
- b Second, calculate forward rates for each year, convert the pound-denominated cash flows into euros using those rates, and discount at the German cost of capital. Verify that the NPV obtained from this approach matches (except perhaps for small rounding errors) that obtained in part (a).

CASE STUDY

INTERNATIONAL FINANCIAL MANAGEMENT

Five years after completing your university degree, you accept an exciting new job with the multinational company Rangsit Trading Incorporated. This new position will involve a great deal of travel, along with some other challenging responsibilities. Part of your job function is to set company policy to manage exchange rate risk. As such, you decide that you need to become fluent in the following topics.

ASSIGNMENT

- 1 First, you decide to review basic exchange rate terminology.

a Describe fixed and floating exchange rate systems. What are some problems with these systems?

b Describe a managed floating rate system.

c Describe a currency board arrangement system.

- 2 Next, you review the interest rate parity relationship and describe interest rate parity.

REAL-WORLD CASE STUDY

'PLANE' AND SIMPLE?

The following extract from the Qantas website provides a summary of how Qantas describes itself:

Founded in the Queensland outback in 1920, Qantas has grown to be Australia's largest domestic and international airline. Registered originally as the Queensland and Northern Territory Aerial Services Limited (QANTAS), Qantas is widely regarded as the world's leading long distance airline and one of the strongest brands in Australia.

We have built a reputation for excellence in safety, operational reliability, engineering and maintenance, and customer service.

The Qantas Group's main business is the transportation of customers using two complementary airline brands – Qantas and Jetstar. We also operate subsidiary businesses including other airlines, and businesses in specialist markets such as Q Catering.

Our airline brands operate regional, domestic and international services. The Group's broad portfolio of subsidiary businesses ranges from Qantas Freight Enterprises to Qantas Frequent Flyer.

We employ over 30,000 people with approximately 93 per cent of them based within Australia.⁵

As a global business, Qantas is significantly exposed to currency risk. However, there is debate about the impact of exchange rates on the business. For example, as the following article demonstrates, the CEO and a former chief economist of the business did not agree about whether or not a strong Australian dollar was good for the business.

HIGH DOLLAR GOOD FOR QANTAS

On Wednesday I attended a speech in which Qantas chief Alan Joyce presented a view that a high Australian dollar was bad for the airline.

There were two main takeaways from the speech, and the question and answer session that followed. The first is that Joyce is better at speaking off the cuff. This is not to say the speechwriters at Qantas are bad – I know them well and they are very good at what they do.

The second is that he appears to be receiving the wrong advice about the impact of the Australian dollar on the airline's business. A strong Australian dollar is unambiguously good for Qantas.

EXCHANGE COMPLEXITIES

The wrong advice Joyce has received, I suspect, is a function of the very complex impact that the exchange rate has on the airline's business. And I suspect he is not the only CEO who has received wrong advice on the impact of exchange rates.

To unravel this exchange rate complexity, one must not only know and understand the revenue and cost streams that are denominated, directly or indirectly, in foreign currency, but also the extent to which the exchange rate exposure is interconnected with other exposures, such as energy prices, the economy and interest rates.

REVENUE EFFECTS

Let me set out the complexity. First, a strong Australian dollar reduces foreign currency-denominated revenue. Qantas sells to passengers from all over the world and they typically pay in their home currencies.

As long as these home currency airfares are not adjusted for exchange rate movements, and generally they aren't, a strong Australian dollar against those currencies will result in lower Australian dollar revenue.

Qantas' international freight business generates revenue that is almost exclusively in

⁵ Qantas. Used with permission. Sourced from <http://www.qantas.com.au/travel/airlines/company/global/en>.



US dollars or in currencies heavily tied to the US dollar. A strong Australian dollar therefore also results in lower freight revenue.

The exchange rate has very little impact on the airline's domestic and regional revenue streams, and the revenue generated from international airfares paid by Australians. The adverse revenue effect is therefore limited to just one segment of the international business.

COST EFFECTS

A strong Australian dollar also reduces costs denominated in foreign currency. The biggest foreign currency costs are in US dollars and include fuel, operating leases, capacity hire, spare parts and aircraft purchases. These costs are born by all segments of the business, including international, domestic and regional.

There are also port and route-related costs denominated in foreign currency that pertain to the international business only, including those attributable to ground handling, station engineering, airport charges, route navigation, catering, use of overseas airspace and running overseas offices.

Qantas also enjoys indirect cost benefits from a strong Australian dollar. Many costs are paid for in Australian dollars but are affected by currency movements because the airline's suppliers pay for them in foreign currency.

These include the cost of road vehicles operated by Qantas, and IT, communications and other electronic equipment. When the Australian dollar is stronger some of the benefits of that strength are passed through into lower Australian dollar prices.

Overall, a stronger Australian dollar unambiguously results in Qantas group costs falling by more than revenue, leaving the company better off. This is mainly because the favourable cost effect impacts the whole business, while the adverse revenue effect impacts a much smaller segment of the business.

PASSENGER MIX

A strong Australian dollar generally does not affect the total number of passengers travelling by air, only the mix of passengers. When the Aussie dollar is stronger there are more Australians travelling abroad than foreign passengers travelling inbound.

As Qantas has a dominant position in the Australian market, a strong dollar that raises outbound and reduces inbound travel is good for the Qantas group because it strengthens the demand segment in which it has the greatest revenue penetration.

About the only negative on the passenger mix front is that strong outbound travel may come at the expense of domestic leisure travel. Qantas is in a superior competitive position domestically than internationally, and so would prefer strong domestic demand over international.

INTERDEPENDENT EXPOSURES

The Australian dollar is high because the oil price and other commodity prices are relatively elevated; our economy is outperforming most others; Australia attracts foreign capital because our interest rates are expected to be higher in the immediate future; and it appears that the Australian dollar's status as a currency from which to flee when global financial risk is heightened has weakened.

What this means for Australian airlines is that the exposure to the exchange rate is inextricably linked to fuel, interest rate and real economy exposures and that there are considerable opportunities to take advantage of the natural hedges generated as a result of these linkages.

In a world that appears to be experiencing significantly greater volatility in financial and commodity markets, this presents Australian carriers with an enormous advantage – one that they can use to overcome the fact they are at a considerable unit labour cost disadvantage.

Qantas



ASSIGNMENT

- 1** Given this background about the business, and what you have learned in Part 5, identify the key issues that drive Qantas' strategic plans.
- 2** How would these have affected the company's financial plans?
- 3** Assess whether the current AUD–USD exchange rate is having a beneficial impact on the company.
- 4** Based on what you have learned in Part 5, what could the company do to manage these risks and the issues you have identified in questions (1) and (2) above?

17

MERGERS, ACQUISITIONS AND CORPORATE CONTROL

WHAT COMPANIES DO

THE DEAL THAT MIGHT HAVE BEEN – BHP BILLITON'S BID FOR RIO TINTO COLLAPSES

Had the deal been successfully completed, Australia's BHP Billiton Ltd's \$140 billion hostile takeover bid for fellow mining company, Britain's Rio Tinto, launched in November 2007, would have been the third-largest takeover in history. Instead, the bid's failure and withdrawal at the end of 2008 resulted in the largest failed takeover attempt ever, and left the shareholders of both companies feeling bruised. The merger seemed to make sense when launched at the peak of the mining industry's global business cycle. But by 2008 it had fallen victim to plunging share and commodity prices, worldwide economic contraction, opposition from powerful national and business interests intent on scuttling a merger between the world's first- and third-largest mining companies, and the desire of Rio Tinto's board and management team to remain independent.

When BHP Billiton approached Rio Tinto's board of directors on 7 November 2007 with an offer to exchange three BHP shares for each Rio Tinto share, this represented a 14% premium over Rio Tinto's share price the

day before. Rio's board immediately rejected the offer as inadequate. Undeterred, BHP followed up with an identical tender offer targeted directly at Rio Tinto's shareholders. It announced that it had lined up a high-powered set of investment and commercial banks to advise BHP on its takeover strategy and to provide financing for a proposed \$30 billion buyback of shares in the combined company, to be executed if and when the merger was completed. BHP also described how it would integrate the two companies, and predicted that it would be able to generate synergies – cost savings, increased sales and more productive investment spending – of \$3.7 billion per year.

Unfortunately for BHP, several large mineral-consuming nations and businesses concluded that the proposed synergies would actually result from price increases for iron ore and other key products, and they challenged the proposed merger on antitrust grounds. These opponents pointed out that a merged BHP–Rio Tinto would control almost 40% of the world's supply of iron ore, and would leave the



industry highly concentrated with just two companies controlling almost 80% of market share. The Chinese state-owned company Chinalco went so far as to pay \$14.1 billion in February 2008 to buy Rio Tinto's UK-listed subsidiary, to ensure that Chinese interests would be represented in a combined BHP–Rio Tinto. The European Union's Competition Commission also opened a formal investigation of the merger and signalled its plans to oppose the deal in court.

Meanwhile, the market capitalisations of both BHP and Rio Tinto fell by more than a third during 2008, as the global financial crisis pummelled share prices and slowing growth

sharply cut worldwide demand for minerals. In December 2008, BHP was forced to withdraw its offer in order to focus on cutting costs in its own operations. The takeover saga, the bid's ultimate collapse and the recession left Rio Tinto so badly weakened that the company was forced to cut its 2009 capital investment spending plans from \$9 billion to \$4 billion, and to search for ways of trimming its \$37 billion in debt – which in February 2009 actually exceeded its \$36 billion share market capitalisation. The year 2008 saw a record number and value of failed takeover bids, and the BHP–Rio Tinto deal that got away was the largest of them all.¹

LEARNING OBJECTIVES

After studying this chapter, you should be able to:

- LO17.1 describe the most important forms of corporate control transactions and distinguish between transactions that integrate two businesses and those that split up an existing single business
- LO17.2 discuss the differences between horizontal, vertical and conglomerate mergers
- LO17.3 explain the different methods of payment acquirers use to execute mergers and acquisitions, and discuss how returns to target and bidder company shareholders differ between cash and share mergers
- LO17.4 contrast the motivations of managers who implement value-maximising mergers and acquisitions to those who execute non-value-maximising combinations
- LO17.5 describe the most important regulations that govern corporate control activities, and explain why international corporate control regulations have become much more important recently.

As its name implies, corporate control refers to the monitoring, supervision and direction of a corporation or other business organisation. The most common change in corporate control results from the combination of two or more business entities into a single organisation, as happens in a merger or acquisition. A change in corporate control also occurs with the consolidation of voting power within a small group of investors, as found in going-private transactions such as leveraged buyouts (LBOs) and management buyouts (MBOs). Transfer of ownership of a business unit with a divestiture and the creation of a new corporation through a spin-off are other ways to bring about such a change.

The forces effecting changes in corporate control and the resulting impact on the business community present some of the most interesting and hotly contested debates in the field of finance. For example, the corporate control contest for RJR Nabisco captivated corporate America in late 1988,

¹ We thank Anil Shrivdasani, Ben Ee, Amanda Gonzales, Ray Groth and Ged Johnson for their help and insights.

spawned a book and a movie about the takeover,² and remains a source of debate for academics and politicians concerned about the social benefit of corporate control activities. We address the causes and consequences of changes in corporate control in this chapter, as well as provide real-world examples of the merger/acquisition process and the technical aspects a corporate manager must consider before making decisions regarding corporate control changes.

In this chapter, we study **corporate control** events, which are related to the monitoring, supervision and direction of a business organisation. The most common change in corporate control is the combination of two or more business entities into a single organisation, as happens in mergers and acquisitions (M&A), which are the main focus of this chapter. A change in corporate control also occurs with the consolidation of voting power within a small group of investors, as found in going-private transactions, such as leveraged buyouts (LBOs) and management buyouts (MBOs). Transfer of ownership of a business unit with a divestiture and the creation of a new corporation through a spin-off are other ways to bring about such a change. The chapter concludes with a brief look at corporate governance; that is, the laws, practices and institutions that determine how – and in whose interests – companies are operated. As the chapter demonstrates, M&A markets around the world move in cycles which reflect changes in economic conditions and business cycles. However, the key insights from different transactions continue to be relevant decades (and often centuries) later – there are great learnings available from looking at older, market-changing transactions.

Before examining mergers and acquisitions in detail, we start by defining some basic terms. A **takeover** is any transaction in which the control of one entity is taken over by another. A takeover can be a friendly merger negotiated between the boards of directors of two independent corporations, or it can be an aggressive and unwanted offer by one company to buy another. An **acquisition** is the purchase of resources by a business enterprise. These resources may be new assets purchased from the producer, assets (such as a plant or a machine) currently owned by another company, or another company that is acquired in its entirety (commonly known as a merger).

The term **merger** applies to a transaction in which two or more business organisations combine into a single entity. Most often, the term *merger* is reserved for a transaction in which one corporation takes over another upon the approval of both companies' boards of directors and shareholders after terms are negotiated in a definitive merger agreement. The company making the acquisition is often called the *acquirer* or *bidder*, and the company being acquired is the *target*. A **vertical merger** combines two companies with a current or potential buyer-seller relationship. In July 2010, Google announced plans to acquire ITA Software, a company that produces the software behind many online travel sites. This is an example of an upstream vertical merger because Google purchased a company that provides a service that is necessary before consumers can use travel sites to book flights (sites that they may find through Google's search engine). The very same month, First Solar, a manufacturer of thin film solar modules, acquired NextLight Renewable Power, a company involved in the construction of large-scale solar power projects. Essentially, NextLight was a potential customer for First Solar, so that acquisition is an example of a downstream vertical merger. In contrast, a **horizontal merger** combines two companies in the same industry, such as the 2010 merger of Continental and United Airlines. Finally, a **conglomerate merger** joins two companies in different lines of business. General Electric was formed by mergers that took place over decades, with the resulting conglomerate company producing everything from washing machines to jet engines to nuclear turbines.

corporate control
The monitoring, supervision and direction of a corporation or other business organisation

takeover
A transaction in which the control of one entity is taken over by another

acquisition
The purchase of resources, assets or another company

merger
A transaction in which two or more business organisations combine into a single entity

vertical merger
Companies with current or potential buyer-seller relationships combine to create a more integrated company

horizontal merger
A combination of competitors within the same industry

conglomerate merger
Unrelated diversification mergers that occur between companies in completely different lines of business

² Both the book and film were entitled *Barbarians at the Gate*.

LO17.1 ➤ 17.1 MERGER WAVES AND INTERNATIONAL ACQUISITION ACTIVITY

In some years, merger activity reaches such a frenzy that there seems to be daily news of yet another dramatic offer from one company to buy another. In other years, activity slows down, often in response to a weak economy. These ebbs and flows in acquisition activity are known as merger waves. As one of the largest M&A markets, the United States provides useful historical data with which to analyse these trends. For example, we see in **Figure 17.1b** that US M&A activity increased dramatically throughout the 1990s, with the number of transactions per annum reaching a new high in 2000, near the peak of the internet/technology bubble. Acquisitions then decreased (in both value and number) during the recession of the early 2000s, only to pick up again in the mid 2000s and then drop once more during the 2008–2009 recession. Activity then began to pick up gradually, from early 2010, and peaked in 2017 before falling slightly in 2018.

FIGURE 17.1A WORLDWIDE TRENDS IN M&A ACTIVITY: BY TOTAL VALUE OF M&A TRANSACTIONS AND BY TOTAL NUMBER OF TRANSACTIONS

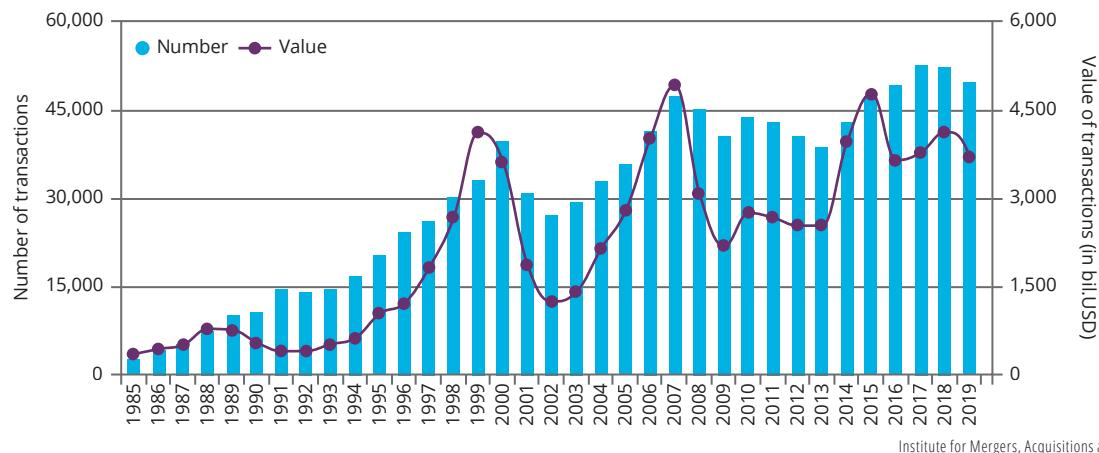


FIGURE 17.1B NORTH AMERICAN TRENDS IN M&A ACTIVITY: BY TOTAL VALUE OF M&A TRANSACTIONS AND BY TOTAL NUMBER OF TRANSACTIONS

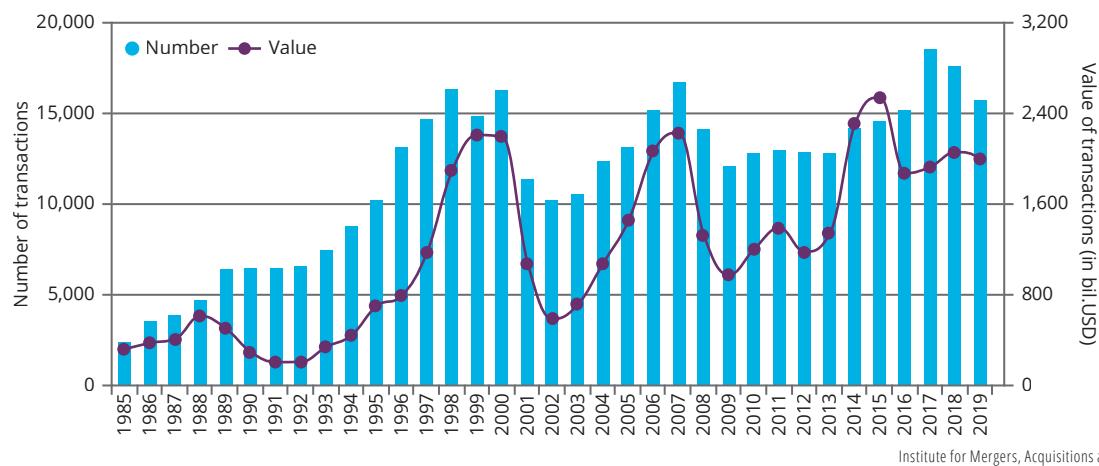
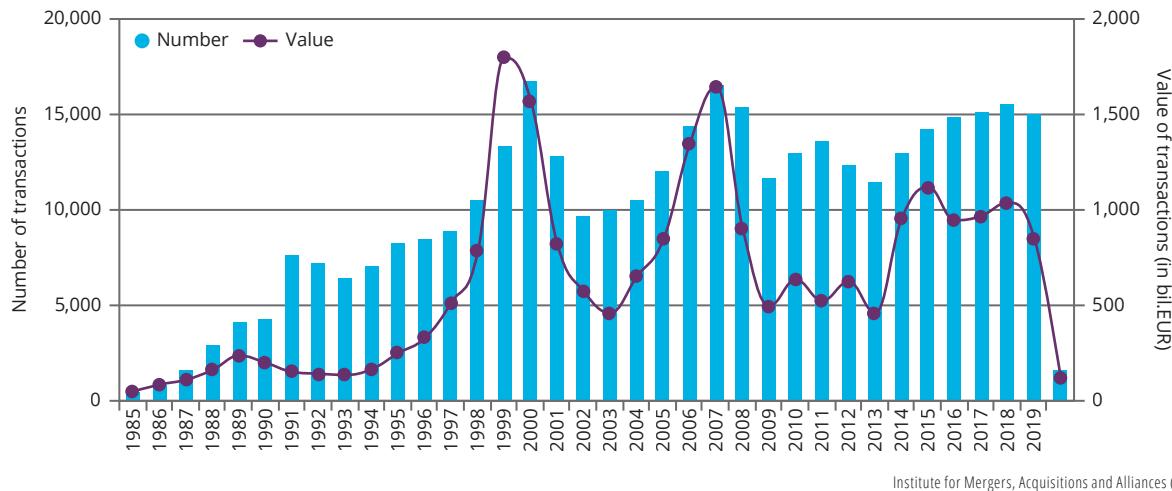


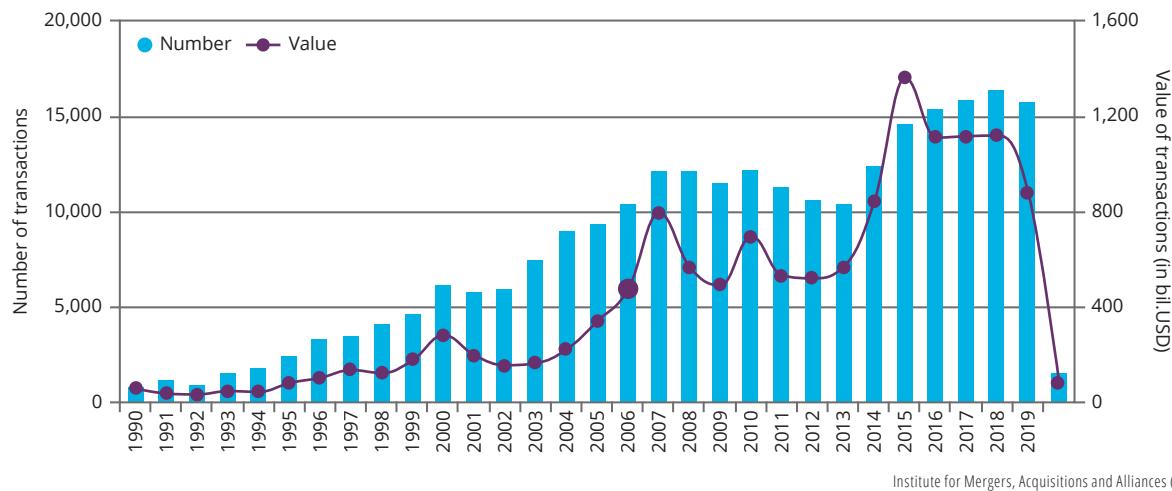


FIGURE 17.1C WESTERN EUROPE TRENDS IN M&A ACTIVITY: BY TOTAL VALUE OF M&A TRANSACTIONS AND BY TOTAL NUMBER OF TRANSACTIONS



Institute for Mergers, Acquisitions and Alliances (IMAA).

FIGURE 17.1D ASIA-PACIFIC TRENDS IN M&A ACTIVITY: BY TOTAL VALUE OF M&A TRANSACTIONS AND BY TOTAL NUMBER OF TRANSACTIONS



Institute for Mergers, Acquisitions and Alliances (IMAA).

and 2019. As Figure 17.1b demonstrates, transaction value (in US dollars) followed a very similar pattern. Since the US market accounts for such a large part of the global market, it is not surprising that global M&A activity seems to have followed similar patterns to the US. The European market, which is the next biggest M&A market, also benefited from major growth in the 1990s, although it peaked slightly earlier than the US (in 1999 rather than 2000). The European market also recovered over the early to mid 2000s, before recession hit in 2008–2009. However, as shown in Figure 17.1c, as European economic growth performance would suggest, the European M&A market has not been able to recover as well as the US market. In contrast, although it was a smaller market, the Asia-Pacific M&A market has grown dramatically since the 1990s; recovering relatively quickly from the internet/technology bubble and growing quite rapidly over the next couple of decades (see Figure 17.1d). It is now almost as large as the European M&A market by both number and value of transactions.

Three economy-wide explanations for the ebbing and flowing of overall merger activity have been put forth. The first explanation suggests that changes in technology, such as the growing importance of internet commerce in the 1990s, often lead to numerous alliances and acquisitions, as companies seek to strategically position themselves in the new economy. Economic or regulatory changes also can lead to a flurry of merger activity. For example, the relaxing of the Glass-Steagall banking regulations in the 1990s opened the door for commercial banks to enter sectors such as insurance and security issuance that had previously been off limits. This naturally also led to mergers between companies in these various industries.

A second explanation of merger waves suggests financial market conditions, such as the ease with which companies can obtain funding for acquisitions or the relative strengths of currencies, will either encourage or discourage M&A activity. Merger waves often occur when the share market is near a recent high (because when share prices are high, companies often find it easier to issue new equity at a reasonable price) and when debt markets are very liquid (at which time the cost of debt is often relatively low). Foreign acquisition of assets in a given country also increases following a drop in home country currency values, since the foreign currency is able to buy more in domestic currency terms. For example, more US companies became targets when the dollar depreciated in 2007, but this trend waned as the dollar grew stronger in 2008 and 2009.

A third explanation of merger waves is related to behavioural finance. When targets or entire industries are believed to be undervalued (that is, current share price is below its true value), these companies become attractive targets, under the assumption that the valuation will eventually correct itself. Note that this explanation implies that the market is at least sometimes inefficient and therefore incorrectly prices target shares. Conversely, companies that believe their shares are overvalued by the market may attempt to use their shares as currency to purchase the assets of another company. For example, if a share's true value is \$10 but it temporarily trades at \$15, if managers can purchase a fairly valued asset with their shares, the company can, to some extent, lock in the \$15 value. The behavioural explanation implies that arbitrage activity does not swiftly eliminate inefficient mispricing of ordinary shares. Consequently, one must be cautious when considering this explanation of merger waves. However, AOL's acquisition of Time Warner in 2000 provides a merger example that suggests this occurs in some cases.

FIGURE 17.2 RECENT TRENDS IN M&A ACTIVITY IN AUSTRALIA: BY TOTAL VALUE OF M&A TRANSACTIONS AND BY TOTAL NUMBER OF TRANSACTIONS

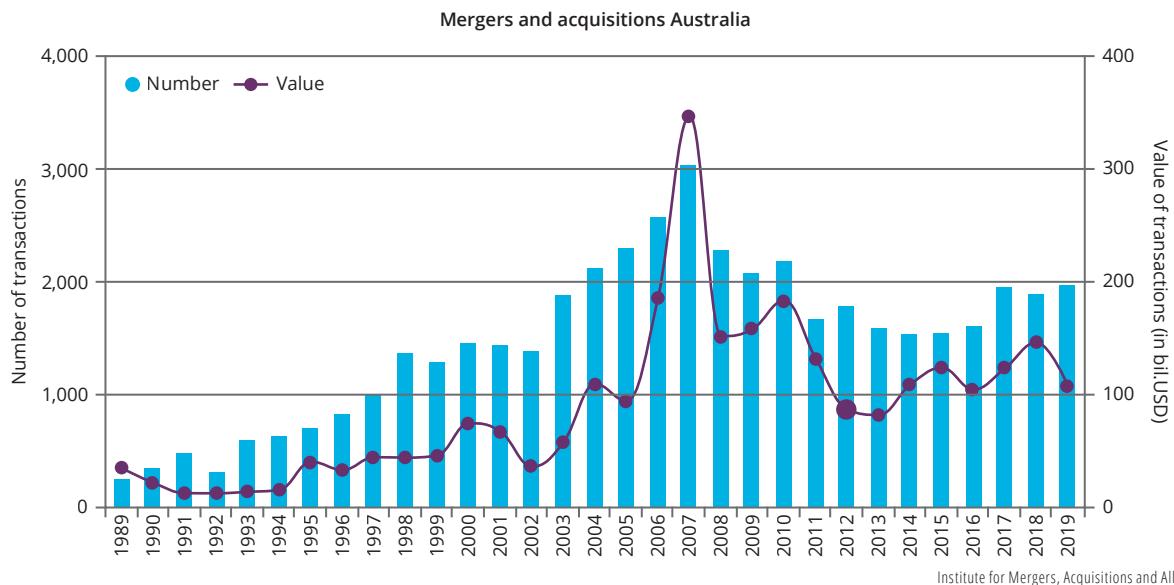


Figure 17.2 shows the recent trends in M&A activity in Australia, both by transaction value and by number of transactions. Comparing the market to the US data, we see that the Australian market is substantially smaller. Although the Australian M&A market is not performing anywhere near the highs of 2007, the market has increased by number of transactions from a low in 2014 and 2015. However, the value of transactions has dipped back down to trend around US\$100 billion.

17.1a INTERNATIONAL ACTIVITY

Historically, the US and North American markets have tended to dominate the global M&A market. This still appears to be the case, as highlighted by **Figure 17.1**, which suggests that North American markets accounted for about half of the deals, by value, in 2019.

The amount of cross-border merger activity has increased dramatically in recent decades. **Figure 17.3** presents cross-border M&A deals, compared to total M&A deals around the world, between 2000 and early 2017. Over the period, cross-border deals have accounted for between 18.5% and 25.7% of worldwide deals.

As further proof of the growing importance of international M&A, **Figure 17.4** lists the top 10 corporate M&A transactions around the world. Many of these involve companies based outside of the United States.

Figure 17.5 lists the top 10 corporate M&A transactions in the Asia-Pacific. As it demonstrates, the market is dominated by transactions in Hong Kong and China, but these are much smaller than the top global transactions.

FIGURE 17.3 PERCENTAGE OF CROSS-BORDER M&A TO TOTAL ANNOUNCED WORLDWIDE M&A (2000 TO FEBRUARY 2017)

YEAR	WORLDWIDE M&A DEALS	CROSS-BORDER M&A	% CROSS-BORDER DEALS
2000	16,346	4,003	24.49%
2001	18,464	4,637	25.11%
2002	15,460	3,593	23.24%
2003	16,855	3,800	
2004	20,293	4,841	23.86%
2005	30,706	7,740	25.21%
2006	41,080	10,327	25.14%
2007	46,691	12,012	25.73%
2008	41,419	131,620	24.20%
2009	35,640	7,080	19.87%
2010	46,436	9,300	20.03%
2011	51,419	10,224	19.88%
2012	52,632	9,967	19.03%
2013	51,701	9,549	18.47%
2014	56,202	10,738	19.11%
2015	59,264	11,435	19.30%
2016	58,643	11,864	20.23%
2016YTD	8,309	1,607	19.34%
2017YTD	8,119	1,607	21.05%

Source: S&P Global Market Intelligence. S&P® is a registered trademark of Standard & Poor's Financial Services LLC. All rights reserved.

FIGURE 17.4 TEN LARGEST M&A TRANSACTIONS, RANKED BY VALUE

RANK	YEAR	ACQUIRER NAME	TARGET NAME	VALUE OF TRANSACTION (IN BIL. USD)	VALUE OF TRANSACTION (IN BIL. EUR)
1	1999	Vodafone AirTouch PLC	Mannesmann AG	202.7	204.7
2	2000	America Online Inc	Time Warner	164.7	160.7
3	2013	Verizon Communications Inc	Verizon Wireless Inc	130.2	100.5
4	2007	Shareholders (Spin out)	Philip Morris Intl Inc	107.6	68.1
5	2015	Anheuser-Busch Inbev SA/NV	SABMiller PLC	101.5	92.3
6	2007	RFS Holdings BV	ABN-AMRO Holding NV	98.2	71.3
7	1999	Pfizer Inc	Warner-Lambert Co	89.6	85.3
8	2017	Walt Disney Co	21st Century Fox Inc	84.2	72.5
9	2016	AT&T Inc	Time Warner Inc	79.4	72.9
10	2019	Bristol-Myers Squibb Co	Celgene Corp	79.4	69.7

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FIGURE 17.5 TEN LARGEST M&A TRANSACTIONS, RANKED BY VALUE ACROSS THE ASIA-PACIFIC

RANK	YEAR	ACQUIRER	NATION	TARGET		VALUE (IN BIL. USD)	VALUE (IN BIL. EUR)		DEAL STATUS
1	2014	CITIC Pacific Ltd	Hong Kong	CITIC Ltd	China	42.2	32	25.5	Completed
2	2000	Pacific Century CyberWorks Ltd	Hong Kong	Cable & Wireless HKT	Hong Kong	37.4	38.4	23.5	Completed
3	2015	Spin-off	Hong Kong	Cheung Kong (Hldg) Ltd- Ppty	Hong Kong	36.9	32.7	24	Completed
4	2000	China Telecom Hong Kong Ltd	Hong Kong	Beijing Mobile,6 others	China	34.2	39.7	23.8	Completed
5	2008	China Unicom Ltd	Hong Kong	China Netcom Grp(HK)Corp Ltd	Hong Kong	25.4	16.4	13.0	Completed
6	2015	Cheung Kong(Holdings)Ltd	Hong Kong	Hutchison Whampoa Ltd	Hong Kong	23.6	20	15.6	Completed
7	2015	China Tower Corp Ltd	China	China-Telecommun tower asts	China	18.3	16.1	12	Completed
8	2012	China Telecom Corp Ltd	China	China Telecom Corp-3G Assets	China	18	14.4	11.4	Completed
9	2008	Westpac Banking Corp	Australia	St George Bank Ltd	Australia	17.9	11.6	9.2	Completed
10	2014	Investor Group	China	Sinopec Sales Co Ltd	China	17.5	13.5	10.7	Completed

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LO17.1

CONCEPT REVIEW QUESTIONS

- What are three explanations for merger waves? Which of these provides the best explanation for the decline in M&A activity during the global financial crisis and recession?
- Figure 17.3 show that companies are much more likely to acquire other companies in the same region than they are to acquire companies from another region. Why do you think this is the case?

THINKING CAP QUESTIONS

- What conditions contribute to a robust M&A environment?
- Why did M&A activity shrink so dramatically in 2007–2008, during the financial crisis?

17.2 WHY DO COMPANIES MAKE ACQUISITIONS?

If you were in charge of the world economy, one of your goals would be to place assets into the hands of the investors or companies that value them the most. This would allow the economy to be most productive and efficient. Given that no one person organises the economy, other means such as mergers and acquisitions attempt to accomplish this goal.

The outcome of acquisitions can often be disruptive: companies are sometimes broken up, employees are often laid off and some divisions may be shut down. While painful in the short run, mergers and acquisitions play a very important role in helping an economy allocate resources efficiently. By moving assets to new companies or investors where they can be used more productively, M&A is often good for the economy's health in the long run. For example, mergers and acquisitions, along with resource reallocation more generally, played an important role in transforming the transportation sector from producing horse-drawn carriages in the early 1900s to producing cars, planes and rocket engines decades later.

Managers at a particular company are less concerned about the overall economy's efficiency than they are about their own company's operations. How can their company operate most effectively, often in the face of intense competition? One strategy might involve acquiring a unit of another company, or perhaps an entire company. For example, acquiring an oil refinery can help a chemical company obtain sole ownership of a key input into its production process, to guarantee smooth, on-time production that is not subject to the whims of the oil markets.

This section discusses several justifications for merger and acquisition activity. Note that in the previous section, we discussed explanations for economy-wide trends that drive merger waves. In this section, we dig deeper into explanations of mergers between two companies in any given year, even during years where overall M&A activity is low.

There are three important principles that managers must keep in mind when evaluating an acquisition opportunity. *First, does it increase shareholder value?* In previous chapters, we emphasised that shareholders are the owners of the company, and therefore maximising long-run share price is a fundamental goal of the company. Bearing this in mind, a merger should only be conducted if it increases long-run shareholder value.³ *Second, what price is being paid for the acquisition?* This is, of course, closely related to the first principle. No matter how attractive a target, the acquiring company can destroy value if it overpays. *Finally, is an acquisition really needed to obtain the hoped-for benefit of the merger?* For example, rather than conduct an outright acquisition, can a chemical company instead arrange a strategic alliance or partnership that allows it to access oil reliably as a key input into its production process? Acquisitions can distract management, often cause disruption, involve fees (especially to lawyers and bankers) and can be painful to reverse. If the sought-after outcome can be obtained in some way that is short of a full-fledged merger, it can at times be less expensive and less risky to pursue this alternative course of action. As we explore the common justifications for mergers and acquisitions, keep these three important principles in mind because we will see that not all of the given explanations make economic sense. Note that these explanations are not mutually exclusive; that is, at times they overlap or are in other ways related to each other.

³ Notice that we refer to long-run shareholder value. When a merger is first announced, the initial stock market reaction is often negative, which can be interpreted to indicate that the market believes that the merger will not add value, even in the long run. There may be some cases in which it is justified to pursue an acquisition even though there is an initial negative stock market reaction. However, to pursue such a merger, management must have a convincing argument for why the long-run benefits of a merger are positive, even though the stock market does not recognise this initially. Of course, these arguments should be scrutinised carefully.

17.2a EXPLAINING MERGERS AND ACQUISITIONS

Growth

A common practitioner view is that companies must grow or they will stagnate and eventually die. After all, from the equation for value,

$$\text{Value} = \text{Cash flow}/(r - g)$$

it may seem that if growth (g) increases, so does company value. Mergers are a primary way for a company to grow, by acquiring another company's customers or production capabilities. We note, however, that acquiring growth at a high price can be short-sighted. Growth only increases company value if the acquisition price does not exceed the present value of the cash flows produced by the acquired assets.⁴

Another cautionary consideration about growth is related to managerial agency costs. Managers can increase their power, prestige and even pay by increasing the size of the empire they oversee. Consequently, a recommendation by a divisional manager, or even a CEO, to pursue a project that they claim is central to a company's growth strategy must be tempered by the realisation that the manager may benefit personally from the transaction, and thus have personal incentive to increase company size more than is optimal.

The important question is whether the acquisition increases the company's value. This will be the case if the value of the acquired assets to the acquiring company is greater than the price paid to purchase those assets. In other words, growth acquisitions make sense when they produce positive NPV.

Synergies

synergy

A reduction in costs or increase in revenues that results from a merger

Michael Eisner, the former CEO of Disney, provided perhaps the best definition of **synergy** with his view of the value created by his company's 1995 merger with Capital Cities/ABC: '1 + 1 = 4'. That is, synergies occur when combining two entities produces extra value, so the combination is worth more than the sum of the two separate entities. Synergies sound good. After all, who wouldn't like to create value? However, synergies are very difficult to measure and even harder to obtain. The synergies expected to result from the Disney–Capital Cities/ABC combination were never realised in full. In fact, perhaps '1 + 1 = 1.5' in this case.

FINANCE IN THE REAL WORLD

WHERE MERGERS GO WRONG

In a 2004 study entitled 'Where Mergers Go Wrong',⁵ McKinsey documented that on average, acquirers in mergers pay sellers almost all of the value created by the merger. This takes the form of a premium that usually ranges from 10% to 35% of the target company's preannouncement value. This occurs because the average acquirer in the study substantially overestimated the synergies that would result from a merger.

McKinsey found that revenue synergies are greatly overestimated, with fewer than one-quarter of merger synergies meeting incremental revenue expectations. In addition, few companies account for the revenue 'dis-synergies' that befall merging companies. These could be temporary business disruptions resulting from consolidations, employee turnover and the like. In contrast, two-thirds of mergers achieve within 10% of

⁴ One subtle point is that when evaluating a merger, the cash flows should be measured relative to the cash flows the firm would receive if no merger were to occur. So if, for example, a company were expected to have annual cash flows of -\$1 million if no merger were to occur, and flat cash flows with the merger, then incremental cash flows as a result of the merger would be \$1 million annually.

⁵ See Scott A. Christofferson, Robert S. McNish and Diane L. Sias, 'Where Mergers Go Wrong', *McKinsey Quarterly* (May 2004).



projected cost savings, which are often related to layoffs and branch closings.

The study recommends that companies should take care to maintain customer relationships during the transitional period. When formulating merger plans, assumptions

of synergies and market growth should be challenged, and double checked against overall industry and economic growth. Managers would do well to apply external benchmarks as sanity checks when formulating cost savings and growth assumptions.

Synergies can occur through *cost reductions* and *revenue enhancements*. Combining two companies can reduce costs for several reasons. One is **economies of scale**, which result when relative operating costs are reduced because of an increase in size that allows for the reduction or elimination of overlapping resources. A simple example is provided by IKEA, an organisation that can sell products cheaply because its huge buying power and global presence gives it economies of scale – units are cheaper because IKEA buys so many of them.

Another economy of scale can occur through workforce and related reductions after two companies are merged. For example, the combined company only needs one CFO, one billing department and one branch on the corner of Broad and Main Streets; therefore, they can reduce workforce and branches, ultimately cutting costs. In general, the CEO and senior executive team of a company are the most highly paid staff members. Executive pay scales can be so far skewed from the rest of the workforce that simply eliminating one senior executive team or head office can produce substantial merger cost synergies. Obviously, senior management are well aware of this, and thus often fight to avoid acquisition, or to ensure that they have control in a merger situation.

Economies of scope also create value because of increased size, in this case when a company produces several different goods or internally houses several aspects of the supply chain. For example, a huge company like Johnson and Johnson can afford to have an in-house graphics team at a cost that is lower than if each division individually contracted out graphics work.

Revenue enhancements can lead to synergistic gains when two combined business entities sell more products than they could sell separately. This revenue synergy is often the result of **resource complementarities**, which occur when a company with a particular operating expertise merges with a company with different strengths to create a company that has expertise in multiple areas. A good example of such a complementarity is the 2010 merger of Disney and Marvel. Benefits of the merger include combining Marvel's deep bench of characters with Disney's well-established distribution channels (for movies and collectibles). Cross-selling opportunities can also arise when an acquisition provides a company with access to markets in a new geography or a new demographic.

Cost reductions are often fairly straightforward to predict and document, and in fact, companies often realise nearly all of the predicted cost synergies. In contrast, revenue enhancements are much harder to achieve. The 'Finance in the Real World' box describes a McKinsey study that documents that fewer than half of mergers achieve hoped-for revenue synergies. As has been mentioned, it is also important to verify that a formal merger (as opposed to a joint venture, for example) is necessary to achieve the hoped-for synergies.

Market Position

Mergers often occur when a company attempts to solidify or improve its position in its industry. For example, between 2010 and 2012, Metcash Food and Grocery, the suppliers of the IGA and Super IGA network of supermarkets, embarked on a series of acquisitions to purchase the former Franklins supermarket stores. Its objective was to strengthen and protect its market position in response to the growing threat from Woolworths and Coles supermarket chains following the collapse of the Franklins chain. A similar

economies of scale
Relative operating costs are reduced for merged companies because of an increase in size that allows for the reduction or elimination of overlapping resources

economies of scope
Value-creating benefits of increased breadth of operations for merged companies

resource complementarities
A company with a particular operating expertise merges with a company with another operating strength to create a company that has expertise in multiple areas

phenomenon can occur in slow-growth or unprofitable industries. In this case, an industry often begins to consolidate, leaving fewer companies to compete over shrinking profits. Managers often take the perspective, ‘Consolidate or be consolidated’. In the US in recent years, the drugstore and domestic airline industries have consolidated. In Australia, substantial consolidation has been taking place in the financial planning industry. The introduction of increased regulation and uncertainty about further regulatory change have made it difficult for many small financial planning practices to remain competitive given their increased compliance burden. Thus, many are merging in order to share compliance costs, and others are selling their client lists to larger players at discounted values and exiting the industry. Industry consolidators such as IOOF Holdings Limited (listed on the ASX as IFL) and SFG Australia Limited (listed on the ASX as SFW) have been able to take advantage of these conditions to increase their industry footprints substantially, by acquiring smaller financial planning dealer groups (which in turn comprise a large number of financial planning practices).

Though market position mergers sometimes make good economic sense, there are at least three issues that may limit a potential merger’s viability. First, government antitrust regulations are designed to prohibit a single company (or companies) from gaining sufficient market power to set prices above the competitive level. Consider the proposed US merger of Staples–Office Depot from 1996. With only three companies competing in this industry before the merger, the regulatory authorities denied this acquisition on the grounds that the merged company would have the power to control prices in the office supplies market, with only one (much smaller) competitor to provide price competition. In February 2015, Staples announced new plans to acquire Office Depot, but this was opposed by regulators in December 2015, on the grounds that it would reduce competition and drive up consumer prices. This saga was ongoing – in 2016, Staples was still trying to formulate alternatives that would be acceptable to the regulators, although it never succeeded.⁶

The second issue, which is particularly pertinent to Australia and other countries with a limited number of industry participants, is that of national interest (or control). Often, domestic companies may control so much of the domestic market share that their only viable acquirers are based overseas. However, given their near monopoly positions in the domestic market, acquisition of these companies by foreign bidders could be considered to be against the national interest, as these acquisitions would effectively transfer control of domestic markets and assets overseas. In such cases, the government may intervene to prevent these deals from going ahead. A classic example of this is evident in the story of the demise of Ansett Airlines, which was at one time Australia’s second-largest airline. When it first ran into financial difficulties, the company was partially owned by Singapore Airlines, Air New Zealand and (then) News Corporation. Singapore Airlines offered to buy the airline, but was effectively blocked by both the Australian and New Zealand governments, which were both concerned about their national interests. Air New Zealand was eventually allowed to acquire the company, but it ran into financial difficulties and interference issues with both governments, and eventually had to let Ansett collapse or risk the failure of Air New Zealand as well. Similarly, in April 2011, the Australian government blocked the \$8.4 billion takeover bid for the Australian Securities Exchange that had been made by the Singapore Exchange. This was because the Federal Treasurer believed that the merger would be ‘contrary to the national interest’.

The third issue is the fundamental question of whether the merger increases company value. From the acquirer’s point of view, this means making sure not to pay more than the net present value of incremental cash flows attributable to the merger. From the seller’s perspective, though, it can be a hard pill to swallow; at times selling the company may create more net present value for shareholders than the target could create if it remained independent or instead attempted to acquire another entity.

⁶ For more, see <http://www.fool.com/investing/general/2016/01/04/why-staples-inc-and-office-depot-inc-tumbled-in-20.aspx>; and <https://www.cnbc.com/2016/05/11/staples-office-depot-tank-on-failed-merger.html>. Accessed 9 January 2015.

Relative Valuation

Managers often state that they acquire assets or companies that are undervalued by the market. Some argue that high-value (perhaps overvalued) companies buy low-value (perhaps undervalued) companies.⁷ A company that uses its overpriced shares as currency to purchase undervalued assets on the cheap does, of course, create value, but keep in mind that this implies that the market is inefficient on two counts: in overvaluing the acquiring shares and in undervaluing the target company's shares. There are well-known examples of such market mispricing seeming to occur, such as AOL's famous acquisition of Time Warner in December 1999, when, during the height of the internet boom, AOL's shares were priced at a stratospheric \$191.00 per share (the price fell to \$72 within one year). However, it seems to us that such market mispricings are fairly rare and should not often be the motivation behind a major corporate event such as an acquisition.

Diversification

A diversifying or conglomerate merger occurs when a company acquires assets or an entire company that operates in another industry. For example, in 2008–2009, Philips Electronics (maker of TVs and stereos) purchased a medical device company because senior management thought health care had greater growth potential.⁸ Obvious questions arise from such acquisitions. Does Philips have a comparative advantage in running a medical device company? Can this deal create new value (synergies), or are the underlying businesses too disparate? Will Philips' senior management possibly get distracted as they attempt to run a medical device company, potentially hurting the electronics division? To provide insight into the answers to these questions, we next list several possible advantages of conglomerate form, most of which also have qualifications and possible disadvantages.

Consider two companies, A and B, one of which operates in an industry that does well in boom times (such as yacht building) and another that does well during recessions (such as coupon distribution). Combining the two companies in a diversifying merger will produce more stable cash flows because as A goes up, B goes down, and vice-versa. We learned in Chapter 6 that portfolio diversification is valuable to investors because it enables them to reduce risk for the same expected rate of return. Even so, is there any advantage to having a company that implements the diversification for investors? Given that investors can already hold individual companies A and B in their diversified portfolio, they will not pay more for the combined company that offers just portfolio diversification. There would need to be some other advantage to combining the companies to justify paying a premium for the combined company.

Related to this point, diversifying mergers are sometimes said to reduce risk. Diversification can reduce the variance of cash flows, and yet if share returns are priced by the capital asset pricing model (CAPM; see Chapter 7), then reducing variance alone may not improve share performance.⁹ The CAPM tells us that conglomeration would need to reduce systematic risk (beta risk) or the cost of capital, while at the same time not hurting growth potential, to improve share performance.

⁷ Rhodes-Kropf, Robinson and Viswanathan (2005) measure value based on MB, the market-to-book ratio (the market value of the firm divided by the book value of assets). These authors show that targets do not in fact have low value. They argue that the more correct statement is that 'high MB buys somewhat lower MB' on average. These authors show that high MB firms have a tendency to buy medium-to-high MB firms, while medium-to-low MB firms acquire low MB companies.

⁸ An example of a conglomerate run amuck is Ling-Temco-Vought (LTV). Ling had an electrical contracting business, then bought two others, next bought Temco Aircraft, then bought Chance Vought Aerospace, then added the wire and cable company Okonite and bought Wilson, the sports equipment company – which was also involved in meat packing and pharmaceuticals. Ling later spun each of these Wilson divisions into separate companies traded on the American Stock Exchange; they soon acquired the trader nicknames 'Golfball', 'Meatball' and 'Football', respectively. Ling then added Greatamerica, Post's holding company for Braniff International Airways and National Car Rental, as well as J&L Steel, and it then acquired a series of resorts in Mexico and Colorado. By 1969, LTV had purchased 33 companies, employed 29,000 workers, offered 15,000 separate products and services, and was one of the 40 largest industrial corporations. In the end, after numerous divestitures, what was left of LTV filed for bankruptcy in 2000.

⁹ If corporate diversification reduces the volatility of taxable income, it can reduce expected taxes paid and hence increase firm value. Consider a firm that has two divisions, A and B. Division A earns \$10 million in taxable income in odd years and loses \$10 million in even years. Division B does the reverse (loses \$10 million in taxable income in odd years and earns positive \$10 million in even years). The conglomerate therefore earns exactly zero dollars every year, and never pays taxes.

Now, let's think about the taxes owed if A and B were separate companies. To keep things simple, assume that each company had exactly \$0 in taxable income each of the past few years. Assume this year is 2020 (an even year) and company A earns \$10 million and pays \$3.5 million in taxes (35% tax rate). In 2021 (an odd year), the company loses \$10 million, and 'carries back' this loss to get a refund of the \$3.5 million in taxes it paid in 2020. That is, the government sends company A a \$3.5 million cheque in 2021. What A loses by paying taxes in 2020 and getting a refund in 2021 is the time value of money on \$3.5 million for one year (not to mention the hassle of filing taxes and then filing again for refunds). Assume the discount rate is 10%. A's 'tax cost' is $\$3.5 \text{ million} - \$3.5 \text{ million}/(1.1) = 0.318 \text{ million}$ – that is, \$318,182. This happens every two years in perpetuity, and A's two-year discount rate is 21% ($=1.1^2 - 1$). Therefore, the present value tax cost to A (as of 2014) is $\$318,182/0.21 = \1.52 million . Company B never pays taxes because it loses \$10 million in even years that it carries forward to the next year, completely shielding taxes in odd years. Therefore, as two stand-alone companies, A and B owe the government taxes with a present value of \$1.52 million. If A and B merge into one company, they would not owe any taxes (recall the first paragraph). Therefore, expected tax obligations are lower for conglomerates, as long as the taxable income across divisions is not perfectly, positively correlated.

In some cases, the stability of a conglomerate can result in a better credit rating than would be possible for the individual divisions to obtain on their own. For example, GE maintained a AA+ credit rating even during the depths of the late 2000s recession, in large part more because of the stability of the overall company than because of the stellar performance of each division. Having a high credit rating reflects the ability to borrow relatively cheaply, including providing access to certain segments of the debt markets, such as the commercial paper market. Of course, having a high credit rating is not the primary goal of a corporation, but rather should be viewed in the context of whether it increases company value.

One possible advantage of conglomerate form stems from internal capital markets. That is, if one division of a company has growth opportunities but would struggle to borrow in capital markets, a conglomerate can transfer profits from a division that produces excess cash flow. This could especially be a good thing in developing economies (where the capital markets might not be fully developed) or when capital markets freeze up, such as during the 2008–2009 recession. Thus, internal capital markets potentially offer the advantage of providing capital to cash-poor, growth-rich divisions. However, internal capital markets can also lead to inefficient outcomes if, for example, management uses profits from a healthy division to prop up a failing division that is destroying overall company value. Most evidence seems to indicate that internal capital markets do not add value in mature, well-functioning economies.

There can also be advantages to conglomerate size, such as economies of scale, as previously discussed. The stability of conglomerates can also increase employee job security, at least in the short run. This could be good if it increases employee productivity, but could be bad if the workforce becomes too complacent or protected from competitive pressures. Moreover, it becomes harder to motivate employees in individual conglomerate business units because it is harder to tie share compensation directly to a given division. Finally, large conglomerates can suffer from slow decision processes.

In most cases, the disadvantages of operating in conglomerate form have been thought to outweigh the advantages in recent years. Fewer conglomerates are formed now versus several decades ago, and if anything, existing conglomerates are often broken up.

Managerial Explanations

Sometimes a company will acquire another company in order to acquire a new management team. This is common when expanding into a new country or new industry. Managerial acquisitions can also occur within an industry to acquire young talent. For example, when JP Morgan Chase acquired Bank One in July 2004, one explanation was that it wanted to acquire a young Jamie Dimon, who became CEO and led JP Morgan Chase through the financial crisis of 2008–2009 relatively unscathed. Other managerial explanations of mergers

are more ominous. We already mentioned the empire-building tendencies that are sometimes linked to upper management.

Roll (1986) offers a somewhat different rationale with his overconfidence or **hubris hypothesis of corporate takeovers**. Roll contends that some managers overestimate their own managerial capabilities and pursue takeovers in the belief that they can better manage their target than can its current management team. Acquiring managers then overbid for the target and fail to realise the expected post-merger gains, thereby diminishing shareholder wealth. Thus, the intent of the managers is not contrary to the best interests of shareholders (the managers think they will create value), but the result is still value decreasing.

hubris hypothesis of corporate takeovers

A theory that contends that some managers overestimate their own managerial capabilities and pursue takeovers with the belief that they can better manage their takeover target than the target's current management



Peanut Butter Buys Jam Sandwiches

Let's say Peanut Butter Pty Ltd decides to buy Jam Sandwiches Co. for \$100 million. The deal should generate cost savings because both companies have similar retail markets and can tap the marketing and distribution channels of the other. Also, people tend to pay more for peanut butter and jam sandwiches than they would for each product individually.

Peanut Butter has 10 million shares outstanding and an annual net income of \$50 million, so EPS is \$5. Peanut Butter's current share price is \$100. Jam has 5 million shares outstanding and annual net income of \$15 million.

After-tax synergies: The merger results in savings of around \$5 million annually. Additionally, because of increased demand due to the popularity and convenience of premade peanut butter and jam sandwiches, Peanut Butter's bankers estimate additional synergies of \$2.14 million. Total pre-tax synergies are therefore \$7.14 million. At a tax rate of 30%, after-tax synergies are \$5 million.

Financing the acquisition: Of the \$100 million purchase price, assume Peanut Butter pays Jam's shareholders with \$50 million in cash, and \$50 million in Peanut Butter shares. This involves:

- 1 Issuing \$30 million in new debt. At 10% yield to maturity, this will result in annual interest payments of \$3.0 million each year. For simplicity, we are assuming that the new debt is perpetual (it never retires).
- 2 Withdrawing \$20 million in corporate cash, which was originally earning 5% per year.
- 3 Issuing 600,000 new shares at \$100 each. Use \$50 million of the proceeds to pay Jam's

shareholders, and the remainder to retire \$10 million of Jam's debt, which incurred annual interest at a rate of 6.7% per year. This results in annual interest expense savings of \$1.5 million, or \$1.05 million in after-tax savings (because interest expense is tax deductible, creating a tax shield of $\$450,000 = \$1.5 \text{ m} \times 30\%$).

Adjustments:

- 1 *After-tax depreciation and amortisation from write-ups:* As a result of the merger, Peanut Butter will be taking over four of Jam's plants. Equipment in the plant was purchased for around \$30.0 million, but is valued at \$45.4 million in the takeover. The difference of \$15.4 million is known as a write-up. Assuming that Peanut Butter is able to depreciate this over 10 years, it can deduct depreciation of \$1.54 million per year. Applying a 30% tax rate, this translates to after-tax depreciation from write-ups of around \$1.08 million a year.
- 2 *After-tax interest expense because of new financing:* New financing results in annual interest expense of \$3.0 million per year. After-tax annual interest expense is therefore \$2.10 million a year (30% tax rate).
- 3 *Opportunity cost of cash balances:* The \$20 million used to pay for the acquisition could have been earning 5%, or \$1 million a year pre-tax, \$700,000 per year after-tax.
- 4 *Add interest expense associated with target's debt that is retired:* Saving \$1.05 million in after-tax interest expense will increase earnings going forward.



Total adjustments = - \$1.08 million - \$2.10 million - \$700,000 + \$1.05 million = -\$2.83 million

Compute post-merger EPS:

$$\begin{aligned} & (\text{Bidder net income} + \text{Target net income} + \text{After-tax synergies} - \text{Adjustment}) / (\text{Bidder shares outstanding} \\ & \quad + \text{New shares issued}) \end{aligned}$$

$$= (\$50 \text{ million} + \$15 \text{ million} + \$5 \text{ million} - \$2.83 \text{ million}) / (10 \text{ million} + 600,000) = \$6.34.$$

Given that the original Peanut Butter EPS is \$5, debt to finance part of the acquisition, instead management expects this merger to be accretive. of all shares, also increases EPS in this example, Note that merger synergies are one important though as discussed next, this made the earnings reason that this deal increases earnings. Using riskier because they were levered up.

EPS Accretion

From Main Street to Wall Street, a common benchmark to measure the gains from a merger is how it affects the acquiring company's earnings per share (EPS). To measure this effect, you sum the earnings of the two companies and divide by the sum of the two companies' number of shares outstanding, plus a few adjustments. If the EPS of the acquiring company goes down, the merger is said to dilute EPS (and, implicitly, hurt share price), while if EPS increases, the deal is accretive to earnings. Sometimes analysts implicitly assume that higher EPS necessarily leads to higher share price. But is it true that higher EPS always leads to higher share price? For example, if EPS increases but earnings also become riskier, does share price necessarily increase? Regardless of the answer to that question, managers of the bidding company as well as Wall Street analysts place a great deal of importance on the effects of a merger on the company's earnings. The next section illustrates how to measure those effects.

17.2b CALCULATING THE EFFECT OF A MERGER ON EARNINGS PER SHARE

The following example illustrates how to determine what EPS will be after a merger deal is closed. The key inputs are earnings of bidder and target before the merger, shares outstanding before and new shares issued to complete the merger, and some adjustments that capture merger-related incremental changes to earnings, such as increases due to synergies. Given that earnings are earned over the year, most analysts use a weighted average of shares outstanding over the year (though others may use year-end shares outstanding). The basic calculation looks like this:

$$\begin{aligned} \text{Post-merger EPS} &= (\text{Bidder net income} + \text{Target net income} + \text{After-tax synergies} \pm \text{Adjustments}) \\ &\quad \div (\text{Bidder shares outstanding} + \text{New shares issued}) \end{aligned}$$

The adjustments are calculated as follows:

- 1 Subtract after-tax depreciation and amortisation from write-ups.
- 2 Subtract incremental after-tax interest expense associated with new debt financing.
- 3 Subtract lost opportunity cost of cash balances for cash that is used to finance the acquisition.
- 4 Add interest expense associated with target's debt that is retired and preferred share dividends associated with preferred shares that are liquidated or converted as part of the acquisition.
- 5 Adjustments are sometimes made for one-time acquisition-related charges, but we ignore those here.

To determine the effect of a merger on share price, it is important to consider not just the merger effects on the level of earnings but also to consider whether the merger makes the company's cash flows and earnings riskier. Consider how the method of payment can affect earnings risk. If the acquiring company issues a lot of debt and uses the principal as cash to acquire a target's shares, then (assuming the target's profitability exceeds financing costs) the acquirer will increase its EPS via the acquisition, while the number of shares outstanding will remain constant, so earnings per share will increase. In contrast, the acquirer could instead issue its own shares to purchase the target's equity. In this case, the effect on earnings will be similar (we need to adjust for after-tax interest paid), but the number of shares will increase because of the new shares issued, which will have an effect of reducing EPS in the shares acquisition.

Does this mean that the first method (borrowing to obtain funds to make the purchase) is better than the second method (increasing the number of shares to make the purchase) because it increases EPS more? Not necessarily. As pointed out in Chapter 14, using debt leverages up the transaction, splitting the gains or losses over a smaller number of acquisition shares. While this may increase expected EPS, it also increases the riskiness of EPS, which puts downward pressure on the share price and the P/E ratio. If P/E falls while EPS increases, it is not clear that share valuation will also increase. Therefore, it is not clear that a company's share price will increase just because a deal is EPS accretive.

Having said this, we emphasise that EPS accretion is often desirable. If an acquisition increases EPS because it cuts costs, increases revenue or otherwise increases net present value (NPV), these are positive effects of the acquisition.

LO17.2

CONCEPT REVIEW QUESTIONS

- 3 What characteristics surrounding a merger would lead you to conclude that it is motivated by value-maximising managers rather than non-value-maximising managers?
- 4 What different challenges and pressures might senior management of an acquirer face if the acquiring company is a public versus a private company?
- 5 Given that many conglomerate mergers and corporate diversifications have proven to be failures, why would any manager pursue these objectives? Can you think of any cases where corporate diversification has worked successfully? What distinguishes these cases from the norm?

THINKING CAP QUESTIONS

- 3 Do mergers, on average, succeed or fail from the standpoint of creating new value? If they fail, why?
- 4 What are more important (reliable): revenue or expense synergies?
- 5 Does the interest that a company has to pay if it uses debt to finance an acquisition affect EPS? If so, does the effect dilute earnings or is it accretive?
- 6 In an all-equity deal, excluding synergies and where the acquirer's price-to-equity multiple exceeds the target's price-to-equity multiple, is the deal accretive or dilutive to earnings?

LO17.3

17.3 DO MERGERS CREATE VALUE?

The previous section described proposed explanations of whether and how mergers might increase, or destroy, company value. Only by looking at the data can we determine whether, on net, mergers actually add value. In this section we demonstrate that, by and large, mergers do create value, but this gain accrues almost entirely to target companies, with the shareholders of acquiring companies often losing money.

For mergers to create value, it must be the case that two companies combined are worth more than the two companies are worth separately, once synergies and other merger gains and costs are considered. One way to determine whether value is added is to compare the present value of all future cash flows of the combined company to the sum of the value of bidder's future cash flows plus the present value of target's future cash flows. This valuation, and several others, are discussed next.

When considering whether to attempt to acquire a target, the acquirer must determine what to bid for the target. This bid price is tied to an assessment of the bidder's fair market value. This determination is typically made using one or more of the following valuation methods briefly summarised below.

It is important, of course, to keep track of whether you are determining the equity value or the total company value (or enterprise value) of the target. Total company value equals the value of the target's traded securities, so in simplest terms company value equals equity value plus debt value. Therefore, if we know debt value, it is easy to convert from equity value to company value (by adding debt value to equity value) or vice-versa. Rather than the total company value, investment bankers and other financial professionals often determine **enterprise value**. Enterprise value is roughly company value minus the dollar value of excess cash, where excess means cash that is not needed to operate the company efficiently.¹⁰ That is, enterprise value is the value of the company's underlying operations. Given how difficult it is to determine which cash is excess versus which is needed for operational purposes, enterprise value is usually determined by subtracting all of the target's cash. This concept will be discussed further in the next section.

enterprise value
The total value of the company (including debt, equity and other securities) that would need to be purchased to control the whole target entity

17.3a MERGER VALUATION METHODS

Next, we discuss the following common merger valuation methods:

- *Discounted cash flow*: As discussed in earlier chapters, DCF values a company based on the present value of expected future cash flows, often discounted at the weighted average cost of capital.
- *Public comparables*: Observable market values of comparable companies, typically publicly traded, are used to estimate the market value of the target.
- *Precedent transactions*: The premiums (or discounts) paid in recent acquisitions that involve the target's competitors, or other companies exhibiting similar characteristics, are used as a benchmark for the premium above (or discount below) market value that an acquirer might be expected to pay for the target in a similar transaction. Precedent transactions are often implemented via multiples, as explained below.

As an example, the following excerpts were included in Sun Microsystems's preliminary merger proxy statement following the definitive agreement to be acquired by Oracle:

- 'Credit Suisse calculated [Sun's enterprise] value as a multiple of certain financial data for selected technology companies' in similar technology sectors.'
- 'The calculated multiples included Fully Diluted Enterprise Value as a multiple of Revenue, EBITDA and [operating income] ... The [comparable] companies were selected because they had publicly traded equity securities and were deemed to be similar to Sun in one or more respects including the nature of their business, size, diversification, financial performance and geographic concentration.'

¹⁰ More specifically: Enterprise value = Equity value + Debt + Preferred shares + Minority interest – Cash.

- ‘Credit Suisse also calculated the net present value of Sun’s free cash flows using Sun’s management forecasts [of cash flows] ... In performing this analysis, Credit Suisse applied discount rates ranging from 10.50% to 13.00% based on Sun’s estimated weighted average cost of capital.’
- ‘Credit Suisse also calculated the premiums paid in selected technology [precedent] transactions since January 1 2007 ... four weeks and one day prior to the announcement of the technology transactions.’¹¹

As we begin to think more about company valuations, it is important to discuss in more detail the difference between equity value and enterprise value. Equity value is the value available to shareholders, whereas enterprise value is the company value available to all stakeholders, including creditors, debtors and non-controlling (minority) interest holders. This is an important distinction because often an acquisition will trigger debt covenants requiring that the target company’s debt be repaid in the event of a transfer of control. So, for example, if Company A pays \$10 million for Company B’s equity but Company B also has \$6 million in debt, Company A will then have to pay Company B shareholders \$10 million and also pay Company B debtholders \$6 million. The enterprise value of this transaction is therefore \$16 million. This figure represents the takeover price, including obligations the buyer must satisfy (such as buying out existing debtholders).

Acquirers and investment bankers often use multiples to estimate enterprise value, after which they deduct the market value of the target’s debt to arrive at an estimate of the value of the target’s equity. It is also common to use multiples to calculate equity value. The key determining which multiples calculate equity value and which calculate enterprise value is the denominator of the multiple. A multiple with earnings before interest, taxes, depreciation and amortisation (EBITDA) or revenue in the denominator will calculate enterprise value (that is, enterprise value is the numerator of the multiple) because both EBITDA and revenue are available to all stakeholders. In contrast, a multiple with earnings in the denominator will calculate equity value because earnings are available only to shareholders.¹²



Deciding between Rival Bidders

Situation: You work in internal strategy for Taft Co. and are preparing an acquisition bid for 100% of W. Lee Co. Without synergies, W. Lee is expected to generate \$5 million, \$8 million and \$10 million in after-tax earnings in each of the next three years, respectively. With synergies, these earnings are expected to be \$6 million, \$10 million and \$12 million. Year 4 ($t = 4$) earnings inclusive of synergies will be 3% higher than $t = 3$ earnings, and then earnings are expected to grow by 3% in perpetuity. Taft discounts using a rate of 9%.

W. Lee has two key rivals. The first, with similar financial and operating characteristics and

expected earnings of \$6.1 million next year, was recently acquired for \$210 million. The second rival is similar, except that it is considered to be in a mature, low-growth stage, and is trading at a P/E multiple of 17.3. What acquisition bid do you recommend for W. Lee Co.?

Solution: Use each valuation method to identify an appropriate range:

- *Discounted cash flow:* Discount the next three years’ earnings, including synergies, to arrive at discounted cash flows.¹³

$$[(\$6 \text{ million}/1.09) + (\$10 \text{ million}/1.092) + (\$12 \text{ million}/1.093)] = \$23.19 \text{ million.}$$

¹¹ SEC preliminary merger proxy statement. <http://www.sec.gov/Archives/edgar/data/709519/000119312509107681/dprem14a.htm>.

¹² EBITDA, by definition, represents earnings before subtracting interest expense, and is therefore available to all stakeholders. Specifically, EBITDA is used to pay debtholders (through principal and interest payments) as well as shareholders (through dividends or share repurchases). Earnings, or net income, are available only to shareholders because earnings are net of interest payments to debtholders.

¹³ We are assuming earnings approximate cash flows.



Next, use the growing perpetuity formula and the fact that year 4 cash flows are 3% higher than the year before to find the present value (at year 3) of all the cash flows in year 4 and beyond, then discount that back to the present time: $[(\$12 \text{ million} \times 1.03)/(0.09 - 0.03)] = \206 million , discounted back three years at 9% equals \$159.07 million]. Finally, sum to arrive at the value for the entire company in today's dollars: \$159.07 million + \$23.19 million = \$182.3 million.

- **Public comparables:** The public rival has a P/E multiple of 17.3, which would imply that W. Lee is worth \$86.5 million ($17.3 \times \5 million), quite a bit lower than the DCF estimate. However, we know this rival is low growth, whereas W. Lee is expecting 40% growth in year 1 and 20% growth in year 2. Therefore, the 17.3 multiple may be only appropriate for the terminal value (in year 3), when W. Lee is expected to reach a mature, low-growth stage. Applying this multiple to determine the terminal

value in $t = 3$ yields $17.3 \times \$12 \text{ million} = \207.6 million . This is very close to our year 3 terminal value estimate above using DCF (\$206 million), which reinforces the terminal value estimated in the DCF analysis.

- **Precedent transactions:** Given the similarities between the companies and transactions, to apply precedent transactions we identify the acquisition multiple ($\$210 \text{ million}/\$6.1 \text{ million} = 34.4$) and multiply by W. Lee's earnings to arrive at an estimate: $34.4 \times \$5 \text{ million} = \172 million . Remember, both synergies and a control premium are built into this valuation, which is the likely explanation for why the multiple is so much larger than the public comparable.

Conclusion: The public comparable is not particularly helpful in this analysis, but gives us comfort that our DCF terminal value is reasonable; the DCF and the precedent transactions methods imply a valuation range between \$172 million and \$182 million.

To determine how target and bidder shareholders fare in an acquisition, we look to the market. A positive combined bidder plus target share market reaction implies that the market believes that a merger creates value.¹⁴ Of course, many things can change after the initial merger announcement: bids may be increased, target management may respond positively or negatively to the initial bid, or the form of payment may change (or be announced). Even with these considerations, studying short-term market reactions provides interesting insights into the market's perception of mergers and acquisitions.

17.3b SHAREHOLDER GAINS (OR LOSSES) IN MERGERS – RETURNS TO BIDDER AND TARGET

Figure 17.6 presents the returns earned by shareholders in each of the past three decades. The returns are shown for the bidding company (the company making the acquisition) and also for the target company (the company being taken over). These are two-day returns, for the day of the announcement and the next day. The returns are expressed net of the normal return expected over those two days, so the announcement reactions are considered abnormal returns (above and beyond what the companies would have been expected to earn on those two days).¹⁵

¹⁴ We are assuming that no word has leaked out in advance of the merger announcement. If information leaks out in advance, the market price may have changed prior to the announcement, and there may not be any market reaction on the day of the official announcement. In such a case, it would not be correct to conclude that there are no valuation effects from the merger.

¹⁵ To be more precise, we use each firm's CAPM beta to determine its expected return, which is equal to the risk-free return plus beta times the market risk premium for a two-day interval. Abnormal return is the difference between actual return and expected return.

FIGURE 17.6 AVERAGE ABNORMAL RETURNS TO TARGETS AND BIDDERS IN A TWO-DAY WINDOW

	1980–89	1990–99	2000–10
Bidding company	0.30%	-2.43%	-1.65%
Target company	12.57%	11.69%	21.92%
Combined	5.1%	3.2%	1.19%

Source: SDC and authors' calculations. © Reuters.

We see that targets earn significantly positive abnormal returns when a merger is announced, reflecting the large premium usually offered for target shares. Over the past several decades, targets have experienced abnormal returns averaging about 15% in the two days surrounding the takeover announcement. Not all targets experience substantial gains though.

Figure 17.6 also shows that bidders, in contrast, lose money on average in some decades, and barely break even in others. This implies that any value gains created by the merger are paid almost entirely (sometimes even more) to the target shareholders. In many cases, therefore, bidders appear to pay too large an acquisition premium on average, paying up-front for any gains the market expects the merger to produce. Why might bidders do this? One reason is that few companies seek to be taken over, so it is necessary to pay a control premium in order to buy out target shareholders. A related explanation is that if a bidding war occurs, with two companies both bidding for the same target, then 'in the heat of the moment' bidders have a tendency to offer aggressive prices for the target. This phenomenon is sometimes called the *winner's curse*, in reference to the possibility that when multiple bidders are attempting to buy an asset with an uncertain value, the ultimate winner may well pay a price that is greater than the asset's true value. A third explanation, described in the next section, relates to the frequent use by acquirers of their ordinary shares as acquisition currency. To put these results in context, it is important to remember that **Figure 17.6** presents two-day returns, so it is possible that bidder shareholders eventually earn their reward in the long run (though currently, the market does not expect them to do so – if the market expected long-run gains, they would be reflected in the two-day return).

While acquiring companies may experience negative abnormal returns around the time of the merger announcement,¹⁶ this does not mean that the merger does not create any value. To determine whether the merger creates value, we need to consider the combined bidder and target returns. For example, if a \$9 billion company bidder earns a 0% return when it takes over a \$1 billion target, which itself earns a 10% abnormal return, then the overall merger created a 1% abnormal return ($= (\$9 \text{ billion} \times 0\%) + \$1 \text{ billion} \times 10\%) \div \10 billion). **Figure 17.6** shows that, on average, mergers do create value (but most of this value gain flows to target shareholders on average). This modest value creation is consistent with research by Andrade, Mitchell and Stafford (2001), who show that, on average, there is a 1% improvement in abnormal operating performance (measured by an increase in return on assets) in the year after an acquisition is completed.

17.3c METHOD OF PAYMENT

Just like any other type of investment, a merger must be financed with capital – such as debt, accumulated profits (that is, cash on hand) or newly issued ordinary equity. These components make up the consideration offered in a transaction, and sum to the *transaction value*: the dollar value of all forms of payment offered to the target for control of the company. Cash on hand from retained earnings and/or generated from a debt issuance is used in financing a cash-only deal, where the target's shareholders receive only cash for their shares in a public company or where the target's owner(s) receives cash for the private enterprise. More rarely, the target receives a new issue of debt in exchange for control in a debt-only transaction.

¹⁶ Negative bidder price pressure can be associated with arbitrageurs shorting the bidder's shares and going long the target's shares.

pure share exchange merger

A merger in which shares are the only mode of payment – such acquisition bids are also known as *scrip bids*

The bidding company's shares are the only mode of payment in a share-swap merger, or **pure share exchange merger** (these takeover bids are also known as *scrip bids*). The most ordinary share-swap merger involves the issuance of new shares of the bidder's ordinary equity in exchange for the target's ordinary shares, but payment may come in the form of either preferred shares or subsidiary tracking shares. The number of shares of the surviving company that target shareholders receive is determined by the exchange ratio. For instance, if an acquirer sets an exchange ratio of 0.75 for a target with 100 million shares outstanding, the acquirer will issue 75 million new shares (0.75×100 million) in exchange for the target's shares. If the acquirer's current share price is \$20 and the target's share price is \$12, the transaction value of this merger would be \$1.5 billion ($\20×75 million). An investor who owns 100 shares of the target (\$1,200) would receive acquirer shares worth \$1,500 ($\20×75 shares), a 25% control premium.¹⁷ One advantage of this approach is that if a share deal is structured properly, a share exchange could be tax free even if the target shareholders experience a capital gain, while a cash offer is taxable to target shareholders if they earn a capital gain. However, this depends on the jurisdiction and tax regulations in place. For example, when St George shareholders were offered Westpac shares in a scrip merger bid in 2008 (referred to as a *scrip for scrip rollover* by the Australian Taxation Office), they were able to defer paying capital gains tax until they disposed of their new Westpac shares.

mixed offerings

A merger financed with a combination of cash and securities

Mergers are often financed with a combination of cash and securities in transactions known as **mixed offerings**. For example, in January 2005, SBC Communications offered AT&T shareholders a combination of SBC shares worth \$18.41 per share plus \$1.30/share in cash. Occasionally, target shareholders are also offered a choice for the medium of exchange. For example, target shareholders could be offered the choice of either \$30 cash or 1.25 shares of the surviving company's shares for each share that they hold. This way, the shareholders can decide whether the exchange ratio is sufficient for them to remain shareholders in the surviving company or whether they should take the money and run with the cash offer.

Figure 17.7 indicates that target shareholders fare well in pure share-for-share transactions, and even better in all-cash deals. Bidders, on the other hand, nearly break even when cash is involved in the purchase and lose on all scrip deals. Note also that a higher percentage of bidders earn positive returns in all cash deals.

FIGURE 17.7 ABNORMAL RETURNS TO TARGETS AND BIDDERS IN TWO-DAY WINDOW CONDITIONAL ON METHOD OF PAYMENT (TENDER OFFERS IN SDC, 2000–2010)

	ALL CASH	ALL EQUITY
Target two-day returns	26.96%	12.22%
Bidder two-day returns	-0.72%	-2.24%
Combined two-day returns	2.62%	-0.50%
% deals with positive returns for bidders	45.56%	23.08%
% deals with positive returns for target	93.27%	81.25%

Source: SDC and authors' calculations. © Reuters

Several theories have been offered to explain the differential returns between cash and scrip offers. The first relates to the signalling model first described in Chapter 14. In the context of this model, the mode of payment offered by acquiring companies signals inside information to the capital markets. If managers use shares to make an acquisition, it can be interpreted by the market as a signal that the company's equity is overvalued. Receiving this signal, the capital markets downwardly revise the value of the acquirer's equity. Other theories concerning the differential returns due to financing method include the tax and pre-emptive

¹⁷ We assume in this example that the bidder share price does not change from \$20 when the merger is announced.

bidding hypotheses. The *tax hypothesis* postulates that target shareholders must be paid a capital gains tax premium in cash offers (because they have to turn around and pay tax to the government on any profits earned), which may not be required in a scrip offer. The *pre-emptive bidding hypothesis* asserts that acquirers who wish to ward off other potential bidders for a target will offer a substantial initial takeover premium in the form of cash. Finally, the lower returns for bidders in scrip deals may reflect the fact that scrip deals are typically dilutive to bidder EPS, which may be received negatively by the share market.

An interesting variant of financing acquisitions is a debt-for-equity swap. For example, in late 2012, Nine Entertainment Co Pty Ltd (the owner of Channel Nine) was able to stave off bankruptcy by entering into a debt-for-equity swap with its lenders, swapping its \$2.7 billion in debt (owed to Goldman Sachs, and hedge funds Apollo Global Management and Oaktree Capital Group) for equity in the company.

17.3d RETURNS TO BONDHOLDERS

Ordinary equity is not the only security affected in corporate control activities; bonds and preferred equity can also be affected. When an acquisition increases the stability of cash flows relative to the target's historic cash flows, thereby reducing default risk, target bonds may increase in value. A 2004 study by Billett, King and Mauer¹⁸ provides evidence consistent with this possibility. The bondholders' gain is a wealth transfer from the merging companies' shareholders – especially the financially healthier company's shareholders – since cash flows that they would have received in the weaker company's loss period are instead diverted to pay the bondholders' claims. The point is that, while corporate managers may pursue mergers at least in part to reduce financial risk, the benefit sometimes accrues to fixed claimants (such as existing bondholders), possibly at the expense of shareholders.¹⁹ The study also demonstrates that when a target is acquired by a less creditworthy bidder, target bondholders experience negative returns.²⁰

Bidder bondholders can experience similar outcomes. Given that bidding companies are rarely experiencing financial distress, bidding bondholders infrequently benefit from merging with a cash-flow rich target; more often, they suffer value loss as a financially weaker target company is acquired.

17.3e HOW DO TARGET CEOs MAKE OUT?

Not only do shareholders of target companies do well in M&A deals, so do their chief executives. Research done in 2004 by Hartzell, Ofek and Yermack²¹ documents payments received by target CEOs as their companies are sold. These target CEOs receive payments equalling 10 to 15 times their annual salaries and bonus when their companies are taken over. About 55% of the payment comes in the form of shares and options, with the rest consisting of golden parachute severance payments and additional bonuses. These payments could be interpreted as a lavish perk to the outgoing executive. Alternatively, the payments may play the role of encouraging CEOs to, and reward them for, taking an action that creates the most value for target shareholders.

¹⁸ See Matthew T. Billett, Tao-Hsien Dolly King and David C. Mauer, 'Bondholder Wealth Effects in Mergers and Acquisitions: New Evidence from the 1980s and 1990s', *Journal of Finance*, 59, February 2004, pp. 107–35.

¹⁹ One subtle consideration is whether the target debt can be refinanced at the bidder cost of capital. For example, if a low-risk acquirer buys a high-risk target, can the target's debt be refinanced at the bidder's low cost of debt? While this possibility is often implicitly assumed in models that analyse merger consequences, the most likely outcome is that the target's securities will be refinanced not at the pre-deal financing costs of the bidder, but rather at the combined firms' post-deal costs. This combined cost may in some cases reflect cost-reducing benefits of diversification of the bidder and target but often will lie between the pre-deal costs of the bidder and target.

²⁰ Another situation in which there are significantly negative returns on existing target bonds occurs when a leveraged buyout occurs, loading substantial new debt on the target firm.

²¹ See J.C. Hartzell, E. Ofek and D. Yermack, 'What's In It For Me? CEOs Whose Firms Are Acquired', *Review of Financial Studies*, 17 (1), Spring 2004, pp. 37–61.

LO17.3

CONCEPT REVIEW QUESTIONS

- 6 In an M&A deal, both the target and the bidder typically do their own valuations. Which valuation method do you think target management favours, and which do you think managers of the bidder advocate?
- 7 Most bidders are much larger than the target companies that they seek to buy. When the bidder is much larger than the target, why might it appear that the bidder's shareholders do not profit much from the deal even if it creates a significant amount of value in total?

THINKING CAP QUESTIONS

- 7 Which valuation method typically yields the highest valuation?
- 8 How do you identify appropriate comparable companies? How do you identify appropriate precedent transactions?
- 9 Can you think of a reason why you typically would not use an EBITDA multiple or a P/E multiple to value a start-up?
- 10 When should an acquirer pay for an acquisition with equity? When should an acquirer finance an acquisition with debt?

LO17.4

17.4 MERGER AND ACQUISITION TRANSACTION DETAILS

There are a number of ways to integrate the assets and resources of an acquired company into the acquiring company. The following discussion describes various forms of resource integration that may be used to combine the resources of an acquirer and a target.

statutory merger

A target integration in which the acquirer can absorb the target's resources directly with no remaining trace of the target as a separate entity

subsidiary merger

A merger in which the acquirer maintains the identity of the target as a separate subsidiary or division

reverse triangle merger

When a subsidiary of the bidder merges with the target company

consolidation

A merger in which both the acquirer and target disappear as separate corporations, combining to form an entirely new corporation with new ordinary shares

17.4a TYPES OF MERGERS

A **statutory merger** occurs when the acquirer absorbs the target's resources directly, with no remaining trace of the target as a separate entity. Many intrastate bank mergers in the US have been of this form. Conversely, an acquirer may wish to maintain the identity of the target as either a separate subsidiary or division. A **subsidiary merger** is often the integration vehicle when there is brand value in the name of the target, such as the acquisition of Jaguar and Land Rover by the Tata Group. Other examples of this may occur because of regulatory requirements. This is quite common in the Australian banking industry. For example, because the federal government was concerned about a potential reduction in industry competition, Westpac and St George Bank were allowed to merge in 2008, but only as long as they maintained separate operations, separate products and separate brands. In a **reverse triangle merger**, the acquiring company creates a subsidiary, and this subsidiary's equity merges with the target company's shares. The target becomes a wholly owned subsidiary of the bidder, with the target's legal entity remaining intact (eliminating the need to rewrite contracts to reflect a new corporate name).

Under **consolidation**, both the acquirer and target disappear as separate companies and combine to form an entirely new company with new ordinary shares. This form of integration is common in so-called mergers of equals, where the market values of the acquirer and target are similar. Many of these new companies adopt

a name that is a hybrid of the former names, such as the 1998 global merger of Price Waterhouse and Coopers & Lybrand to form PricewaterhouseCoopers. However, some managers of newly created companies want a fresh start with a company name. An example of this occurred in 2000, when the Amsterdam Stock Exchange, the Paris Bourse and the Brussels Stock Exchange merged to form Euronext.

An acquirer can also attain control of a public corporation through a non-negotiated purchase of the company's shares in the open market, or by obtaining voting control of other shareholders' shares via a proxy contest. Theoretically, an acquirer can gain control simply through open-market purchases of a target company's shares, though regulation severely restricts this form of creeping acquisition in most developed countries. Generally, an acquirer must explicitly bid for control through a tender offer for shares. A **tender offer** is a structured purchase of the target's shares in which the acquirer announces a public offer to buy a minimum number of shares at a specific price in a cash offer directly to the target's shareholders. Interested shareholders may then tender their shares at the offer price. If at least the minimum number of shares is tendered, then the acquirer buys those shares at the offer price. The acquirer has the option to buy the shares tendered at the offer price or of cancelling the offer altogether if the minimum number of shares are not tendered. Although fairly rare, a two-step offer occurs when the acquirer offers to buy a certain number of shares at one price and, if the first step is successful, then more shares in a second step at another (typically lower) price. A *short-form merger* occurs when the bidder acquires substantially most of the outstanding shares. In this case, the bidder can do a short-form merger the next day to own 100% of the target's outstanding shares, as long as the payment in the merger is the same as the payment in the tender offer.

Tender offers can be part of a hostile takeover attempt (an offer not solicited by the target board of directors that bypasses the target board and goes straight to target shareholders) or a friendly tender offer (that occurs after a deal is negotiated with the target board). Unsolicited takeover attempts are not particularly common, especially outside the United States, but many a friendly merger has been completed because of the threat of an unsolicited takeover by an undesired bidder. There are, of course, some mergers that are friendly from the start.

In Australia, an individual shareholder is considered to have a *relevant interest* in a listed company if it owns 5% or more of the company's voting shares. Under s.671B of the *Corporations Act 2001* (Corporations Act), shareholders are required to disclose any ownership of 5% or more, and any subsequent increase of 1% or more of the company's voting shares, so that the company's other shareholders can monitor any attempts to gain control of the company. Furthermore, although there are various exemptions to this requirement, the 20% takeover threshold means that an individual cannot normally acquire 20% or more of the company's voting equity without making a formal takeover bid. A shareholder is entitled to compulsorily acquire any remaining securities of a listed entity if it owns 90% or more of those securities.

In more recent years, the financial press has used the phrase **merger of equals** to describe some transactions. For example, on 3 May 2010, Continental and United Airlines announced a merger of equals, indicating in a press release that 'the all-stock merger of equals brings together two of the world's premier airlines, creating a combined company well positioned to succeed in an increasingly competitive global and domestic aviation industry'. In September 2012, Cortona Resources Limited (listed on the ASX as CRC) and Unity Mining Limited (listed on the ASX as UML) announced their merger of equals to form an Australian gold business to be known as Unity Mining Limited. The merger announcement document surmised this as a merger of equals and can be viewed at: http://www.majorscreek.org.au/sites/default/files/300_Unity_Announces_Merger_with_Cortona_28.09.2012.pdf.

Mergers of equals most often involve bidders and targets of roughly similar size, and are friendly in terms of board negotiations. Often, the bidding company promises to treat the board members, management and employees of the target company fairly, and perhaps offer concessions in terms of the location of headquarters or company name. On average, mergers of equals result in a smaller premium paid to target shareholders. Cynics argue that the target board and management sell out shareholders by accepting a lower premium in exchange for their own wellbeing and remuneration. Proponents of mergers of equals argue that a

tender offer

The structured purchase of a target's shares, in which the acquirer announces a public offer to buy a minimum number of shares at a specific price

merger of equals

A merger of two companies that are roughly the same size; usually friendly

smaller premium allows the bidder to proceed slowly and carefully when integrating the companies, rather than making drastic changes quickly in an effort to justify the larger premiums that usually accompany acquisitions. While there may be elements of truth to both arguments, we note that ultimately there is one surviving company, with one CEO, one CFO and one board, and often this surviving entity is dominated by representatives of the bidding company.

public-to-private transactions

The transformation of a public corporation into a private company through issuance of large amounts of debt used to buy the outstanding shares of the corporation

management buyout (MBO)

The transformation of a public corporation into a private company by the current managers of the corporation purchasing the voting shares, often with the assistance of a private equity company

employee stock ownership plan (ESOP)

The transformation of a public corporation into a private company by the employees of the corporation itself

reverse LBO

A formerly public company that has previously gone private through a leveraged buyout and then goes public again

dual-class recapitalisation

Issuance of a new class of ordinary shares with the intent of concentrating control of voting rights in one group of investors

leveraged recapitalisation

When a company greatly increases the portion of debt in its capital structure, often retiring equity in the process

17.4b LBOS, MBOS AND RECAPITALISATIONS

Changes in corporate control also occur when voting power becomes concentrated in the hands of one individual or a small group. Public-to-private transactions (known as *going-private transactions* in the US) are one way to achieve this concentration of control. Just as they sound, **public-to-private transactions** transform public corporations into private companies through issuance of sufficient debt to buy all of the outstanding shares of the corporation. The acquiring party may be a leveraged-buyout (LBO) or private equity company²² – such as Kohlberg, Kravis and Roberts (KKR), which specialises in such deals. Other public-to-private transactions can be driven by the current managers of the corporation (known as a **management buyout**, or **MBO**); or even the employees of the corporation itself through an **employee stock ownership plan (ESOP)**. An LBO that sells shares to the public again in a second initial public offering is known as a **reverse LBO**. An interesting Australian example of this type of deal occurred with the Myer Group. It was listed on the ASX as Myer Emporium Ltd, but subsequently merged with another listed entity, GJ Coles & Coy Ltd, in the mid-1980s to become Coles Myer Limited. In 2006, Myer was acquired from Coles Myer and taken private by private equity group Texas Pacific Group. It was then restructured, transformed and re-listed on the ASX in 2009.

Leveraged buyouts are interesting because of the high premiums often paid and the extensive use of debt financing. Of course, increased risk accompanies high debt levels, resulting in high costs of debt and equity (as discussed in Chapter 13, **Equation 13.2** can be used to lever up the cost of equity to reflect greater financial risk). Typically, high debt levels are maintained for several years in an LBO, then are gradually reduced to more normal, long-term levels. Therefore, when valuing an LBO, the discount rate is typically high in early years but gradually declines. Terminal values are very important in LBO valuation and represent the value at which an LBO investor may cash out by selling its stake in the buyout, perhaps by issuing ordinary shares and taking the company public again.

A **dual-class recapitalisation** may also concentrate control. Under this form of organisational restructuring, the parties wishing to concentrate control (usually management) buy all the shares of newly issued Class B shares, which carries super voting rights (100 votes per share, for example). Traditional Class A shareholders generally receive some form of compensation, such as higher dividends, for the dilution of their voting power. Dual-class companies are rare in the United States, but are common in other countries.²³ The higher share price typically assigned to the share class with superior voting rights, often called the voting premium, has been used as a measure for the private benefits of control in a publicly traded company.

A **leveraged recapitalisation** occurs when a company issues substantial debt to repurchase equity. The company essentially performs a leveraged buyout on itself, except that not all of the outstanding equity is retired. The remaining shareholders, known as the stub equity, own a much more highly levered (and riskier) stake in the company.

Just how much debt can a company manage, whether it becomes highly levered via an LBO or a leveraged recap? The typical metric considered on the street by finance professionals is based on the debt/EBITDA ratio.

22 When a private equity firm such as KKR buys a company, it is referred to as a financial buyer. In contrast, when one company buys another company, the acquirer is often called a strategic buyer. The key difference between each buyer's acquisition strategy is that strategic buyers seek opportunities that will synergistically create short- and long-term value for the acquiring firm, while financial buyers often seek to buy a company, operate it for a short period and then resell it, often within five years.

23 See Tatiana Nenova, 'The Value of Corporate Voting Rights and Control: A Cross-Country Analysis', *Journal of Financial Economics*, 68, 2003, pp. 325–51.

By considering earnings before interest, taxes, depreciation and amortisation, analysts argue that this captures the full cash flow available to the company to make debt interest payments. Consequently, LBO pricing and valuation is often expressed in terms of EBITDA multiples (such as ‘five times EBITDA’). One word of caution: the debt/EBITDA ratio does not explicitly capture the capital needs of the company. This may not be a major concern if the capital expenditure and other working capital needs of the company do not outstrip cash inflows. If working capital needs are significant, however, overall liquidity and working capital implications should be carefully considered when determining a company’s debt capacity. More generally, we recommend that analysts and managers consider the capital structure issues presented in Chapter 13 when determining debt capacity.

17.4c TAKEOVER DEFENCES AND DIVESTITURES

Takeover Defences

Takeover defences are defensive measures that many companies rely on to ward off surprise or unwanted takeover attempts. Some of these defences are written in company charters, and most countries and states have extensive takeover statutes that dictate the offer and defence strategies for companies incorporated in that state. Not only might these defensive tactics prevent an unwanted takeover, but they can also provide a shield that a target can use to delay a takeover attempt in a way that strengthens the target’s negotiating power. **Figure 17.8** describes several takeover defences. Many of these provisions have the ultimate effect of increasing the price the bidder must pay to acquire the target.

takeover defences
Means by which a target thwarts or delays a takeover attempt

FIGURE 17.8 COMMONLY USED ANTI-TAKEOVER DEVICES

MEASURE	ANTI-TAKEOVER EFFECT
Fair-price amendments	Require that a fair price be paid to all shareholders in the event of a takeover, usually defined as the highest price paid to any shareholder
Golden parachutes	Large termination payments and other arrangements made to target executives that are activated after a takeover
Greenmail	The payment of a premium price for the shares held by a potential hostile acquirer but not paid to all shareholders; prevented in some legal jurisdictions
Just-say-no defence	Refusal to accept a takeover offer on the grounds that management feels it is not in the long-term interests of shareholders ²⁴
Pac-Man defence	The initiation of a takeover attempt for the hostile acquirer itself
Poison pills	Dilution of the value of shares acquired by a hostile bidder through the offer of additional shares to all other existing shareholders at a discounted price
Poison puts	Deterrent to hostile takeovers through put options attached to bonds that allow the holders to sell their bonds back to the company at a pre-specified price in the event of a takeover or change in control
Recapitalisation	A change in capital structure designed to make the target less attractive. Usually involves a substantial increase in debt
Classified boards	Only a fraction of directors stand for election in any given year, for example, because of different term lengths or staggered start/end dates, making it harder for an outsider to take control by electing a majority of the board
Standstill agreements	Negotiated contracts that prevent a substantial shareholder from acquiring additional shares for a defined period of time
Supermajority approvals	Require the approval of large majorities (such as 67% or 80%) for a takeover to occur
White knight defence	The pursuit of a friendly acquirer to take over the company instead of a hostile acquirer
White squire defence	The sale of a substantial number of shares to an entity that is sympathetic to current management but has no current intention of acquiring the company

²⁴ The courts generally do not engage in second-guessing past business decisions made by a company. The courts presume that managers and boards of directors generally make business decisions that are in the best long-run interests of shareholders, according to a case law concept known as the *business judgement rule*. Thus, at times, a board can just say no and reject what appears to be an attractive takeover offer, under the logic that the board knows what is best for the shareholders in the long run, even if an offer is for a large premium, or the share market reacts negatively to the rejection of an attractive offer. See section 17.5 for additional discussion.

Divestitures

We have explored in detail how and why a company goes about acquiring assets from another company. But what about the other side of the transaction, when a company wants to divest (get rid of) one of its plants or business units? A company may decide to divest a unit that it feels is no longer a strategic fit with its core business because a unit has large capital demands that the parent feels it cannot afford, because a multi-segment company (such as a conglomerate) is priced at a discount relative to peer companies or perhaps because the parent is in distress and needs to sell something to raise cash (such as Citigroup's June 2009 sale of its 51% stake in Smith Barney). What options are available to a company that wants to sell or otherwise separate a division or some fraction of its assets? A **divestiture** occurs when the assets and/or resources of a subsidiary or division are conveyed to another organisation. This is quite a common trend in the Australian financial services and investment banking landscape, where global financial institutions often divest their Australian divisions or businesses. An example of a divestiture occurred in 2012, when CIMB Group (a Malaysian investment bank) bought Royal Bank of Scotland's Australian equities, mergers and acquisition advisory and equity capital markets businesses.

divestiture
Assets and/or resources of a subsidiary or division are conveyed to another organisation

asset sale
Assets of one company are sold to another organisation, usually for cash

An **asset sale** or sell-off occurs when a company sells a division, plant or machinery to new owners, usually in exchange for cash. The receipt of cash makes this a taxable event, and the seller must pay tax (at the corporate income tax rate) for any capital gains above the tax basis of the sold assets. Asset sales were a key feature in the Victorian government's privatisation of the electricity and gas industry in the 1990s. Sales of electricity assets between 1993 and 1999 generated \$21.4 billion, with sales of gas assets producing an extra \$6.5 billion, all of which were used to dramatically reduce the state's debt levels.

In a *spin-off*, the parent company distributes to its own shareholders a division or subsidiary of the parent. This spun-off company is a new entity, with equity shares that are distinct from the parent equity. Existing shareholders receive a pro rata distribution of shares in the new company. For example, on 11 February 2009, the FCC granted approval of the separation of Time Warner Inc. and Time Warner Cable in a spin-off. On 12 February 2009, Time Warner Cable received a favourable Internal Revenue Service (IRS) ruling, meaning that this spin-off, like most, was not taxable to shareholders. In 2012, News Corporation announced that it planned to spin off its Australian assets in mid-2013. Having gained shareholder approval, the company split into two publicly traded companies, with the publishing arm forming one and retaining the name News Corporation, and the media businesses forming the other and renaming as 21st Century Fox. Both Class A (non-voting) and Class B (voting) shareholders were reported to receive a stock dividend of one share of the new News Corporation for every four shares they owned in the old News Corporation.²⁵

split-off
A parent company creates a new, independent company with its own shares, and ownership is transferred to certain shareholders only, in exchange for their shares in the parent

A **split-off** is similar to a spin-off, in that the parent company creates a newly independent company from a subsidiary, but ownership of the company is transferred only to certain existing shareholders in exchange for their shares in the parent. *Equity carve-outs* (described more fully in Chapter 18) bring a cash infusion to the parent from the sale of an ordinary share interest in a subsidiary through a partial public offering to new shareholders. One key feature of an equity carve-out is that the parent company retains some control of the decision process in the subsidiary, versus a spin-off, where the parent gives up decision rights. (It is often the case that a carve-out precedes the ultimate spin-off of a unit.)

split-up
The division and sale of all of a company's subsidiaries, so that it ceases to exist

Split-ups and bust-ups are extreme corporate control events. As it sounds, the **split-up** of a corporation is the split-up and sale of all its subsidiaries so that it ceases to exist (except possibly as a holding company with few, if any, assets). A **bust-up** is the takeover of a company that is subsequently split up.

bust-up
The takeover of a company that is subsequently split up

To decide among these various divestiture options, management will usually consider the after-tax proceeds received by the parent company from each option, how many bidders might exist to purchase a given unit and whether the company's existing shareholders are likely to hold on to, or immediately churn (sell),

25 M. Wall, 'News Corp Shareholders Vote to Split Company into Two', *BBC News*, 11 June 2013, <https://www.bbc.com/news/business-22857106>. Accessed 15 February 2020.

the divested unit if they were to receive it in a spin-off. The ultimate decision should be based on the desire to maximise long-run shareholder value, combined with the company's desire to focus its ongoing operations on business units for which it has a comparative advantage running.

LO17.4

CONCEPT REVIEW QUESTIONS

- 8 List several different types of merger structures. Why might different types be used in different settings?
- 9 How does a tender offer differ from a proxy fight? Why might these two corporate control actions be considered different ways to achieve the same objective?
- 10 What are the two most important methods of paying for corporate acquisitions?
- 11 Who wins and who loses in corporate takeovers? Why do acquiring-company shareholders generally lose in share-swap mergers, but either benefit or at least breakeven in acquisitions paid for with cash?

THINKING CAP QUESTIONS

- 11 Why is it sometimes said that 'there is no such thing as a merger of equals'?
- 12 What are common characteristics of a good LBO target?

LO17.5

17.5 ACCOUNTING TREATMENT OF MERGERS AND ACQUISITIONS

Under International Financial Reporting Standard (IFRS) 3, acquisitions (or *business combinations*) are accounted for using the *acquisition method*. This usually means the acquiring company recognises the target's assets and liabilities in its consolidated financial statements at their fair values at the time of the acquisition.²⁶ (Should the target continue to prepare its own separate financial statements, the acquisition does not affect the carrying values of the target's assets and liabilities.)

The acquiring company also determines whether there is a difference between the fair value of the target's net assets and the amount that it paid for the target. If the acquiring company paid more than the fair value of the target's net assets (for example, because of expected synergies from combining the acquiring company's and target's assets), it recognises the difference as an intangible asset on its balance sheet called **goodwill**. If the acquiring company paid less than the fair value of the target's net assets (a bargain purchase), it recognises the difference as a gain in earnings at the time of the acquisition.

After the acquisition closes, the value of goodwill must be evaluated to determine if it has been impaired because of a decline in fair value relative to carrying value. If the value of goodwill is impaired, then the amount of the impairment is written down from the goodwill account on the balance sheet and charged off against earnings. Otherwise, the goodwill balance remains unchanged on the balance sheet indefinitely. The following 'Example' details the treatment of accounting for acquisitions.

goodwill

An intangible asset created if the restated values of the target in a merger lead to a situation in which its assets are less than its liabilities and equity

²⁶ Fair value represents the price that would be received to sell an asset or paid to transfer a liability in an orderly transaction between market participants at the measurement date.


EXAMPLE

The Importance of Goodwill

Assume that a target company has 5 million shares outstanding, priced at \$10 per share. The acquiring company offers a 20% takeover premium (\$12 per share) for a transaction value of \$60 million. The acquiring company wants the R&D capabilities of the target company so that it can exploit synergies with its own assets and is willing to pay a premium to obtain those capabilities. The fair value of the target's current assets is \$10 million, and the fair value of its long-term assets is \$60 million. Deducting the \$5 million in current liabilities and \$25 million in long-term liabilities, the target company has a net asset value of \$40 million. Thus, the acquiring

company is willing to pay \$20 million (\$60 million less \$40 million) for intangible assets that represent the premium paid to acquire the R&D capabilities.

Current assets	\$10,000,000
Long-term assets	60,000,000
Less: Liabilities	30,000,000
Net asset value	\$40,000,000
Purchase price paid	60,000,000
Less: Net asset value	40,000,000
Goodwill	\$20,000,000

	PRE-ACQUISITION		POST-ACQUISITION	
	ACQUIRER'S FINANCIAL STATEMENTS (\$ MILLIONS)	TARGET'S FINANCIAL STATEMENTS (\$ MILLIONS)	FAIR VALUES OF TARGET ASSETS AND LIABILITIES (\$ MILLIONS)	CONSOLIDATED FINANCIAL STATEMENTS (\$ MILLIONS)
Assets				
Current	100	10	10	50*
Long-term	350	50	60	410
Goodwill	0	0		20
Total assets	450	60		480**
Liabilities				
Current	50	5	5	55
Long-term	250	25	25	275
Total liabilities	300	30		330
Owners' equity	150	30		150***
Total liabilities and owners' equity	450	60		480

* If the acquirer used \$60 million cash to make the acquisition, consolidated current assets = $100 + 10 - 60 = 50$.

** If the acquirer used \$60 million cash to make the acquisition, consolidated total assets = $450 + 70 + 20 - 60 = 480$ (Acquirer's assets + Fair value of target's assets + Goodwill – Payment for target's shares).

*** In consolidated statements, only the shares held by outside investors are shown.

Assume that the target company is treated as a separate reporting unit after the acquisition. Going forward, the company must evaluate its goodwill to determine whether its value has been impaired. As long as the company can demonstrate that the goodwill's fair value has not fallen below its carrying value of \$20 million on the balance sheet, then it will remain unaffected

on the balance sheet. However, if the value is impaired (that is, fair value has decreased), then the value loss must be reported, deducted from the balance sheet and taken as a write-off against current period earnings. For example, assume that two years later the R&D capabilities of the subsidiary do not turn out to be as valuable as expected. The fair value of the





reporting unit is estimated at \$55 million, and the fair value of the net assets is estimated at \$50 million, resulting in an implied fair value of the goodwill of \$5 million. Because the carrying value of the goodwill is \$20 million, this represents a

\$15 million impairment. This \$15 million will be deducted from the balance sheet and taken as an intangible asset write-down on the income statement, reducing earnings by \$15 million in the year that the impairment is recognised.

An alternative scenario might arise in which the acquiring company obtains control of the target but does not acquire all of the target's outstanding shares. For example, if the acquiring company in the above example were able to acquire only 85% of the target's outstanding shares, there would be a 15% non-controlling interest in the target (this 15% is also known as a minority interest). The acquiring company would still recognise 100% of the fair value of the target's assets and liabilities in its consolidated financial statements. In addition, it would recognise either the fair value of the non-controlling interest or the proportionate share of identifiable net assets acquired, as an equity item, and would calculate goodwill as the difference between the amount it paid for the target plus the value attributed to the non-controlling interest and the fair value of the target's net assets.

LO17.5

CONCEPT REVIEW QUESTIONS

- 12 What is *goodwill* in the context of merger accounting? What must an acquiring company do if the value of an acquired company is revealed to have declined after a merger?
- 13 Describe target companies you think would yield substantial goodwill once acquired.

THINKING CAP QUESTION

- 13 How is goodwill created through a merger? Under what conditions may it be subsequently adjusted?

LO17.6

17.6 REGULATION OF MERGERS AND ACQUISITIONS

In this section, we describe the most important regulations that govern corporate control activities, and explain why international corporate control regulations have recently become much more important.

17.6a ANTITRUST REGULATION

Mergers, especially horizontal mergers, present the possibility of creating corporate giants that have the potential to reduce competition. For this reason, antitrust enforcement seeks to prevent mergers that are deemed anticompetitive. The following sections outline the major aspects of various antitrust laws, starting with the guidelines established by regulatory agencies for determining the anticompetitive potential of a merger. As discussed below, international regulation of M&A activity has increased in importance in recent decades.

Determination of Anti-Competitiveness

The Herfindahl Index (HI) (also known as the Herfindahl–Hirschman Index) is often used to determine market concentration. The HI is calculated as the sum of the squares of each company's percentage of sales

within a market (industry). For example, if there are three companies in an industry, and they account for 50%, 30% and 20% of total sales, the HI Index would be 3,800 ($50^2 + 30^2 + 20^2$). If the smaller two companies merged, the HI Index would increase to 5,000.

The HI can be used to establish a range of concentration levels within a market or industry:

HI > 2,500	Highly concentrated
HI = 1,500 to 2,500	Moderately concentrated
HI < 1,500	Not concentrated

Mergers resulting in a highly concentrated HI measure are the most likely to be challenged. Consider the example in **Figure 17.9**. The pre-merger HI of this industry is 1,750 (moderately concentrated). A merger between Company 7 and Company 8 would reduce the number of competitors in the industry, but the marginal impact of a merger between the two smallest players in the industry would increase the HI to only 1800 and would probably not face a challenge. However, a merger between the two largest companies in the industry would result in an HI of 2,950 – moving this industry from moderately to highly concentrated and likely prompting a challenge by the competition regulator.

FIGURE 17.9 DETERMINATION OF ANTI-COMPETITIVENESS USING THE HERFINDAHL INDEX (HI)

PRE-MERGER CONCENTRATION			POST-MERGER CONCENTRATION					
COMPANY	MARKET SHARE (%)	MARKET SHARE ²	COMPANY	MARKET SHARE (%)	MARKET SHARE ²	COMPANY	MARKET SHARE (%)	MARKET SHARE ²
1	30	900	1	30	900	1 + 2	50	2,500
2	20	400	2	20	400	3	10	100
3	10	100	3	10	100	4	10	100
4	10	100	4	10	100	5	10	100
5	10	100	5	10	100	6	10	100
6	10	100	6	10	100	7	5	25
7	5	25	7 + 8	10	100	8	5	25
8	5	25						
Sum (=HI)		1,750			1,800			2,950
Concentration		Moderate			Moderate			High

EXAMPLE

The Influence of Regulators on M&A Deals

The failed 1997 merger attempt of Staples and Office Depot exemplifies the role of regulatory agencies in preventing what are deemed to be anticompetitive combinations. On 4 September 1996, Staples and Office Depot announced their intent to merge in a \$3.4 billion deal. At the time, Office Depot and Staples were the largest and second-largest US office supply superstores, respectively. Of the \$14.0 billion in sales in this market, Office Depot had a market share of \$6.6 billion, followed by Staples with \$4.1 billion, and

the only other major competitor was OfficeMax, with sales of \$3.3 billion.

The Federal Trade Commission (FTC) reviewed the proposed merger for anticompetitive effects and requested more information from the companies at the end of the initial review period. At the end of the second review, the FTC concluded that the proposed merger would have an anticompetitive impact if allowed to be consummated, so it rejected the merger proposal. One of the key



points cited by the FTC in its rejection was the market power (the 5% rule)²⁷ that the merged company would be able to wield in those markets where no stores other than Staples or Office Depot existed. In order to remedy this obstacle, Staples and Office Depot proposed to sell 63 stores to OfficeMax in the geographic markets where both Staples and Office Depot were located. The FTC again rejected the merger, and threatened to sue the companies in federal court if they attempted to pursue it. The FTC further threatened that it would continue to pursue the merged company for antitrust violations.

The managers of both companies continued to fight for their combination, despite the FTC's threats. When presenting their argument to the federal judge assigned to the case, lawyers for the companies expressed the companies'

willingness to sell off stores in order to satisfy the FTC and enhance competition; they also contended that the FTC had improperly defined their industry when determining the Herfindahl Index. The FTC had limited their industry classification to office supply superstores, so there were only three main competitors and an HI of 3,634 (already highly concentrated). The HI would increase to 6,394 after the merger. Lawyers for the companies, however, stated that the appropriate industry classification should be discount retailers, and should include such stores as Walmart and Kmart in addition to office supply stores. The judge in the case disagreed with the companies' lawyers and sided with the FTC in barring the merger from taking place. The managers of Staples and Office Depot announced their intentions to abandon their merger plans shortly thereafter.

Other Antitrust Considerations

Managers contemplating a merger now face antitrust scrutiny from regulators beyond just domestic regulators. Globalisation can play an important role in merger approval.

17.6b INTERNATIONAL REGULATION OF MERGERS AND ACQUISITIONS

International regulatory authorities, especially in Europe, have become more proactive when dealing with global, large-scale mergers. The European Commission (EC) first signalled its more stringent antitrust regulatory authority in 1999 when it vetoed the proposed merger of US communications giants WorldCom and Sprint. The EC expressed concerns about the pricing power that the combined company could have if the second- and third-largest US communications companies (behind then industry leader AT&T) merged to become the first- or second-largest communications company in many European markets. The managers of both WorldCom and Sprint abandoned their effort to merge after the EC's decision.

EC competition commissioner Mario Monti created an international stir in 2001 when he denied the petition to merge filed by General Electric and Honeywell, although the merger had already been approved by US antitrust authorities. Monti's stern defence of his position and denial of the petition on appeal sent a clear message that companies with international operations that are considering a merger must take into account antitrust authorities outside the United States, even if the merger is between US companies. Monti caused an even bigger stir when, in early 2004, his commission sued Microsoft in an attempt to force the company to uncouple application packages from its operating system (Windows). The commission maintained that this tie gave Microsoft monopoly power. The EC won this court case in 2005, and the top European Union court upheld this ruling in September 2007. Five months later, European regulators imposed a record €899 million (\$1.4 billion) fine on Microsoft for failure to comply with demands to end its alleged anticompetitive practices.

²⁷ The 5% rule is an alternative to the HI anti-competitiveness rule presented in Figure 17.9. This alternative rule is based on an elasticity measure that gauges whether a merged firm will have the market power to control prices in its market. To implement the 5% rule, the US Department of Justice determines whether a 5% increase in price would result in a decline of more than 5% in market demand. If it would, then that market is deemed elastic and therefore unlikely to be adversely affected by a merger (and also less likely to be strictly governed by the HI measure).

Adding insult to injury, these regulators opened a new antitrust case against Microsoft in early 2009, seeking to force the company to open up its Explorer Internet software to competing companies.

More recently, the EC made headlines by signalling initial objection to an acquisition of Sun Microsystems by Oracle, suggesting that Oracle's ownership of a key Sun asset, MySQL, would be detrimental to competition. After five months of due diligence, and well after the FTC approved the transaction, the EC gave their blessing. An important implication of this process is the significance and influence of the European Commission, as well as other international securities and trade regulators, in affecting the outcome of proposed M&A transactions.

17.6c OTHER LEGAL ISSUES CONCERNING CORPORATE CONTROL

Securities laws also regulate the actions of managers in corporate control events. The high-profile insider-trading scandals of the 1980s generated a keen interest in these laws, while the 2001 Enron and WorldCom scandals prompted the US Congress to pass the Sarbanes–Oxley Act of 2002. This legislation primarily targeted accounting practices, but it also mandated significant changes in how (and how much) information must be reported by companies to investors. Individual states have also become more interested in promoting corporate control legislation after witnessing business practices that were perceived as detrimental to the welfare of the electorate.

Laws Affecting Corporate Insiders

Federal securities laws govern the actions of corporate managers and corporate insiders (and generally anyone in possession of material non-public information) during corporate control events. These laws generally attempt to prevent informed trading on non-public information (that is, inside information), such as an upcoming takeover attempt known only to the insiders of the acquiring company. Trading on inside information about a pending merger is considered a material misrepresentation because material information (news of the merger) is being withheld. Managers are also restricted from issuing misleading information regarding merger negotiations. In Australia, the Australian Securities and Investments Commission (ASIC) is responsible for monitoring the market and detecting and investigating breaches of the rules prohibiting insider trading and market manipulation. Penalties for such breaches include sanctions, fines and imprisonment.

LO17.6

CONCEPT REVIEW QUESTIONS

- 14 Which industries do you anticipate will experience industry shocks that will spur merger activity in the near future?
- 15 Do you believe that increasing global competition will further heighten merger activity?
- 16 What is the Herfindahl Index, and what does it measure?
- 17 What is the purpose of classifying mergers by degree of business concentration? Why do you think these classifications have changed over time?

17.7 CORPORATE GOVERNANCE

Corporate governance refers to how companies are governed; that is, the processes and rules that affect who ultimately makes the decisions in a company. In Chapter 1, we discussed how shareholders are the ultimate owners of any corporation, and therefore in principle have the right to make company decisions. However, any one shareholder typically owns only a small portion of any particular public company, and the ownership of any particular company is diffuse (that is, spread across many different shareholders). Therefore, shareholders rarely have the time or insight to oversee a company and all its operations, so they elect representatives whose job is to oversee the decisions made at the company. These representatives are known as the *board of directors* of the company. This section briefly reviews corporate governance, and, in particular, the duties of the board in the context of merger and acquisition transactions.

Other than in extreme circumstances, such as when a company is in extreme financial difficulty or is a bidder or target in an acquisition, the board members are not involved in the daily activities of the company. Instead, the company hires professional managers and employees to perform day-to-day operations. Board members typically have four to eight meetings per year, and at these meetings upper management updates the board on key issues facing the company, usually making recommendations on the course of action they believe the company should follow. Ideally, the board is fully engaged, and does not just rubber-stamp the recommendations of upper management. However, board members are often identified and approved by the company's CEO and upper management team, which raises the possibility that the board is captured by management, in the sense that the board may not fully scrutinise the company's recommendations and decisions. The number of captured boards has declined in the US since the 2002 passage of the Sarbanes-Oxley Act because public companies are now required to have a nominating committee comprised entirely of independent directors. Corporate governance involves the study of these interrelations between the board, management and, in general, the oversight of the company.

One of the primary functions of the board is to *monitor* upper management and the decisions of the company. Another is to offer *advice*. Therefore, a board is ideally made up of experienced business veterans, bankers and experts in the operations of the company. A portion of the board should ideally be independent and not in any way personally tied to the CEO or upper management to ensure that objective oversight and advice are provided.

Governance varies widely across countries. In many European countries, there are two boards of directors, a management board and a supervisory board, with the latter being selected in large part by employees and labour unions. Not surprisingly, governance in Europe is often employee-friendly. In many Asian countries, there is a pyramid structure to corporate ownership, in which company A owns a substantial portion of company B, which in turn owns a substantial portion of company C, and so on. The actual decision-making process therefore involves numerous companies and is interlocked with the decisions of other companies. In Japan, such a network of companies is often organised around a main bank and is called a *keiretsu*. There are many other interesting aspects to corporate governance. However, because this chapter is about mergers and acquisitions, we focus the rest of this section on responsibilities of the board and governance in the context of M&A.

17.7a DUTIES OF THE BOARD IN THE CONTEXT OF M&A

The board of directors' primary obligation is to shareholders, in particular to maximise long-run shareholder value. When a bidder wishes to acquire another company, the bidder can make an offer directly to shareholders in the form of a tender offer. However, it is usually in the bidder's best interest to approach the target board

corporate governance
The processes and rules
that determine how a
company is governed

or CEO in a friendly manner and negotiate the terms and conditions of the offer. Ultimately, the target shareholders must approve the sale of the company, but the target's board plays a crucial role in interacting with the bidder and representing the shareholders' best interests.

Often, when a company is the target of a takeover bid, the outside bidder offers to buy the target's shares at a premium over current share price. Should the board immediately agree to the first offer above current share price? Does the target board legally have to agree to a bidder's offer, especially when it is extremely generous? The board has fiduciary duties – legal obligations – to shareholders in this context. The *duty of loyalty* requires the board to make decisions that are in the best interests of the company and its shareholders, not in their own personal interests. The *duty of care* requires the board to fully inform themselves, and follow a reasonable decision process, when making business decisions. As discussed in footnote 22, the *business judgement rule* usually offers protection for the board in terms of defending its decisions, as long as there is no evidence of fraud, negligence or illegality, and the board performs these basic duties.

If there is the chance of a conflict of interest, in which the personal interest of board members might conflict with the best interests of the company or shareholders, a special committee is formed to handle merger negotiations. This special committee includes independent board members who are at arm's length and can make objective decisions about the proposed merger (because the personal jobs of inside board members, who also work at the company, may be affected by the merger outcome).

When a company that has no plans to sell itself receives an outside bid, the board should carefully consider the bid. Is the premium offered large enough that it appears to maximise the wealth of shareholders? For example, is it likely that the target share price will at any time in the foreseeable future exceed the offer price in a present value sense? If not, then it may be sensible for the target to accept the bid at this time or attempt to negotiate an even higher bid. However, as long as the board satisfies the duties laid out above, it is not under obligation to recommend accepting an outside bid. One important exception occurs when the target is deemed to be in play and the sale of the company is inevitable. In this case, *Revlon duties* may apply, and the target board's obligation is to secure the highest offer price available, and takeover defences cannot be used to thwart such an offer.²⁸ Note that the valuation of an offer price can still be subjective. For example, if one bidder offers \$50 in cash and another bidder offers high-risk securities that it argues are worth \$51 (but the target does not feel are worth \$51), the lower cash bid is at times accepted by the board.

There are other interesting aspects of acquisition negotiations. Who will be the CEO of the new, combined company? The bidder CEO, the target CEO or someone entirely different? Often the bidder CEO becomes the new CEO, though it is not unusual for there to be a planned transition to another CEO within a couple of years, and it is not uncommon for this new CEO to be the target's current CEO. Likewise, the new board of directors of the combined company often consists of majority representation of the bidder board, along with target representation. This is one reason that boards often increase in size following mergers. The determination of the chairman of the new board often follows a transition like that just described for CEOs.

LO17.7

CONCEPT REVIEW QUESTION

- 18 What does the term *corporate governance* mean? Can you think of any examples of deficient corporate governance during the technology bubble and the financial crisis?

²⁸ 'Revlon' refers to a famous takeover contest involving Revlon Corp. In that case, two firms were competing to acquire Revlon, and courts ultimately ruled that Revlon's board was obliged to sell the company to the highest bidder.

STUDY TOOLS

SUMMARY

LO17.1

- Corporate control transactions refer to transactions where the control and decision-making power of an entity are altered by another entity. For example, a takeover occurs if the control of one entity is taken over by another entity. An acquisition can refer to such a situation, or may be related specifically to one entity acquiring control of some of the assets of the selling entity. In such examples, the target business may be split up. Where two or more businesses are integrated, the transaction is typically referred to as a merger. (However, large-scale mergers can take many years to 'bed down', and the end result can be significant rationalisation of one business – suggesting that it was actually a takeover couched as a merger.)
- Due to concerns about potential antitrust provisions and political or nationalistic interests, some takeovers by foreign bidders may also be couched as mergers.
- Mergers and acquisitions tend to occur in waves. Merger waves may occur because of technological or regulatory changes, fluctuations in the cost and availability of funding or widespread mis-valuations in the market. Cross-border M&A activity has been increasing over time.

LO17.2

- Horizontal mergers occur between companies that operate in the same space, providing the same, or similar goods or services. This is one way to increase market share and supplier power.
- Vertical mergers involve companies merging with a customer or supplier, to reduce their costs of production across the supply chain involved with taking a product or service to market. For example, in the financial services industry, financial product developers such as insurance businesses and superannuation providers may merge with banks so that they can distribute products to bank customers.
- Conglomerate mergers involve multifaceted businesses that merge with others. Usually, the motivation is to increase overall market power and potentially achieve economies of scale or scope. These mergers can also assist the business with diversifying its exposure to different markets.

LO17.3

- Mergers and acquisitions can be financed with debt, cash (drawn from accumulated profits) or equity. Often, acquisitions may be financed by a combination of methods, and these are called mixed offerings. Where an acquisition is solely financed via equity, shareholders from the target company receive shares in the acquiring company. Such takeovers are referred to as share-swap mergers, pure share mergers or scrip bids.
- The most common methods used by a bidder to value a potential target include discounted cash flow valuation, the use of valuation multiples for comparable companies or precedent transactions multiples.
- Mergers tend to create value for target shareholders, but much less frequently create value for bidder shareholders.

LO17.4

- The justifications for M&A activity given by managers include driving growth, capturing synergies, improving the bidder's market position or enhancing its relative valuation, diversifying the company's operations and increasing earnings per share. It is important to keep in mind that, whatever the motivation for a merger might be, it should only be conducted if it leads to higher value for shareholders.
- Target company managers may be averse to bids because an acquisition can jeopardise their employment. Target companies (and in particular their directors and managers) that want to remain independent have a wide range of defensive tactics that they can use to discourage bidders.

LO17.5

- Antitrust regulations govern merger and acquisitions and are important to help stem a reduction in competition. With the growth of international conglomerates, international regulatory authorities, especially in the EC, have started to protect domestic consumers by invoking these regulations. Antitrust regulations sometimes become a barrier to the consummation of a deal if regulators believe that a deal would adversely affect competition in a particular market.

QUESTIONS

- Q17-1** What is meant by a change in corporate control? List and describe the various ways in which a change of corporate control may occur.
- Q17-2** What is a tender offer, and how can it be used as a mechanism to orchestrate a merger?
- Q17-3** Elaborate on the significance of the mode of payment for the shareholders of the target company and their continued interest in the surviving company. Specifically, which form of payment retains the shareholders of the target company as shareholders in the surviving company? Which payment form receives preferential tax treatment?
- Q17-4** What is the signalling theory of mergers? What is the relationship between signalling and the mode of payment used in acquisitions? Is there a relationship between the mode of payment used in acquisitions and the level of insider shareholdings of acquiring companies?
- Q17-5** Empirically, what are the wealth effects of corporate control activities? Who wins and who loses in corporate control contests? What explanations or theories are offered for the differences in returns of acquiring companies' ordinary equity? Why are higher takeover premiums paid in cash transactions rather than in share transactions? How do other security holders fare in takeovers?
- Q17-6** Describe several different motives for mergers. Are each of these motives likely to increase bidder value?
- Q17-7** Define the types of synergy that may result from mergers. What are the sources of these synergies?
- Q17-8** Explain how agency problems may lead to non-value-maximising motives for mergers. Discuss the various academic theories offered as the rationale for motives induced by the agency problem.
- Q17-9** Why does the precedent transactions valuation method typically yield higher valuations?
- Q17-10** Would a large technology company and a large conglomerate (that operates in many industries) be good comparable companies for a multiples-based valuation? Why or why not?
- Q17-11** Describe the relationship between conglomerate mergers and portfolio theory. What is the desired result of merging two unrelated businesses? Has the empirical evidence proven corporate diversification to be successful?
- Q17-12** To whom is the board of directors accountable, and how should this responsibility affect how the board of directors treats an acquisition bid?

PROBLEMS

OVERVIEW OF CORPORATE CONTROL ACTIVITIES

- P17-1** A company has four divisions – food, cookware, retail and credit services – which generate revenues of \$1.5 million, \$3.8 million, \$5.7 million and \$3.1 million, respectively. Compute the Herfindahl Index (HI) for the company. The company is considering the purchase of a rival retailer, which would increase the retail division's revenues by another \$3.2 million. The company is also considering selling its credit services division. Assuming these two actions occur, what will the HI become? What is the HI if the sale of the credit division does not occur but the rival is acquired?

- P17-2** HHG Consultants has been asked to analyse Carol & Carroll Co. (C&C), which has one retail division. C&C is concerned that it is not focused on its core mission of sales despite only having one division. Each store is divided into departments: casual clothing (CC), formal clothing (FC), outerwear (OW), shoes (S) and specialty items (SI). C&C's initial impression is that all of the departments contribute equally to sales. However, examination of each department's actual sales reveals that the breakdown is very different: \$5.2 billion (CC), \$2.7 billion (FC), \$3.75 billion (OW), \$4.5 billion (S) and \$1.7 billion (SI). Compute a Herfindahl Index (HI) based on the departments having equal sales and based on the actual sales. Your conclusion concerning the company's becoming unfocused will be based on the actual HI being lower than the equivalent sales HI scenario. What does your analysis find with regard to the focus of C&C's retailing division?
- P17-3** Company X has three divisions that generate revenues of \$1.3 billion, \$2.5 billion and \$5.2 billion. Company Y is a competitor with three associated divisions that generate \$2 billion each. Using a Herfindahl Index (HI) to measure focus, determine if both Company X and Company Y shareholders would see a merger as an action that would increase or rather decrease focus.
- P17-4** Shareholders of the company Up-4-Grabs (U4G) have been offered \$36.00 per share in cash for each of their U4G shares currently selling for \$29.53. What is the control premium being offered in this cash deal? U4G is also considering a share-swap offer from another company, BuyNow (BYN). BYN will issue one share for every two shares of U4G. At what price will BYN shares be equivalent to the control premium available in the cash offer? When news leaks out about the merger, BYN shares increase to \$77.00 and U4G shares increase to \$35.24. What control premium does BYN offer now?
- P17-5** HBABB Co. has purchased all of the 10 million BOBCO shares for \$43.75 a share. BOBCO's net asset value is \$350 million. How much goodwill does HBABB need to consider on its balance sheet? Suppose part of the deal requires HBABB to pay \$30 million of BOBCO's debt. Refigure the net asset value (that is, reduce the debt by \$30 million) and then recalculate the goodwill. One of your accountants tells you that the net asset value should not be changed, and that the \$30 million used for BOBCO's debt should be added to the purchase price. Refigure the goodwill calculation and determine if there really is a difference. If there is a difference, which calculation is correct?
- P17-6** Mega Service Corporation (MSC) is offering to exchange 2.5 of its own shares for each of target company Norman Corp. shares as consideration for a proposed merger. There are 10 million Norman Corp. shares outstanding, and its share price was \$60 before the merger offer. MSC's pre-offer share price was \$30. What is the control premium percentage offered? Now suppose that, when the merger is consummated eight months later, MSC's share price drops to \$25. At that point, what is the control premium percentage and total transaction value?
- P17-7** Bulldog Industries is offering target Blazerco, as consideration for merger, 1.5 shares for each share of Blazerco. There are 1 million shares of Blazerco outstanding, and its share price was \$50 before the merger offer. Bulldog's pre-offer share price was \$40. What is the control premium percentage offered? Now suppose that, when the merger is consummated six months later, Bulldog's share price drops to \$30. At that point, what is the control premium percentage and total transaction value?
- P17-8** You are the director of capital acquisitions for Crimson Software Company. One of the projects you are considering is the acquisition of Geekware, a private software company that produces software for finance professors. Dave Vanzandt, the owner of Geekware, is amenable to the idea of selling his enterprise to Crimson, but he has certain conditions that must be met before selling. The primary condition set forth is a non-negotiable, all-cash purchase price of \$20 million. Your project analysis team estimates that the purchase of Geekware will generate the following marginal cash flow: of the \$20 million in cash needed for the purchase, \$5 million is

available from retained earnings with a required return of 12%, and the remaining \$15 million will come from a new debt issue yielding 8%. Crimson's tax rate is 40%. Should you recommend acquiring Geekware to your CEO?

YEAR	CASH FLOW
1	\$1,000,000
2	3,000,000
3	5,000,000
4	7,500,000
5	7,500,000

- P17-9** You are the director of capital acquisitions for Morningside Hotel Company. One of the projects you are deliberating about is the acquisition of Monroe Hospitality, a company that owns and operates a chain of bed-and-breakfast inns. Susan Sharp, Monroe's owner, is willing to sell her company to Morningside only if she is offered an all-cash purchase price of \$5 million. Your project analysis team estimates that the purchase of Monroe Hospitality will generate the following after-tax marginal cash flow: if you decide to go ahead with this acquisition, it will be funded with Morningside's standard mix of debt and equity at the company's weighted average (after-tax) cost of capital of 9%. Morningside's tax rate is 30%. Should you recommend acquiring Monroe Hospitality to your CEO?

YEAR	CASH FLOW
1	\$1,000,000
2	1,500,000
3	2,000,000
4	2,500,000
5	3,000,000

- P17-10** Company A plans to acquire Company B. The acquisition would result in incremental cash flows for Company A of \$10 million in each of the first five years. Company A expects to divest Company B at the end of the fifth year for \$100 million. The beta for Company A is 1.1, which is expected to remain unchanged after the acquisition. The risk-free rate, R_f , is 7%, and the expected market rate of return, R_m , is 15%. Company A is financed by 80% equity and 20% debt, and this leverage will remain unchanged after the acquisition. Company A pays interest of 10% on its debt, which will also remain unchanged after the acquisition.
- a Disregarding taxes, what is the maximum price that Company A should pay for Company B?
 - b Company A has a share price of \$30 per share and 10 million shares outstanding. If Company B shareholders are to be paid the maximum price determined in part (a) via a new share issue, then how many new shares will be issued, and what will be the post-merger share price?

- P17-11** Charger Incorporated and Sparks Electrical Company are competitors in the business of electrical components distribution. Sparks is the smaller company and has attracted the attention of the management of Charger, for Sparks has taken away market share from the larger company by increasing its sales force over the past few years. Charger is considering a takeover offer for Sparks, and has asked you to serve on the acquisition valuation team that will turn into the due diligence team if an offer is made and accepted. Given the financial information and proposal assumptions that follow, how would you respond to (a) and (b)?
- a Make your recommendation about whether or not the acquisition should be pursued.
 - b Assume that Sparks has accepted the takeover offer from Charger and that the new subsidiary must now be consolidated within Charger's financial statements. Taking Sparks' most recent balance sheet and a restated market value of assets of \$295.6 million, calculate the goodwill that must be booked for this transaction.

SPARKS ELECTRICAL COMPANY CONDENSED BALANCE SHEET PREVIOUS YEAR (\$ IN MILLIONS)	
	2021
Current assets	12.2
Fixed assets	442.5
Total assets	454.7
Current liabilities	10.1
Long-term debt	150.0
Total liabilities	160.1
Shareholders' equity	294.6
Total liabilities and equity	454.7

SPARKS ELECTRICAL COMPANY CONDENSED BALANCE SHEET PREVIOUS YEARS (\$ IN MILLIONS)					
	2020	2019	2018	2017	2016
Revenues	1,626.5	1,614.1	1,485.2	1,380.5	1,373.4
Less: Cost of goods sold	1,488.1	1,490.9	1,359.5	1,271.4	1,268.0
Gross profit	138.4	123.2	125.7	109.1	105.4
Selling, general & administrative expenses (SG&A)	41.1	36.8	41.2	35.0	36.1
Non-cash expense (depreciation & amortisation)	7.3	6.7	7.1	6.6	6.4
Less: Operating expense	48.4	43.5	48.3	41.6	42.5
Operating profit (EBIT)	90.0	79.7	77.4	67.5	62.9
Less: Interest expense	11.5	12.0	12.0	12.0	12.0
Earnings before taxes (EBT)	78.5	67.7	65.4	55.5	50.9
Less: Taxes paid	24.3	20.8	19.9	16.8	15.3
Net income	54.2	46.9	45.5	38.7	35.6

Assumptions:

- Sparks would become a wholly owned subsidiary of Charger.
- Revenues will continue to grow at 4.3% for the next five years and will level off at 4% thereafter.
- The cost of goods sold will represent 95% of revenue going forward.
- Sales-force layoffs will reduce SG&A expenses to \$22 million next year, with a 2% growth rate going forward.
- These layoffs and other restructuring charges are expected to result in expensed restructuring charges of \$30 million, \$15 million and \$5 million (respectively) over the next three years.
- Non-cash expenses are expected to remain around \$7 million going forward.
- Interest expenses are expected to remain around \$11.5 million going forward.
- A tax rate of 31% is assumed going forward.
- Charger's cost of equity is 12%.
- Sparks' current market capitalisation is \$315.7 million.
- Charger will offer Sparks a takeover premium of 20% over current market capitalisation.

P17-12 Referring to Problem 17-11, assume it is now two years after the acquisition of Sparks and you must perform a goodwill impairment test of the subsidiary. Growth expectations have been lowered to 3% going forward. Using the following five-year projection of cash flows and a 12%

cost of equity, estimate the value of the subsidiary beyond year 5, the current value of the subsidiary, the current value of goodwill and any goodwill impairment. Total assets (excluding intangibles) are now \$612.5 million, and total liabilities are \$175.0 million.

CASH FLOW PROJECTION FOR NEXT FIVE YEARS (\$ IN MILLIONS)					
	2023	2024	2025	2026	2027
Revenues	1,815.2	1,869.7	1,925.7	1,983.5	2,043.0
Less: Cost of goods sold @ 95% of revenue	1,724.4	1,776.2	1,829.5	1,884.3	1,940.9
Gross profit	90.8	93.5	96.2	99.2	102.1
SG&A expense @ 2% growth rate going forward	23.0	23.5	23.9	24.4	24.9
Non-cash expense (depreciation & amortisation)	7.0	7.0	7.0	7.0	7.0
Less: Operating expense	30.0	30.5	30.9	31.4	31.9
Operating profit (EBIT)	60.8	63.0	65.3	67.8	70.2
Less: Interest expense	11.5	11.5	11.5	11.5	11.5
Less: Restructuring charges	5.0	0.0	0.0	0.0	0.0
Earnings before taxes (EBT)	44.3	51.5	53.8	56.3	58.7
Less: Taxes paid	13.7	16.0	16.7	17.4	18.2
Net income	30.6	35.5	37.1	38.9	40.5
Free cash flow	54.1	54.0	55.6	57.4	59.0

P17-13 Companies AFD, TYU, CHG and LAN are competitors within an industry. Their respective sales figures are \$2.8 billion, \$3.9 billion, \$4.8 billion and \$2.1 billion. What is the Herfindahl Index (HI) for the industry? Is the industry considered highly concentrated, moderately concentrated or not concentrated? Assuming that two more companies – QBC (\$3.6 billion in sales) and RTY (\$2.7 billion in sales) – are added to the industry figures, does the concentration level of the industry change? (Recompute HI to determine this.) If the three smallest companies (AFD, LAN and RTY) merged, would the FTC be concerned? If so, why? (Note: the HI is measured in units of 2%. For example, $50\% \times 50\% = 2,500\%$ (or, in decimal form, $0.50 \times 0.50 = 0.25$). To make the conversion from decimal to percentage form mathematically, multiply the answer by 10,000; using the same example, this yields $0.50 \times 0.50 \times 10,000 = 2,500$.)

P17-14 Bogey Pty Ltd (BOG), with a share price of \$36 and EPS of \$3, purchases Zoe Co., with a pre-acquisition share price of \$20 and EPS of \$2, for a 10% premium. If the deal is financed exclusively with BOG equity and no material synergies are expected, is the deal accretive or dilutive to BOG shareholders?

P17-15 Following the previous question, what if BOG instead financed the acquisition entirely with debt at an after-tax cost of 9%? Would the deal be accretive or dilute to earnings for BOG shareholders?

P17-16 GRJ Corp. just reported \$10 million in after-tax earnings, and management expects to grow at 3% in perpetuity with a weighted average cost of capital of 13%:

- How would you value GRJ using a growing perpetuity formula?
- If GRJ's market capitalisation is \$100 million, what does this say about the market's perception of management's growth and/or cost of capital expectations?

P17-17 Posada (POS) expects to earn EBITDA of \$4.2 million next year, and expects slow but steady growth thereafter. POS's three key competitors (nearly identical operations and growth prospects) are JET (EBITDA of \$5.1 million, market capitalisation of \$30.3 million), PET (EBITDA

of \$2.8 million, market capitalisation of \$15.4 million) and MO (EBITDA of \$6.5 million, market capitalisation of \$40 million). What would you estimate POS's market valuation to be?

- P17-18** You are assessing a potential acquisition for a client and your analyst informs you that the historic EBITDA multiple based on public comparables is 5.8 and the historic EBITDA multiple based on precedent transactions is 7.3. If the target is expecting EBITDA of \$90 million, what are the valuations under each method? Can you rationalise the difference between the two?
- P17-19** A given market was initially segmented evenly among 20 companies (Phase 1). Five years later, the market was still segmented evenly among competing companies, but there were now only 10 companies (Phase 2). Eventually, six companies emerged with equal portions of the market (Phase 3), but a move towards deregulation of the industry has prompted two of the companies to merge. Determine the Herfindahl Index (HI) for the three phases. Next, determine whether the merger will cause the industry to be considered highly concentrated. In a pre-emptive move (fearing the FTC), the merged companies agree to sell off portions of the market to the other four companies so that the market will be equally divided among all five companies. How does this affect the HI, and is the merger viable under these circumstances?

CASE STUDY

MERGERS, CORPORATE CONTROL AND CORPORATE GOVERNANCE

Jackson Enterprises (JE) is offering a 25% takeover premium to Michael Studios, Inc. (MSI) for the company's 2 million outstanding shares, which are currently trading for a pre-offer price of \$20 per share.

The balance sheet for MSI is:

ASSETS		LIABILITIES	
Current	\$15,000,000	Current	\$7,500,000
Fixed	45,000,000	Long-term	25,000,000
Total	\$60,000,000	Total	\$32,500,000
		Owners' equity	27,500,000
		Total liabilities and equity	\$60,000,000

The market value of MSI's fixed assets is \$60,000,000. The sales (in millions) for the industry by company are:

	SALES
ABC	\$89
CWC	66
DEF	35
JE	45
KOJ	42
MSI	18
SEE	76

ASSIGNMENT

- Determine the amount JE is willing to pay in terms of goodwill.
- If JE's shares are currently trading at \$62.43, then how many shares should JE offer for every share of MSI?
- Assuming that MSI will be treated as a separate reporting subsidiary following the merger, develop the balance sheet for the subsidiary.
- Calculate the Herfindahl Index (HI) for the industry both before and after the proposed merger.

REAL-WORLD CASE STUDY

RESTRUCTURING FINANCES TO END LITIGATION

London Manhattan Company, founded in 1989, sources funding for its clients, many of which are in 'unproductive lender relationships' and seeking improved financial arrangements. The continued existence of organisations like London Manhattan Company indicates both the need for non-financial corporates to seek help when adjusting their capital structures and funding arrangements, and the complexity of deals that need to be arranged. The good news is that concepts in our previous chapters, which focus on long-term financing and leasing, and decisions about dividend payouts, underpin the set-up of even the most complicated refinancing deals.

Below is a case study of a moderately complex deal from London Manhattan Company's webpage.

'The London Manhattan Company recently found a \$9 Million Cash Flow Term Loan Financing for one of our clients in the food service industry. The client had no fixed assets.

The working relationship between our client and its former lender had deteriorated, leading to litigation. Settlement discussions had ground to a halt. The parties asked LMC to broker a settlement deal between them, and then arrange the financing to implement it.

LMC negotiated the financial terms of the litigation settlement between the parties, and arranged new cash flow financing to fund it. The new loan provided proceeds to refinance the borrower's existing debt, fund the repurchase of the stock and warrants held by its prior lender, and provide additional working capital to the company.

Below is a sketch of the financing arrangements set-up by LMC.

- a** amount financed: \$9 million.
- b** structure for financing: variable rate term loan.
- c** index: 30-day LIBOR plus margin.
- d** amortisation: stipulated monthly payments with a balloon payment at maturity.
- e** loan term: 72 months.

- f** collateral: cash flow plus overall lien on all intangible assets of the company and personal property subject only to liens allowed by the new lender.
- g** use of proceeds: to retire existing debt, repurchase ordinary shares, preferred shares and warrants from the prior lender, and provide working capital.
- h** other closing conditions: execution of settlement agreement between the borrower and the prior lender.'

Source: The London Manhattan Company.

ASSIGNMENT

- 1 For point b: What are the benefits and risks of a variable rate loan as opposed to a fixed rate loan?
- 2 For point c: Because this basis for setting the interest rate on the loan means it may vary month-to-month, what actions could the borrower take to manage the risk of volatility?
- 3 For point f: What sorts of 'intangibles' might be suitable collateral for a long-term loan?
- 4 For point g: Why do you think that the borrower would be willing to explain its use of the borrowed funds (think about the investors' points of view)?
- 5 Discuss the reasons why the borrower may have chosen to enter into a new loan agreement, rather than raise capital via an equity issue.
- 6 The borrower intends to use some of the proceeds of the loan to repurchase some of the company's ordinary shares, preferred shares and warrants. What are the factors that the borrower should consider when making these repurchase decisions? What are the likely effects of this on capital structure and gearing?

SOUND BITES: ETHICS IN CORPORATE FINANCE – PART 4

WRITTEN BY BORIS BIELER

Boris Bieler has over twenty years of risk management experience mainly gained in senior audit leadership roles at foreign corporate and investment banks in Australia. For his full biography, please see p. 114.



PUBLIC EXPECTATIONS ON A COMPANY'S ETHICAL STANDARDS AND THE PURPOSE OF A CORPORATION

Jane has been impressed by her company's ethical standards, which make her firm an employer of choice. Jane's company has integrated ethics throughout the organisation, as well as developing some corporate social responsibility (CSR) programs. The following paragraphs introduce CSR and make reference to US business leaders who announced a new 'corporation's purpose statement' in August 2019.

- CSR entails the company's duty to act in the interests of the communities and society as a whole. Driven by expectations from clients, investors, the public and media, companies accept responsibilities beyond the firm's purely economic focus and implement projects to address issues such as education, environment, poverty and human rights.
- On top of the benefits to society, CSR initiatives become an important employee engagement tool which increases productivity, staff morale and retention. It teaches new skills, develops leadership and accountability, and enhances teamwork among work colleagues.
- Employees' volunteer days and matching donation programs are examples of a firm's community engagement. Jane's

company helps an Indigenous school in a socioeconomically disadvantaged area by paying for school equipment and running a mentoring program where employees assist students in finding their first internships. Senior management become involved as guest speakers at the school and provide updates to staff on the program's long-term goals to increase the school's attendance rates and the successful transition of its pupils from students to working professionals.

- In August 2019, the US Business Round Table, which represents CEOs of America's most powerful companies, declared that it would take a broader view of the purpose of a company and strive to benefit all stakeholders including customers, employees, suppliers and communities. This statement is in contrast to past objectives which focused on maximising shareholders' profits only.

Jane supports those public demands. She is proud of her company's CSR work and she looks forward to the volunteer day where she helps students write résumés and prepare for job interviews. For her, it is also a great opportunity to bond with new team members outside work.



ASSIGNMENT

- 1 Corporate social responsibility programs may lead to increased employee engagement. Please assess how Jane's volunteering time may positively impact team building, staff morale, recruitment and retention.
- 2 Based on your online research, does CSR always pay off? How do you define 'pay off': higher profits, higher staff satisfaction, less carbon footprint, no gender pay gap?
- 3 The 2019 Australian Royal Banking Commission raised the issue of whether banks should offer financial services in remote rural areas. Would that be part of a bank's mandate and purpose statement? Could the offering of bank products in remote areas boost the bank's bottom line?
- 4 CSR models are widely seen as a form of self-regulation, which has increased in focus due to public scrutiny. There are, however, a few examples worldwide where this approach has been made mandatory and enforced by law. Do you think that it needs to be made compulsory across countries in the Asia-Pacific region?
- 5 Personally, would you trade off a higher salary in return for working at a company with strong social responsibility and a fair treatment of customers, suppliers and employees?



Corporate finance is the art of measuring and managing value over time and with uncertainty

Cash is the physical measure of value, which is embedded in the flow of **Time** and affected by **Uncertainty**. Exchange of value occurs through **Market interaction**.

PART 5

Financial Lifecycle

- 18 Financial Planning**
- 19 Introduction to Financial Risk Management**
- 20 Entrepreneurial Finance and Venture Capital**
- 21 Cash Conversion, Inventory and Receivables Management**
- 22 Cash, Payables and Liquidity Management**
- 23 Insolvency and Financial Distress**

Corporations have lifecycles in the same way that humans and other animals do, with births, phases of growth and maturity, and progression to old age and death – with the interruptions that illnesses or other factors may cause. In Part V, we examine some of these critical phases, starting with financial planning and financial risk modelling, then plunging into start-up financing, mature growth cash management and ending with how we measure and cope with financial distress and insolvency.

Chapter 18 describes the financial planning process. Financial planning methods vary widely, but almost all companies' financial plans have certain characteristics in common. Most companies plan over several horizons, with the detail of the plan decreasing as the planning horizon increases. That is, companies have very detailed plans that they use to project inflows and outflows of cash, as well as earnings, over the next year or two. Most

companies also develop plans that look ahead two to five years or more. Financial plans help companies focus on goal achievement, identify problems before they arise and arrange financing before cash shortfalls become critical.

Chapter 19 gives an advanced focus on the ways in which we manage financial risk. Earlier chapters offered methods for discussing financial risk, and various measures of it, but this chapter provides a deep dive into the ways we actually manage the financial risks once they have been identified.

In Chapter 20, we consider how to give financial support to new start-up organisations. As new ventures, they typically do not have an extant cash flow from existing output that can be diverted into the new activities, and they may also lack a track record of successful business that would encourage traditional capital providers to support them. Further, cash

use by start-ups may often consume more cash than they generate. In this chapter, we shall see how such new ventures create opportunities for investors to work with them, allowing for the different risk profiles the start-ups reveal.

Chapters 21 and 22 focus on organisations which have passed through their start-up phase and are providing confidence in their cash flows. This cash needs to be captured and managed, and these chapters discuss a range of methods that have been developed to understand this work. The key idea is the identification and management of the

operating cash cycle, and we explore how it is influenced by the flows of accounts payable and receivable, inventories and liquidity available to the organisation.

Finally, Chapter 23 moves to potential end-states for organisations if they encounter financial distress and perhaps become insolvent. There is a close connection between the potential actions of failing companies and the bankruptcy laws in most countries where they operate, and we review the primary types of such interactions.

18

FINANCIAL PLANNING

WHAT COMPANIES DO

DAVID JONES TAKES STEPS TO UNLOCK LONG-TERM VALUE AND GROWTH POTENTIAL

Following its 40% fall in profits for the 2012 financial year, and the impact of a struggling domestic retail market, David Jones conducted a strategic review to identify ways of unlocking long-term shareholder value, and took steps to ensure that it was able to sustain its long-term growth potential.

Most of the slump in profits can be attributed to the doldrums plaguing the retail market, which saw sales fall by 4.8% to \$1.87 billion for the year. However, this was reinforced by rising costs, which resulted in a slide in gross profit margin from 39.1% to 37.5%. To compensate for this fall in profits and to preserve long-term value, the company implemented a dramatic cut in its final dividend to 7 cents per share – a reduction of 33.3% on its interim dividend (10.5 cents per share) and 53.3% on its final dividend for the previous year (15 cents per share).

As part of the strategic review, the company obtained valuations for its flagship Sydney and Melbourne city stores, which were valued

in the accounts at \$460 million. These would be valued at up to \$612 million if DJs were to sell them and rent them back (at an estimated annual cost of \$39 million). However, the strategic review suggested there could be further gains that could be unlocked if these sites were redeveloped, since they are situated in prime locations.

In September 2012, the company announced limited details of this strategic review and revealed its intention to spend the subsequent six months reviewing structural issues, planning limitations, design considerations and the trading impact of various strategic scenarios that were under consideration.

Source: Adapted from Michael Janda, 'DJs Looks to Real Estate Amid Sales Slump', 19 September 2012, <http://www.abc.net.au/news/2012-09-19/david-jones-profit-slumps-as-expected/4269432>. To watch an ABC news item about this David Jones profit issue or to listen to commentary on David Jones' CEO's briefing to analysts providing insight into the strategic and financial planning process undertaken by the company, go to: <http://www.abc.net.au/news/2012-09-19/david-jones-profit-slumps-as-expected>.

LEARNING OBJECTIVES

After studying this chapter, you should be able to:

- LO18.1 understand the relationship between a company's strategy and its plans, and the roles that finance plays in constructing strategic plans
- LO18.2 describe the impact of growth on the company's balance sheet, the role of the sustainable growth model and pro forma financial statements in the financial planning process, and the shorthand approach for estimating external funds required
- LO18.3 review the conservative, aggressive and matching financing strategies that a company might employ to fund the long-term trend and seasonal fluctuations in its business and describe the role of the cash budget in planning and monitoring the company's cash inflows and outflows on a short-term basis

Financial planning is an important corporate finance activity that touches almost all functional groups in a company. Financial planning encompasses a wide array of activities: setting long-run strategic goals, preparing quarterly and annual budgets and managing day-to-day fluctuations in cash balances. Although most people with corporate work experience are familiar with the budgeting process, they often know little about how budgets and other financial plans are compiled at the corporate level, how they tie together competing interests within the company and how they interact with the company's strategic objectives. In this chapter, we discuss various elements of a company's financial planning processes. The chapter emphasises both long-term and short-term financial planning, and demonstrates how companies' financial plans must balance the interests and objectives of different business units and functional areas. For example, in setting long-term strategic and financial goals, a company must prioritise its desires to increase sales and market share; to change or maintain its exposure to financial risk; to achieve production efficiencies; to attract and retain capable employees; and to distribute cash to shareholders. In almost every instance, making incremental progress on one of these objectives means an incremental sacrifice on one or more of the other goals.

Financial planning, particularly long-term planning, is more art than science: the connection between most financial planning models and the objective of maximising shareholder wealth is at times tenuous.¹ The 'What Companies Do' box provides data that confirm the difficulty of adapting to macroeconomic forecasts. At one level, the advice we would give to a company constructing a long-term plan is straightforward: do whatever is necessary to invest in all positive-NPV projects. In practice, a variety of factors make following that advice a major challenge. CFOs usually tell us that they have many more acceptable projects than they can possibly undertake. Limits on capital, production capacity, human resources and many other inputs make the planning process more complex than simply accepting all projects that look promising. We concede that the theoretical underpinnings of planning models are weak, so in this chapter we focus as much as possible on practice. We describe how companies *actually* build long-term and short-term financial plans rather than argue about how they *should* plan.

¹ A number of models – such as economic value added (EVA) and shareholder value added (SVA) – tie financial decisions and plans to shareholder value. Those widely used models, introduced in Chapter 9, are briefly discussed later in this chapter.

LO18.1

18.1 OVERVIEW OF THE PLANNING PROCESS

A long-term financial plan begins with strategy. Typically, the senior management team analyses the markets in which the company competes. Managers try to identify ways to protect and increase the company's competitive advantage in those markets. For example, a company that competes by achieving the lowest production cost in an industry might seek to determine whether it should make additional investments in manufacturing facilities to achieve even greater production efficiencies. A risk to this strategy is that market demand may turn out to be less than what was expected, leaving the company's fixed assets underutilised. This type of company, therefore, will try to forecast market demand and develop contingency plans for the possibility that the expected demand does not materialise. If a company's competitive advantage derives from the value of its brand, it might begin by assessing whether new or expanded marketing programs might increase the value of its brand relative to competitors.

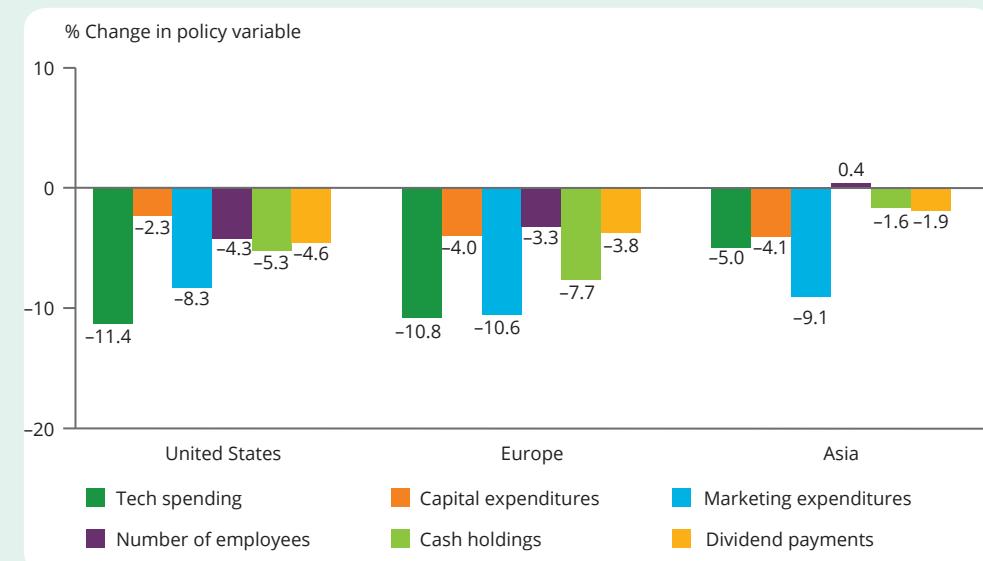
FINANCE IN THE REAL WORLD



HOW COMPANIES ADJUST FINANCIAL PLANS WHEN A GLOBAL RECESSION HITS

A recession highlights the importance of clear financial and strategic operating plans because a company's survival may hinge on how effectively it can cut costs and match output to lower demand. This lesson was brought home to managers in 2008 as the global credit crisis cut demand for goods and services and forced the world's major economies to contract.

US, EUROPEAN AND ASIAN PRO FORMA PLANS FOR 2009



Source: Figures from Murillo Campello, John R. Graham and Campbell R. Harvey, 'The Real Effects of Financial Constraints: Evidence from the Financial Crisis', *Journal of Financial Economics*, Vol. 97 (2010), pp. 470–87.



A 2008 survey of 1,050 chief financial officers (CFOs) in the United States, Europe and Asia showed how managers were preparing to cope with the deepening recession. The survey found that managers were planning to cut research and development, marketing and capital expenditures; to draw down their cash holdings; and to cut dividend payments. These actions were dramatic – for example, recall from Chapter 15 that companies are very reluctant to cut dividends. The survey results presented in the figure above also show that managers in Europe and the US were planning to reduce personnel, but that Asian managers expected to keep employment levels virtually unchanged. Managers in all three regions were planning to cut marketing expenditures significantly, while managers in Europe and the US were planning much more drastic cuts in technology spending than were Asian managers.

18.1a SUCCESSFUL LONG-TERM PLANNING

Long-term planning requires more than paying close attention to a company's existing markets. Even more important is the ability to identify and prioritise new market opportunities. Successful long-term planning means asking and answering questions such as the following:

- In what emerging markets might we have a sustainable competitive advantage?
- How can we leverage our competitive strengths across existing markets in which we currently do not compete?
- What threats to our current business exist, and how can we meet those threats?
- Where in the world should we produce? Where should we sell?
- Can we deploy resources more efficiently by exiting certain markets and using those resources elsewhere?

strategic plan

A multi-year action plan for the major investments and competitive initiatives that a company's senior managers believe will drive the future success of the enterprise

As the company's senior managers develop answers to these questions, they construct a **strategic plan**, a multi-year action plan for the major investments and competitive initiatives that they believe will drive the future success of the enterprise.

18.1b THE ROLE OF FINANCE IN LONG-TERM PLANNING

Finance plays several roles in long-term planning. First, financial managers draw on a broad set of skills to *assess the likelihood that a given strategic objective can be achieved*. With respect to a major new investment proposal, their first questions should be, 'Does this investment make sense?' and 'Is there good reason to expect this proposal to generate wealth for our shareholders?'

Second, the finance function *assesses the feasibility of a strategic plan*, given a company's existing and prospective sources of funding. Though some corporate giants, such as Microsoft and Intel, hold such vast amounts of cash that they are nearly unconstrained in their ability to make large new investments, for most companies financial constraints are more limiting. Given a broad set of strategic objectives, financial managers must determine whether the company's ability to generate cash internally, plus its ability to raise cash externally, will be sufficient to fund new spending initiatives.² Financial analysts generally treat expected dividend payments as a factor that limits a company's ability to make new investments. Similarly, if fulfilling strategic objectives will require a significant increase in leverage, it is the finance group's role to communicate this trade-off to the top management team. As we will see in other chapters, financial managers

2 Considerations such as these are particularly important when credit market conditions are extremely tight, such as was the case during the global financial crisis.

have several tools that enable them to highlight the trade-offs that companies face when setting growth targets.

Third, finance clearly *plays an important control function as companies implement their strategic plans*. Financial analysts prepare and update cash budgets to make sure that companies do not unknowingly slip into a liquidity crisis. At an even more detailed level, analysts monitor individual items in the cash budget, such as changes in inventories and receivables (our focus in the online Chapter 21) and changes in payables (our focus in the online Chapter 22). Here, too, financial managers must evaluate trade-offs.

Fourth, a major contribution of finance to the strategic planning process involves *risk management*. If a company's strategy calls for making new investments in overseas markets (either producing or selling abroad), then the company faces a new set of risk exposures. The finance function manages these exposures so the company takes those risks that it believes it has a comparative advantage in taking and hedges risks for which it has no advantage. Similarly, more than in any other functional area, the job of finance is to identify problems that could develop in the future if the company's strategic plans unfold in unexpected ways. Developing 'problem scenarios' and options for dealing with them is an important part of finance's risk-management responsibility, which is covered in Chapter 19 online.

In this chapter, we focus primarily on the second and third roles just described.

LO18.1

CONCEPT REVIEW QUESTIONS

- 1 A company decides to compete by making a major investment to modernise its production facilities. Describe two ways in which meeting this objective might force a company to sacrifice other objectives.
- 2 Company A competes in a market in which the demand for its product and its selling price are highly unpredictable. Company B competes in a market in which these factors are much more stable. Which company probably creates cash budgets more frequently and monitors them more carefully?

THINKING CAP QUESTION

- 1 What role does finance play in a company's strategic planning process?

LO18.2

18.2 PLANNING FOR GROWTH

18.2a SUSTAINABLE GROWTH

Most companies strive to grow over time, and most companies view rapid growth as preferable to slow growth. Of course, rapid growth does not always maximise wealth, since it is possible for growth to be detrimental to shareholders. For now, we put aside the question of whether growth is desirable. Assuming that companies seek growth, they can focus on one or a number of measures of growth.

Popular Measures of Growth

Three of the most popular measures of growth are the accounting return on investment (ROI), economic value added (EVA) and growth in sales or assets. All of these methods rely on accounting data and are typically measured on an annual basis. We next describe ROI and EVA more fully.

Return on Investment

return on investment (ROI)

A measure of a company's overall effectiveness in using its assets to generate returns to ordinary shareholders; also, *return on total assets (ROA)*

The accounting **return on investment (ROI)** is the company's earnings available for ordinary shareholders divided by its total assets. (In Chapter 2 we referred to this measure by its alternative name, *return on total assets* or *ROA*.) Return on investment measures the company's overall effectiveness in using its assets to generate returns to ordinary shareholders.

Companies that use this metric as a measure of growth attempt to maintain ROI above some minimum *hurdle rate* and often raise this standard over time. These companies frequently set hurdle rates for minimum ROI based on the company's *cost of capital*. They assume that if the ROI is greater than the cost of capital (plus perhaps a fudge factor), then shareholder value will be created. The problem with this approach is that it compares the *accounting-based* ROI to an *economic-based* measure of the return demanded by suppliers of capital. Although use of this method has practical appeal, its theoretical roots are shallow at best.

Economic Value Added (EVA)

As noted in Chapter 9, *economic value added (EVA)* is the difference between *net operating profits after taxes (NOPAT)* and the cost of funds; when applied correctly, EVA prompts managers to make the same investment decisions that the NPV method directs them to do. The cost of funds is found by multiplying the company's cost of capital by its investment. Analysts can apply EVA to individual investments or to the entire company, but its use in financial planning tends to focus on the entire company or on entire divisions.

Companies that employ EVA in the planning process typically build the EVA model into their spreadsheets and evaluate various scenarios by calculating the EVAs of the scenarios. By comparing all positive EVAs, the company can implement the set of plans with the highest EVA, which should create the most value for shareholders. Although widely examined in the financial literature,³ EVA's degree of positive correlation with actual share valuations remains unclear. It is sometimes difficult to implement because it requires accrual-based accounting inputs (NOPAT and investment). This disconnection between theory and practice, coupled with its complex computations, tends to result in greater planning focus on growth rates.

Defining Growth

Companies frequently set planning goals in terms of *target growth rates*, typically annual growth in sales or assets. For the moment, we set aside the question of whether growth creates or destroys shareholder value. Instead we focus on measuring target growth rates in light of their intuitive, computational and practical appeal. Our goal is to demonstrate a simple model that highlights the trade-offs that companies must weigh when they choose to grow. These trade-offs depend on several factors: how rapidly the company plans to grow; how profitable its existing business is; how much of its earnings it retains and how much it pays out to shareholders; how efficiently it manages its assets; and how much financial leverage it is willing to bear.

First, let us define what we mean by 'growth'. A company's growth can be measured by increases in its market value, its asset base, the number of people it employs or any number of other metrics. For now, let us imagine that a company establishes a growth target in terms of sales. *Our experience suggests that most companies define and measure growth targets in terms of sales*, so we will use that convention as well. That is, when we say that a company plans to grow by 10% next year, we mean that it hopes to achieve a 10% increase in sales revenue.

With sales growth in mind, think about what growth means for a company in terms of its balance sheet. An increase in sales probably requires additional investments in assets. Certainly, we would anticipate that increased sales volume would require additional investments in current assets, such as inventories and

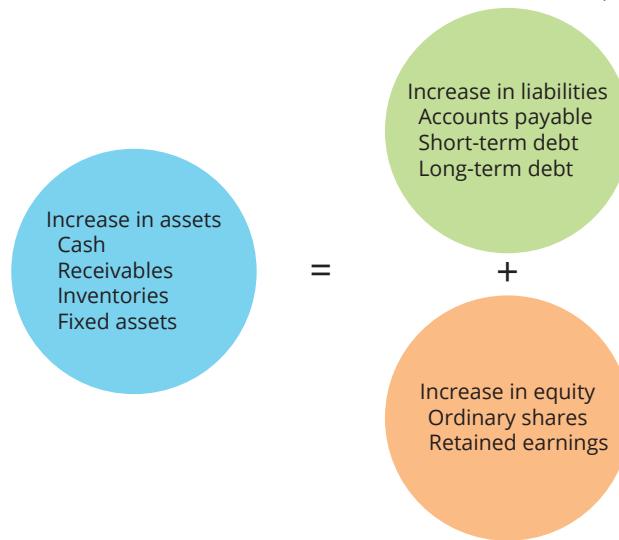
³ For some critical analyses of EVA, see Ray D. Dillon and James E. Owers, 'EVA as a Financial Metric: Attributes, Utilization, and Relationship to NPV', *Financial Practice and Education* (Spring/Summer 1997), pp. 32–40; John D. Martin, J. William Petty and Steven P. Rich, 'A Survey of EVA and Other Residual Income Models of Firm Performance', *Journal of Finance Literature* (Winter 2005), pp. 1–20; and John M. Griffith, 'The True Value of EVA', *Journal of Applied Finance* (Fall/Winter 2004), pp. 25–9.

receivables. Over time, increases in sales will also require new investments in fixed assets, such as production capacity and office space. As a shortcut, let us assume that a company's total asset turnover ratio, the ratio of sales (S) divided by total assets (A), remains constant through time. In other words, any increase in sales will be matched by a comparable percentage increase in assets. Because the balance sheet equation must hold, increases in liabilities and shareholders' equity must equal the increase in assets. So how would we expect increases in liabilities and shareholders' equity to come about?

In previous chapters we learned that most companies issue new ordinary shares very infrequently, so we will rule that out as a potential source of new financing. As with inventories and receivables, accounts payable should increase (higher sales volume means higher purchases). We might also expect to see higher accruals and higher short-term liabilities of other types. Similarly, if a company's business is profitable, then its equity account will increase (even if it does not issue any new shares) by the amount of earnings it retains. **Figure 18.1** illustrates that the growth in assets must equal growth in these liability and equity accounts over time.

FIGURE 18.1 SUSTAINABLE GROWTH EQUALITY

As a company grows, it must invest in new assets to support increased sales volume. The investments in new assets must be financed with some combination of increased liabilities and increased equity.



Developing the Sustainable Growth Model

The **sustainable growth model** starts with a balance sheet identity. It then adds a few assumptions and ultimately derives an expression that determines how rapidly a company can grow while maintaining a balance between its outflows (increases in assets) and inflows (increases in liabilities and equity) of funds. Specifically, the sustainable growth model assumes the following:

- 1 The company's only form of equity is from ordinary shares (E), and it will not issue new ordinary shares next year.
- 2 The company's total asset turnover ratio, S/A , remains constant.
- 3 The company pays out a constant fraction, d , of its earnings as dividends.
- 4 The company maintains a constant assets-to-equity ratio, A/E .
- 5 The company's net profit margin, m , is constant.

sustainable growth model

Derives an expression that determines how rapidly a company can grow while maintaining a balance between its outflows (increases in assets) and inflows (increases in liabilities and equity) of cash

Consider a company that wants to increase sales next period by g per cent. If total assets in the current period equal A , and if the total asset turnover ratio remains constant, then assets must increase in the next period by gA . This represents a change in the left-hand side of the company's balance sheet next period – a change that must be balanced by an equal change on the right-hand side.

Given sales this period of S , a net profit margin (in this case, defined as net income divided by sales) equal to m and a dividend payout ratio of d , we can determine the company's retained earnings next period:

$$\text{Retained earnings} = S(m)(1 + g)(1 - d)$$

The product of S and m yields net profits in the current year. Multiplying this product by $(1 + g)$ results in next year's profits, and multiplying this result by $(1 - d)$ gives next year's retained earnings. This is the amount by which the book equity component of the balance sheet will grow. Next, observe that the ratio of assets to equity (total assets to ordinary share equity) equals 1 plus the ratio of total liabilities, L , to shareholders' equity:

$$\begin{aligned} A &= E + L \\ \frac{A}{E} &= \frac{E + L}{E} = 1 + \frac{L}{E} \end{aligned}$$

Assuming that the company maintains a constant assets-to-equity ratio is equivalent to assuming that the ratio of liabilities to equity remains constant. Hence, for each dollar of earnings that the company retains, it can borrow an additional L/E dollars to keep the mix of debt and equity constant. For example, if a company finances half of its assets with debt and half with equity, then the ratio L/E equals 1.0. If the company retains \$1 million in earnings in a given year, then it can afford to borrow an additional \$1 million and so maintain the desired mix of debt and equity.

The increase in liabilities next year simply equals the product of next year's retained earnings and the ratio of liabilities to equity:

$$\text{Increase in liabilities} = [S(m)(1 + g)(1 - d)] \left(\frac{L}{E} \right)$$

Finally, if the increases in assets must match the increase in the sum of liabilities and equity, then we can write the following equations:

$$\begin{aligned} gA &= S(m)(1 + g)(1 - d) + \left[S(m)(1 + g)(1 - d) \right] \left(\frac{L}{E} \right) \\ &\quad \uparrow \text{assets} \qquad \uparrow \text{ret. earnings} \qquad \uparrow \text{liabilities} \\ &= \left[S(m)(1 + g)(1 - d) \right] \left(1 + \frac{L}{E} \right) \\ &\quad \uparrow \left(\text{equity} + \text{liabilities} \right) \end{aligned}$$

The premise of the sustainable growth model is that there will be some rate of growth, g^* , that keeps the outflows and inflows of funds in balance. This is the *sustainable growth rate*. It can be found by solving and rearranging the preceding equation and substituting A/E for $(1 + L/E)$. It can be represented as follows:

$$(Eq. 18.1) \quad g^* = \frac{\frac{m(1-d)}{E}}{\frac{A - m(1-d)}{S} \frac{A}{E}}$$

Notice how each of the key variables in **Equation 18.1** affects the sustainable growth rate:

- If a company's net profit margin (m) increases, then the numerator rises and the denominator falls, so g^* increases. Therefore, generating higher profits per dollar of sales provides fuel for a higher growth rate.

- Similarly, an increase in the ratio of assets to equity (A/E) – which can occur only if the company is willing to accept greater financial leverage – also increases the sustainable growth rate. Companies willing to borrow more can grow more rapidly.
- If a company can increase its total asset turnover ratio (S/A), then the inverse ratio A/S falls and the sustainable growth rate rises. Companies that manage assets more efficiently and generate higher sales volume per dollar of assets can achieve more rapid growth.
- Finally, a reduction in dividend payouts (d) also tends to increase g^* . When companies retain more earnings, they can finance faster growth.
- This relates to the DuPont system discussed in Chapter 2.



Calculating Sustainable Growth Rates

In 2012, Virgin Australia Holdings Limited reported the following preliminary financial data:

Sales	\$3,919.5 million
Net income	\$ 22.8 million
Total assets	\$3,995.2 million
Total equity	\$ 929.7 million
Dividends	\$ 0

From these figures, we can determine that Virgin Australia's net profit margin was 0.58%, its assets-to-equity ratio was 4.30, its total asset turnover ratio was 0.98 (which implies an assets-to-sales ratio of 1.02) and its dividend payout ratio was 0.0. Plugging these values into **Equation 18.1** yields a sustainable growth rate of about 2.5%. This meant that the company could increase sales by 2.5% without issuing new ordinary shares and without changing total asset turnover, dividend policy, profit margins or leverage.

Source: Virgin Australia Holdings Limited: *Preliminary Final Report* for the year ended 30 June 2012.

Interpreting the Sustainable Growth Model

It is just as important to understand what the sustainable growth model *does not say* as it is to grasp what it does say. From the previous calculation, should we assume that Virgin Australia managers should have set as their company's growth target an increase in sales of 2.5%, equal to the sustainable growth rate? Not at all. Virgin Australia managers should have decided what rate of growth would maximise shareholder wealth, and then they should have used the sustainable growth model as a planning device to help them prepare for the consequences of their growth plans. Suppose that Virgin Australia decided it was best for its shareholders if the company grew at a more rapid rate than 2.5%. In order to do this, Virgin Australia would need to alter one or more of the baseline assumptions of the model. It could have found ways to increase its profit margin, its asset turnover or its leverage. Since Virgin Australia did not pay dividends at that time, it could not use a dividend cut to increase growth.

The sustainable growth model gives managers a shorthand projection that ties together growth objectives and financing needs. It provides hints about the levers that managers must pull in order to achieve growth above the sustainable rate. The model also identifies some financial benefits of growing more slowly than the sustainable rate. A company that expects to grow at a rate less than g^* can plan to reduce leverage or asset turnover, or to increase dividends. Again, we emphasise that the model does not say anything about how fast the company *should* grow.

The sustainable growth model also highlights tensions that can develop as companies pursue multiple objectives simultaneously. We have seen that one way to finance faster growth is to increase leverage, so

the goals of increasing sales and maintaining the current degree of leverage may be difficult to achieve simultaneously. For the company to achieve faster sales growth, the marketing group may agree that it should offer a wider array of products. Doing so may result in lower inventory turnover and reduced total asset turnover. If the company is unwilling to increase leverage, and if expanding the product line means reducing asset turnover, then meeting the sales target will depend on improving profit margins or cutting dividend payout. Compensation issues may further cloud the evaluation of competing objectives; for example, the compensation of the vice-president of marketing may be tied to generating additional sales volume, whereas the CFO's compensation may depend on maintaining the company's credit rating.

The primary advantage of the sustainable growth model is its simple way of linking various aspects of financial planning. However, the financial planning process generally involves more complex projections. These projections are usually embodied in a set of pro forma income statements and balance sheets that companies use to provide a benchmark against which to judge future performance.

18.2b PRO FORMA FINANCIAL STATEMENTS

pro forma financial statements

A forecast of what a company expects its income statement and balance sheet to look like a year or two ahead

Periodically, companies produce **pro forma financial statements**, which are forecasts of what they expect the income statement and balance sheet to look like a year or two ahead. Occasionally, companies use these statements to communicate their plans to outside investors (such as at the time of an IPO or earnings announcement). Most of the time, however, managers construct pro forma financial statements for purposes of internal planning and control. By making projections of sales volume, profits, fixed asset requirements, working capital needs and sources of financing, the company can establish goals to which compensation may be tied. The company can also predict liquidity requirements with enough lead time to arrange additional financing when needed.

The Sales Forecast

The process of creating pro forma financial statements varies from company to company, but there are some common elements. Most pro forma statements begin with a *sales forecast*. The sales forecast may be derived through either a 'top-down' or 'bottom-up' approach.

top-down sales forecast

A sales forecast that relies heavily on macroeconomic and industry forecasts

Top-down sales forecasts rely heavily on macroeconomic and industry forecasts. Some companies use complex statistical models or subscribe to forecasts produced by econometric modelling companies. In the top-down approach, senior managers establish a company-wide objective for increased sales. Next, individual divisions or business units receive targets that, in aggregate, collectively achieve the company's overall growth target. Division heads pass down sales targets to product line managers and other smaller-scale units. The sales targets will vary across units within the division, but they must add up to achieve the division's goal.

Companies that use a **bottom-up sales forecast** begin by assessing demand in the coming year on a customer-by-customer basis. Managers add up these figures across sales territories, product lines and divisions to arrive at the overall sales forecast for the company. Bottom-up forecasting approaches generally do not rely on mathematical or statistical models.

Unsurprisingly, many companies use a blend of these two approaches. For example, a company may generate a set of assumptions regarding the macroeconomic environment to which all divisions must adhere. It then can generate forecasts from the customer level, and aggregate them to an overall forecast for the entire company that is consistent with the macro assumptions. Some companies produce two sets of forecasts, one that uses a statistical approach and another that relies on customer feedback. Senior managers then compare the two forecasts before setting a final sales objective.

Constructing Pro Forma Statements

Starting with the sales forecast, financial analysts construct pro forma income statements and balance sheets using a mix of facts and assumptions. For example, if a company's strategic plan calls for major investments in fixed assets, then the analyst will incorporate those projections in the forecast of total fixed asset requirements as well as in the forecast of depreciation expense. In the absence of any specific knowledge of capital spending plans, an analyst may assume that total fixed assets will remain at a fixed percentage relative to sales or total assets; this assumption would, in turn, drive the depreciation line item on the income statement.

Similarly, an analyst can make projections for line items that vary with sales volume. For example, by assuming a constant gross profit margin, the analyst can estimate cost of goods sold directly from the sales forecast. When companies construct pro forma statements by assuming that all items grow in proportion to sales and by extending that percentage to all income statement and balance sheet accounts, they are using the **percentage-of-sales method**. This is a convenient way to construct pro forma statements, and it is usually a good starting point when making financial projections. Such balance sheet items as receivables, inventory and payables do typically increase with sales, although not always in a linear fashion. For example, a company with \$100 billion in sales may not need 100 times as much inventory as a company with \$1 billion in sales.

percentage-of-sales method

Method of constructing pro forma statements by assuming all items grow in proportion to sales

In constructing pro forma statements, analysts usually leave one line item on the balance sheet as a **plug figure**, which is adjusted after making all other projections. For example, an analyst may make projections for all asset, liability and equity accounts except for the cash balance; then, after the projections are complete, the analyst could simply adjust the cash account to make the balance sheet balance. Alternatively, the analyst might leave a short-term liability account open to serve as the plug figure. The analyst could, for example, use the line item representing the amount borrowed on a bank line of credit to make the right-hand and left-hand sides of the balance sheet equal. If this assumed amount of borrowing on the credit line seems unreasonable, the company may need to recalculate the other assumptions underlying its planning process.

plug figure

A line item on the pro forma balance sheet that represents an account that can be adjusted after all other projections are made



Using a Plug Figure

Figure 18.2 shows the 2021 balance sheet and income statement for Walk-A-Bout Shoes. We will use this historical information plus some assumptions to generate pro forma financial statements for 2022. We make the following assumptions:

- 1 Walk-A-Bout Shoes plans to increase sales by 30% in 2022.
- 2 The company's gross profit margin will remain at 35%.
- 3 Operating expenses will equal 10% of sales, as they did in 2021.
- 4 Walk-A-Bout Shoes pays 10% interest on both its long-term debt and its credit line.
- 5 Walk-A-Bout Shoes will invest an additional \$20 million in fixed assets in 2022, which will increase depreciation expense from \$10 million to \$15 million in 2022.
- 6 The company faces a 35% tax rate.
- 7 The company plans to increase cash holdings by \$1 million next year.
- 8 Accounts receivable equal 8.5% of sales.
- 9 Inventories equal 10% of sales.
- 10 Accounts payable equal 12% of cost of goods sold.
- 11 The company will repay an additional \$5 million in long-term debt in 2022.
- 12 The company will pay out 50% of its net income as a cash dividend.
- 13 The company plans to use its credit line as the plug figure.

From this set of assumptions and the data in **Figure 18.2**, we can construct the pro forma statements for 2022 shown in **Figure 18.3**. To build the pro forma income statement, we first



note that Walk-A-Bout Shoes' sales increase to \$325 million. Cost of goods sold and operating expenses increase 30% over the previous year (hitting the percentage-of-sales assumptions above). This is true because gross profit margin is assumed to remain at 35%, meaning that the cost of goods sold must increase by the same percentage as sales. Similarly, since operating expenses will remain at 10% of sales, the same argument holds true – they will also increase by 30%. Interest expense is a tricky item. To begin, assume that Walk-A-Bout Shoes will maintain a \$5 million balance on its credit line and will retire the current portion of long-term debt (\$5 million). This means that its total outstanding debt during 2022 will be \$25 million. At 10%, interest expense

should equal \$2.5 million. (We shall see that this assumption may change as we continue to build the statements.)

Putting these figures together in the pro forma income statement, we see that Walk-A-Bout Shoes earns a net profit of just over \$41 million, half of which it pays out to shareholders.

Next, we build the pro forma balance sheet. Cash is given at \$11 million (\$10 million in 2021 plus a \$1 million increase). Accounts receivable and inventory increase with sales as stated, so current assets increase to \$71,125 million. With the additional investment in fixed assets of \$20 million (less 2022's depreciation expense), net fixed assets grow to \$65 million. Total assets equal \$136,125 million.

FIGURE 18.2 FINANCIAL STATEMENTS FOR 2021 (\$ IN THOUSANDS)

WALK-A-BOUT SHOES BALANCE SHEET AS AT 31 DECEMBER 2021			
ASSETS		LIABILITIES AND EQUITY	
Cash	\$ 10,000	Accounts payable	\$ 19,500
Accounts receivable	21,250	Credit line	5,000
Inventory	25,000	Current long-term debt	5,000
Current assets	<u>\$ 56,250</u>	Current liabilities	\$ 29,500
Gross fixed assets	\$ 80,000	Long-term debt	20,000
Less: Accumulated depreciation	20,000	Ordinary shareholder equity	20,200
Net fixed assets	<u>\$ 60,000</u>	Retained earnings	<u>46,550</u>
Total assets	<u>\$116,250</u>	Total liabilities and equity	<u>\$116,250</u>

WALK-A-BOUT SHOE INCOME STATEMENT AS AT 31 DECEMBER 2021	
Sales	\$250,000
Less: Cost of goods sold	162,500
Gross profit	\$ 87,500
Less: Operating expenses	25,000
Less: Interest expense	3,000
Less: Depreciation	10,000
Pre-tax income	\$ 49,500
Less: Taxes	17,325
Net income	<u>\$ 32,175</u>





FIGURE 18.3 PRO FORMA FINANCIAL STATEMENTS FOR 2022 (\$ IN THOUSANDS)

WALK-A-BOUT SHOES PRO FORMA BALANCE SHEET AS AT 31 DECEMBER 2022			
ASSETS		LIABILITIES AND EQUITY	
Cash	\$ 11,000	Accounts payable	\$ 25,350
Accounts receivable	27,625	Credit line	3,306
Inventory	32,500	Current long-term debt	5,000
Current assets	71,125	Current liabilities	33,656
Gross fixed assets	\$100,000	Long-term debt	15,000
Less: Accumulated depreciation	35,000	Ordinary shareholder equity	20,200
Net fixed assets	65,000	Retained earnings	67,269
Total assets	\$136,125	Total liabilities and equity	\$136,125

WALK-A-BOUT SHOES PRO FORMA INCOME STATEMENT FOR THE YEAR ENDED 31 DECEMBER 2022	
Sales	\$325,000
Less: Cost of goods sold	211,250
Gross profit	113,750
Less: Operating expenses	32,500
Less: Interest expense	2,500
Less: Depreciation	15,000
Pre-tax income	63,750
Less: Taxes	22,312
Net income	41,438
Dividends	20,719

On the liabilities/equity side, accounts payable increase with sales, the current portion of long-term debt remains at \$5 million, total long-term debt declines by \$5 million and ordinary shareholder equity does not change. The retained earnings figure for 2022 equals the 2021 figure plus half of 2022's net income. Walk-A-Bout Shoes

uses its credit line as the plug figure. That is, given all the assumptions so far, the credit line will decline from \$5 million to \$3,306 million, because otherwise the assets will not balance with the sum of liabilities and equity.

Yet, because the credit line declines, our estimate of interest expense in the income statement is too high. Recall that we predicted interest expense of \$2.5 million based on a 10% interest rate on total outstanding debt of \$25 million. The pro forma balance sheet now shows long-term and short-term debt of just \$23,306 million, so interest expense falls to \$2.33 million. A decline in interest expense leads to an increase in profits and retained earnings. Higher retained earnings means that the company can reduce the line of credit even more, and the cycle repeats. To find the amount of borrowing on the credit line and the corresponding interest expense that reconciles the balance sheet with the income statement, an analyst would need to use an iterative approach, such as Excel's 'Solver' feature.

The bottom line for Walk-A-Bout Shoes is that its pro forma outlook is quite good. If the company achieves its sales growth target and keeps expenses and current asset and current liability accounts in line with historical norms, then it can invest \$20 million in new fixed assets while reducing its outstanding interest-bearing debt.

In one sense, this conclusion is hardly surprising. If we take the 2021 data for Walk-A-Bout Shoes and plug it into **Equation 18.1**, we find that the company's sustainable growth rate is 31.8%. Therefore, the company's target growth rate of 30% should leave it with some financial 'slack'. Going through the added steps to build pro forma statements provides the company with much more information than does the sustainable growth rate alone. With the figures in **Figures 18.2** and **18.3** programmed into a spreadsheet, analysts could easily

study the effects of changes in any of the assumptions – such as Walk-A-Bout Shoes' ability to pay down debt – or identify a need to increase the credit line balance.

A Shorthand Approach for Estimating External Funds Required

external funds required (EFR)

The expected shortage or surplus of financial resources, given the company's growth objectives

We can use the notation defined earlier to present another shorthand approach for estimating the amount of **external funds required (EFR)** – the external financing that a company will require. **Equation 18.2** states that the EFR is a function of three factors. The first term in the equation, $(A/S)\Delta S$, indicates the additional investment in assets required for a company if it plans to maintain its total asset turnover ratio and increase the dollar volume of sales by ΔS . The second term measures the inflow of funds available to finance this growth. The inflow represented by the second term assumes that the relationship between a company's sales and its spontaneous liabilities (in this case, accounts payable (AP)) remains constant. The third term captures the additional financing inflows that the company creates internally through retained earnings. Thus, we have:

(Eq. 18.2)

$$EFR = \frac{A}{S} \Delta S - \frac{AP}{S} \Delta S - mS(1+g)(1-d)$$

If we apply this shorthand calculation to Walk-A-Bout Shoes, we can determine its external funds requirement (in thousands of dollars):

$$\begin{aligned} EFR &= \frac{\$116,250}{\$250,000} \times (\$75,000) - \frac{\$19,500}{\$250,000} \times (\$75,000) \\ &\quad - \left(\frac{\$32,175}{\$250,000} \right) \times \$250,000 \times (1+0.30) \times (1-0.50) = \$8,111 \end{aligned}$$

Under the assumptions of this model, Walk-A-Bout Shoes will require additional external funding of \$8.1 million. In the pro forma projections in **Figure 18.3**, Walk-A-Bout Shoes' total external financing actually declines by \$6.7 million.⁴ Why the discrepancy? Closer examination of the pro forma statements reveals that several of the assumptions in **Equation 18.2** do not hold in a more complete analysis. For instance, from 2021 to 2022, Walk-A-Bout Shoes' ratio of assets to sales is not constant, as the equation assumes; instead, the ratio declines from 0.465 to 0.419. Walk-A-Bout Shoes is increasing sales more rapidly than assets, so its funding needs are actually less than **Equation 18.2** assumes. When we build projections on an account-by-account basis, the apparent need for external funding predicted by **Equation 18.2** turns into a financial surplus, highlighting that **Equation 18.2** is just an approximation.

Some Concluding Remarks

This discussion has presented two important points. First, shorthand approaches – such as the sustainable growth model or the equation for determining *external funds required (EFR)* – help managers predict whether they should expect a scarcity or a surplus of financial resources, given the company's growth objectives. Second, companies can construct a more complete picture of their funding requirements by building pro forma income statements and balance sheets. Managers can use any of these models to reduce the risk of experiencing unpleasant financial surprises a year or two ahead.

⁴ Comparing Figure 18.2 and Figure 18.3 produces a \$5 million reduction in long-term debt and a \$1.7 million (\$5.0 million – \$3.3 million) reduction in the line of credit. The figures are imprecise because the interest expense and outstanding debt figures in Figure 18.3 are not fully reconciled.

Besides planning for growth that will occur over a period of years, companies also construct financial plans with shorter time horizons. These plans generally focus on temporary cash surpluses or deficits due to seasonal fluctuations in transactions volume. The next section examines this dimension of financial planning.

LO18.2

CONCEPT REVIEW QUESTIONS

- 3 Describe and evaluate the use of *return on investment (ROI)* and *economic value added (EVA)* as growth targets in financial planning. Why do companies often use annual growth in sales or in assets as a target growth rate?
- 4 Explain the difference between a company's *sustainable* growth rate and its *optimal* growth rate. In what circumstances is a company's optimal growth rate likely to exceed its sustainable growth rate? Under what conditions would you expect the opposite to be true?
- 5 Current asset accounts, especially cash and inventory, usually increase at a rate that is slightly less than the growth rate in sales. Why? What is the implication of this fact for the sustainable growth model?

THINKING CAP QUESTIONS

- 2 What metrics do companies use as growth targets, and what role, if any, does economic value added (EVA) play in planning processes?
- 3 What are the financial consequences of very rapid growth?
- 4 With what frequency do companies construct pro forma financial statements for planning purposes?

LO18.3

18.3 PLANNING AND CONTROL

In the previous section we observed that most companies establish growth as one of their long-term objectives. So it is not unusual to observe a distinct upward trend in any company's historical sales volume. However, in a single year, many companies experience sharp quarter-to-quarter sales changes because of seasonal factors. Construction-related businesses, for instance, generate much higher volume in the summer than they do in the winter; in contrast, toy companies experience peak volume in the winter. As a result, short-term financing strategies are also important, and companies may employ conservative, aggressive and matching financing strategies to fund the long-term trend and seasonal fluctuations in their businesses.

18.3a SHORT-TERM FINANCING STRATEGIES

Companies monitor these fluctuations very closely, with frequent internal management accounts. However, they try to keep this detailed information confidential, as it can have an impact on their competitive position. Instead, they tend only to publish financial reporting data when they are required to do so by regulation. In Australia, most listed companies are only required to publish financial reports every six months. Resource-related companies are also required to publish quarterly cash flow details, but are not required to publish

quarterly balance sheet or income statement information. In the US, listed companies are required to file their financial returns on a quarterly basis, so financial data from US companies can be more informative when trying to assess the impact of short-term financial planning.

Because sales volume tends to fluctuate around a long-term upward trend, we expect to observe the same pattern when we examine a company's total assets over time. As sales volume grows, so does the company's need for current and fixed assets. During the year, a company's investment in current assets will tend to rise and fall with sales. This seasonal pattern creates temporary cash surpluses and deficits that the company must manage. In the remainder of this section, we use data for Hershey Foods (in the US) to demonstrate alternative financing strategies.

Hershey Foods Quarterly Sales and Total Current Assets

Panel A of [Figure 18.4](#) plots quarterly sales figures for the Hershey Company from 1997 to the second quarter of 2015. Hershey's fiscal year matches the calendar year, so its quarterly income statements report sales for quarters ending in March, June, September and December each year. For Hershey, sales usually peak in the third or fourth quarter of each year. Sales troughs typically occur in the second quarter. Panel A of [Figure 18.4](#) also reveals a gradual upward trend in Hershey sales from 1997 to 1999. That growth trend levelled off from 2000 to 2003 with the US economic recession; it then resumed growth from 2004 to 2006, before levelling off again beginning in 2007.

Panel B of [Figure 18.4](#) plots Hershey's quarterly total current assets over the same period. You can see that the patterns closely match those in Panel A. Hershey's total current assets show the same seasonal pattern (with a lag of one quarter) and the same upward trend of the company's sales. Hershey builds current assets, mostly inventory and receivables, during the third and fourth quarters of each year, and it draws down these items during the first and second quarters.

Because Hershey's total current assets fluctuate around a long-term upward trend, we can think of the company's current assets as containing both a temporary and a permanent component. The temporary component reflects the differences between the seasonal peaks and troughs of Hershey's business. The permanent component represents the sizeable investment in current assets that Hershey maintains even during the quarters when business is slow.

Hershey's fixed assets (not shown in the figure) do not exhibit the seasonal pattern of sales and current assets. However, its fixed assets do follow the long-term upward trend, essentially following the long-term growth in Hershey's sales.

Financing Strategies

conservative strategy

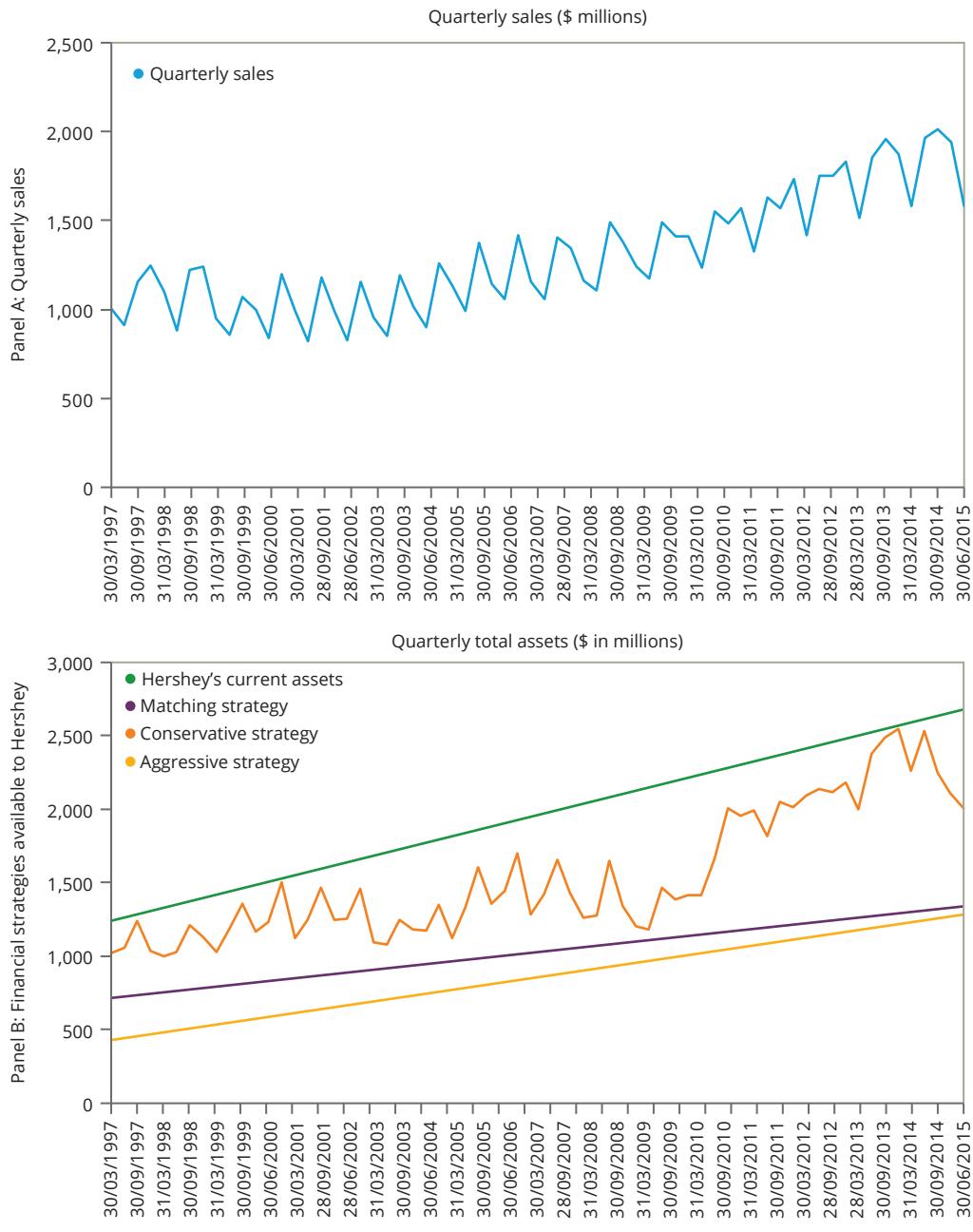
Financing strategy in which a company makes sure that it has enough long-term financing to cover its permanent investments in fixed and current assets as well as the additional seasonal investments in current assets that it makes during the various quarters each year

What financing strategies might Hershey employ to fund both the long-term trend and the seasonal fluctuations in its total current assets? First, Hershey might adopt a **conservative strategy**, one in which the company makes sure it has enough long-term financing to cover its permanent and seasonal investments in current assets. For example, Hershey might issue long-term bonds to generate enough cash to cover all its cash needs for several years. This strategy is represented graphically by the orange line in Panel B of [Figure 18.4](#). By using this strategy, Hershey has a cash surplus for much of the year, drawing down that surplus only when total current assets reach their peak during the third and fourth quarters each year. Hershey will invest its excess cash balances in marketable securities. We describe this strategy as conservative because it minimises the risk that Hershey will experience a liquidity crisis during peak quarters. However, keep in mind that large investments in cash and marketable securities are not likely to make Hershey shareholders rich.⁵ Furthermore, because the term structure of interest rates (the *yield curve*) is typically upward-sloping, Hershey will generally pay higher interest rates on its long-term debt than it would pay if it were willing to borrow on a short-term basis.

5 Companies sometimes argue that a large cash reserve is a strategic asset because it enables the company to make acquisitions quickly as opportunities arise. We agree that, in principle, a cash reserve could have strategic value, but it also enables managers to make value-reducing investments without facing the discipline that comes with raising money in the capital markets. As discussed in Chapter 17, research evidence suggests that managers of acquiring firms generally do not create wealth for their shareholders.

FIGURE 18.4 QUARTERLY SALES AND TOTAL CURRENT ASSETS FOR THE HERSHEY COMPANY (1997–SECOND QUARTER OF 2015)

Panel A shows the seasonal pattern in Hershey's sales and Panel B shows a similar pattern for current assets. The straight lines represent different levels of long-term financing. The yellow line represents an *aggressive strategy*, in the sense that Hershey does not secure enough long-term financing to cover the permanent component of the growth in current assets. The orange line is a *conservative strategy* because Hershey has sufficient long-term financing to pay for both the permanent upward trend and the seasonal fluctuations in assets. The purple line is a *matching strategy*, a middle-of-the-road approach in which Hershey finances permanent assets (fixed assets plus the permanent component of current assets) with long-term funding sources, and finances temporary or seasonal asset requirements with short-term debt.



Source: Bloomberg

aggressive strategy

Financing strategy in which a company relies heavily on short-term borrowing, not only to meet the seasonal peaks each year but also to finance a portion of the long-term growth in sales and assets

matching strategy

Financing strategy in which a company finances permanent assets (fixed assets plus the permanent component of current assets) with long-term funding sources and finances its temporary or seasonal asset requirements with short-term debt

The second strategy that Hershey might adopt is much more aggressive. In this **aggressive strategy**, Hershey relies heavily on short-term borrowing not only to meet the seasonal peaks each year but also to finance a portion of the long-term growth in total current assets. In Panel B of **Figure 18.4**, the yellow line represents the aggressive strategy. The difference between that line and the one representing Hershey's total current assets indicates how much short-term debt Hershey has outstanding at any moment in time. During peak quarters, Hershey increases its short-term borrowings. But even during the first and second quarters, when business is relatively slow, Hershey continues to finance at least part of its operations with short-term debt. Thus, Hershey uses short-term financing to fund a portion of its long-term, or permanent, growth in total current assets. With this strategy, the company takes advantage of short-term interest rates, which are usually lower than long-term rates. However, if short-term rates rise, Hershey will face increased interest expense. The company also faces a significant *refinancing risk* in this strategy. That is, if Hershey's financial condition weakens, it may not be able to roll over short-term debt as it had in the past.

A third strategy is the **matching strategy**. Companies that follow the matching strategy finance the permanent component of current assets with long-term financing, and finance the temporary or seasonal portion of current assets with short-term debt. The matching strategy is represented by the purple line in Panel B of **Figure 18.4**. In the figure, notice that Hershey will increase short-term borrowing during peak periods. It will repay those loans as it reduces its investment in total current assets during slow periods.

The matching strategy is a middle-of-the-road approach. If Hershey finances its short-term assets with short-term debt, then it will have smaller cash surpluses than under the conservative approach, but its borrowing costs will be lower, on average (because short-term debt is usually lower-cost than long-term debt). Hershey's interest costs will be higher under the matching strategy than with the aggressive strategy, but it will face less exposure to refinancing risk, and its interest costs will not fluctuate as much from quarter to quarter.

Regardless of which strategy Hershey decides to pursue, the company will pay careful attention to short-term inflows and outflows of cash. Doing so will allow the company to invest unanticipated cash surpluses and cover unexpected deficits. The primary tool for managing cash flow on a short-term basis is the cash budget.

18.3b THE CASH BUDGET

Managers use the tools described in the section on planning for growth to make financial projections over horizons of a year or more. However, they also need to monitor the company's financial performance over shorter horizons. Because it takes cash to operate on a day-to-day basis, companies monitor their cash inflows and outflows very closely, and the primary tool they use for this purpose is the cash budget.

cash budget

A statement of a company's planned inflows and outflows of cash

A **cash budget** is a statement of the company's planned inflows and outflows of cash. Companies use the cash budget to ensure they will have enough cash available to meet short-term financial obligations. Any surplus cash resources can be invested quickly and efficiently. Typically, the cash budget spans a one-year period, with more frequent breakdowns provided as components of the budget. The CFO of Finish Line Pty Ltd, a specialty retailer, once described his company to us as a 'cash and inventory business'. What he meant was that running a successful retail enterprise requires close attention to managing cash flows and inventory. A company like Finish Line needs to know its exact cash position at the end of every business day. For other companies, monitoring cash positions on a weekly or monthly basis may be sufficient. Besides the volume of cash transactions, other factors that determine the frequency with which companies construct cash budgets include the volatility of prices and sales volume, and the importance of seasonal fluctuations.

Running out of cash is an ever-present threat at small and medium-size companies. Vulnerable companies include those that are growing rapidly and those that are in distress. Even in large corporations, though, astonishing changes in cash reserves can occur over just a few years. For example, in September 2007, General

Motors reported cash and marketable security holdings of \$30 billion, but over the following six quarters the company's cash reserves fell to \$11.6 billion. Although \$11.6 billion may seem like plenty of cash, GM reported a net cash outflow of \$10.2 billion in just the first quarter of 2009! By the first quarter of 2015, GM had grown cash reserves to \$ 17.2 billion, reporting a net cash outflow of \$3.2 billion. With the possibility of such dramatic swings in cash holdings, even large companies must monitor their cash positions closely.

As is the case with pro forma financial statements, the key input required to build a cash budget is the company's sales forecast. On the basis of this forecast, the financial manager estimates the monthly cash inflows from cash sales, receivable collections and other sources. Naturally, a complete cash budget also contains estimates of cash outflows; some of these vary directly with sales and some do not. Cash outlays include purchases of raw materials, labour and other production expenses, selling expenses and investments in fixed assets. A cash budget usually presents projected inflows (cash receipts) first. Next come the projected outflows (cash disbursements). Finally, the cash budget shows whether the company expects a net cash inflow or outflow for the period. Depending on the company's cash balance at the start of the period, the cash budget will either reveal a need for additional financing or demonstrate that the company will have surplus cash to invest in short-term marketable securities.

Cash Receipts

Cash receipts include all the company's cash inflows in a given period. The most common components of cash receipts are cash sales, collections of accounts receivable and other cash receipts. The company estimates collections of accounts receivable using the past payment patterns of its customers.⁶

cash receipts
All of a company's cash inflows in a given period



Calculating Expected Cash Receipts

Consider the cash receipts projections of Farewell Traders, a lolly manufacturer, which is developing a cash budget for October, November and December. Farewell Traders' sales in August and September were \$300,000 and \$600,000, respectively. The company forecasts sales of \$1,200,000, \$900,000 and \$600,000 for October, November and December, respectively. Typically, 10% of Farewell Traders' sales are cash sales and 90% are credit sales; Farewell Traders collects about 60% of each month's sales within the next month, but must wait two months to collect the remaining 30% of sales. Bad debts have been negligible. In December, the company expects to receive a \$90,000 dividend from shares it holds in a subsidiary.

As a first step in preparing a cash budget, Farewell Traders prepares a schedule of projected cash receipts (see **Figure 18.5**). The first row shows total sales in each month. Remember, the figures for October–December are projections.

The second row lists cash sales in each month, which (by assumption) equal 10% of total monthly sales. The third and fourth rows report the expected cash inflows from collecting receivables from the previous two months' sales. The next line reports cash receipts not related to sales, and the final line shows total cash receipts each month.

For example, consider the month of November. Projected sales are \$900,000, implying that expected cash sales equal \$90,000 ($0.10 \times \$900,000$). During November, Farewell Traders expects to collect receivables equal to 60% of October's \$1,200,000 sales, or \$720,000. Farewell Traders also expects to collect the 30% of September's \$600,000 sales still on the books as receivables, or \$180,000. The company expects no other cash flows in November, so total cash receipts equal \$990,000 (\$90,000 + \$720,000 + \$180,000).

⁶ We discuss payment patterns more fully in the online Chapter 21.



FIGURE 18.5 SCHEDULE OF PROJECTED CASH RECEIPTS FOR FAREWELL TRADERS (\$ THOUSANDS)

	AUGUST	SEPTEMBER	OCTOBER	NOVEMBER	DECEMBER
Forecast sales:	\$300	\$600	\$1,200	\$900	\$ 600
Cash sales (10%)	\$ 30	\$ 60	\$ 120	\$ 90	\$ 60
Collection of accounts receivable					
Previous month (60%)		\$180	\$ 360	\$720	\$ 540
Two months prior (30%)			\$ 90	\$180	\$ 360
Other cash receipts			—	—	\$ 90
Total cash receipts			\$ 570	\$990	\$1,050

Cash Disbursements

cash disbursements

All outlays of cash by a company in a given period

Cash disbursements include all outlays of cash by the company in the period. The most common cash disbursements are cash purchases, fixed asset outlays, payments of accounts payable, wages, interest payments, taxes and rent and lease payments. Cash disbursements may also include items such as dividend payments and share repurchases. It is important to remember that depreciation and other non-cash expenses are *not* included in the cash budget. They are not outlays of cash, but represent a scheduled write-off of an earlier cash outflow. (Depreciation does have a cash outflow effect through its impact on tax payments.)



Calculating Expected Cash Disbursements

Farewell Traders has gathered the following data needed for the preparation of a cash disbursements schedule for October, November and December.

- *Purchases:* The company's purchases average 70% of sales. Of this amount, Farewell Traders pays 20% in cash, 60% in the month following the purchase and the remaining 20% two months following the purchase. Thus, October purchases are \$840,000 ($0.70 \times \$1,200,000$). Of that amount, Farewell Traders pays \$168,000 ($0.20 \times \$840,000$) in cash, then puts \$504,000 ($0.60 \times \$840,000$) on account to pay in November and \$168,000 ($0.20 \times \$840,000$) on account to pay in December.
- *Rent payments:* Farewell Traders will pay rent of \$20,000 each month.
- *Wages and salaries:* The company's wages and salaries equal 10% of monthly sales plus

\$30,000. Thus, October's wages and salaries will be \$150,000 [$(0.10 \times \$1,200,000) \times \$30,000$]. The figures for November and December are calculated in the same manner.

- *Tax payments:* Farewell Traders must pay taxes of \$75,000 in December.
- *Fixed asset outlays:* The company will purchase new machinery costing \$390,000 and pay for it in November.
- *Interest payments:* An interest payment of \$30,000 is due in December.
- *Cash dividend payments:* Farewell Traders will pay cash dividends of \$60,000 in October.
- *Principal payments:* A \$60,000 principal payment is due in December.

Figure 18.6 presents the company's schedule of projected cash disbursements, based on the preceding data.





FIGURE 18.6 SCHEDULE OF PROJECTED CASH DISBURSEMENTS FOR FAREWELL TRADERS (\$ THOUSANDS)

	AUGUST	SEPTEMBER	OCTOBER	NOVEMBER	DECEMBER
Purchases (70% of sales)	\$210	\$420	\$840	\$ 630	\$420
Cash purchases (20%)	\$ 42	\$ 84	\$168	\$ 126	\$ 84
Payments of accounts payable:					
Previous month (60%)		126	252	504	378
Two months prior (20%)			42	84	168
Rent payments			20	20	20
Wages and salaries			150	120	90
Tax payments					5
Fixed asset outlays				390	
Interest payments					30
Cash dividend payments			60		
Principal payments			-	-	60
Total cash disbursements			<u>\$692</u>	<u>\$1,244</u>	<u>\$905</u>

Net Cash Flow, Ending Cash, Financing Needs and Excess Cash

We can calculate the company's net cash flow by subtracting its cash disbursements from its cash receipts for each period. By adding the beginning cash balance to the company's net cash flow, we determine the ending cash balance for each period.

Like most companies, Farewell Traders does not want its cash balance to dip below some minimum level at any time. Therefore, by subtracting the desired minimum cash balance from the ending cash balance, we arrive at one of two results: the required total financing or the excess cash balance. If the ending cash balance is less than the desired minimum cash balance, then the company has a short-term financing need. The company meets this need with short-term borrowing, typically notes payable. If the ending cash balance exceeds the desired minimum cash balance, then the company has an excess cash balance that it can invest in short-term marketable securities.



Calculating a Cash Budget

Figure 18.7 presents the cash budget for Farewell Traders based on the cash receipt and disbursement schedules developed in earlier Examples, together with the following additional information: (1) Farewell Traders' cash balance at the end of September is \$200,000; (2) notes payable and marketable securities are \$0 at the end of September; and (3) the desired minimum cash balance is \$50,000.

For Farewell Traders to maintain its desired minimum ending cash balance of \$50,000, it will have notes payable (short-term borrowing)

balances of \$226,000 in November and \$81,000 in December. In October, the company will have excess cash of \$28,000, which it can invest in marketable securities. The required total financing figures in the cash budget refer to how much the company will owe at the end of each month, but the figures do not represent the monthly change in borrowing. For Farewell Traders, the monthly financial activities are as follows:

- *October:* Farewell Traders invests \$28,000 of excess cash.





FIGURE 18.7 CASH BUDGET FOR FAREWELL TRADERS (\$ THOUSANDS)

	OCTOBER	NOVEMBER	DECEMBER
Total cash receipts ^a	\$570	\$ 990	\$1,050
Less: Total cash disbursements ^b	692	\$1,244	905
Net cash flow	-\$122	-\$ 254	\$ 145
Add: Beginning cash	200	78	-176
Ending balance cash	\$ 78	-\$ 176	-\$ 31
Less: Minimum cash balance	50	50	50
Required total financing (notes payable) ^c		\$ 226	\$ 81
Excess cash balance (marketable securities) ^d	\$ 28		

a From [Figure 18.5](#).

b From [Figure 18.6](#).

c Values are placed on this line when the ending cash balance is less than the desired minimum cash balance. These amounts are typically financed by short-term arrangements, so are represented by notes payable.

d Values are placed on this line when the ending cash balance is greater than the desired minimum cash balance. These amounts are typically invested in short-term vehicles and so are represented by marketable securities.

- *November:* The company liquidates \$28,000 of excess cash and borrows \$226,000. Net cash flow of -\$254,000 uses all the available cash reserves (\$50,000 minimum cash balance from October plus \$28,000 excess cash), leaving an ending cash balance of -\$176,000. To cover that negative balance and maintain the desired

minimum cash balance, Farewell Traders must borrow \$226,000 (\$176,000 + \$50,000).

- *December:* Net cash flows of \$145,000 reduce Farewell Traders' end-of-month borrowing needs to \$81,000 (versus November's \$226,000). Thus, Farewell Traders repays \$145,000 of the amount borrowed.

The cash budget provides the company with figures indicating whether a cash shortage (financing need) or a cash surplus (short-term investment opportunity) is expected in each of the months covered by the forecast. In our example, Farewell Traders can expect a cash surplus of \$28,000 in October, followed by cash shortages of \$226,000 in November and \$81,000 in December. Each of these values is based on the internal constraint of a minimum cash balance of \$50,000.

Because the company expects to borrow as much as \$226,000 during the three-month period, the financial manager should establish a line of credit to ensure the availability of the necessary funds. The maximum amount of borrowing available on the line of credit should actually exceed the \$226,000, in order to allow for possible forecast errors.

FINANCE IN THE REAL WORLD

CAN I MAKE ENDS MEET?

In a recent survey by Accenture, analysis found that the following issues were central to the finance function in the organisation and the role of the CFO in managing it.

In order to achieve your personal financial goals and meet your financial obligations in a timely manner, thereby avoiding late payments and maintaining a strong credit rating, you





should regularly prepare a personal cash budget. Typically, these budgets cover the coming year divided into months. They schedule and net out cash inflows and cash outflows in order to plan for cash surpluses and shortages. Surpluses can be invested, and shortages can be met in a variety of ways, such as drawing down savings or borrowing.

To demonstrate the personal cash budget, let's look at your total inflow and outflow estimates (detailed cash flows not shown) for the next three months.

	MONTH 1	MONTH 2	MONTH 3
(1) Total inflows	\$5,550	\$5,555	\$5,555
(2) Total outflows	\$6,265	\$5,365	\$6,240
Net cash flow			
[(1) – (2)]	<u>-\$ 715</u>	<u>\$ 190</u>	<u>-\$ 685</u>

Reviewing your personal cash budgets for the next three months, it is clear that you need to take action in order to make ends meet. Specifically, you need to cover the deficits in months 1 and 3 ($\$715 + \$685 = \$1,400$) net of the surplus in month 2 (\$190), or a total of \$1,210 ($\$1,400 - \190). Your budgets can be brought into balance by: (1) increasing inflows by \$1,210; (2) cutting outflows by \$1,210; (3) drawing down savings by \$1,210; (4) borrowing \$1,210; or (5) a combination of these strategies that will reduce the \$1,210 gap to zero. Clearly, the best strategy would be to reduce planned outflows by a total of \$1,210 over the next three months.

Dealing with Uncertainty in the Cash Budget

Because the cash budget provides only month-end totals, it does not ensure that the company has sufficient credit to cover intra-month financing needs. For example, what if a company's disbursements occur before its receipts during a particular month? In that case, its intra-month borrowing needs will exceed the monthly totals shown in its cash budget. To ensure sufficient credit, the company may forecast its expected receipts and disbursement on a *daily* basis, and use these estimates, along with its cash budget, when arranging adequate credit to cover its maximum expected cash deficit.

The monthly cash surpluses and deficits predicted in the budget are affected by virtually all facets of a company's operations. For example, changes in receivables collection, in payment patterns or in inventory turnover can have a dramatic impact on financing needs. Any action that slows collections from customers or accelerates payments to suppliers will increase monthly financial deficits (or reduce surpluses). In that sense, almost any functional area in the company can affect, or be affected by, the cash budget.

One key aspect of cash flow management is to maximise the time taken to pay suppliers (**creditor days**) while minimising the time taken to collect payments from customers (**debtor days**). Consider a large retail store. Typically, you need to pay for goods (either via cash or credit card) before you take possession of them. This involves debtor days of zero (or perhaps a couple of days, in the case of EFTPOS or credit card payments). However, the store usually will have negotiated very favourable credit terms with its suppliers, and may have many months before it needs to pay suppliers. Thus, during this time period, it has extra cash to fund other activities – meaning that, in effect, the funding cost for this period is zero. The online Chapter 21 discusses this concept in depth.

In this chapter, we have emphasised the importance of financial planning and illustrated a few of the most widely used tools of the trade. We end with a word of caution. When companies construct financial plans, they clearly hope to meet the plans' goals. However, the value of planning is not just in attaining established goals; rather, its importance derives from the thinking it forces managers to do – not only about what they expect to occur in the future, but also about what they will do if their expectations are not realised.

creditor days

A measure of the average time a business takes to pay its creditors

debtor days

A measure of the average time a company takes to collect payment from its debtors

LO18.3

CONCEPT REVIEW QUESTIONS

- 6 Suppose that a company follows the *matching financing strategy*. Does this imply that the company's current assets will equal its current liabilities?
- 7 Why do companies prepare *cash budgets*? How do (a) collection patterns and (b) payment patterns affect the cash budget?
- 8 What can be done to deal with uncertainty in the cash budgeting process? Why might an intra-month view of the company's cash flows cause a well-prepared cash budget to fail?

THINKING CAP QUESTIONS

- 5 What are the risks of financing a long-term need with a short-term line of credit?
- 6 What impact would offering customers more generous credit terms have on the cash budget?

STUDY TOOLS

SUMMARY

LO18.1

- Strategic (long-term) financial plans guide companies in preparing operating (short-term) financial plans. For most companies, strategic plans are driven by competitive forces that are not always explicitly financial in nature. However, strategic plans have important financial consequences.
- The finance function partners with other functional units in developing the company's strategic plan. Once the company establishes the plan, finance personnel ensure that the plan is feasible, given the company's financial resources. Finance personnel also play a crucial role in monitoring progress and in managing risks associated with financial plans.

LO18.2

- Most companies strive to grow over time. Popular measurements of growth include: (1) achieving accounting return on investment (ROI) in excess of the cost of capital; (2) undertaking only actions that result in positive economic value added (EVA); and (3) realising a target growth rate in sales or assets. Target growth rates are widely used because of their intuitive, computational and practical appeal.
- The sustainable growth model is a tool that is used to determine the feasibility of a target growth rate under certain conditions. When the growth rate that maximises shareholder value does not match the sustainable rate, the company must make adjustments to the model's inputs – such as altering leverage or dividend policy – to achieve the desired growth rate.
- Pro forma financial statements are projected, or forecast, financial statements typically based on historical financial data about the company. Preparation of these statements begins with a sales forecast that can be developed by using a top-down or a bottom-up approach or a blend of these two approaches. The key inputs to pro forma statements are a mix of facts and assumptions.

- Companies can prepare pro forma statements using the percentage-of-sales method, which assumes that all items grow in proportion to sales. Yet certain balance sheet accounts do not typically increase in a linear fashion. As a result, analysts typically use one line item on the balance sheet as a 'plug figure' that can be used to make sure the pro forma balance sheet balances. Analysts can also estimate directly the amount of external financing required to fund a company's anticipated growth by using the equation for external funds required (EFR). This approach, like the preparation of pro forma statements, helps managers determine if they can expect a scarcity or surplus of financial resources, given the company's growth objectives.

LO18.3

- During the year, a company's investment in current assets tends to rise and fall with sales. This seasonal pattern creates temporary cash surpluses and deficits that the company must manage. Three basic financing strategies – conservative, aggressive and matching – can be used to fund both the long-term trend and seasonal fluctuations in a business. The conservative strategy is generally the least risky and least profitable, the aggressive strategy is the usually most risky and most profitable, and the matching strategy falls between the other two in terms of risk and profits.
- A cash budget forecasts the short-term cash inflows and outflows of a company. For a company with significant seasonal variations, the financial manager typically prepares the cash budget month by month. This allows the company to determine peak short-term financing needs and peak short-term investment opportunities, typically over an annual or quarterly period.
- The financial manager must also consider intra-month cash flows to ensure that sufficient credit is available. Changes in collection and payment periods can significantly affect the cash budget's projections.

IMPORTANT EQUATIONS

TABLE OF IMPORTANT EQUATIONS

$$18.1 \quad g^* = \frac{m(1-d) \frac{A}{E}}{\frac{A}{S} - m(1-d) \frac{A}{E}}$$

$$18.2 \quad EFR = \frac{A}{S} \Delta S - \frac{AP}{S} \Delta S - mS(1+g)(1-d)$$

SELF-TEST PROBLEMS

Answers to these 'Self-test problems' and the 'Concept review' questions throughout the chapter appear on the Student Companion Website (<http://login.cengagebrain.com>) or via your instructor.

ST18-1 Use the following key financial data from the most recent annual report of Rancho Ltd to answer the following questions.

Sales	\$12.7 million
Net income	\$ 1.3 million
Total assets	\$ 7.6 million
Total equity	\$ 5.2 million
Dividends	\$ 0.3 million

The company's CFO wishes to use this data to estimate its sustainable growth rate.

- Use the data provided to calculate Rancho's net profit margin, assets-to-equity ratio, total asset turnover ratio and dividend payout ratio.
- Use your findings in part (a) to find Rancho's sustainable growth rate.

- c Interpret the sustainable growth rate calculated in part (b). Does this rate of growth assure shareholder wealth maximisation? Explain.
- d If the company's board feels that it is best for its shareholders if the company grows more slowly, what alterations in each of the baseline assumptions would be necessary to achieve this objective?

ST18-2 Planet & Partners wishes to construct a pro forma income statement and a pro forma balance sheet for the coming year using the following data:

- Sales are forecast to grow by 5% from \$809.5 million last year to \$850 million in the coming year.
- Cost of goods sold is expected to represent 72% of forecast sales.
- Operating expenses are expected to represent 11% of forecast sales.
- Depreciation expense on the company's existing net fixed assets, which currently total \$275 million, is expected to remain at \$55 million per year for at least four more years.
- Planet's marginal tax rate is expected to remain at 40%.
- Planet is expected to continue its policy of paying out 10% of net income as dividends.
- Planet's net profit margin last year was 5.2%.
- Planet wishes to maintain a minimum cash balance of \$8 million in the coming year.
- The company's accounts receivable are expected to equal about 15% of sales.
- The company's inventory has historically averaged about 12% of cost of goods sold.
- Planet is planning to invest an additional \$35 million in fixed assets, which will be depreciated on a straight-line basis over a seven-year life.
- The company's accounts payable, which totalled \$63.5 million at the end of last year, is expected to equal about 11% of cost of goods sold in the coming year.
- Planet plans to maintain its notes payable of \$42 million, requiring annual interest of 5%, which totals \$2.1 million.
- The company has \$80 million of long-term debt, which matures as a lump sum due and payable in full in five years. Annual interest of \$4.8 million must be paid on this debt.
- Planet has no preferred shares outstanding, and its retained earnings and ordinary shares currently total \$250 million.
- Planet's total assets at the end of last year were \$435 million.
 - a Use the preceding data to prepare Planet's pro forma income statement for the coming year.
 - b Use the data provided and your findings in part (a) to prepare Planet's pro forma balance sheet for the coming year. Use notes payable as the balancing figure and ignore any change in annual interest expense caused by the change in notes payable.
 - c Explain the amount of notes payable used as the balancing figure in part (b). Indicate the resulting amount of the plug figure needed to create the balancing figure. Will Planet be able to fund its planned growth internally? Explain.
 - d Use **Equation 18.2**, along with Planet's relevant data, to determine its *external funds required (EFR)*. Compare this value with the *plug figure* you found in part (c), and explain, in general terms, why differences between these two values might result.

ST18-3 Sportif Pty Ltd's financial analyst has compiled sales and total cash disbursement estimates for the coming months of January to May. Historically, 60% of sales are for cash, with the remaining

40% collected in the following month. The ending cash balance in January is \$1,000. The company's minimum cash balance is \$1,000. The analyst plans to use this data to prepare a cash budget for the months of February to May.

SPORTIF PTY LTD		
MONTH	SALES	TOTAL CASH DISBURSEMENTS
January	\$ 5,000	\$6,000
February	6,000	8,000
March	10,000	8,000
April	10,000	6,000
May	10,000	5,000

- a Use the data provided to prepare Sportif's cash budget for the four months February–May.
- b How much total financing will Sportif need to meet its financial requirements for the period February–May?
- c If a pro forma balance sheet dated at the end of May were prepared from the information presented, how much would Sportif have in accounts receivable?

QUESTIONS

- Q18-1** What is the financial planning process? What is a strategic plan? Describe the roles that financial managers play with regard to strategic planning.
- Q18-2** Briefly describe the following popular growth targets: (1) accounting-based *return on investment (ROI)*; (2) *economic value added (EVA)*; and (3) target growth rate of sales or assets. Which is most widely used, and why?
- Q18-3** In the sustainable growth model, what does the word 'sustainable' mean? In what ways can the sustainable growth model highlight conflicts between a company's competing objectives?
- Q18-4** With reference to **Equation 18.1**, explain how each of the variables influences the company's sustainable growth rate. If high leverage allows a company to increase its sustainable growth rate, does that mean higher leverage is necessarily good for the company?
- Q18-5** A company chooses to grow at a rate above its sustainable rate. What changes might we expect to see on the company's financial statements in the next year? What changes would result from growing at a rate below the company's sustainable rate?
- Q18-6** Describe the differences between the *top-down* and the *bottom-up* sales forecast methods. Describe advantages and disadvantages of each. Do you think one approach is likely to be more accurate than the other?
- Q18-7** What is the logic of the *percentage-of-sales method* for constructing *pro forma financial statements*? On a year-to-year basis, which balance sheet and income statement items do you think will fluctuate most closely with sales, and which items are not likely to vary as directly with sales volume?
- Q18-8** Why does it make sense to let the company's cash balance or a short-term liability account serve as the *plug figure* in pro forma projections? Why not use gross fixed assets as the plug figure?
- Q18-9** Why might pro forma statements and the equation for *external funds required (EFR)* yield different projections for a company's financing needs?
- Q18-10** What is the difference between the *conservative strategy*, the *aggressive strategy* and the *matching strategy* for funding the long-term trend and the seasonal fluctuations in a company's total current assets? Which strategy is most risky? Which is least profitable?

Q18-11 How is a *cash budget* different from a set of pro forma financial statements? Why do you think that companies typically create cash budgets at higher frequencies than they create pro forma financial statements?

Q18-12 Explain how slower inventory turnovers, slower receivables collections or faster payments to suppliers would influence the numbers produced by a cash budget.

PROBLEMS

PLANNING FOR GROWTH

P18-1 Go to <http://www.finance.yahoo.com>, or another financial website, and download the most recent two years' balance sheets and income statements for a company of your choice. Do not choose a company that issued or retired a significant amount of ordinary shares in either year.

- a Calculate the actual percentage change in sales from two years ago to last year.
- b Using the balance sheet and income statement from two years ago, calculate the company's sustainable growth rate.
- c If the sustainable growth rate does not equal the actual growth rate in sales, explain how changes in the company's financial ratios in the second year reflected the company's decision in the previous year to grow at a rate other than the sustainable rate.

P18-2 Eisner Amusement Parks reported the following data in its most recent annual report:

Sales	\$42.5 million
Net income	3.8 million
Dividends	1.1 million
Assets	50.0 million

Eisner is financed 100% with equity. What is the company's *sustainable growth rate*? Suppose that Eisner issued bonds to the public and used the proceeds to repurchase half of its outstanding shares. This recapitalisation would create additional interest expenses of \$2 million. Assuming that the company faces a 35% tax rate, what impact would this restructuring have on its sustainable growth rate?

P18-3 Review the abbreviated financial statements for the last two years for Trefall Utility. All values are expressed in billions of dollars.

TREFALL UTILITY BALANCE SHEET (\$ IN THOUSANDS)		
	2021	2020
Current assets	\$3.7	\$3.5
Fixed assets	4.5	4.4
Total assets	<u>\$8.2</u>	<u>\$7.9</u>
Current liabilities	\$1.9	\$1.8
Long-term debt	3.1	3.2
Shareholders' equity	<u>3.2</u>	<u>2.9</u>
Total liabilities and equity	<u>\$8.2</u>	<u>\$7.9</u>

TREFALL UTILITY INCOME STATEMENT (\$ IN THOUSANDS)		
	2021	2020
Sales	\$8.5	\$8.1
Net income	1.5	1.4
Dividends	0.6	0.4

- a What was Trefall Utility's *sustainable growth rate* at the end of 2020?
- b How rapidly did Trefall Utility actually grow sales in 2021?
- c What changes in Trefall Utility's financial condition from 2020 to 2021 can you trace to the difference between the actual and sustainable growth rates?

P18-4 The 2021 sales forecast for Flinston Development is \$160 million. Interest expense will not change in the coming year. Use Flinston Development's 2020 income statement, presented below, to answer the questions that follow.

FLINSTON DEVELOPMENT INCOME STATEMENT (\$ IN THOUSANDS)	
Sales	\$125,000
Less: Cost of goods sold	80,000
Gross profit	\$ 45,000
Less: Operating expenses	30,000
Less: Interest	10,000
Pre-tax profit	\$ 5,000
Less: Taxes (35%)	1,750
Net income	\$ 3,250

- a Use the percentage-of-sales method to construct a pro forma income statement for 2021.
- b You learn that 25% of the cost of goods sold and operating expense figures for 2020 are fixed costs that will not change in 2021. Reconstruct the pro forma income statement.
- c Compare and contrast the statement prepared in parts (a) and (b). Which statement will likely provide the better estimate of 2021 income? Explain.

P18-5 Halliwell Distribution wants to construct a *pro forma balance sheet* for 2021. Build the statement using the following data and assumptions:

- Projected sales for 2021 are \$45 million.
- Halliwell's gross profit margin is 35%.
- Operating expenses average 10% of sales.
- Depreciation expense last year was \$5 million.
- Halliwell faces a tax rate of 35%.
- Halliwell distributes 20% of its net income to shareholders as a dividend.
- Halliwell wants to maintain a minimum cash balance of \$3 million.
- Accounts receivable equal 8.5% of sales.
- Inventory averages 10% of the cost of goods sold.
- Last year's balance sheet lists net fixed assets of \$30 million. All of these assets are depreciated on a straight-line basis, and none of them will be fully depreciated for at least three years.
- Halliwell plans to invest an additional \$1 million in fixed assets that it will depreciate over a five-year life on a straight-line basis.
- In 2020, Halliwell reported ordinary shares and retained earnings of \$20 million.
- Accounts payable averages 9% of sales.

Will Halliwell's cash balance at the end of 2021 exceed its minimum requirement of \$3 million?

P18-6 Review the following 2021 balance sheet and income statement for T F Baker Cosmetics.

T F BAKER COSMETICS BALANCE SHEET (\$ IN THOUSANDS)			
Cash	\$ 5,000	Accounts payable	\$10,000
Accounts receivable	12,500	Short-term bank loan	15,000
Inventory	10,000	Long-term debt	10,000
Current assets	\$27,500	Ordinary shareholder equity	15,000
Gross fixed assets	\$65,000	Retained earnings	12,500
Less: Accum. depr.	30,000	Total liabilities and equity	\$62,500
Net fixed assets	\$35,000		
Total assets	\$62,500		

T F BAKER COSMETICS INCOME STATEMENT (\$ IN THOUSANDS)	
Sales	\$150,000
Less: Cost of goods sold	120,000
Gross profit	\$ 30,000
Less: Operating expenses	15,000
Less: Depreciation	5,000
Less: Interest expense	2,000
Pre-tax profit	\$ 8,000
Less: Taxes (35%)	2,800
Net income	\$ 5,200

At a recent board meeting, the company set the following objectives for 2022:

- The company would increase liquidity. For competitive reasons, the company expects accounts receivable and inventory balances to continue their historical relationships with sales and cost of goods sold, respectively, but the board felt that the company should double its cash holdings.
- The company would accelerate payments to suppliers. This would have two effects. First, by paying more rapidly, the company would be able to take advantage of early payment discounts, which would increase its gross margin from 20% to 22%. Second, by paying earlier, the company's accounts payable balance, which historically averaged about 8.3% of cost of goods sold, would decline to 4% of cost of goods sold.
- The company would expand its warehouse, which would require an investment in fixed assets of \$10 million. This would increase projected depreciation expense from \$5 million in 2021 to \$7 million in 2022.
- The company would issue no new ordinary shares during the year, and it would initiate a dividend.
- Operating expenses would remain at 10% of sales.
- The company did not expect to retire any long-term debt, and it was willing to borrow up to the limit of its current bank credit line of \$20 million. The interest rate on its outstanding debts would average 8%.
- The company set a sales target for 2022 of \$200 million.

Develop a set of pro forma financial statements to determine whether or not T F Baker Cosmetics can achieve all these goals simultaneously.

PLANNING AND CONTROL

P18-7 A company has actual sales of \$50,000 in January and \$70,000 in February. It expects sales of \$90,000 in March and \$110,000 in both April and May. Assuming that sales are the only source of cash inflow, and that 60% of these are for cash and the rest are collected evenly over the following two months, what are the company's expected cash receipts for March, April and May?

P18-8 Bachrach Fertiliser Corp. had sales of \$2 million in March and \$2.2 million in April. Expected sales for the next three months are \$2.4 million, \$2.5 million and \$2.7 million. Bachrach has a cash balance of \$200,000 on 1 May and does not want its balance to dip below that level. Prepare a cash budget for May, June and July, given the following information:

- Of total sales, 30% are for cash, 50% are collected in the month after the sale, and 20% are collected two months after the sale.
- Bachrach has cash receipts from other sources of \$100,000 per month.
- The company expects to purchase items for \$2 million in each of the next three months. All purchases are paid for in cash.
- Bachrach has fixed cash expenses of \$150,000 per month and variable cash expenses equal to 5% of the previous month's sales.
- Bachrach will pay a cash dividend of \$300,000 in June.
- The company must make a \$250,000 loan payment in June.
- Bachrach plans to acquire fixed assets worth \$500,000 in July.
- Bachrach must make a tax payment of \$225,000 in June.

P18-9 The actual sales and purchases for PitterPatter Partnership for September and October 2021, along with its forecast sales and purchases for November 2021 to April 2022, follow.

YEAR	MONTH	SALES	PURCHASES
2021	September	\$330,000	\$230,000
2021	October	350,000	250,000
2021	November	280,000	250,000
2021	December	260,000	200,000
2022	January	240,000	180,000
2022	February	280,000	210,000
2022	March	300,000	200,000
2022	April	350,000	190,000

The firm makes 30% of all sales for cash and collects 35% of its sales in each of the two months following the sale. Other cash inflows are expected to be \$22,000 in September and April, \$25,000 in January and March, and \$37,000 in February. The firm pays cash for 20% of its purchases. It pays for 40% of its purchases in the following month and for 40% of its purchases two months later.

Wages and salaries amount to 15% of the preceding month's sales. The firm must pay lease expenses of \$30,000 per month. Interest payments of \$20,000 are due in January and April. A principal payment of \$50,000 is also due in April. The firm expects to pay a cash dividend of \$30,000 in January and April. Taxes of \$120,000 are due in April. The firm also intends to make a \$55,000 cash purchase of fixed assets in December.

- a Assuming that the firm has a cash balance of \$42,000 at the beginning of November and that its desired minimum cash balance is \$25,000, prepare a cash budget for November to April.
- b If the firm is requesting a line of credit, how large should the line be? Explain your answer.

P18-10 Berlin Ltd expects sales of \$300,000 during each of the next three months. It will make monthly purchases of \$180,000 during this time. Wages and salaries are \$30,000 per month plus 5% of monthly sales. The company expects to make a \$60,000 tax payment in the first month and a \$45,000 purchase of fixed assets in the second month. It expects to receive \$24,000 in cash from the sale of an asset in the third month. All sales and purchases are for cash. Beginning cash and the minimum cash balance equal zero.

- a Construct a cash budget for the next three months.
- b Berlin is unsure of the level of sales, but all other figures are certain. If the most pessimistic sales figure is \$240,000 per month and the most optimistic is \$360,000 per month, what are the monthly minimum and maximum ending cash balances that the company can expect for each month?
- c Discuss how the financial manager can use the data in parts (a) and (b).

CASE STUDY

FINANCIAL PLANNING

Bar BQ, a regional restaurant chain, has decided to expand nationwide, and consequently expects rapid growth. As Bar BQ's new CFO, you are in charge of planning for this growth. Before starting to plan, you decide to refresh your knowledge of financial planning by answering the following questions.

ASSIGNMENT

- 1 One method of estimating the effects of growth is the *sustainable growth* model. What assumptions are inherent with this model?
- 2 Another method of estimating growth is for the company's managers to forecast *pro forma financial*

statements. How are the sales forecasts that are necessary to create pro forma statements derived?

- 3 Why might the estimates for *external funds required (EFR)* differ between using the *percentage-of-sales* method to estimate pro forma statements and using the shorthand approach in **Equation 18.2**?
- 4 If sales volume fluctuates in the short-term around the long-term estimated trend, what alternative financing strategies might be considered?
- 5 Discuss how managers might monitor a company's cash inflows and cash outflows on a day-to-day basis.



19

INTRODUCTION TO FINANCIAL RISK MANAGEMENT

WHAT COMPANIES DO

GOOGLE'S EARNINGS BOOSTED BY HEDGING PROGRAM

When Google held its second quarter 2011 earnings call, most participants focused on the company's record quarterly net income of \$9 billion, a jump of 32% from the prior year. For a relatively young company, Google generated a remarkable 54% of its revenues in overseas markets. With Google doing such a large amount of business in foreign currencies, Patrick Pichette, then Google's chief financial officer, had responsibility for developing and managing the company's currency hedging program. Ideally, Google's currency hedges would help offset fluctuations in the value of the US dollar

against the other currencies in which Google engages in transactions. In the earnings call, Pichette reported that the company's foreign currency hedging transactions increased by 29%, roughly in line with the growth in overseas business volume. The company reported a small net gain on its hedging program for the quarter, but the main purpose of Google's hedging was not to increase the company's bottom line, but rather to insulate it from excessive volatility due to currency movements.

Source: 'Google's CEO Discusses Q2 2011 Results – Earnings Call Transcript', SeekingAlpha.com, 14 July 2011, <http://seekingalpha.com/article/279555-google-ceo-discusses-q2-2011-results-earnings-call-transcript>.

LEARNING OBJECTIVES

After studying this chapter, you should be able to:

- LO19.1 describe the types of financial risks that can adversely affect a company's cash flows and explain why companies might choose to hedge those risks
- LO19.2 calculate the price of a forward contract and illustrate how to use such a contract to hedge a financial risk exposure
- LO19.3 explain the differences between forward and futures contracts
- LO19.4 describe the basic features of options and swaps and explain how they can be used to hedge financial risk exposure
- LO19.5 understand how financial engineering can be employed to cope with risk management situations when standard hedging instruments are not available.

Trading in virtually all types of financial instruments has increased over the past two decades, but no markets have experienced growth rates as explosive as those for the financial instruments used for hedging and risk management. Since the collapse of the Bretton Woods fixed exchange rate regime in 1973, corporations have been exposed to extreme fluctuations in interest rates, exchange rates and the prices of important raw materials. This increased risk has led to a mushrooming demand for financial instruments and strategies that corporations can use to hedge, or offset, their underlying operating and financial exposures.

More recently, following the global financial crisis and subsequent recession, CFOs and corporate risk managers report that the risks their companies face have increased dramatically. **Figure 19.1** shows the results from a survey of 1,161 corporate risk managers from around the world. This group of managers was asked to indicate whether specific types of risk had increased, remained the same or decreased since 2006. As you can see in the figure, a majority of respondents indicated that risks associated with foreign exchange movements, interest rate fluctuations and commodity price volatility had all increased in recent years.

financial risk management

The process of identifying, measuring and managing all types of risk exposures, including interest rate, commodity and currency risk exposures

financial engineering

The application of finance principles to design securities and strategies that help companies manage their risk exposures

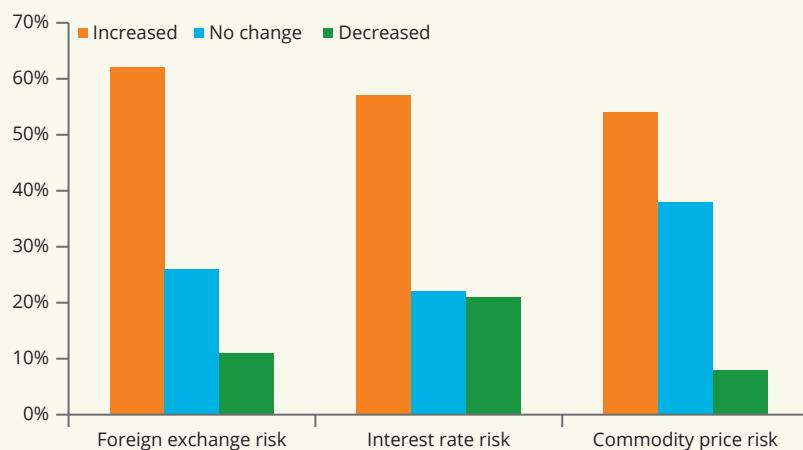
This chapter discusses risk management and financial engineering in the modern corporation.

Financial risk management refers to the process of identifying, measuring and managing all types of risk exposures, including interest rate, commodity and currency risk exposures. There are three ways to minimise a company's risk exposures: diversifying, insuring and hedging. This chapter focuses on hedging. Derivative securities, including forwards, futures, options and swaps, are the financial instruments commonly used for hedging and risk management.

Though the financial press often portrays derivatives in a negative light, these securities can be an effective means of hedging risk exposures. We will discuss several different types of derivative instruments, but we begin with an overview of risk management. Next, we describe each of the major types of derivative securities and discuss how each can be used to manage a company's risk exposures. Finally, we discuss **financial engineering**, which is the application of finance principles to design securities and strategies that help companies manage their risk exposures.

FIGURE 19.1 RISK MANAGERS REPORT INCREASES IN COMMON RISKS FACING THEIR COMPANIES

Survey responses from 1,161 risk managers around the world indicate that a majority of the managers believe that foreign exchange risk, interest rate risk and commodity price risk have all increased significantly since 2006.



Source: G.Bodnar, J. Graham, C. Harvey and R. Marston, 'Managing Risk Management: Evidence from a Global Survey of Risk Managers'. Unpublished working paper.

19.1 OVERVIEW OF FINANCIAL RISK MANAGEMENT

Risk management involves identifying potential events that represent a threat to a company's cash flows, and either minimising the likelihood of those events occurring or minimising their impact on the company's cash flows. This process includes company-specific events, such as workers' compensation claims, product recalls, product liability claims and loss from fire or flood. However, in this chapter we focus on elements of risk management that deal with market-wide sources of exposure, such as movements in foreign exchange rates, interest rates and commodity prices.

19.1a RISK FACTORS

Chapters 6 and 7 introduced the concepts of systematic and unsystematic risk. Systematic risks affect a broad class of securities simultaneously, and cannot be eliminated through diversification. The underlying forces that drive systematic risks are largely out of the control of managers, but managers can take certain actions to minimise the impact of these risks on their companies' cash flows.

If a change in the level of interest rates will adversely affect the cash flows of a company, that company is exposed to interest rate risk. An increase in interest rates might reduce a company's cash flows by increasing the company's borrowing rate, but a decrease in interest rates could also have a negative impact on cash flows by reducing the returns that a company earns on its assets. According to the survey of risk managers by Bodnar and colleagues, interest rate risk is the single most common concern among managers engaged in risk management, with 71% of respondents indicating that their company faces significant risks related to interest rate movements.

Interest rate risk is of particular concern to financial companies such as banks that derive their earnings from the spread between the interest rates they pay to depositors and the interest rates they earn on loans and investments. In the survey of risk managers, more than 90% of respondents who worked for financial companies said that interest rate risk represented a material risk for their companies. Even non-financial companies are exposed to this type of risk. For example, a retailing company that funds its seasonal build-up of inventories with floating-rate debt will face higher interest expenses if market rates of interest increase. This is an example of **transactions exposure**, the risk that a change in prices will negatively affect the value of a specific transaction or series of transactions.

Interest rate fluctuations can also affect a company's cash flows in indirect ways. For example, some companies have revenue streams that are sensitive to changes in interest rates, such as a building products manufacturer that may experience lower demand when interest rates increase. Even if the manufacturer has no outstanding debt, and thus does not face higher interest expenses when rates rise, the increase in rates lowers the company's cash flows through its effects on the company's customers. This is an example of **economic exposure**, the risk that a change in interest rates (or more broadly, a change in exchange rates or commodity prices) will have a negative impact on the future cash flows generated by the company. As we will see later in this chapter, corporations can minimise both their transactions and their economic exposures to interest rate risk in several ways.

At the same time that currency exchange rates were becoming more volatile, world economies were becoming more integrated. In recent years, currency exchange rates have remained volatile, and the pace of global integration has continued to accelerate. This means ever-increasing exposure to foreign exchange risk, as discussed in Chapter 16. Consider another example of a transactions exposure. A US-based company with manufacturing operations in Canada denominates the products it sells in international markets in the buyer's home currency. Suppose that it books a sale, denominated in euros, to a buyer in Germany, requiring delivery and payment in three months. If the euro depreciates in value relative to the Canadian dollar (C\$) over the

transactions exposure
The risk that a change in prices will negatively affect the value of a specific transaction or series of transactions

economic exposure
The risk that a change in interest rates (or more broadly, a change in exchange rates or commodity prices) will have a negative impact on the future cash flows generated by the company

next three months, this company will receive fewer C\$ than expected when it converts the euros received in payment into C\$ to cover its own production costs.

As another example of economic exposure, if this US manufacturing company faces stiff competition from a Japanese manufacturer and the value of the yen declines, the Japanese company may be able to reduce the prices it charges in European markets, thereby hurting demand for the products manufactured by the US company. Again, the decline in the value of the yen reduces the value of the US company even though that company has neither expenses nor revenues denominated in yen. Its exposure is not through a specific transaction, but rather through the broader economic effects of the falling yen.

Commodity price risk is also very important for many companies. Any company that uses a commodity as a production input is potentially exposed to losses if the price of the commodity increases. Likewise, the commodity producers are also exposed to the risk that the price of the commodity could decline.



To Hedge or Not to Hedge . . . Cocoa

A significant source of risk for Hershey Foods Corporation is the price of cocoa. Cocoa is an important commodity input for Hershey. If the price of cocoa increases, Hershey may be able to pass the increase to consumers by charging higher prices for Kisses and other confections. However, an increase in the price of Kisses is bound to hurt the demand for them. Consider the consequences of not hedging this risk exposure, especially if competitors such as Nestlé

and Mars do hedge their exposure by locking in the price they pay for cocoa. Hershey could be faced with having to increase the price of its products in response to an increase in the price of cocoa, whereas the prices of Nestlé and Mars products remain the same. Of course, if the price of cocoa declines, Hershey would benefit from the lower price, while Nestlé and Mars are committed to paying a higher price.

19.1b THE HEDGING DECISION

Although it is clear that the corporate demand for hedging and risk-management products has grown dramatically in recent years, it is less clear why a public company would choose to hedge at all. In Chapters 13 and 15, we learned that, in perfect markets, investors can effectively unwind managers' decisions regarding capital structure and dividends. Modigliani and Miller¹ showed that managers could not increase company value by choosing an optimal capital structure or dividend policy. The same conclusion applies to risk management when markets are perfect. If managers use derivative securities to hedge a particular risk, investors can trade on their own to undo what managers have done. The explanation for companies' hedging activities could be either that markets are imperfect or that managers hedge for their own benefit rather than for the benefit of shareholders. This section discusses the various potential motivations for hedging and possible hedging strategies.

Motivations for Hedging

The motivations for buying insurance are similar to those for hedging. However, there are some crucial differences. By purchasing insurance, a corporation benefits from the insurance company's expertise, in terms of its ability to evaluate and price certain types of risks. Therefore, insurance companies have a comparative advantage in bearing these sources of risk. Similarly, insurance companies have the ability to process claims more efficiently and effectively than other corporations. For example, insurance companies have expertise in negotiating, settling and providing legal representation in liability suits.

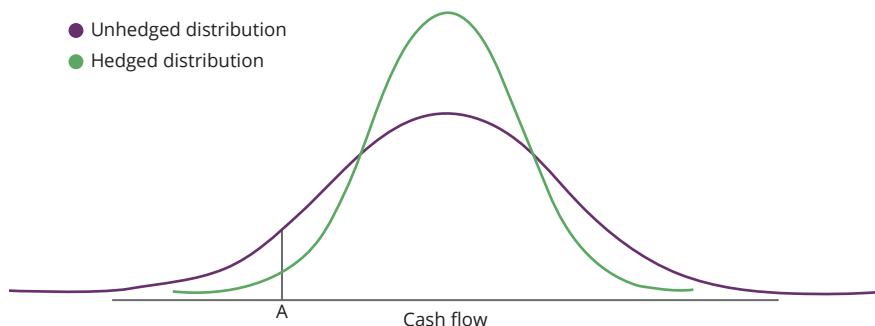
¹ F. Modigliani and M.H. Miller 'The Cost of Capital, Corporate Finance and the Theory of Investment', *American Economic Review*, 48, 1958, pp. 261–97.

Hedging market-wide sources of risk, on the other hand, does not seem to provide any real service other than reduced volatility. In addition, this risk reduction is costly in terms of the resources required to implement an effective risk-management program. There are direct costs associated with hedging – transactions costs of buying and selling forwards, futures, options and swaps – and indirect costs in the form of managers' time and expertise.

According to modern hedging theory, value-maximising companies hedge because hedging can increase company value in several ways. The principal reason most companies hedge, however, is to reduce the likelihood of financial distress. **Figure 19.2** illustrates the impact of hedging on the likelihood of financial distress, showing the range of possible cash flows for the company in a given period and the associated probability distribution. If the company's cash flows are below point A on the x-axis, the company experiences financial distress. By hedging, the company is able to reduce the probability of the company's cash flows being below point A.

FIGURE 19.2 PROBABILITY DISTRIBUTION OF POSSIBLE CASH FLOWS FOR A CORPORATION

Hedging reduces the volatility of the cash flows, thereby reducing the probability of cash flows falling below point A, where financial distress occurs.



Reducing the likelihood of financial distress benefits the company by also reducing the likelihood it will experience the costs associated with this distress. Direct costs of distress include out-of-pocket cash expenses that must be paid to third parties (such as lawyers, auditors, consultants and court personnel) in the event of bankruptcy or severe financial distress. Many of the indirect costs are contracting costs involving relationships with creditors, suppliers and employees. For example, a credible promise to hedge can sometimes entice creditors to lend the company money on more favourable terms than they would be willing to lend to an unhedged borrower. Similarly, suppliers are more likely to extend trade credit when the likelihood of financial distress is low. In addition to potential cost savings, hedging may increase revenue for companies that sell products with warranties or service contracts. Warranties or service contracts are more likely to be honoured, and customers will place a higher value on them, if the company has a lower likelihood of financial distress. Similarly, if the products will require replacement parts or if there is the possibility of future upgrades, minimising the likelihood of financial distress can promote sales.

Hedging can also reduce a company's expected tax liability. If a company's tax rate increases as income increases, hedging can reduce the expected tax liability and increase expected after-tax earnings. For example, suppose that a company thinks its taxable earnings over the coming year will be one of three equally likely levels, depending on the actual realised price of a key input. If the input price is very high, the company will generate no earnings at all. If the input price is very low, then earnings will be \$20,000. In the intermediate case with a medium price for the key input, the company's earnings are \$10,000. Managers believe that each of these outcomes is equally likely:

$$\left(\text{Probability} = \frac{1}{3} \right)$$

To highlight the tax incentive to hedge, we will make two assumptions. First, assume that by hedging, the company can lock in the price of its key input at the medium level, and thereby ensure that its pre-tax earnings will be \$10,000. Second, assume that the company pays a 10% tax rate on the first \$10,000 in earnings and a 20% tax rate on all earnings above \$10,000. **Figure 19.3** illustrates how the company's hedging decision can affect its value.

FIGURE 19.3 THE TAX INCENTIVE TO HEDGE

This table illustrates that when companies face higher tax rates as their earnings increase, the tax schedule creates an incentive to hedge. If the company does not hedge, its expected after-tax earnings equal \$8,667, but if it does hedge, it can lock in after-tax earnings of \$9,000.

	NO HEDGING SCENARIO		
INPUT PRICE	HIGH	MEDIUM	LOW
Taxable earnings	\$0	\$10,000	\$20,000
- Taxes due	0	1,000	3,000
After-tax earnings	\$0	\$9,000	\$17,000
Expected after-tax earnings	$\frac{1}{3}(\$0) + \frac{1}{3}(\$9,000) + \frac{1}{3}(\$17,000) = \$8,667$		

HEDGING SCENARIO (INPUT PRICE LOCKED IN AT MEDIUM)	
Taxable earnings	\$10,000
- Taxes due	1,000
After-tax earnings	\$ 9,000
Tax schedule	
Tax rate on first \$10,000	10%
Tax rate on earnings > \$10,000	20%

If the company hedges to lock in the key input price, then its after-tax earnings equal \$9,000. The tax schedule drives the difference in the two scenarios. When the company does not hedge, it pays a higher tax rate when the input price is low and earnings are high than at other times. As a result, the expected tax bill is higher and earnings are lower than when the company hedges and earns \$10,000 before taxes. Hedging can also reduce expected tax liabilities by smoothing the profit stream and reducing the likelihood that the company will pay high taxes in one period while having to forgo (or delay) the benefits of tax shields in another period. Current tax laws limit the extent to which corporations can use losses in one period to offset gains in another period. For this reason, it is in the interest of some corporations to hedge their risk exposures; otherwise, they could lose some of the tax benefits associated with losses experienced in periods of poor performance.

Closely held companies are more likely to hedge risk exposures because owners have a greater proportion of their wealth invested in the company. Because the owners of these companies are less diversified, they generally seek to minimise the risk exposures faced by the company. Similarly, if the managers of the company are risk-averse, the company is more likely to pursue strategies that minimise risk exposures. Research studies confirm these expectations. The hedging activities of companies increase as share ownership by managers increases.

Another benefit of hedging is that it makes it easier for the board of directors and outsiders to evaluate the performance of managers. Absent an effective risk-management program, it is difficult to disentangle

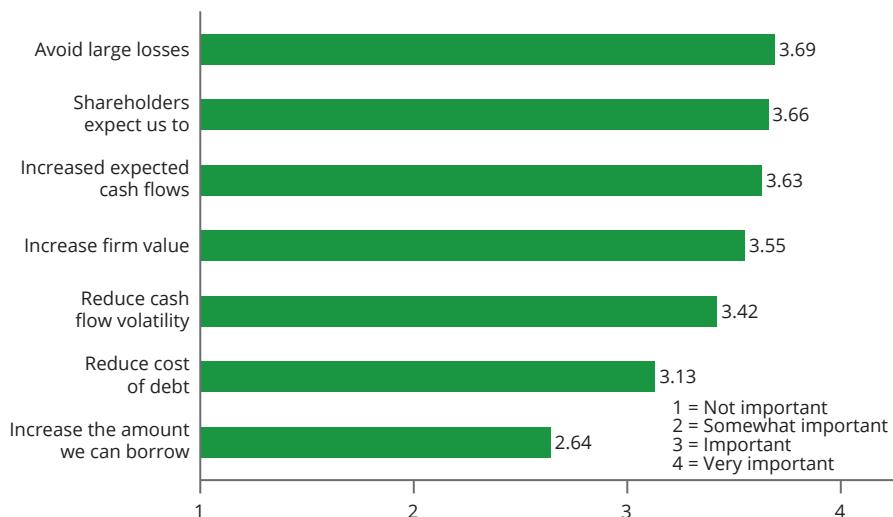
company performance due to the manager's performance from company performance due to external factors. A manager can make his or her performance more observable by minimising the company's exposure to external risk factors. For this reason, superior managers may be more inclined to hedge, whereas inferior managers may prefer to disguise their performance behind the company's unhedged performance.

Finally, even though shareholders can hedge the exposures they face as a result of owning shares in a risky company, there are some circumstances under which it may be less costly for the company to minimise risk than for the shareholders to hold a diversified portfolio. For some companies, however, the costs of hedging outweigh the benefits. There are substantial fixed costs associated with hedging, including the costs of acquiring the necessary expertise to implement a successful risk-management program, and small companies are therefore less likely to hedge than large companies.

In their global survey of risk managers, Bodnar and colleagues² asked managers to rate the importance of various motivations for their companies' hedging programs. **Figure 19.4** summarises some of their responses. Nearly all the managers responding to the survey said that avoiding large losses was an important motivation for their companies' hedging programs. Other important reasons for hedging cited in the survey were meeting shareholders' expectations to hedge, increasing expected cash flows, increasing company value and reducing the volatility of cash flows. Risk managers did not see reducing the cost of debt or increasing the amount of debt that their company could borrow as important motivations for their hedging activities.

FIGURE 19.4 WHY DO COMPANIES HEDGE?

The figure shows the average response of 1,161 risk managers when asked about the importance of several different reasons for why the company had a hedging program.



Source: G. Bodnar, J. Graham, C. Harvey and R. Marston, 'Managing Risk Management: Evidence from a Global Survey of Risk Managers.' Unpublished working paper.

Hedging Strategies

In some circumstances, a company may not hedge a risk exposure if it is confident that the risk factor will be changing in a positive direction, or that it has a comparative advantage in bearing the risk. For example, if a silver-mining company is convinced that the price of silver will increase in the coming months, it may choose not to hedge its exposure to changes in the price of silver. When the price of silver increases, the mining

2 G. Bodnar, J. Graham, C. Harvey and R. Marston, 'Managing Risk Management: Evidence from a Global Survey of Risk Managers'. Unpublished working paper.

company will benefit from the higher price it will receive for silver. In other circumstances, a company may over-hedge if it is certain that a risk factor will be changing in a negative direction. For example, if the mining company is convinced that the price of silver will decrease in the coming months, it may over-hedge by taking a position in a derivative security that will more than offset the reduced price it receives for silver, thereby generating a profit on the price decrease. These examples illustrate that derivatives are an effective means for managers to take a position in a risk factor based on their expectations. It is important to note that if a company chooses *not* to hedge a risk exposure, or chooses to over-hedge, it is speculating on changes in the risk factor.

How a company chooses to hedge a given risk exposure will depend on the costs and benefits of the alternative hedging strategies. The company needs to consider transactions costs, the effectiveness and accuracy of alternative strategies in offsetting underlying risk exposures, and the liquidity and default risks associated with those strategies. Customised hedging strategies, especially those that are financially engineered, are effective and accurate, but suffer from greater transactions costs and low liquidity. Off-the-shelf solutions, such as exchange-traded derivative securities, while attractive because of their low transactions costs, high liquidity and low default risk, may not effectively and accurately offset the risk exposure.

LO19.1

CONCEPT REVIEW QUESTIONS

- 1 What does it mean to say that a company, by not hedging, is speculating on changes in the risk factor?
- 2 Why do you think derivative securities have acquired a questionable reputation?

LO19.2

19.2 FORWARD CONTRACTS

forward price

The price to which parties in a forward contract agree. The price at which a purchaser will buy a specified amount of an asset from the seller at a fixed date in the future

spot price

The price that the buyer pays the seller today in a cash market transaction

settlement date

The date on which the buyer pays the seller and the seller delivers the asset to the buyer. In a forward contract, this will be an agreed date in the future

As discussed in Chapter 16, a forward contract involves two parties agreeing today on a price, called the **forward price**, at which the purchaser will buy a specified amount of an asset from the seller at a fixed date in the future. This is in contrast to a cash market transaction, in which the buyer and seller conduct their transaction today at the **spot price**. The buyer of a forward contract has a long position and has an obligation to pay the forward price for the asset. The seller of a forward contract has a short position and has an obligation to sell the asset to the buyer in exchange for the forward price. The future date on which the buyer pays the seller (and the seller delivers the asset to the buyer) is referred to as the **settlement date**. It is important to note that, unlike options, which were discussed in Chapter 8, forward contracts are obligations, and failure to make or take delivery of the underlying asset represents default. In addition, no cash changes hands in a forward contract until the contract settlement date. For these two reasons, default risk is a concern in forward contracts, and market participants prefer to enter into such contracts with parties that they know and trust.

Most forward contracts are individually negotiated between corporations and financial intermediaries, but there are active markets for standard denomination and maturity forward contracts on several currencies and raw materials that institutions (including the bank market-makers themselves) can use to hedge their own exposures.

19.2a FORWARD PRICES

The forward price is the price that makes the forward contract have zero net present value (NPV). The key to determining a security's fair forward price is being able to form an alternative to the forward contract that has identical cash flows. For example, consider an asset that pays no income (such as a discount bond) and does not cost anything to store (such as financial assets). Rather than buy the asset six months forward, we could borrow the current price of the asset and buy it today. Six months from now, we would repay the loan plus interest. Whether we buy the asset six months forward or borrow and buy it today, we end up in the same position – owning the asset in six months. Because both strategies have identical cash flows in all circumstances, we can make the argument that the value of both strategies must be the same. This argument is based on a no-arbitrage principle. **Arbitrage** involves generating a riskless profit by simultaneously buying the strategy with the low value and selling the strategy with the high value. In a well-functioning market, these opportunities are quickly eliminated. Therefore, the forward price, F , for an asset that pays no income and does not cost anything to store should be the following:

(Eq. 19.1)
$$F = S_0(1 + r_f)^n$$

where S_0 is the current spot price of the asset, r_f is the current risk-free rate and n is the number of years until the forward contract is to be settled. If **Equation 19.1** does not hold, and F is greater than $S_0(1 + r_f)^n$, we can make a riskless profit by simultaneously borrowing an amount equal to S_0 , using the borrowed funds to buy the asset and selling the asset forward. On the settlement date, assuming we are able to borrow at the risk-free rate, we would sell the asset for F by delivering on the forward contract and pay our debt (including interest) of $S_0(1 + r_f)^n$. This arbitrage strategy would generate $F - S_0(1 + r_f)^n > 0$ in riskless profits on the settlement date without requiring any up-front investment.

Alternatively, if F is less than $S_0(1 + r_f)^n$, we would simultaneously short-sell the asset for S_0 , lend the proceeds from the short sale at the risk-free rate and buy the asset forward. On the settlement date, we would collect $S_0(1 + r_f)^n$ from the loan, pay F for the asset and close out our short-sale position. This arbitrage strategy would generate $S_0(1 + r_f)^n - F > 0$ in riskless profits on the settlement date without requiring any up-front investment.

arbitrage

The process of buying something in one market at a low price and simultaneously selling it in another market at a higher price to generate an immediate, risk-free profit



Calculating a Forward Price 1

Helen Clemons is a portfolio manager who plans to buy one-month Treasury notes in two months with a total face amount of \$5 million. The current price for three-month Treasury notes is \$985,149 per \$1 million face amount. The current risk-free rate is 6.17%. The fair forward price is calculated as follows:

$$F = \$985,149(1 + 0.0617)^{2/12} = \$995,029$$

Therefore, the total forward price Helen should pay is \$4,975,145 ($\$995,029 \times 5$). If this is not the forward rate quoted to her, Helen or another arbitrageur (a person who is trying to benefit from arbitrage opportunities or price disequilibrium between markets) has an opportunity to earn a riskless profit.

A similar approach can be used to determine the forward price for an asset that pays income (such as a coupon bond) or is costly to store (such as commodities). In this case, we must account for the receipt of income and/or the payment of storage cost before the contract matures. If an investor purchases an asset through a forward contract rather than through a spot market transaction, the investor incurs certain costs and benefits. If the asset generates any income, then an investor who owns the asset receives the income,

whereas the investor who owns the futures contract does not. Similarly, if the asset is costly to store, then the owner of the asset must bear those costs and the futures contract holder avoids them. Therefore, a fair future contract price strikes a balance between the benefits and costs of owning the asset. We determine the appropriate forward price for these assets as follows:

(Eq. 19.2)

$$F = (S_0 - I + W)(1 + r_f)^n$$

where I is the present value of income to be paid by the asset during the life of the forward contract, and W equals the present value of the cost of storing the asset for the life of the contract.



Calculating a Forward Price 2

Consider a forward contract to purchase a 10-year bond in one year. Currently, an 11-year bond has a coupon rate of 8% and a price of \$1,100, and will thus make two \$40 coupon interest payments over the coming year. The current effective annual

risk-free rate of interest over the next year is 5%. Because the 10-year bond costs nothing to store, $W = \$0$, and the fair forward price is calculated as follows:

$$F = \$ \left[\frac{\$40}{(1+0.05)^{0.5}} + \frac{\$40}{(1+0.05)^1} \right] (1+0.05) = \$1,074.01$$

Of course, we have made a number of assumptions to arrive at **Equations 19.1** and **19.2**. First, we have assumed that market participants are able to borrow and lend at the risk-free rate, though most individual and institutional investors are unable to do so. However, a sufficiently large number of institutional investors can borrow at or near the risk-free rate, such that **Equations 19.1** and **19.2** should hold. Second, we have assumed that there are no transactions costs associated with establishing these positions, which will tend to widen the bounds on futures prices. Third, we have assumed that we can use the proceeds from short selling, and that short selling does not involve any costs. In reality, only institutional investors can use all the proceeds from short selling, and there are transactions costs associated with short selling. These costs can be incorporated into the model by discounting the right-hand side of **Equations 19.1** and **19.2**.

19.2b CURRENCY FORWARD CONTRACTS

currency forward contract

A contract that involves exchanging one currency for another at a fixed date in the future

forward rate

The forward price in a currency forward contract

Currency forward contracts, which involve exchanging one currency for another at a fixed date in the future, express the forward price as a **forward rate**. **Figure 19.5** presents hypothetical spot and forward exchange rates between the US dollar, the British pound and the euro. For example, the spot rate between pounds and dollars is US\$1.6150/£ (or, equivalently, £0.6192/US\$), and the spot rate between euros and US dollars is US\$1.1100/€ (or €0.9009/US\$).

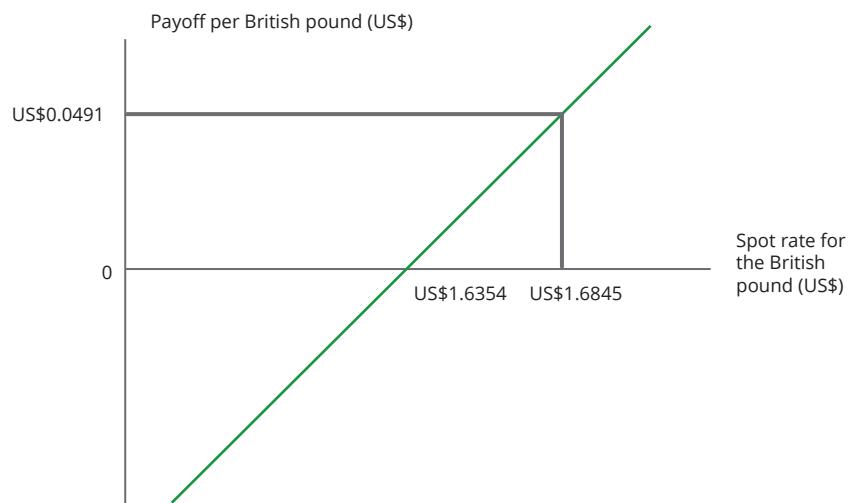
Figures 19.6 and **19.7** show payoff diagrams for the buyer and seller of a six-month forward contract on the British pound, where the forward rate, which is agreed upon at contract origination, is US\$1.6354/£. Under this forward contract agreement, the purchaser of the contract has agreed to purchase £1 in six months, at a price of US\$1.6354. The seller of the contract has agreed to sell £1 in six months, at a price of US\$1.6354 (or effectively to buy US\$1.6354 at a cost of £1). The x -axis of these diagrams represents possible spot rates for the British pound on the settlement date (six months in the future). The y -axis represents the profit or loss to the parties involved in the transaction. The buyer's profit is the spot rate for the British pound on the settlement date minus the forward rate.

The seller's profit is the forward rate minus the spot rate on the settlement date. For example, if the spot rate is US\$1.6845/£ in six months, then the buyer's profit is US\$0.0491/£ (US\$1.6845/£ – US\$1.6354/£). The seller would have a loss of US\$0.0491/£.³

FIGURE 19.5 SPOT AND FORWARD EXCHANGE RATES

CURRENCY	US\$ EQUIVALENT	CURRENCY PER US\$
Pound		
Spot	1.6150	0.6192
1-month forward	1.6216	0.6167
3-month forward	1.6247	0.6155
6-month forward	1.6354	0.6115
EURO		
Spot	1.1100	0.9009
1-month forward	1.1144	0.8973
3-month forward	1.1233	0.8902
6-month forward	1.1366	0.8798

FIGURE 19.6 PAYOFF DIAGRAM FOR THE BUYER OF A SIX-MONTH FORWARD CONTRACT ON THE BRITISH POUND

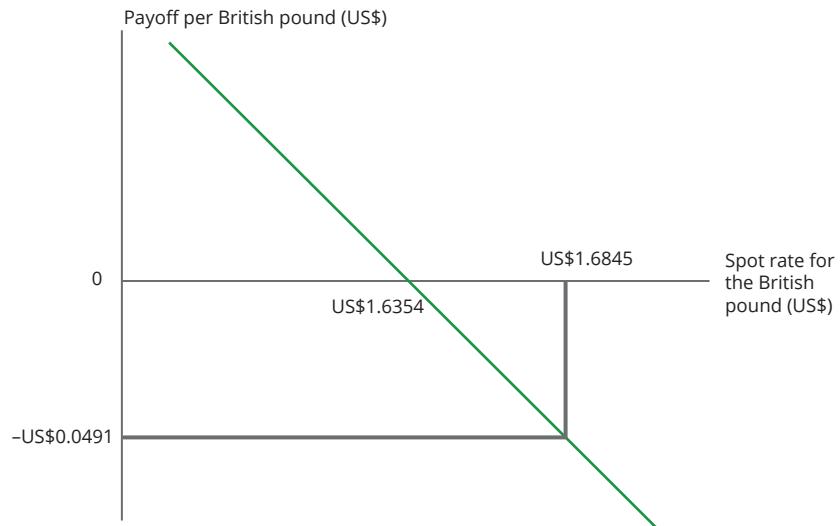


Currency Forward Rates

Determining the fair forward rate in a currency contract is slightly more complicated than doing so for a financial asset that pays no income. Unlike the financial asset discussed previously, currencies generate income in the form of interest earned from investing the currency. However, the principle of how we determine the fair forward price still applies. For example, rather than buy British pounds three months forward, we could borrow dollars, convert the dollars to British pounds at the spot rate and invest the pounds in Britain at the risk-free rate. These transactions guarantee a fixed amount of British pounds in three months, just as a forward contract does.

3 To understand why the profit or loss from a forward position depends on the spot rate at the settlement date, consider the following. If we pay US\$1.6354/£ on the settlement date and immediately sell the British pounds in the spot market, we will receive US\$1.6845/£. The net effect of this transaction is a cash inflow of US\$0.0491/£. On the other hand, if we have the short position, we would be selling British pounds for US\$0.0491/£ less than they are worth, thus experiencing a loss.

FIGURE 19.7 PAYOFF DIAGRAM FOR THE SELLER OF A SIX-MONTH FORWARD CONTRACT ON THE BRITISH POUND



In fact, we have already studied a pricing relationship for forward exchange rates. In Chapter 16, we saw that interest rate parity established conditions under which an investor was indifferent between investing in a risk-free asset at home or abroad. These conditions are expressed mathematically as follows:

$$\frac{F}{S} = \frac{1+r_{for}}{1+r_{dom}}$$

This equation says that the ratio of the forward rate to the spot rate (expressed in foreign currency per unit of domestic currency) must equal the ratio of one plus the foreign risk-free rate divided by one plus the domestic risk-free rate. If this equation does not hold, then an arbitrage opportunity exists, and traders can borrow in one country and simultaneously invest in another country to make a quick profit. Rearranging this equation slightly, we can derive the formula for the fair price of a forward exchange contract:

(Eq. 19.3)

$$F = \left(S \right) \left(\frac{1+r_{for}}{1+r_{dom}} \right)$$



Forex Forward Rate Calculation

Suppose that the current spot exchange rate on the Swiss franc (SF) is \$0.5800/SF, or SF1.7241/\$. The one-year risk-free rate for borrowing in dollars is 6%, and the rate for borrowing in Swiss

francs is 5%. According to **Equation 19.3**, the following is the one-year forward exchange rate on the Swiss franc:

$$F = \left(1.7241 \right) \left(\frac{1+0.05}{1+0.06} \right) = SF1.7078/\$$$

Hedging with Currency Forward Contracts

To see how forward contracts can be used to hedge foreign exchange risk, consider a multinational company's treasurer who expects to receive a 10 million Swiss franc (SF) payment in 90 days. Suppose the spot rate is currently \$0.6050/SF. In 90 days, however, the spot rate may be lower. For example, if the spot rate declines to \$0.5800/SF, then the SF10 million payment will be worth only \$5,800,000 ($\$0.5800/\text{SF} \times \$10,000,000$) rather than the \$6,050,000 ($\$0.6050/\text{SF} \times \$10,000,000$) it would be worth today.

This type of foreign exchange risk can be hedged by selling the payment forward. Suppose the three-month forward rate for exchanging Swiss francs into dollars is \$0.6051/SF. In three months, after receiving the SF10 million payment, the company will deliver SF10 million to the counterparty in the forward contract and receive in exchange \$6,051,000 ($\$0.6051/\text{SF} \times \$10,000,000$), regardless of what the spot rate happens to be at that time. The treasurer has hedged the company's foreign exchange risk associated with this payment by locking in the dollar price that the company will receive for its foreign currency cash flow.

19.2c INTEREST RATE FORWARD CONTRACTS

The underlying asset in an interest rate forward contract is either an interest rate or a debt security. Contracts involving an interest rate as the underlying security are cash settled, which simply means that the underlying security is not transferred from the seller to the buyer. Instead, the buyer and seller exchange the cash value of the contract. Either way, interest rate forward contracts are used to hedge an interest rate risk exposure in much the same way that currency forward contracts are used to hedge a currency risk exposure.

Forward Rate Agreements

A **forward rate agreement (FRA)** is a forward contract where the underlying asset is not an asset at all but an interest rate. An FRA is an agreement between two parties to exchange cash flows based on a reference interest rate and principal amount at a single point in time in the future. In an FRA, the first party will pay the second party if the market rate of interest at a specified future time is greater than the fixed interest rate (that is, the forward rate) specified in the contract. If, however, the market rate of interest is less than the forward rate, the second party will pay the first party. The size of the payment will depend on the hypothetical principal amount, called the *notional principal*, and the difference between the market rate of interest and the forward rate. **Equation 19.4** shows how to determine the cash flow in an FRA (CF_{FRA}). Note that, by convention, this computation uses a 360-day year.

$$(Eq. 19.4) \quad CF_{FRA} = \frac{np \times \left(r_s - r_{fwd} \right) \times \left(D / 360 \right)}{1 + \left[r_s \times \left(D / 360 \right) \right]}$$

In this equation, np stands for the contract's notional principal, r_s is the reference rate on the contract settlement date (for example, the three-month Treasury bill rate), r_{fwd} is the forward rate established at the beginning of the contract and D is the number of days in the contract period.

forward rate agreement (FRA)
A forward contract in which the underlying asset is not an asset at all but an interest rate

Hedging with Interest Rate Forward Contracts

To see how FRAs can be used to hedge interest rate risk, consider AuAg Commodities (AuAg). The company is planning to borrow \$10 million in six months at LIBOR plus 100 basis points, and is concerned that LIBOR will increase before the company borrows.⁴ To hedge this exposure, AuAg and Bank Oz enter into a six-month FRA

⁴ LIBOR, the London Interbank Offered Rate, is the rate of interest charged for Eurodollar borrowing between banks. Most large bank loans are priced with reference to LIBOR. However, due to concerns caused by previous financial scandals, the UK Financial Conduct Authority is phasing out the use of LIBOR by the end of 2021.

with a notional principal of \$10 million. The terms of the contract are such that AuAg will pay Bank Oz if the three-month LIBOR six months from now is less than the fixed rate of 6%. If the three-month LIBOR exceeds 6%, Bank Oz must pay AuAg. The size of the cash flow is determined by **Equation 19.4**. For example, if the three-month LIBOR six months from now is 7%, Bank Oz must pay AuAg the following:

$$\frac{\$10,000,000 \times (0.07 - 0.06) \times (92 / 360)}{1 + [0.07 \times (92 / 360)]} = \$25,106.43$$

However, if the three-month LIBOR six months from now is 5% rather than 7%, AuAg must pay Bank Oz \$25,233.13.

LO19.2

CONCEPT REVIEW QUESTIONS

- 3 If **Equation 19.2** does not hold, how might an arbitrageur earn a riskless profit?
- 4 What is the difference in the timing of cash flows in a forward contract and a spot market transaction?

LO19.3

19.3 FUTURES CONTRACTS

futures contract

Involves two parties agreeing today on a price at which the purchaser will buy a given amount of a commodity or financial instrument from the seller at a fixed date in the future

For companies trying to hedge risk exposures, forward contracts suffer from two important problems: default risk and liquidity. Futures contracts reduce these problems. Like a forward contract, a **futures contract** involves two parties agreeing today on a price at which the purchaser will buy a given amount of a commodity or financial instrument from the seller at a fixed date in the future. In fact, the contracts are so similar that, for most purposes, we can use the same pricing formulas to price futures contracts that we used for forward contracts. Similarly, we can use the same payoff diagram for futures that we used for forwards.

Although futures and forwards serve the same economic function, there are differences in the characteristics of the two contracts. In contrast to a forward contract, a futures contract is an exchange-traded contract that promises the delivery of a specified volume of a commodity or financial instrument on a standardised date of the month in which the contract expires. The futures exchange acts as a guarantor for all transactions, mitigating the forward contract's problem of counterparty risk.⁵

Because futures exchanges offer a limited set of contracts for trading, futures contracts are relatively liquid compared with forward contracts.

For example, gold futures contracts are traded on the COMEX. The standard gold futures contract size is 100 troy ounces. Contracts are available for delivery in the current month; the next two months; any February, April, August and October falling within the next two years; and any June and December falling within the next six years.

Figure 19.8 provides data on prices of a number of gold futures contracts on 3 January 2020. For the January 2020 gold futures, the first trade of the day, called the **opening futures price**, was \$1,530.1 per troy ounce for delivery in January 2020. The highest price for the day was \$1,552.7. The low for the day was the

opening futures price
The price on the first trade of the day

⁵ In practice, the exchange acts as a clearing house, and only transacts with the clearing brokers that are members of the exchange. Thus, the clearing house guarantees all transactions between it and the clearing brokers. However, clients do not usually have recourse to the exchange. They transact with the clearing brokers, and are thus taking counterparty risk on the clearing brokers.

opening price of \$1,530.1 per ounce. The last January 2020 futures price for the day was \$1,551.7 per ounce. This **closing futures price** is the result of a \$27.2 per ounce increase in the **settle price** from the previous day, as indicated by the change column. The closing price is also known as the **settlement price**, and is used to settle all contracts at the end of each day's trading in a process called marking-to-market (see page 687). The **open interest** represents the number of contracts that are currently outstanding. This number changes every day as contracts are bought and sold. If a trader were to take a long position in gold futures contracts at the settle price of \$1,551.7 per ounce, the total futures price of one contract would be \$155,170 ($\$1,551.7 \times 100$ troy ounces).

Figure 19.9 provides a few examples of the types of available futures contracts, the exchanges on which they are traded and the face amount (size) of each contract.

closing futures price
The price used to settle all contracts at the end of each day's trading. Also called the *settlement price* or *settle price*

settle price
The price used to settle all contracts at the end of each day's trading. Also called the *closing futures price* or *settlement price*

open interest
The number of a given type of futures contracts that are currently outstanding

FIGURE 19.8 GOLD FUTURES PRICES, 3 JANUARY 2020

MONTH	OPTIONS	CHARTS	LAST	CHANGE	PRIOR SETTLE	OPEN	HIGH	LOW	VOLUME	HI/LOW LIMIT	UPDATED
JAN 2020	OPT	Bar	1551.7	+27.2	1524.5	1530.1	1552.7	1530.1	107	No Limit/ No Limit	16:36:45 CT 03 Jan 2020
FEB 2020	OPT	Bar	1555.2	+27.1	1528.1	1531.7	1555.6	1530.4	420.633	No Limit/ No Limit	16:37:26 CT 03 Jan 2020
MAR 2020	OPT	Bar	1558.0	+26.1	1531.4	1535.2	1558.3	1535.2	269	No Limit/ No Limit	16:36:52 CT 03 Jan 2020
APR 2020	OPT	Bar	1561.3	+27.0	1534.3	1537.9	1562.2	1536.7	17.677	No Limit/ No Limit	16:37:01 CT 03 Jan 2020
JUN 2020	OPT	Bar	1566.5	+26.4	1540.1	1543.9	1567.6	1543.9	4.263	No Limit/ No Limit	16:36:57 CT 03 Jan 2020
AUG 2020	OPT	Bar	1570.3	+24.7	1545.6	1549.5	1571.6	1549.5	2.032	No Limit/ No Limit	16:37:05 CT 03 Jan 2020
OCT 2020	OPT	Bar	1572.8	+22.3	1550.5	1563.3	1572.8	1562.4	915	No Limit/ No Limit	16:37:00 CT 03 Jan 2020
DEC 2020	OPT	Bar	1582.5	+27.3	1555.2	1561.6	1583.6	1561.6	4.736	No Limit/ No Limit	16:36:53 CT 03 Jan 2020
FEB 2021	OPT	Bar	1586.8	+27.1	1559.7	1566.0	1586.8	1566.0	1.556	No Limit/ No Limit	16:37:13 CT 03 Jan 2020
APR 2021	OPT	Bar	1588.6	+24.6	1564.0	1591.0	1592.1	1588.6	209	No Limit/ No Limit	16:37:01 CT 03 Jan 2020
JUN 2021	OPT	Bar	-	-	1567.9	-	-	-	1	No Limit/ No Limit	16:36:19 CT 03 Jan 2020
AUG 2021	OPT	Bar	-	-	1572.1	-	-	-	0	No Limit/ No Limit	16:36:51 CT 03 Jan 2020
OCT 2021	OPT	Bar	-	-	1576.0	-	-	-	0	No Limit/ No Limit	16:36:56 CT 03 Jan 2020
DEC 2021	OPT	Bar	1602.5	+22.5	1580.0	1549.9	1602.5	1549.9	5	No Limit/ No Limit	16:36:42 CT 03 Jan 2020
JUN 2022	OPT	Bar	-	-	1589.9	-	-	-	0	No Limit/ No Limit	16:36:57 CT 03 Jan 2020
DEC 2022	OPT	Bar	-	-	1597.8	-	-	-	0	No Limit/ No Limit	16:36:50 CT 03 Jan 2020

Source: CME Group, 'Gold Futures Quotes', <https://www.cmegroup.com/trading/metals/precious/gold.html>. Accessed 6 January 2020.

FIGURE 19.9 EXAMPLES OF EXCHANGE-TRADED FUTURES CONTRACTS

CONTRACT	EXCHANGE	FACE AMOUNT
GRAINS AND OILSEEDS		
Corn	Chicago Board of Trade	5,000 bushels
Oats	Chicago Board of Trade	5,000 bushels
Wheat	Chicago Board of Trade	5,000 bushels
LIVESTOCK AND MEAT		
Cattle – feeder	Chicago Mercantile Exchange	50,000 lb
Cattle – live	Chicago Mercantile Exchange	40,000 lb
Pork bellies	Chicago Mercantile Exchange	40,000 lb
FOOD AND FIBRE		
Cocoa	New York Board of Trade	10 metric tons
Coffee	New York Board of Trade	37,500 lb
Sugar – world	New York Board of Trade	112,000 lb
Sugar – domestic	New York Board of Trade	112,000 lb
Cotton	New York Board of Trade	50,000 lb
Orange juice	New York Board of Trade	15,000 lb
METALS AND PETROLEUM		
Copper	COMEX	25,000 lb
Gold	COMEX	100 troy oz
Platinum	New York Mercantile Exchange	50 troy oz
Silver	COMEX	5,000 troy oz
Crude oil	New York Mercantile Exchange	1,000 bls
Natural gas	New York Mercantile Exchange	10,000 MMBtu
INTEREST RATE		
Treasury bonds	Chicago Board of Trade	\$100,000
5-year Treasury notes	Chicago Board of Trade	\$100,000
30-day federal funds	Chicago Board of Trade	\$5 million
LIBOR	Chicago Mercantile Exchange	\$3 million
Eurodollars	Chicago Mercantile Exchange	\$1 million
INDEX		
Dow Jones Industrial Average	Chicago Board of Trade	\$10 × average
S&P 500	Chicago Mercantile Exchange	\$250 × average
Currency		
Japanese yen (¥)	Chicago Mercantile Exchange	¥12.5 million
British pound (BP)	Chicago Mercantile Exchange	BP62,500
Swiss franc (SF)	Chicago Mercantile Exchange	SF125,000

Source: *The Wall Street Journal*. Used with permission. Futures Contracts, *Wall Street Journal*, 11 October 2011, p. C9.

All the contracts traded on these exchanges are standardised with respect to size and delivery date. The economic rationale for designing futures contracts in this way is that it provides a standardised, high-trading-volume (hence low transactions cost) financial instrument that can be used by both individuals and businesses to hedge underlying commercial risks, as well as by speculators wishing to place a highly leveraged bet on the direction of commodity prices. Contract sizes are small enough for individuals to be able

to participate in futures markets, and the volume is high enough for businesses to take significant positions by buying or selling multiple contracts.

Although both futures and forwards impose obligations on their holders, the default risk of a futures contract is much lower, for two reasons. First, every major futures exchange operates a clearinghouse that acts as the counterparty to all buyers and sellers. This means that traders need not worry about the creditworthiness of the party they trade with (as forward market traders must), but only about the creditworthiness of the exchange itself. Second, futures contracts feature daily cash settlement of all contracts, called **marking-to-market**. By its very nature, a futures contract is a zero-sum game because whenever the market price of a commodity changes, the underlying value of a long (purchase) or short (sale) position also changes – and one party's gain is the other party's loss. By requiring each contract's loser to pay the winner the net amount of this change each day, futures exchanges eliminate the possibility that large, unrealised losses will build up over time. In a forward contract, on the other hand, there are no cash flows until termination of the contract.

marking-to-market
The process of daily cash settlement applied to all futures contracts

► EXAMPLE

Transacting Futures Contracts with Daily Marking-to-Market

As an example of marking-to-market, consider the gold futures discussed previously. Recall that the settle price for the January 2020 contract was \$1,551.7 per troy ounce. If the settle price on the next business day is \$1,552.3/oz, the person with the long position will receive \$0.60/oz (the new futures price minus the original futures price), or a total of \$60.00 per contract ($\$0.60/\text{oz} \times 100 \text{ troy ounces}$). The person with the short position must pay \$0.60/oz. In effect, the new contract with a futures price of \$1,552.3/oz replaces

the original contract. The party with the long position is compensated (and the person with the short position must pay) for the increase in the futures price. This type of daily settlement takes place on every trading day until delivery takes place. It is important to note that the party with the long position ultimately ends up paying a total of \$1,551.7/oz, and the party with the short position receives a total of \$1,551.7/oz upon delivery if each party holds his or her contract until maturity.

When taking a position in a futures contract, the investor must deposit a minimum dollar amount called the **initial margin**, which varies by contract, in a **margin account**. The investor deposits gains in or withdraws losses from this account. Each exchange has margin requirements, and brokerage companies may require additional margin above the minimum specified. If losses deplete the margin below the level needed to maintain an open position, the **maintenance margin**, the investor must deposit additional funds in the account to bring the account back to the initial margin. Failure to deposit additional funds before the next day's trading results in the position being closed out by the exchange.

In addition to these distinctions, futures differ from forward contracts in two other important respects. First, futures contracts are designed to have a low enough value that will appeal to a retail market of individuals and smaller companies, whereas most actively traded forward contracts have minimum denominations of \$1 million or more. For example, in Australia, the SFE SPI 200 futures contract is generally one of the most heavily traded contracts. It is valued at \$25 per index point.⁶ This small contract size is rarely a problem for futures traders, however, as those wishing to hedge large exposures can simply purchase multiple contracts. Second, most forward contracts are settled by actual delivery, but this rarely occurs with futures contracts. Instead, futures market hedgers will execute an offsetting trade to close out their position in the futures market whenever they have closed out their underlying commercial risk through delivery in the normal course of business.

initial margin
The minimum dollar amount required of an investor when taking a position in a futures contract

margin account
The account into which a futures contract investor must deposit the initial margin

maintenance margin
Margin level required in a futures contract to maintain an open position

⁶ Details of this contract can be viewed at <http://www.asx.com.au/products/index-derivatives/asx-index-futures-contract-specifications.htm>.

fungibility

The ability to close out a futures contract position by taking an offsetting position

The ability to close out a position by taking an offsetting position is referred to as **fungibility**. Fungibility is made possible because the counterparty in a futures contract is the clearinghouse and because futures contracts are settled daily. If an investor were to take a long position in a futures contract and subsequently take a short position in the same contract, the contracts would cancel each other out for two reasons: (1) after marking-to-market, the futures prices of the two contracts would be the same; and (2) the clearinghouse is the counterparty to both contracts. It is important to note that unless buyers or sellers close out their positions, they are required to make or take delivery of the underlying asset.

19.3a HEDGING WITH FUTURES CONTRACTS

Futures contracts are a very effective mechanism for hedging. In addition to futures markets for metals, there are futures markets for foreign currencies, interest rates, share indexes and commodities. *Long hedges* involve buying a futures contract to offset an underlying short (sold) position. *Short hedges* involve selling a futures contract to offset an underlying long (purchased) position.

Hedging with Foreign Currency Futures

The multinational company with the SF10 million exposure discussed earlier could have chosen to hedge that exposure in the futures market rather than with a forward contract by selling 80 Swiss franc futures contracts (each mandating delivery of SF125,000). Recall that the multinational company will be receiving a payment of SF10 million in 90 days. By selling 80 SF futures contracts that expire after the date on which it will receive the SF payments (because futures contracts have fixed delivery periods, they will only rarely exactly match a trader's desired payment date), the company can hedge this exposure using futures rather than forwards. Suppose that the current settle price for Swiss franc futures is \$0.6057/SF. When the SF payment is received, the company will exchange it for dollars at whatever the spot \$/SF exchange rate happens to be at the time, and will simultaneously buy 80 SF futures contracts with the same delivery date as the contracts purchased earlier – thereby offsetting, or closing out, its futures position. If the dollar value of the Swiss franc declines from \$0.6050/SF to, say, \$0.5000/SF during the 90 days in question, then the company will lose \$0.1050/SF, or a total of \$1,050,000, on its spot market sale of the SF payment. However, this loss will be offset by the profit the company will achieve on its futures position. For example, if the futures price declines from \$0.6057/SF to \$0.5007/SF, the profit in the futures position will be \$0.1050/SF, or a total of \$1,050,000, exactly offsetting the loss in the cash market position. If the Swiss franc appreciates rather than depreciates against the dollar, then the company will gain on its cash market transaction and lose on its futures contracts. Either way, hedgers can use a futures contract to hedge an underlying commercial risk without actually having to take physical delivery on the futures contract.

Hedging with Interest Rate Futures

We can use futures contracts to hedge interest rate risk in much the same way that we hedged foreign exchange risk. Consider a corporate treasurer who anticipates borrowing \$1 million in five months. The loan will be at 100 basis points over the three-month LIBOR at the time of borrowing. LIBOR is currently at 5%. Eurodollar futures contracts for delivery in six months are trading at a yield of 5.2%. By selling one Eurodollar futures contract, the treasurer can effectively lock in a borrowing rate of 6.2% (5.2% plus 100 basis points) for the three months beginning in six months. As in the currency contract, the treasurer would close out the position in Eurodollar futures and borrow at the same time.

19.3b CONCERNs WHEN USING FUTURES CONTRACTS

In the previous examples, we ignored several potential problems associated with using futures markets to hedge. We discuss some of these problems in the following sections.

Basis Risk

The **basis** in a futures contract is the difference between the futures price and the spot price. **Basis risk** arises from the possibility of unanticipated changes in the basis. As the maturity date approaches, the basis goes to zero. This simply means that when a futures contract is about to expire, the futures price must equal the spot price. If this were not the case, a trader could easily make an instant profit. For example, if the futures price is greater than the spot price, then a trader could buy the underlying asset on the spot market and sell it at the higher futures price.

If a futures contract is closed out before maturity, as in the previous examples, basis risk can cause gains (losses) in the underlying risky position to differ from the offsetting losses (gains) in the futures position. In the currency hedging example, if the futures price had not changed by exactly the amount as the spot price, the loss in the cash position would have differed from the gain in the futures position.

basis

In a futures contract, this is the difference between the futures price and the spot price

basis risk

The possibility of unanticipated changes in the difference between the futures price and the spot price

Cross-Hedging

The underlying securities in the futures contracts were identical to the assets being hedged in the two previous examples. However, the underlying securities in the futures contract and the assets being hedged often have different characteristics. This practice is called **cross-hedging**. For example, a farmer who uses orange juice futures to hedge his crop of grapefruits is cross-hedging. Some traders use cross-hedging strategies because there is no futures contract available that precisely matches the asset exposure that the trader wants to hedge, or because one futures contract is more liquid than another one that matches the underlying asset being hedged. To minimise basis risk in a cross-hedge, we need to determine the relation between changes in the value of the asset being hedged and changes in the value of the asset in the futures contract. It is possible to estimate this relation using historical data. Once we measure the sensitivity of the asset being hedged to changes in the price of the underlying asset in the futures contract, we can use that information to adjust the number of futures contracts to buy or sell in order to achieve an effective hedge.

cross-hedging

A hedge in which the underlying securities in a futures contract and the assets being hedged have different characteristics

Tailing the Hedge

Because of the marking-to-market feature of futures contracts, interest is earned on gains to the futures position as they are paid in and interest is lost on losses as they are paid out. This causes gains on a long position in futures to be slightly greater than the losses on a short position in the underlying asset because of the interest earned on the gains. To avoid over-hedging, we can **tail the hedge**, or purchase enough futures contracts to hedge the risk exposure, but not so many that we over-hedge. To achieve a perfect hedge in the currency hedging example, we would need to sell slightly fewer than 80 Swiss franc futures contracts.

tailing the hedge

Purchasing enough futures contracts to hedge risk exposure, but not so many as to cause over-hedging

Delivery Options

The deliverable instrument in some futures contracts can take a variety of forms. For example, the underlying security in a Treasury bond futures contract is a 20-year Treasury bond. However, the contract allows for the delivery of any Treasury bond that has a maturity date of at least 15 years from the first day of the delivery month. If the bond is callable, it must not be callable for at least 15 years from the first day of the delivery month. When delivery occurs, a conversion factor is used to account for differences in the characteristics of the deliverable instruments. See the CME Group's website (<http://www.cmegroup.com>) for information on current conversion factors.

Another delivery option is the timing option. Many futures contracts allow delivery to take place at any time during the delivery month. In fact, several futures contracts allow for delivery to take place several days after the last trading day for a contract. For example, the delivery process for Treasury bond futures contracts is as follows: (1) at some time during the delivery month, the seller notifies the clearinghouse of the intent to deliver on the futures contract; (2) the clearinghouse notifies the party with the oldest long position that

delivery will take place in two days; (3) the seller delivers Treasury bonds to the individual with the long position; and (4) the seller receives the futures price (adjusted by the conversion factors associated with the bonds).

Because delivery rarely takes place in a futures contract, delivery options are not generally a major concern for the manager who is using futures to hedge risk. However, these delivery options do affect futures prices, and are important for those market participants who are planning to make or take delivery of the underlying asset in the futures market.

LO19.3

CONCEPT REVIEW QUESTIONS

- 5 What is the difference in the cash flows for a forward contract and a futures contract?
- 6 What features of a futures contract tend to reduce default risk?

LO19.4

19.4 OPTIONS AND SWAPS

Options and swaps can also be used to hedge risk exposures. This section discusses both these instruments, and describes how they can be used to hedge risk exposures.

19.4a OPTIONS

As discussed in Chapter 8, options contracts are pervasive in modern financial systems. There are exchange-traded options contracts on individual ordinary shares, on share indexes, on numerous currencies and interest rates, on a bewildering number of industrial and agricultural commodities and even on futures contracts. Financial institutions custom-design even more options to meet the needs of their customers (these are often called over-the-counter, or OTC options). A call option gives its holder the right to buy a fixed amount of a commodity at a fixed price, on (with a European option) or by (with an American option) a fixed date in the future, whereas a put option entails a similar right to sell that commodity. The valuation of, and payoff patterns for, options are discussed in depth in Chapter 8.

For our purposes, the key feature of an option as a hedging tool is that it provides protection against adverse price risk (an investor has the right to exercise the option if price changes make it optimal to do so) without having to forfeit the right to profit if the price on the underlying commodity moves in the investor's favour (in which case, the investor allows the option to expire unexercised). Of course, this one-sided protection against risk comes at a price. To acquire an option, unlike a forward contract, a trader must first pay the premium to the option seller.

Hedging with Currency Options

Recall the multinational corporation that is expecting to receive a payment of SF10 million. Earlier, we demonstrated how this foreign exchange risk could be hedged using forwards or futures. We can also hedge this risk using options. The multinational company could have purchased 160 SF put options (each granting the right to deliver SF62,500) that expire after the date on which it will receive the SF payments (like futures contracts, exchange-traded options have fixed expiration dates and will only rarely exactly match a trader's desired payment date). When the SF payment is received, the company will exchange it for dollars at the current spot \$/SF exchange rate and will simultaneously sell 160 SF put options with the same delivery date

as the contracts purchased earlier – thereby offsetting, or cancelling out, its options position. If the dollar value of the Swiss franc has declined from \$0.6050/SF to, say, \$0.5000/SF during the 90 days in question, then the company will lose on its cash market transaction and gain on its options contract. If the Swiss franc appreciates against the dollar, the company will gain on its cash market transaction, and its losses on the options contract will be limited to the premium paid for the option. By using an option to hedge this foreign exchange risk, the multinational corporation minimises its downside risk without giving up its upside potential. The cost of this hedge is the premium paid for the option.

Hedging with Interest Rate Options

In addition to hedging foreign exchange risk, options are commonly used to hedge interest rate risk. For example, a retailer that has borrowed using a variable-rate loan is probably concerned about interest rates rising. If the loan rate is tied to short-term interest rates, the company could hedge this interest rate risk by purchasing interest rate call options. For example, in Australia, the retailer could purchase ASX 90-day bank bill options.⁷ Prices are quoted in annual percentage yield in multiples of 0.01%.⁸

If the yield to maturity (YTM) on the 90-day bank bill falls below the exercise price quoted for the option at maturity, the option will expire worthless and the purchaser of the option will have lost only the premium paid for the option. (It will be cheaper for the option purchaser to borrow in the market than to pay the call option rate.) The advantage of using options to hedge the retailer's interest rate risk is that the retailer retains the potential for lower interest costs if interest rates decline, but is able to offset the potential for higher interest costs if interest rates increase.

The underlying instruments in interest rate derivatives are yields rather than prices, but the value at which the owner of an interest rate option can exercise their rights is still referred to as the 'exercise price'.

Call options on interest rates are called **interest rate caps**. Similarly, an **interest rate floor** is a put option on interest rates. Recall from Chapter 8 that a put option represents the right to sell an asset for a specified price within a specified period of time. In the case of interest rate options, which involve cash settlement, a put option will generate a positive payoff for the buyer when the underlying YTM declines below the exercise price.

One common strategy, called an **interest rate collar**, is to buy an interest rate cap and simultaneously sell an interest rate floor. The purpose of this strategy is to use the proceeds from selling the floor to purchase the cap. Of course, by selling the floor, an investor forgoes some upside potential. If our intrepid retailer sold a July 50 put for 0.75 and bought the July 55 call at the same time, then the retailer would receive \$75 ($0.75 \times \100) for the put. This would offset all but \$25 of the \$100 premium paid for the call. The result of this strategy would be the same as just purchasing the cap for all yields above 5.0%. Below 5.0%, however, gains from the lower interest costs will be offset by losses from selling the put.

interest rate cap
A call option on interest rates

interest rate floor
A put option on interest rates

interest rate collar
A strategy involving the purchase of an interest rate cap and the simultaneous sale of an interest rate floor, using the proceeds from selling the floor to purchase the cap

19.4b SWAPS

In a **swap contract**, two parties agree to exchange payment obligations on two underlying financial liabilities that are equal in principal amount but differ in payment patterns. Investors use swaps to change the characteristics of cash flows, most often to change the characteristics of cash outflows. Since each counterparty in the swap contract is effectively accessing the other counterparty's cash flows, another key advantage is that they may be able to borrow at a more attractive rate than if they were to borrow directly. Remember that rates at which companies can borrow reflect the perceived risk of lending to these companies

swap contract
Agreement between two parties to exchange payment obligations on two underlying financial liabilities that are equal in principal amount but differ in payment patterns

⁷ These options are actually options on the 90-day bank bill future (rather than the 90-day interest rate itself).

⁸ See the following document on the ASX website for further details about short-term interest rate derivatives: <http://www.asx.com.au/documents/products/90-Day-bank-bill-futures-factsheet.pdf>.

(and hence their credit rating). A company with a higher credit rating should be able to borrow at a lower rate than a company with a lower credit rating.

We will concentrate on the most common types, *interest rate swaps* and *currency swaps*. According to a survey by the Bank for International Settlements, the total notional volume of over-the-counter derivative contracts outstanding totalled more than \$630 trillion at December 2014, with interest rate swaps accounting for the bulk (\$505 trillion) of this total.⁹ It is important to note that, like forward contracts, swap contracts are over-the-counter instruments and subject to default risk. For this reason, swap market participants enter into contracts only with parties that they know and trust.

Interest Rate Swaps

interest rate swap

A swap contract in which two parties exchange payment obligations involving different interest payment schedules

fixed-for-floating interest rate swap

Typically one party will make fixed-rate interest payments to another party in exchange for floating-rate interest payments

interest differential

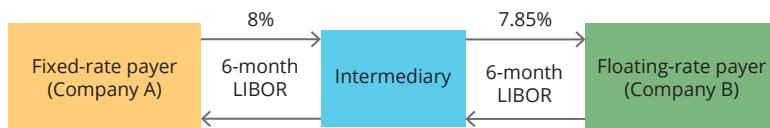
The difference between the fixed and floating interest rates that is exchanged in an interest rate

An **interest rate swap** is the most common type of swap transaction. In a typical interest rate swap, one party will make fixed-rate payments to another party in exchange for floating-rate payments. This is often called a **fixed-for-floating interest rate swap**. As in the FRAs discussed earlier, the interest payments on a fixed-for-floating swap will be based on a hypothetical principal amount called the *notional principal*. The actual cash flows that are exchanged during the life of the swap will be the periodic net difference between the respective interest payments. In contrast to currency swaps (discussed later in the chapter), the notional principal is not physically exchanged.

Figure 19.10 illustrates the structure of a fixed-for-floating swap. The party making fixed-rate payments, Company A, promises to make fixed-rate payments based on some notional principal amount to a financial intermediary in exchange for floating-rate payments. In this example, as in many swap transactions, an intermediary has arranged the swap and is acting as the counterparty to both contracts. The contract calls for Company A to pay the intermediary 8% per year based on a notional principal of \$10 million. In return, the intermediary will pay Company A the six-month LIBOR applied to the same \$10 million notional principal amount. In practice, only the **interest differential** is exchanged between the intermediary and Company A.

FIGURE 19.10 TYPICAL STRUCTURE OF A FIXED-FOR-FLOATING INTEREST RATE SWAP

Swaps allow companies that can borrow fixed-rate debt more cheaply, but wish to borrow floating-rate debt, to swap payment obligations with companies that can borrow floating-rate debt more cheaply but prefer to borrow fixed-rate debt.



At the same time that the intermediary and company agree to swap interest payments, the intermediary enters into an agreement to pay a fixed rate of interest to the floating-rate payer, Company B, in exchange for a floating rate. In this example, the intermediary agrees to pay Company B 7.85% in exchange for the six-month LIBOR. The intermediary's compensation is the spread between the fixed rate received from Company A and the fixed rate paid to Company B.

Figures 19.11 and **19.12** show payoff diagrams for Company A and Company B in the interest rate swap. The x-axis of these diagrams represents possible spot rates for the six-month LIBOR applicable to each six-month period. The y-axis represents the cash flow to the parties involved in the transaction. If the contract calls for semiannual payments, the cash flow for Company A is $[\$10,000,000 \times (\text{LIBOR} - 0.08)/2]$. The cash flow for Company B is $[\$10,000,000 \times (0.0785 - \text{LIBOR})/2]$. If the six-month LIBOR is 7% at the start of the first six-month period, this is the floating rate applicable for the first six months. At the end of this six-month

⁹ These figures were obtained at http://www.bis.org/statistics/d5_1.pdf.

period, Company A will pay the intermediary \$50,000 [$\$10,000,000 \times (0.07 - 0.08)/2$]. The intermediary will pay Company B \$42,500 [$\$10,000,000 \times (0.0785 - 0.07)/2$]. Six months later, if the applicable six-month LIBOR is 8.5%, the intermediary will pay Company A \$25,000 [$\$10,000,000 \times (0.085 - 0.08)/2$]. Company B will pay the intermediary \$32,500 [$\$10,000,000 \times (0.0785 - 0.085)/2$]. These exchanges will take place every six months until the termination date.

FIGURE 19.11 SEMIANNUAL NET CASH FLOW FOR THE FIXED-RATE PAYER IN A FIXED-FOR-FLOATING SWAP WITH A NOTIONAL PRINCIPAL OF \$10 MILLION

The actual interest payment made by the floating-rate payer to the fixed-rate payer at the end of each six-month period depends on the floating interest rate (6-month LIBOR) at the beginning of each six-month period. The fixed-payer's payment is fixed, so the net payment received by the fixed-rate payer rises with increases in the 6-month LIBOR.

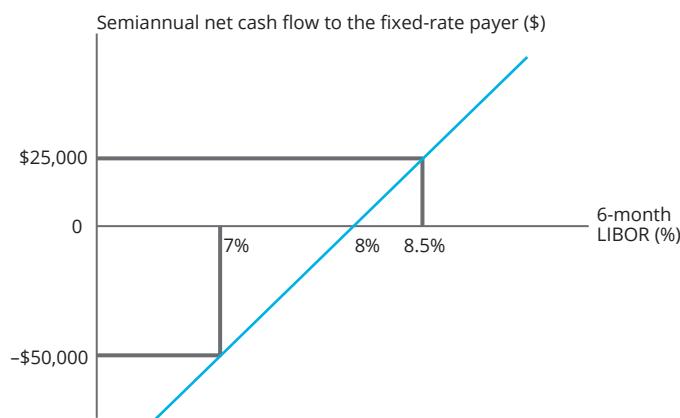
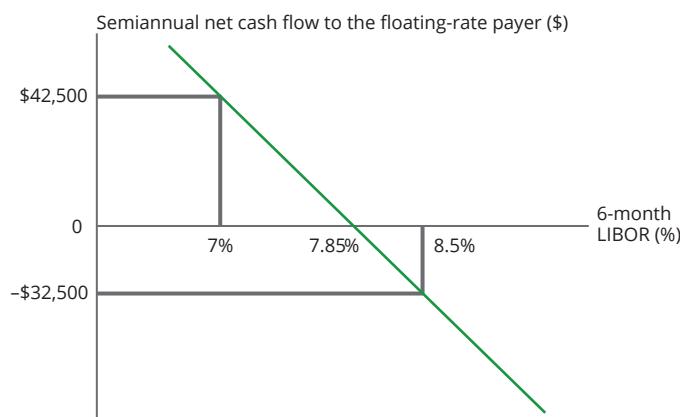


FIGURE 19.12 SEMIANNUAL NET CASH FLOW FOR THE FLOATING-RATE PAYER IN A FIXED-FOR-FLOATING SWAP WITH A NOTIONAL PRINCIPAL OF \$10 MILLION

The interest payment made by the fixed-rate payer to the floating-rate payer is fixed and does not depend on the floating interest rate (6-month LIBOR). However, because the payment by the floating-rate payer does depend on the LIBOR rate, the net payment received by the floating-rate payer declines with increases in the 6-month LIBOR rate.



Typically, these interest rate swaps arise because one party wanted to issue fixed-rate debt but chose instead to issue floating-rate debt, either because the fixed-rate market was closed to this issuer or was more costly. By entering a swap agreement, the floating-rate issuer can effectively obtain a fixed-rate payment obligation. By paying a fixed rate and receiving a floating rate, this company can use the cash inflows in the form of floating-rate payments to make the floating-rate payments on the debt that is outstanding. The net effect of the swap agreement is to offset the floating-rate payments being paid on the floating-rate debt with the floating-rate payments received on the swap. The fixed-rate payments being made on the swap are all that remain. The counterparty in the swap contract (who has better access to fixed-rate debt markets) achieves a preferred floating-rate pattern of payments. As mentioned previously, rather than exchange gross amounts, the two parties will exchange only the net difference between the two payment obligations, the interest differential; therefore, the party that has swapped a fixed-rate payment obligation for one with a floating rate will lose (have to increase payment amounts) if market rates rise and will benefit if market rates fall.

Currency Swaps

currency swap

A swap contract in which two parties exchange payment obligations denominated in different currencies

The second-most common type of swap contract is the **currency swap**, in which two parties exchange payment obligations denominated in different currencies. For example, a US company wishing to invest in Switzerland would prefer to borrow in Swiss francs rather than in US dollars. If, however, the company could borrow on more attractive terms in dollars (as is often the case) than in francs, a logical strategy would be to borrow the money needed for investment in dollars, say, by issuing bonds, and then swap payment obligations with a Swiss company seeking dollars for investment in the US. The Swiss company would issue bonds that are denominated in Swiss francs.

The US company would make periodic Swiss franc payments to the Swiss company. The Swiss company would make periodic dollar payments to the US company. The dollar payments made by the Swiss company would cover the interest and principal payments on the dollar borrowing by the US company, and the Swiss franc payments made by the US company would cover the interest and principal payments on the Swiss franc borrowing by the Swiss company. By engaging in the swap, the US company has transformed its dollar liabilities into Swiss franc liabilities, and the Swiss company has transformed its Swiss franc liabilities into dollar liabilities.

Suppose that the US company issues \$7 million in 10-year bonds that have a coupon rate of 8%. The Swiss company issues SF10 million in 10-year bonds that also have a coupon rate of 8%. In this example, we will assume that the companies have agreed on a fixed exchange rate in the swap contract of US\$0.70/SF. The two parties will exchange the principal amounts at contract origination. At the end of the first six-month period, the US company will pay SF400,000 ($SF10,000,000 \times 0.08/2$) to the Swiss company in exchange for US\$280,000 ($US\$7,000,000 \times 0.08/2$). These payments will occur every six months until the termination date. On the termination date, the two parties will exchange principal amounts again to terminate the contract. The principal amounts will then be used to retire the bonds each company originally issued.

Note that unlike interest rate swaps, the notional principal in a currency swap is often exchanged at the origination and termination dates of the contract. If the notional principal were not exchanged at the termination date, the US company would still be faced with a dollar liability when the dollar-denominated bonds mature, and the Swiss company would be faced with a Swiss franc liability.

fixed-for-floating currency swap

A combination of a currency swap and an interest rate swap

Another variant of the currency swap is the **fixed-for-floating currency swap**. This is simply a combination of a currency swap and an interest rate swap. In this transaction, the first party pays a fixed rate of interest denominated in one currency to the second party in exchange for a floating rate of interest denominated in another currency. For example, if the US company in the previous example preferred to borrow in Swiss francs at a floating rate of interest, and the Swiss company preferred to borrow in dollars at a fixed rate of interest, the two companies could engage in a fixed-for-floating currency swap.

Suppose that the US company could borrow \$7 million in 10-year bonds with a coupon rate of 8%. The Swiss company borrows SF10 million in 10-year bonds with a coupon rate of LIBOR + 100 basis points. This spread of 100 basis points above LIBOR is a reflection of the credit rating of the Swiss company. As in the currency swap, the two parties will exchange the principal amounts at contract origination. At the end of the first six-month period, if LIBOR is 6.5%, the cost of the loan will be 7.5% ($0.065 + 0.01$). The US company will pay SF375,000 [$\text{SF}10,000,000 \times (0.065 + 0.01)/2$] to the Swiss company in exchange for US\$280,000 (US\$7,000,000 $\times 0.08/2$). For both parties, the semiannual cash inflows from the swap contract are used to make the interest payments on the bonds that were issued in the cash market. Upon termination of the swap contract, the principal amounts are exchanged again and the bonds are retired.

LO19.4

CONCEPT REVIEW QUESTIONS

- 7 Describe how an interest rate swap is just a portfolio of FRAs.
- 8 Why would any corporation hedge with forwards, futures or swaps if it could keep its upside potential by hedging with options?

LO19.5

19.5 FINANCIAL ENGINEERING

The key to a successful hedging strategy is the ability to identify and offset the underlying risk exposure that has the largest impact on the company's value. For many companies, however, the underlying risk exposure is unique because the risk exposure is based on an asset whose value is not easily hedged. As noted earlier, *financial engineering* is the application of finance principles to design securities and strategies that help companies manage their risk exposures. In particular, financial engineering has meant combining the risk-management building blocks – forwards, futures, options and swaps – in complex patterns in order to achieve specific risk profiles that benefit corporate issuers, or to offer investors unique payoff structures that help them optimise their investment portfolios, or both. For example, some companies are not able to use off-the-shelf hedging instruments because those instruments do not have payoff structures that will offset the company's underlying risk exposures. Similarly, an institutional investor may desire an investment security that has specific payoff structures, but no such security is currently available.

By combining elements of forwards, futures, options and swaps, however, it is often possible to create a financial instrument that meets the needs of the corporation trying to hedge its risk exposure, or that offers the institutional investor an investment opportunity with a unique payoff structure. Modern corporations, and the financial institutions that cater to them, have become extremely adept at this process.

Given that the returns to successful financial innovation can be very high, a great many new financial products are developed every year. Enough of these products succeed that we can identify certain trends that are likely to continue for the foreseeable future. First, longer-maturity risk-management products will continue to be developed. Standard futures, forwards and options are all short-term contracts, but recent years have seen the introduction of contracts with much longer dates, as well as the development of intermediate- and long-term securities that effectively perform hedging roles. Second, even more complex securities will be developed to hedge multiple interest rate, currency and input/output pricing risks, particularly in the international arena. Third, new techniques for hedging pricing and underwriting risks in the issuance of new securities will continue to arise as the securitisation trend accelerates around the world. Finally, it seems inevitable that new methods of hedging the strategic and currency risks of investing in small, politically

unstable or financially underdeveloped countries will emerge in the coming decade as Western capital is committed to the transformation of the formerly socialist or mixed economies of China, India, Russia and eastern Europe.

The practice of risk management and financial engineering is evolving, and we have only touched on the basic strategies here. As the markets for derivative securities grow and the practice of risk management develops, it is likely that we will see increasingly complex financially engineered instruments. However, it is important to remember that even the most complex instrument includes elements of the securities we described here.

LO19.5

CONCEPT REVIEW QUESTION

- 9 Under what circumstances might a corporation prefer a financially engineered solution for a risk management problem to an off-the-shelf solution?

STUDY TOOLS

SUMMARY

LO19.1

- Increased volatility in interest rates, currency exchange rates and commodity prices has led to mushrooming demand for financial instruments that corporations can use to hedge their exposure to these risk factors.
- It is not always in the corporation's best interest to hedge. However, hedging can reduce the likelihood of financial distress, thereby reducing the expected costs of financial distress.

LO19.2

- The fair forward price (or rate) in a forward contract is the price that eliminates the possibility of an arbitrageur generating riskless profits by trading in the forward contract.
- The following 'Table of Important Equations' provides the equations used to calculate the price of a forward. **Equation 19.1** provides the basic equation, used when the asset provides no income and does not cost anything to store. **Equation 19.2** adjusts this to incorporate assets that provide income and incur storage costs. **Equation 19.3** calculates the price of a currency forward. **Equation 19.4** prices a forward rate agreement (FRA), which is a forward where the underlying asset is an interest rate.

LO19.3

- A forward contract is an over-the-counter instrument that involves two parties agreeing on a price at which the purchaser will buy a specified amount of an asset from the seller at a fixed date some time in the future. A futures contract is similar to a forward contract but is traded on an organised exchange.
- Unlike forward contracts, which are customised instruments, futures are standardised. Several issues to consider when using futures to hedge include basis risk, cross-hedging, tailing the hedge and delivery options.

LO19.4

- Options offer a corporation the opportunity to hedge its downside risk without giving up its upside potential. However, this comes at a cost in the form of the premium paid for the option. Swap contracts are longer-term hedging instruments that allow corporations to change the characteristics of their periodic cash flows.

LO19.5

- In some cases, a corporation may not be able to hedge its risk exposure using off-the-shelf forwards, futures, options or swaps. In these cases, the corporation may turn to financial engineering in an effort to create a specialised financial instrument that will hedge the exposure.

IMPORTANT EQUATIONS

TABLE OF IMPORTANT EQUATIONS

$$19.1 F = S_0 (1 + r_f)^n$$

$$19.2 F = (S_0 - I + W)(1 + r_f)^n$$

$$19.3 F = \left(S_0 \right) \frac{1 + r_{for}}{1 + r_{dam}}$$

$$19.4 CF_{FRA} = \frac{npx(r_s - r_{fwd}) \times (D/360)}{1 + [r_s \times (D/360)]}$$

SELF-TEST PROBLEMS

Answers to these 'Self-test problems' and the 'Concept review' questions throughout the chapter appear on the Student Companion Website (<http://login.cengagebrain.com>) or via your instructor.

- ST19-1** A certain commodity sells for \$150 today. The present value of the cost of storing this commodity for one year is \$20. The risk-free rate is 2%. What is a fair price for a one-year forward contract on this asset?
- ST19-2** The spot exchange rate is \$1.6666/E. The risk-free rate is 4% in Australia and 3% in the United Kingdom. What is the forward exchange rate (assuming a one-year contract)?

QUESTIONS

- Q19-1** Historically, what types of risk were the focus of most companies' risk-management practices?
- Q19-2** Distinguish between the motivations for purchasing insurance and the motivations for hedging market-wide sources of risk.
- Q19-3** Distinguish between transactions exposure and economic exposure.
- Q19-4** In what way can hedging reduce the risk of financial distress? How might reducing the risk of financial distress increase company value?
- Q19-5** Explain how hedging can reduce a company's tax liability.
- Q19-6** Why do closely held companies tend to hedge more than companies with diffuse ownership?
- Q19-7** How can hedging make it easier to evaluate a manager's performance?
- Q19-8** What are the advantages of using exchange-traded derivatives to hedge a risk exposure? What are the advantages of over-the-counter derivatives?
- Q19-9** Conceptually, how do we determine the fair forward price for an asset? What are the necessary assumptions to arrive at a fair forward price?
- Q19-10** Conceptually, what are the differences between **Equations 19.1, 19.2** and **19.3**? Which equation would you use to determine the fair forward price for an asset that does not earn any income but is costly to store, such as gold or silver? How would you modify the equation?

- Q19-11** Describe the features of a futures contract that make it more liquid than a forward contract.
- Q19-12** Explain the features of a futures contract that make it have less credit risk than a forward contract.
- Q19-13** Why is fungibility an important feature of futures contracts?
- Q19-14** Describe the delivery process for futures contracts. Why does delivery rarely take place in futures contracts?
- Q19-15** Why is a call option on an interest rate called an interest rate cap and a put option called an interest rate floor?
- Q19-16** Explain how a fixed-for-floating swap can be considered a portfolio of forward contracts on six-month discount bonds.
- Q19-17** Go to the CME Group website (<http://www.cmegroup.com>), and determine the contract specifications for soybean meal futures and 10-year US Treasury note futures. Apart from the difference in the type of asset, what is the difference between the two contracts in terms of what qualifies as deliverable grades?

PROBLEMS

FORWARD CONTRACTS

- P19-1** Suppose that an investor has agreed to pay \$94,339.62 for a one-year discount bond in one year. Two years from now, the investor will receive the bond's face value of \$100,000. The current effective annual risk-free rate of interest is 5.8%, and the current spot price for a two-year discount bond is \$88,999.64. Has the investor agreed to pay too much or too little? How might an arbitrageur capitalise on this opportunity?
- P19-2** Company A's shares will pay a dividend of \$5 in three months and \$6 in six months. The current share price is \$200, and the risk-free rate of interest is 3% per year with monthly compounding for all maturities. What is the fair forward price for a seven-month forward contract?
- P19-3** The current price of gold is \$288 per troy oz. The cost of storing gold is \$0.03/oz per month. Assuming an annual risk-free rate of interest of 4% compounded monthly, what is the approximate futures price of gold for delivery in four months?
- P19-4** Following is the current yield to maturity on Treasury notes of various maturities:

TIME TO MATURITY MONTHS	YIELD %
1	5.0
3	5.2
6	5.4
9	5.8

Assuming monthly compounding, what should the forward interest rate of a three-month Treasury note be if it is to be delivered at the end of three months? What if it is to be delivered at the end of six months?

- P19-5** Using the information in **Figure 19.5**, determine whether the three-month forward rate on euros is fair if the annualised yield for risk-free borrowing over the next three months is 8% in Europe and 5% in the United States. If the price is not fair, how could you capitalise on the arbitrage opportunity? What is the potential profit? Assume monthly compounding for borrowing and lending.

- P19-6** A US car importer is expecting a shipment of custom-made cars from Britain in six months. Upon delivery, the importer will pay for the cars in pounds. Using the information in **Figure 19.5**, suggest a hedging strategy for the importer. Explain the consequences for the spot market transaction and the forward market transaction if the US\$/£ spot exchange rate increases over the next six months.
- P19-7** Suppose that KF Exports enters into an FRA with Interfirst Bank with a notional principal of \$50 million and the following terms: in six months, if LIBOR is above 6%, KF will pay Interfirst according to the standard FRA formula. On the other hand, if LIBOR is less than 6%, Interfirst will pay KF. If LIBOR is 5.5% in six months, who pays and how much will the company pay? What if LIBOR is 6.5%?

FUTURES CONTRACTS

- P19-8** An investor purchases one gold futures contract for delivery in January 2020. Using the information in **Figure 19.8**, determine the settle price for the contract on 3 January 2020. What is the total futures price for the contract? If the settle price on the next trading day is \$1,600.00/oz, will the investor have money deposited into his margin account or withdrawn? How much? Suppose that the investor eventually closes out the position by selling at \$1,162.00/oz. How much is his profit or loss?
- P19-9** Consider the following scenarios, determine how to hedge each scenario using bond futures and comment on whether it would be appropriate to hedge the exposure.
- a** A bond portfolio manager will be paid a large bonus if her \$10 million portfolio earns 6% in the current fiscal year. She has done very well through the first nine months. However, she is concerned that interest rates might increase over the next few months.
 - b** The manager of a company is selling one of its warehouses. The deal will close in two months. The manager plans to buy six-month Treasury notes when the company receives payment for the warehouse space, but the manager is worried that interest rates might decline in the next two months.
 - c** Sam Blackwell plans to retire in a year. Upon retirement, he will be paid a lump sum based on the value of the securities in his defined-contribution retirement plan. Sam's portfolio consists largely of Treasury bonds, and he is worried that interest rates will be increasing in the coming year.

OPTIONS AND SWAPS

- P19-10** Chipman Products Company will suffer an increase in borrowing costs if the 13-week US Treasury bill rate increases in the next six months. Chipman Products is willing to accept the risk of small changes in the 13-week T-bill rate, but wishes to avoid the potential losses associated with large changes. The company plans to hedge its risk exposure using an interest rate collar. If the company buys a call option on the 13-week T-bill rate with a strike price of 60 and sells a put option with a strike price of 50, describe how this strategy will limit the company's exposure to changes in the T-bill rate. The premium on the call is 0.75, and the premium on the put is 0.85. What is the company's profit (or loss) in the option market if the T-bill rate is 4.5% in five months? If the T-bill rate is 5.5%? If the T-bill rate is 6.5%?
- P19-11** Go to the CME Group website (<http://www.cmegroup.com>), and determine the contract specifications for Dow Jones Industrial Average futures. (This is referred to as the Big Dow DJIA (\$25) Futures contract.) Determine the current futures price for the next available contract month. What would your profit or loss be if you bought one contract today, and the Dow Jones Industrial Average increased by 100 points before the last settlement date?

P19-12 Company A, based in Switzerland, would like to borrow US\$10 million at a fixed rate of interest. Because the company is not well known, however, it has been unable to find a willing US lender. Instead, the company can borrow SF17,825,000 at 11% per year for five years. Company B, based in the United States, would like to borrow SF17,825,000 for five years at a fixed rate of interest. It has not been able to find a Swiss lender. However, it has been offered a loan of US\$10 million at 9% per year. Five-year government bonds are yielding 9.5% and 8.5% in Switzerland and the United States, respectively. Suggest a currency swap that would net the financial intermediary 0.5% per year.

P19-13 Citibank and ABM Company enter into a five-year interest rate swap with a notional principal of \$100 million and the following terms: every year for the next five years, ABM agrees to pay Citibank 6% and receive from Citibank LIBOR. Using the following information about LIBOR at the end of each of the next five years, determine the cash flows in the swap.

YEAR	LIBOR (%)
1	5.0
2	5.5
3	6.2
4	6.0
5	6.4

P19-14 Based on the type of swap ABM entered into in the previous problem, what type of liabilities do you think ABM has? Long-term or short-term?

CASE STUDY

RISK MANAGEMENT

Basic International Group has been involved in international trade for the past four years. Recently, the CEO has come to realise that Basic needs better risk management, and she asks you to investigate ways to manage risk through hedging. You remember that derivative securities, including forwards, futures, options and swaps, are the financial instruments commonly used for hedging and risk management. However, to gain more insight into risk management, you decide to answer the following questions.

ASSIGNMENT

- 1 What are the types of risk factors that a company faces?
- 2 If risk aversion cannot explain why companies choose to hedge, then what are their motivations?

- 3 Explain how a company's management can limit risk exposure through using a forward contract. What types of forward contracts are available?
- 4 What are the differences between forward and futures contracts?
- 5 How do managers use futures contracts to limit risk exposure?
- 6 How do managers use options to limit risk exposure?
- 7 How do managers use swaps to limit risk exposure?

20

ENTREPRENEURIAL FINANCE AND VENTURE CAPITAL

WHAT COMPANIES DO

AMAZON REDEFINES E-COMMERCE, BUT FOLLOWS A TYPICAL FINANCING PATH FOR AN ENTREPRENEURIAL COMPANY

Since its founding in July 1994, Amazon.com, Inc. has emerged as one of the prototypical successful companies of the internet age. It quickly established itself as the premier online retailer of published materials, offering several million titles in a variety of languages. In 1999, Amazon began expanding its online offerings to include music, auctions, toys, electronics, travel and numerous other products and services. By 2011, amazon.com was selling products to customers in over 200 countries with total revenues approaching US\$37 billion.

In addition to being one of the great success stories to emerge from the 'dot-com bubble', Amazon offers a classic example of creative corporate finance. Launched with a US\$10,000 cash investment and a US\$15,000 loan from Jeffrey Bezos, the company's founder and CEO, Amazon's early growth was fuelled, in part, by credit card loans drawn on Mr Bezos' personal account. In July 1995, one year after amazon.com went online, the company secured

private equity funding from Silicon Valley's top venture capital company (Kleiner Perkins Caufield Byers), and less than two years later, the company executed one of the splashiest initial public offerings of a very splashy decade. Investors who purchased Amazon's shares at its IPO price of US\$18 per share experienced a one-year return of more than 400%. The private equity investors (whose weighted average share purchase price was a mere US\$0.56 per share) received an astronomical total return of more than 15,000%. Amazon.com's shares surpassed the US\$200 mark in May 2011, which translated into a market capitalisation of over US\$90 billion. By April 2015, the share price exceeded US\$445, giving the company a market capitalisation over US\$200 billion.

Sources: The information on Amazon is drawn from the prospectus for the company's IPO, the company's website (<http://www.amazon.com>), the websites of CNN Money (<http://www.money.cnn.com>), Quicken (<http://www.quicken.com>), Yahoo! (<http://www.yahooofinance.com>) and various published reports.

LEARNING OBJECTIVES

After studying this chapter, you should be able to:

- LO20.1 describe how financing of entrepreneurial growth companies differs from the financing techniques used by more mature, publicly traded corporations
- LO20.2 discuss the main types of institutional venture capital funds in operation today, and explain how these differ in terms of organisation, financing and investment objectives
- LO20.3 explain how venture capitalists structure their investments, and why they use staged financing and generally use convertible preferred shares as their investment vehicle; and review how venture capitalists price their investments and the principal methods they use to exit an investment
- LO20.4 describe the international markets for venture capital, particularly those in Australia, the US, Western Europe, Canada, Israel, China and Japan.

entrepreneurial finance

Focuses on the special challenges and problems associated with the investment in and financing of risky businesses, typically start-ups

entrepreneurial growth companies (EGCs)

Typically high-risk, technology-based start-ups that are commonly funded by venture capitalists

Beginning around 1980, no area of finance has prospered quite as much as the field of **entrepreneurial finance**. Entrepreneurial finance focuses on the special challenges and problems associated with the investment in and financing of risky businesses, typically start-ups. From the proliferation of *venture capital* investors to the boom and bust in internet-related IPOs, the financial performance of **entrepreneurial growth companies (EGCs)**, typically high-risk, technology-based start-ups, has offered spectacular theatre during the past 40 years.

In this chapter, we examine the particular challenges faced by financial managers of EGCs and the ways that venture capitalists (VCs) help meet these challenges. The topic is an important one, even for students who are not aspiring venture capitalists. Formerly the near-exclusive domain of small, highly specialised venture capital limited partnerships, the financing of EGCs now affects professionals working for mutual funds, pension funds and even Fortune 500 manufacturing concerns. Increasingly, large corporations, such as Microsoft, Pfizer and General Electric, have internal venture capital units that spend billions annually to finance, nurture and grow new business opportunities. By studying how VCs choose and structure EGC investments, we can learn lessons that extend well beyond the venture capital industry.

LO20.1

20.1 THE CHALLENGES OF FINANCING ENTREPRENEURIAL GROWTH COMPANIES

How does entrepreneurial finance differ from ordinary corporate finance? Entrepreneurial growth companies (EGCs) differ from large, publicly traded companies in four important ways. First, EGCs often achieve very rapid growth, at times consuming much more cash than they generate. Rapid growth requires substantial ongoing investments in fixed assets and working capital. Privately owned EGCs usually plan to convert to public ownership, either through an initial public offering (IPO) of ordinary shares or by selling out to a larger company. Once they become publicly traded, EGCs are much more likely to raise external financing through a further equity offering than are older, larger companies.

Second, the most valuable assets of many of these companies are often patents and other (intangible) intellectual property rights. Because these rights are difficult to finance externally, they pose a huge challenge to the professionals who must obtain adequate funding on attractive terms. Amazon

demonstrates this point very well. The company has total assets of around US\$55 billion, but it boasts a stock market capitalisation of around US\$285 billion. Third, many EGCs seek to commercialise highly promising, but untested, technologies. This inevitably means that both the risk of failure and the potential payoff from success are dizzyingly high. Fourth, EGCs must attract, motivate, compensate and retain highly skilled technical and entrepreneurial talent – but do so in a way that minimises cash outflow because EGCs are often severely cash constrained. Not surprisingly, they partially compensate employees with share-option grants.

The distinctive features of entrepreneurial finance are that: (1) EGCs rely heavily on equity financing; and (2) financial contracting between them and their financiers is fraught with information problems. As we learned in Chapter 13, growth opportunities cannot easily be financed with borrowed money, so they must be funded with equity capital. Whereas most technology- and knowledge-based companies struggle to finance growth opportunities with equity, mature companies can obtain the bulk of the equity funding they need each year by reinvesting profits. EGCs grow very rapidly. They must rely on *external* equity financing to fund investments, which vastly exceed the amount of internal funding the companies can generate. Finally, because most EGCs are privately held, they lack access to public share markets and rely instead on private-equity financing. **Private equity** generally means either capital investments by current owners or funding by professional venture capitalists or private investors, rather than through public equity markets, as is typically the case for listed companies. Thus, the private equity asset class is an example of an unlisted asset class. The term is also used to refer to buyout funds, organisations that manage companies acquired through leveraged buyouts.

In Australia, the term ‘private equity’ is often used to refer to this entire asset class, which ranges from very early or seed-stage investments to typical venture capital investments, and more broadly to include later-stage investments such as managed or leveraged buyouts, and even some infrastructure investments. Alternatively, it is also used in Australia to refer to later-stage (non-venture capital) investments. Thus, ‘venture capital’ in Australia is either a subset of private equity, or refers to a different set of investments from private equity investments. The Australian Private Equity and Venture Capital Association Limited (AVCAL) defines a venture capital company as a company that makes equity investments for the launch, early development or expansion of a business, typically in an innovative/high tech product or service. Venture capital covers seed, early stage, later stage VC and balanced VC funds. It does not include buyout investing. AVCAL defines private equity (PE) as a term that ‘covers growth/expansion, generalist, buyout/later stage, turnaround, secondary and mezzanine funds’.¹

In contrast, in the US, the terms ‘venture capital’ and ‘private equity’ are often used interchangeably, and are assumed to mean the same thing.

The vast majority of companies, even those that subsequently emerge as EGCs, begin life on a modest scale, often with little or no external equity financing other than that provided by the founder’s friends and family. Only after entrepreneurs exhaust these sources of personal equity can they expect to obtain debt financing from banks or other financial institutions. **Figure 20.1** provides details of start-up funding in the US. It suggests that in 2014, self-funding was highly prevalent, accounting

private equity
Financing provided either through capital investments by current owners or through funding by professional venture capitalists or private investors, rather than through public equity markets, as is typically the case for listed companies. Thus, the private equity asset class is an example of an unlisted asset class

FIGURE 20.1 2014 US SOURCES OF START-UP CAPITAL

SOURCE OF START-UP CAPITAL	% OF START-UP COMPANIES ACCESSING ONE OR MORE OF THESE SOURCES
Self-funded	82%
Loans/lines of credit	41%
Crowdfunding	3%
Venture capital	1%

Source: Fundable, ‘A Look Back at Startup Funding in 2014.’ <http://www.fundable.com/learn/resources/infographics/look-back-startup-funding-2014>.

¹ Sourced from the 2012 *Yearbook Australian Private Equity and Venture Capital Activity Report*, November 2012, Australian Private Equity and Venture Capital Association Limited (AVCAL) in partnership with Ernst & Young, p. 28.

for 82% of start-up funding. In contrast, venture capital only accounted for 1%. Crowdfunding, a more recent source, accounted for 3% of funding and was worth \$5.1 billion. Another emerging funding source is peer-to-peer lending.

LO20.1

CONCEPT REVIEW QUESTIONS

- 1 What are the most important ways that *entrepreneurial finance* differs from ordinary finance? What special burdens confront financial managers of entrepreneurial growth companies (EGCs)?
- 2 Why must companies usually finance intangible assets with equity rather than with debt?

LO20.2

20.2 VENTURE CAPITAL AND PRIVATE EQUITY FINANCING

venture capital

A professionally managed pool of money raised for the purpose of making actively managed direct equity investments in rapidly growing private companies

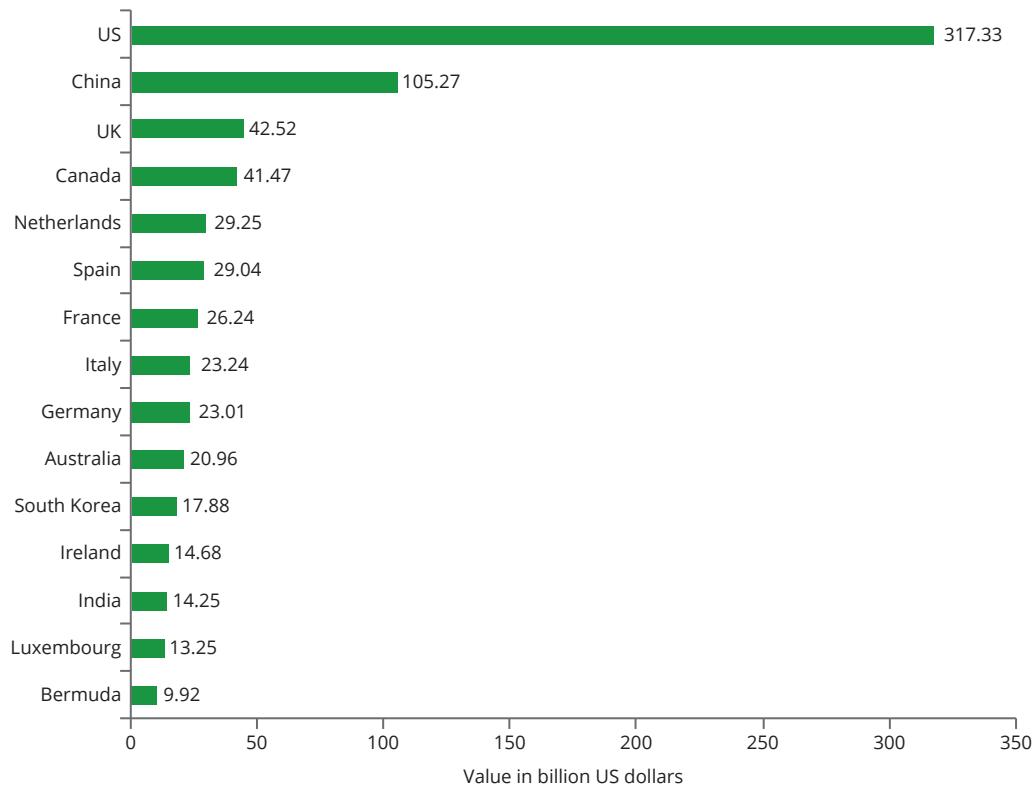
Venture capital is a professionally managed pool of money that is raised for the purpose of making actively managed direct equity investments in rapidly growing private companies. Many of the companies in which venture capitalists invest are involved in bringing new scientific discoveries to market. Although the venture capital industry is often referred to as an industry originating from the US, many countries have experienced rapid growth in venture capital financing over the past 15 years. By its very nature, this type of investment is considered far more risky than investments in well-established companies.

Through the late 1970s, the total pool of venture capital in the US was quite small. Most of the active funds were sponsored either by financial institutions (such as Citicorp Venture Capital) or non-financial corporations (such as Xerox). Most of the money raised by these funds came from their corporate backers and from wealthy individuals or family trusts. There are two features of early venture capital funds that we still observe today: (1) these funds' investments were mostly intermediate-term, equity-related investments targeted at technology-based private companies; and (2) the venture capitalists (VCs) played a unique role as active investors, contributing both capital and expertise to portfolio companies. Also, from the very start, VCs looked to invest in those rare companies that not only had the potential of going public or being acquired at a premium within a few years, but also offered investment returns of 25% to 50% per year. Over the years, reductions in tax rates and liberalised pension fund investment regulations resulted in rapid growth in VC investment from about \$68 million in 1977 to more than \$30 billion in 2007. After a drop to just over \$19 billion during the economic downturn in 2009, VC funding rebounded to \$23.7 billion in 2010. According to the MoneyTree™ Report by PricewaterhouseCoopers LLP (PwC) and the National Venture Capital Association (NVCA) (based on data from Thomson Reuters), VC funding in the US increased to US\$48.3 billion in 2014, accounting for 4,356 deals.²

Outside the US, Australia was the third-largest market for attracting private equity funding, in 2011. However, as is shown in **Figure 20.2**, by 2018 Australia was no longer one of the top five destinations for private equity funding. As can be seen from **Figure 20.3**, the Chinese market far outweighed all other Asia

² Sourced from <http://nvca.org/pressreleases/annual-venture-capital-investment-tops-48-billion-2014-reaching-highest-level-decade-according-moneytree-report/>. Accessed 22 January 2015.

FIGURE 20.2 VALUE OF PRIVATE EQUITY DEALS WORLDWIDE IN 2018, BY TARGET COUNTRY (USD BILLIONS)



Zephyr published by Bureau van Dijk.

Pacific markets in attracting private equity and venture capital funds (as at June 2018), accounting for 66% of assets under management (AUM).

The following charts (in [Figure 20.4](#)) show funds raised by the Australian industry over the period from 2007 to 2018. They clearly demonstrate that there was a dramatic reduction in fund-raising ability following the global financial crisis and credit crunch that occurred in 2007 to 2008. This had a lagged, knock-on effect, resulting in a drastic reduction in the number of new funds across the industry. This did not really start to show signs of sustained recovery until 2015 and 2016, and did improve to levels similar to 2007 and 2008 by 2018. The total funds raised in 2018 were \$6.6 billion (\$1.3 billion was raised by VC funds and \$5.3 billion was raised by PE funds).

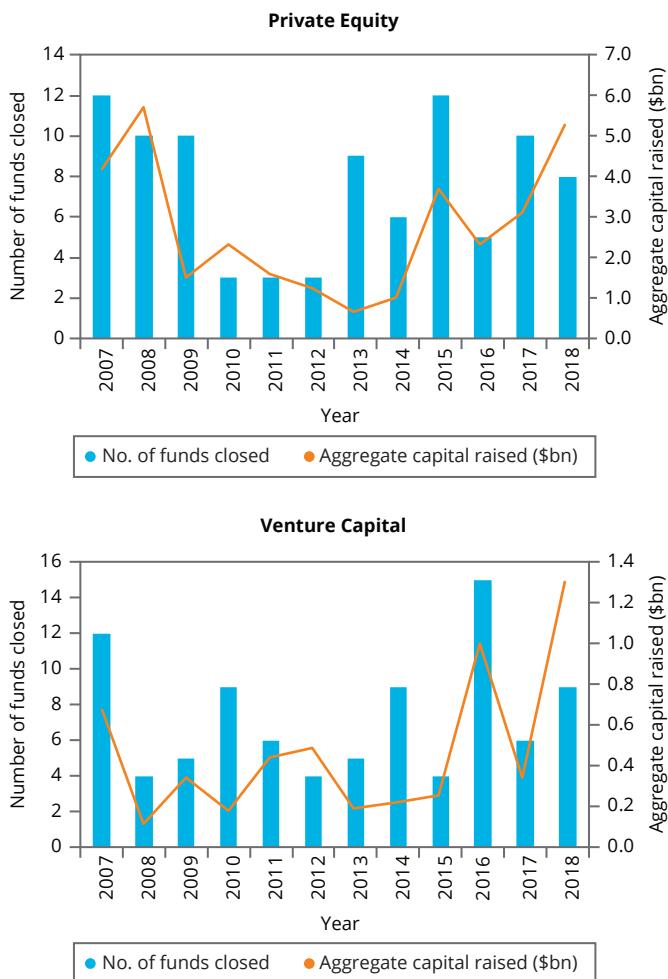
FIGURE 20.3 ASIA-PACIFIC-BASED PRIVATE EQUITY & VENTURE CAPITAL ASSETS UNDER MANAGEMENT BY LOCATION (AS AT JUNE 2018)

COUNTRY	PROPORTION OF ASSETS UNDER MANAGEMENT (AUM)
China	66%
Hong Kong	13%
South Korea	7%
Japan	4%
India	3%
Australia	3%
Singapore	2%
Malaysia	1%
Rest of Asia	1%

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FIGURE 20.4 FUNDS RAISED BY THE AUSTRALIAN VC AND PE INDUSTRY

This figure details the funds raised by Australian VC and PE funds over the period from 2007 to 2018.



*MF Venture Private Investments Infinity was excluded from the dataset and the rest of the report due to a lack of verifiable data.

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20.2a TYPES OF VENTURE CAPITAL FUNDS

institutional venture capital funds

Formal business entities with full-time professionals dedicated to seeking out and funding promising ventures

angel capitalists

Wealthy individuals who make private equity investments on an ad hoc basis

When discussing venture capital, it is important to differentiate carefully between institutional venture capital funds and angel capitalists. **Institutional venture capital funds** are formal business entities in which full-time professionals seek out and fund promising ventures, whereas **angel capitalists** (or *angels*) are wealthy individuals who make private-equity investments on a more ad hoc basis. A vibrant market for angel capital routinely provides billions per year in total equity investment to private businesses in the United States. In many years, the amount of capital provided by angel capitalists rivals that invested by venture capitalists. Nonetheless, we focus on the former group because these companies operate nationally and provide the performance benchmark against which all private equity investment is compared. Although statistics on angel capitalists are difficult to find, the role of angel investors in nurturing the growth of new businesses has been highlighted in a successful television program, *Dragon's Den*, which originated in the UK

but has been copied in a number of countries, including Australia. (A current version of the series is named *Shark Tank*.) On the show, entrepreneurs and inventors pitch their ideas to try to obtain funding and advice from a number of angel investors.

There are a number of main categories of institutional venture capital funds. First, **financial venture capital funds** are subsidiaries of financial institutions, particularly commercial banks. These are generally set up both to nurture companies, which will ultimately become profitable customers of the corporate parent, and to earn high investment returns by leveraging the financial expertise and contacts of existing corporate staff. Second, **corporate venture capital funds** are subsidiaries or stand-alone companies established by non-financial corporations, which are eager to gain access to emerging technologies by making early-stage investments in high-tech companies. Finally, **venture capital limited partnerships** are funds that are established by professional venture capital companies. These companies act as the general partners – organising, investing, managing and ultimately liquidating the capital raised from the limited partners. Most limited partnerships have a single-industry focus that is determined by the expertise of the general partners.

In the US, there are also small business investment companies (SBICs), which are federally chartered corporations established as a result of the Small Business Administration Act of 1958.

financial venture capital funds

Subsidiaries of financial institutions, particularly commercial banks

corporate venture capital funds

Subsidiaries or stand-alone companies established by non-financial corporations to gain access to emerging technologies

venture capital limited partnerships

Funds established by professional venture capital companies, and organised as limited partnerships

FINANCE IN THE REAL WORLD



HOW DO I FINANCE MY BUSINESS START-UP?

Many business students plan to start their own business one day, and all who do struggle with the same question: how can I obtain the funding needed to start my own business?

Almost all new companies are financed informally, with investments of cash and effort (sweat equity) by the entrepreneur, and perhaps supplemental investments from the entrepreneur's friends and family. Although every prospective entrepreneur can, and should, develop a detailed business plan, this alone will not allow the entrepreneur to borrow money successfully from a bank or obtain arm's-length equity capital from investors. The entrepreneur instead should concentrate on getting the business up and running and – most vitally – generating the positive cash flow that must be reinvested in the new business. Such internally generated funds are usually the only source of growth capital during a new business's very early stage of development.

Once the business has been operating successfully for many months (or years), the

new entrepreneur is in a position to approach one or more angel investors for external equity capital. Angels are typically wealthy businesspeople who can invest from \$50,000 to over \$200,000 in a new business, and can also offer practical advice and monitoring to the entrepreneur. Angels are looking for an attractive financial return of 20–40% per year from investments made in functioning, profitable businesses with real customers, products and cash flow.

So if you are dreaming of starting your own business, keep the following advice in mind. First, start small, using only money that you, your friends and your family can provide. Second, reinvest all your profits in the business, and employ any reasonably priced debt financing that may be provided by banks, suppliers or customers (but try to avoid credit card advances). Finally, approach business angels for your first round of external funding once you have your business established – then present your business plan to them as an opportunity to invest in a growth business. Good luck and happy entrepreneurship!

Limited partnerships dominate the venture capital industry, partly because they make their investment decisions free from outside influences. The financial and corporate funds tend to suffer because their ultimate loyalty rests with their corporate parents rather than the companies in which they invest. Finally, corporate funds have histories of only intermittent commitment to venture capital investing. Corporate funds tend to scale back dramatically when business conditions sour. For all these reasons, limited partnerships now control the majority of total industry resources, and their influence on fund raising seems to be increasing.

20.2b INVESTMENT PATTERNS OF VENTURE CAPITAL AND PRIVATE EQUITY COMPANIES

Given the media attention lavished on venture capital in the United States, most people are surprised to learn that the industry invested only a few billion dollars each year before 1996. Of course, annual disbursements naturally differ from total fund raising. The total amount of money available for investment is the sum of realised investment returns (from IPOs and mergers of companies owned by VCs) as well as new fund inflows from investors. After 1996, total investment spending surged to an astonishing US\$100 billion (spread over 5,608 companies) in 2000, before declining very sharply thereafter to just over US\$23 billion during 2010. By 2014, this figure rose to US\$49 billion.³

The bulk of venture capital funding once came either from corporate sponsors (in the case of financial or corporate funds) or wealthy individuals. However, today institutional investors have become the dominant sources of funding. Pension funds alone typically account for 25–40% of all new money raised by institutional venture capital companies. Even though few pension funds allocate more than 5% of their total assets to private-equity investments, their sheer size makes them extremely important investors.

In Australia, the sources of funding are similar, with a large proportion of funding sourced from sovereign funds, superannuation funds or overseas pension funds.

An important reason why pension funds and superannuation funds are attracted to VC and PE investments is that they provide opportunities to match the duration of some of their liabilities. Typically, PE investments require investors to commit funds for a long length of time (often up to 10 years), with little opportunity for liquidity during their investment term. This can provide a good match against liabilities to superannuation fund members who are unable to liquidate their superannuation assets until their retirement. Another attraction is that their high-risk nature and long investment time frames mean PE investments provide superannuation and pension funds with the ability to diversify investment portfolios, thereby reducing their portfolio risk – although in Australia, they tend to be slightly conservative in their attitudes towards risk, preferring later-stage or buyout investments.

20.2c INDUSTRIAL AND GEOGRAPHIC DISTRIBUTION OF VENTURE CAPITAL INVESTMENT

One reason for the success enjoyed by institutional VCs is that they usually invest only in those industries where they have some competitive advantage, and where their involvement in management of the companies they fund can create real economic value. The majority of VC investment flows into information-technology industries (communications and computers). Other industries receiving significant VC funding during recent years include biotechnology, telecommunications, and medical devices and equipment.

Another striking regularity in venture capital investment patterns concerns the geographical distribution of the companies funded by VCs. Companies located in California consistently receive more venture capital backing than companies in any other US state. For instance, Californian companies have typically captured well above 40% of total annual funding, generally over three times the funding received by companies in New

³ Source: 2015 National Venture Capital Association Yearbook, National Venture Capital Association, prepared by Buyouts Insider, Copyright 2015 Thomson Reuters, p. 9.

England. The flow of money into California has typically dwarfed that in other large, populous states, such as New York and Texas, which on average each receive about 5% of total annual VC funding. One can surmise that close proximity to Silicon Valley is driving this investment.

Another interesting phenomenon is the growth in venture capital funds around universities. This trend seems to have come about for a number of reasons. In the current investment environment, it can be quite difficult for new ideas and innovations to attract seed funding or early-stage funding in order to commercialise them. Many universities are heavily involved in research, and as a result produce innovative ideas. By investing in the commercialisation of these, the universities can support their researchers. They can also earn potential royalties and other forms of investment returns that can be fed back into the fund to invest in other innovations. An added benefit could be potential synergies with university endowment funds. Although these are likely to be managed independently, endowment funds, like pension funds, typically look for long-dated investments. As a result, they tend to have a high portfolio allocation to private equity (although many may tend to skew their investments towards later-stage investments that are less risky than pure start-ups).

FINANCE IN THE REAL WORLD



UNISEED – AUSTRALIA'S FIRST UNIVERSITY VENTURE FUND

Uniseed was established as Australia's first university venture capital fund. It was founded in 2000 as a \$20 million joint venture between the University of Melbourne and the University of Queensland. This fund made over 20 investments in commercialisation projects for innovations from the two universities, and the typical investment size was between \$250,000 and \$500,000. In 2006, the company established a new \$40-million venture fund with investments from the two universities, as well as the University of New South Wales and an institutional investor, the Westscheme Superannuation Fund. (Westscheme's investments were taken over by AustralianSuper in 2011.)

The company subsequently recruited an independent investment management team and increased its nominal investment size to \$2 million, in order to participate in further rounds of capital-raising by its investee companies.

According to the company, the various stakeholders derive a number of different benefits from their involvement with Uniseed: preferred access to a venture deal flow of high quality; the venture management skills of Uniseed's and the universities' commercialisation personnel; and the option to provide direct follow-on funding into Uniseed investee companies.

The university partners benefit from three main financial outcomes: research income; investment return; and value generated from intellectual property. In addition, Uniseed investee companies have provided the following to its university shareholders:

- Over 800 patents have been supported by Uniseed investee companies (over 100 patent families)
- Over 300 people have been employed through the support of Uniseed investee companies, with many of these employed at our research partners
- Over 130 journal articles have been published on research projects funded by these companies
- Over 600 media releases and news articles have been published on Uniseed investee companies
- Over 200 presentations have been made at conferences and seminars, or in industry magazines, based on research funded by Uniseed investee companies
- More than 40 key inventors have been able to lead the formation of new companies, which under Uniseed's funding and development model can be done while remaining in their academic posts.

Source: Uniseed.

20.2d VENTURE CAPITAL AND PRIVATE EQUITY INVESTMENT BY STAGE OF COMPANY DEVELOPMENT

The popular image of VCs holds that they specialise in making investments in start-up or very early-stage companies. This is not necessarily true, and varies by year. However, in general, although the number of investments in start-up, seed or early-stage investments may be relatively high, the typical investment sizes are substantially smaller than for later-stage investments. As can be seen from [Figures 20.5a](#) and [20.5b](#), in

FIGURE 20.5A PROPORTION OF VENTURE CAPITAL DEALS IN AUSTRALIA BY STAGE (2009 TO 2018)

YEAR	ADD-ON & OTHER	ANGEL/SEED	GRANT	GROWTH CAPITAL/EXPANSION	PIPE	SERIES A/ROUND 1	SERIES B/ROUND 2	SERIES C/ROUND 3	SERIES D/ROUND 4 AND LATER	VENTURE DEBT
2009	32%	11%	32%	0%	5%	16%	5%	0%	0%	0%
2010	24%	24%	6%	6%	6%	24%	0%	0%	0%	12%
2011	13%	25%	23%	6%	0%	23%	4%	0%	0%	6%
2012	3%	44%	17%	2%	3%	20%	3%	2%	0%	5%
2013	9%	55%	16%	5%	0%	4%	5%	0%	0%	5%
2014	5%	61%	5%	4%	1%	16%	4%	3%	0%	1%
2015	4%	51%	20%	2%	1%	13%	5%	2%	0%	1%
2016	4%	51%	19%	0%	2%	16%	5%	0%	0%	3%
2017	3%	50%	1%	3%	3%	25%	9%	2%	2%	4%
2018	5%	45%	2%	1%	1%	29%	11%	1%	2%	4%

Note: PIPE funding refers to Private Investment in Public Equity, where an investment is made by a PE firm in a public company, which remains public post-investment.

Series A, B, C and D are the different rounds of shares that start-ups typically offer to investors during early-stage capital raising. Typical investee companies will use these sources of funding after they have exhausted seed and angel investments.

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FIGURE 20.5B PROPORTION OF AGGREGATE VALUE OF VENTURE CAPITAL DEALS IN AUSTRALIA BY STAGE (2009 TO 2018)

YEAR	ADD-ON & OTHER	ANGEL/SEED	GRANT	GROWTH CAPITAL/EXPANSION	PIPE	SERIES A/ROUND 1	SERIES B/ROUND 2	SERIES C/ROUND 3	SERIES D/ROUND 4 AND LATER	VENTURE DEBT
2009	45%	2%	27%	0%	8%	11%	7%	0%	0%	0%
2010	24%	2%	0%	0%	11%	40%	0%	0%	0%	24%
2011	35%	7%	11%	5%	0%	34%	7%	0%	0%	1%
2012	0%	10%	16%	2%	1%	24%	6%	11%	0%	28%
2013	69%	9%	4%	10%	0%	0%	7%	0%	0%	0%
2014	49%	8%	3%	1%	4%	8%	12%	16%	0%	0%
2015	63%	5%	1%	0%	0%	9%	11%	0%	0%	9%
2016	5%	17%	5%	0%	8%	40%	17%	0%	0%	7%
2017	0%	7%	0%	5%	8%	21%	9%	8%	5%	37%
2018	0%	5%	0%	0%	1%	31%	28%	4%	4%	27%

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the period from 2009 to 2018 Australian early-stage financing (seed funding and angel investments) typically accounted for the largest proportion of deals in most years, but in most years, accounted for less than 10% of deal value. Being rational investors, venture capitalists are as leery as anyone else of backing extremely risky new companies. They are more likely to invest if the entrepreneur-founder is well known to the venture capitalists or the venture is exceptionally promising, or both.

As can be seen from **Figure 20.6**, the buyout sector represented around 68% of total Australian industry investment in the period from 2012 to 2018, although the sector represented only 24% of the total number of industry investments. This bias towards the buyout sector in Australia reflects the investment choices and risk preferences of many institutional investors. As mentioned earlier, institutional investors (including superannuation funds, pension funds and sovereign funds) account for a large part of the investment into the VC and PE industry. They often perceive early-stage VC investment as being too high risk to include in their portfolios. In many cases, their investment mandates may specifically prevent them from investing in such investments. Thus, in order to reap the diversification benefits from investing in the private equity sector, they tend to focus on the expansion and buyout sectors.

**FIGURE 20.6 AUSTRALIA-BASED PRIVATE EQUITY AND VENTURE CAPITAL FUNDRAISING BY FUND TYPE
(2012 TO 2018)**

FUND TYPE	NUMBER OF FUNDS CLOSED	PERCENTAGE OF FUNDS CLOSED	AGGREGATE CAPITAL RAISED (\$BN)	PERCENTAGE OF CAPITAL RAISED (\$BN)
Buyout	25	24%	14.5	68%
Venture Capital	52	50%	3.8	18%
Fund of Funds	4	4%	0.4	2%
Growth	17	16%	1.5	7%
Other Private Equity*	7	7%	1.2	6%
Total	105	100%	21.3	100%

*Other Private Equity includes Balanced, Co-Investment, Secondaries, and Turnaround funds.

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In the US, pension funds and endowment funds tend to be more aggressive in their attitude towards risk, making early stage VC investments more acceptable as portfolio choices.

Although the distribution between early- and later-stage funding varies from year to year, one principle of venture capital funding never changes – the earlier the development stage of the company being financed, the higher the expected return on investment demanded by the venture capitalist. Professional VCs typically demand compound annual investment returns in excess of 50% on start-up investments. But PE managers will accept returns of 20–30% per year on later-stage deals because the risk is far lower in more established companies. VCs extract a higher expected return on early-stage investments, in part, by requiring entrepreneurs to sell them a higher ownership stake for a given investment amount in these deals.

Usually, there is not a stark choice between early- and later-stage investments. Most VC funds that invest in a company during its early years remain committed to the company as it develops. VCs typically participate in many financing rounds as the company they have initially financed matures. On average, the prices venture capitalists pay to acquire additional shares in companies in which they have made earlier investments rise in each subsequent round of financing.

20.2e THE ECONOMIC EFFECT OF VENTURE CAPITAL AND PRIVATE EQUITY INVESTMENT

Before examining the organisational structure of the venture capital industry, we should briefly assess whether venture capital investments have really been as large and influential as is generally believed. A 2010 report published by the World Economic Forum⁴ found that industries that include private equity activity tend to experience more rapid growth (measured by total production, value added measures and employment), and employment levels in these industries are often less volatile than in other industries. Thus, the private equity industry can be an important catalyst for innovation, economic development and growth. Furthermore, the industry can provide a number of less tangible benefits, including the provision of management advice and improving corporate governance for small businesses that receive venture backing.

In a report published in 2006, PricewaterhouseCoopers studied the economic impact of the Australian VC and PE industry.⁵ It found that the industry provided substantial benefits in terms of employment and innovation, accounting for 650,000 jobs or 8% of private sector employment. In their 12-year study of Australian listed companies that had received venture capital funding prior to listing (*venture-backed IPOs*),⁶ Victor Bivell and Brindha Gunasingham found that, on average, these companies consistently, and substantially, outperformed the rest of the listed market. They suggest this outperformance could be attributed to various factors, which could include better management practices introduced by their venture capital investors, as well as the skills of these venture capitalists in identifying, investing in and nurturing companies with the potential to outperform.

A study published in the US by the National Venture Capital Association documented the scale and economic effect of 30 years of VC investment in the United States.⁷ Over the period 1970 to 2005, American venture capitalists invested over \$410 billion in more than 23,000 companies in all 50 states. Venture capital-backed companies employed 10.0 million people and generated \$2.1 trillion in sales during 2005, representing 9.0% of jobs and 16.6% of GDP for that year. The study also found that 'venture capital-financed companies had approximately twice the sales, paid almost three times the federal taxes, generated almost twice the exports, and invested almost three times as much in R&D per \$1,000 in assets as did the average non-venture capital-backed companies'. Finally, the study documented that, on average, every \$36,000 in VC investment created one new job.

Much the same pattern is observed in Western Europe, the other major international market for venture capital. A study by the European Private Equity and Venture Capital Association found that VC-backed European companies generated significantly higher growth rates in sales, research spending, exports and job creation during the 1990–95 period than did otherwise comparable non-VC-backed companies.⁸ Updates of this study show that European private equity funds invested €8.4 billion in 8,399 VC-stage companies during 2003. Roughly one-quarter of the total investment was in early-stage companies. Finally, an astonishing 95% of European venture-backed companies said that they either would not exist or would not have developed as quickly without VC investment.

4 'Globalization of Alternative Investments', *Working Papers Volume 3, The Global Economic Impact of Private Equity Report 2010*, World Economic Forum.

5 'Economic Impact of Private Equity and Venture Capital in Australia, 2006', PricewaterhouseCoopers and AVCAL.

6 Victor Bivell and Brindha Gunasingham, 'Australian Venture Backed IPOs – 1992–93 to 2003–04', 2005. Private Equity Media and FitzBiz Investment Analysis & Strategy. <http://www.fitzbiz.com.au/Australian%20Venture%20Backed%20IPOs%201992%20-%202004%20Sep%2009.pdf>.

7 See Jeanne Metzger and Channa Brooks, 'Three Decades of Venture Capital Investment Yields 7.6 Million Jobs and \$1.3 Trillion in Revenue', National Venture Capital Association (22 October 2001). Downloaded at <http://www.nvca.org>.

8 The study is entitled 'The Economic Impact of Venture Capital in Europe', and is available for downloading at <http://www.evca.com>. Updates of this study include the *Survey of the Economic and Social Impact of Venture Capital in Europe*, published by EVCA on 20 June 2002, and the *EVCA Final Survey of Pan-European Private Equity and Venture Capital Activity 2002*, published by EVCA on 4 June 2003.

LO20.2

CONCEPT REVIEW QUESTIONS

- 3 What is an *angel capitalist*, and how does this type of investor differ from a professional (institutional) venture capitalist?

- 4 Why do you think that private limited partnerships have come to dominate the venture capital industry? Can you think of any weaknesses this organisational form might have as a vehicle for financing entrepreneurial growth companies?

THINKING CAP QUESTION

- 1 A company is considering establishing a corporate venture capital fund in order to gain access to emerging technologies. Why might this strategy be preferred over expanding existing R&D operations?

LO20.3

20.3 THE ORGANISATION AND OPERATIONS OF VENTURE CAPITAL AND PRIVATE EQUITY COMPANIES

In this section we discuss how venture capital and private equity companies differ in terms of organisation. We also discuss how they structure, price and exit their investments.

20.3a ORGANISATION AND FUNDING OF VENTURE CAPITAL AND PRIVATE EQUITY LIMITED PARTNERSHIPS

Most of the top venture capital companies are organised as general partnerships, and many of them are concentrated in California's Silicon Valley, south of San Francisco. These companies usually begin the venture financing process by creating a distinct limited partnership fund, often with a dedicated investment target, such as funding clean-energy start-ups. Although some venture funds are created by public offerings of limited partnership interests (which can then be freely traded), the vast majority are organised and capitalised by private negotiation between the fund's sponsor and a well-established group of institutional investors. To say that a fund is capitalised at its inception is something of a misnomer. In practice, the **limited partners** make capital commitments, which the **general partner** then draws on over time as the fund becomes fully invested. In addition to organising the limited partnership, the sponsoring company acts as the general partner (and has unlimited liability) over the fund's entire life, typically 10 years (though often extendable for up to three additional years). As general partner, the VC is responsible for: (1) seeking out investment opportunities and negotiating the terms on which these investments will be made; (2) monitoring the performance of the portfolio (or investee) companies and providing additional funding and expertise as necessary; (3) finding an attractive exit opportunity, such as an IPO or a *trade sale* of the company to another company or investor group, that will allow the fund to liquidate its investments; and (4) distributing the realised cash returns from these exits to the limited partners and then terminating the fund. For its services, the general partner receives an annual management fee equal to 1–3% (usually 2%) of the fund's total committed capital, as well as an incentive fee, called **carried interest**, which is often equal to 20%, on the realised return on the fund's investments. It is also worth emphasising that the management fee is based on

limited partner (investment fund)

An investor in the fund who makes capital commitments, which the general partner then draws on over time as the fund becomes fully invested

general partners

The fund management company responsible for seeking out and managing investment opportunities, negotiating investment terms, monitoring performance, arranging investment exit strategies and managing distributions of returns to the limited partners. The general partners have unlimited liability over the life of the fund

carried interest

A performance or incentive fee, paid to the general partner, which is often equal to 20% on the realised return on the fund's investments

committed capital, not on total assets under management or deal value, though this fee often declines after the fund's investment period is complete.

The relationship between VCs and investors is fraught with *agency problems*. Investors must commit large amounts of money for long-term, illiquid, non-transparent investments in private partnerships, over which they can exercise no direct control without forfeiting their limited liability. Venture capitalists have many opportunities to expropriate the limited partners' wealth. They can set up new funds, which exclude the old limited partners, to finance the most promising companies, and they can make side deals with the best companies in their fund. Reputational concerns largely control these problems, but contractual covenants also play a role in curtailing agency problems. These include limiting the VC's ability to establish new funds, without granting existing investors equal access, mandating that existing investors be included in any equity sale contracts the VC negotiates, and restricting the VC's freedom to invest in foreign and in publicly traded securities or in leveraged buyouts. These covenants restrict the VC's ability to expropriate the limited partners' wealth through side deals, as well as ensure that the VC will not make investments outside the fund manager's area of expertise.

Another area fraught with agency problems is that of performance reporting. Even though most funds are required to report their quarterly performance, until returns are realised by the divestment of their investments, the valuations of the **investee companies** are very subjective and open to manipulation. This is because these valuations are generally conducted by the general partners of the funds (and it is usually in their best interests to report good performance). Pricing is examined further in section 20.3d.

Many senior partners at top venture capital companies are well known for their skills in finding, nurturing and bringing to market high-tech companies. Examples include John Doerr of Kleiner Perkins, William Hambrecht of Hambrecht and Quist, and Sam Rosen of Rosen Partners. These industry leaders have become extraordinarily wealthy, but even 'ordinary' venture capitalists did quite well during the 1995–2000 boom. The industry's financial rewards attract numerous would-be VCs, but jobs in the industry are notoriously difficult to obtain, particularly for newly minted business school graduates. Partners and associates in venture capital companies often are engineers or other technically trained professionals who themselves worked in high-tech companies before becoming full-time VCs. This experience gives them in-depth knowledge of both the technological and business aspects of the industries in which they invest. It is this expertise, along with capital and contacts, that entrepreneurs look for when they approach a VC for funding. For example, John Doerr of Kleiner Perkins has bachelor's and master's degrees in electrical engineering, plus an MBA from Harvard Business School. He worked for Intel Corporation for five years before becoming a venture capitalist.

investee companies

Companies in which the fund invests. These are also called portfolio companies

20.3b HOW VENTURE CAPITALISTS AND PRIVATE EQUITY MANAGERS STRUCTURE THEIR INVESTMENTS

Although one should be wary of describing anything as unique as a venture capital investment contract as standard, most agreements between VCs and entrepreneurs share certain characteristics. First and foremost, venture capital contracts allocate risk, return and ownership rights between the entrepreneur (and other existing owners of a portfolio company) and the fund. The distribution of rights and responsibilities depends on: (1) the experience and reputation of the entrepreneur; (2) the attractiveness of the portfolio company as an investment opportunity; (3) the stage of the company's development; (4) the negotiating skills of the contracting parties; and (5) the overall state of the market. If, at a time of fierce competition among VCs, a respected and experienced entrepreneur approaches a fund with an opportunity to invest in an established company with a promising technology, then the entrepreneur will secure financing on relatively attractive terms. At the other extreme, if an inexperienced entrepreneur seeks start-up funding at a time when venture

capital is scarce (such as during a recession), the entrepreneur will have to accept fairly onerous contract terms in order to attract funding.

Early in the negotiation process, the parties must estimate the candidate company's value. The company's past R&D efforts, its current and prospective sales revenue, its tangible assets and the present value of its expected net cash flows all enter into the valuation equation. To a large extent, this valuation will determine what fraction of the company the entrepreneur must exchange for venture backing. Next, the parties must agree on the amount of new funding the venture capitalist will provide and the required return on that investment. Naturally, the higher the perceived risk, the higher the required return.

Venture capitalists use **staged financing** to minimise their risk exposure. To illustrate how staged financing works, assume that a company needs \$25 million in private funding to fully commercialise a promising new technology. Rather than invest the entire amount at once, the venture capitalist initially advances only enough (say, \$5 million) to fund the company to its next development stage. Both parties agree to specific performance objectives (such as building a working product prototype) as a condition for more rounds of financing. If the company succeeds in reaching those goals, the venture capitalist will provide funding for the next development stage, usually on terms more favourable to the entrepreneur. Staged financing is not only an efficient way to minimise risk for the venture capitalist, but it also gives the venture fund an extremely valuable option to deny or delay additional funding. This **cancellation option** places the maximum feasible amount of business risk on the entrepreneur, but in return it allows the entrepreneur to obtain funding at a lower price than would otherwise be required. Staged financing also provides tremendous incentives for the entrepreneur to create value because at each new funding stage the VC provides capital on increasingly attractive terms.

EXAMPLE

Staged Financing

Paul Gompers provides two classic examples of how staged financing should work in the development of private companies: Apple Computer and Federal Express.⁹ Apple received three rounds of private equity funding. In the first round, venture capitalists purchased shares at \$0.09 per share, but this rose to \$0.28 per share in the second round and then \$0.97 per share in the third round. Needless to say, all these investments proved spectacularly profitable when Apple went public, at \$22.00 per share in 1980. Investors in Federal Express, however, used staged financing with more telling effect during their three rounds of private equity financing.

The investors purchased shares for \$204.17 per share in the first round, but the company's early performance was much poorer than anticipated. In the second round, shares were purchased for \$7.34 each, but the company's finances continued to deteriorate, so a third financing round, at \$0.63 per share, was required. As we know, FedEx eventually became a roaring success and went public at \$6.00 per share, in 1978, but staged financing allowed venture capitalists to intervene decisively during the company's problematic early development.

A study by Hochberg, Ljungqvist and Lu¹⁰ describes how venture capitalists use staged financing. The study examines 47,705 investments made by VCs, and finds that roughly one-third of the companies receiving first-round investments were written off without obtaining subsequent financing, and another 6.3% were able to exit through an IPO or trade sale after only one VC funding round. However, the majority (60.5%) of first-

9 See Paul A. Gompers, 'Optimal Investment, Monitoring, and the Staging of Venture Capital', *Journal of Finance*, vol. 50 (December 1995), pp. 1461–89.

10 Yael V. Hochberg, Alexander Ljungqvist and Yang Lu, 'Whom You Know Matters: Venture Capital Networks and Investment Performance', *Journal of Finance*, vol. 62 (February 2007), pp. 251–301.

staged financing

Method of investing venture capital in a portfolio company in stages, over time

cancellation option

Option held by the venture capitalist to deny or delay additional funding for a portfolio company

round deals proceeded to a second financing round, and then 70.0% of these proceeded to a third round. A lower fraction of second-round companies failed (22.3% write-offs) than during the first round, and a higher fraction (7.7%) achieved successful exit. This pattern of decreasing failure rates and rising exit rates continues for all subsequent rounds. In other words, if your company makes it to the third financing round, the likelihood of business failure is much reduced, and the odds of ultimately achieving a successful exit are very high.

term sheet

An investment proposal detailing all of the economic, control and ownership terms – including covenants – that is prepared and presented to an entrepreneur by a venture capitalist

ownership right agreements

Agreements between venture capital investors and portfolio-company managers allocating ownership stakes and voting rights to venture capitalists

ratchet provisions

Contract terms that adjust downward the par value of the share venture capitalists have purchased in a company in case the company must sell new shares at a lower price than the VC originally paid

demand registration rights

Agreements giving the venture capitalists the right to demand that a portfolio company's managers arrange for a public offering of shares in the company

participation rights

Agreements giving the venture capitalists the right to participate in any sale of shares that a portfolio company's managers might arrange for themselves

repurchase rights

Give the venture capitalists the right to force the company to buy back (repurchase) the shares held by the VC

share option plans

Plans set up to provide share options to newly hired managers of portfolio companies in order to give them incentives to manage the company to create value

A distinguishing characteristic of venture capital investment contracts is their extensive and sophisticated *covenants*. Some of these covenants – both positive and negative – appear in many standard debt financing contracts. For example, venture capital contracts often contain clauses that specify maximum acceptable leverage and dividend payout ratios, require the company to carry certain types of business insurance and restrict the company's ability to acquire other companies or sell assets without prior investor approval. Other covenants occur almost exclusively in private equity investment contracts. All of the economic, control and ownership terms of an investment proposal are detailed in a **term sheet** that the venture capitalist prepares and presents to the entrepreneur.

- 1 **Ownership right agreements** not only specify the distribution of ownership but also allocate board seats and voting rights to the participating VC. Special voting rights often given to VCs include the rights to veto major corporate actions and to remove the management team if the company fails to meet performance goals.
- 2 **Ratchet provisions** protect the venture group's ownership rights in the event that the company sells new equity under duress. Generally, these provisions ensure that the venture capital group's share values adjust so that the entrepreneur bears the penalty of selling low-priced new shares under duress in the type of down round financing that Federal Express had to accept. For example, if the venture fund purchased shares initially for \$1 each and the start-up later sells new shares at \$0.50 per share, then a full ratchet provision would mandate that the venture group receive one new share for each old share, thereby protecting the value of the VC's initial stake. A partial ratchet adjusts VC share ownership only in an amount that is proportional to the amount of new capital raised. Obviously, it would not take many rounds of financing at reduced prices to completely wipe out a management team's ownership stake.
- 3 **Demand registration rights, participation rights** and **repurchase rights** preserve exit opportunities for VCs. Demand registration rights give the venture fund the right to compel the company to register shares with the US Securities and Exchange Commission for a public offering – at the company's expense. Participation rights give VCs the option to participate in any private share sale that the company's managers arrange for themselves. If a company held by the VC does not conduct an IPO or sell out to another company within a specified time period, then repurchase rights give VCs the option to sell their shares back to the company.
- 4 **Share option plans** provide incentives for company managers in virtually all venture capital deals. As part of these plans, the company sets aside a large pool of shares to compensate current managers for superior performance and to attract talented new managers as the company grows.

This listing of covenants is by no means comprehensive. Other common provisions describe the conditions for additional financing and the payoffs to entrepreneurs if the VCs decide to hire new managers. However, the most fascinating and distinguishing feature of venture capital contracts is unquestionably their nearly total reliance on convertible securities as their investment vehicle of choice.

20.3c WHY VENTURE CAPITALISTS AND PRIVATE EQUITY MANAGERS USE CONVERTIBLE SECURITIES

Most people assume that when VCs invest in a company, they receive shares of ordinary shares in exchange for their capital. In fact, US venture capitalists almost always receive some type of convertible security instead –

either convertible debt or, more frequently, convertible preferred shares. There are several reasons for this marked preference. First, venture capitalists could exercise effective voting control with ordinary shares only if they purchased a majority of the company's ordinary shares, which would be extremely expensive and would place far more of the company's business risk on the venture group than on the entrepreneur. Because convertible debt or preferred shares is a distinct security class, contract terms and covenants specific to that issue are negotiable, whereas all ordinary shareholders must be given the same per-share voting and control rights. Furthermore, because companies can create multiple classes of convertible debt or preferred shares, they can use these securities to construct extremely complex and sophisticated contracting arrangements with different investor groups.

Seniority offers a second reason why venture capitalists generally demand convertible debt or preferred shares rather than ordinary shares: it places the VC ahead of the entrepreneur in the line of claimants on the company's assets should the company not succeed. However, preferred shares or subordinated debt leaves the company the option to issue more senior debt, thereby preserving its borrowing capacity and making it easier for the company to arrange trade credit or bank loans. The convertible securities held by VCs typically pay a low dividend, suggesting that VCs use these securities for control rather than to generate steady cash flows.

Most important, convertible securities give VCs the right to participate in the upside when companies they hold thrive. In fact, VCs are usually required to convert their preferred shares into ordinary shares before venture-backed companies execute initial public offerings (IPOs) in order to present an uncluttered balance sheet to prospective investors.

20.3d THE PRICING OF VENTURE CAPITAL AND PRIVATE EQUITY INVESTMENTS

As you might expect, valuing the types of young, rapidly growing companies that venture capital companies finance presents a huge challenge. How do VCs and PE managers value portfolio companies? The empirical evidence suggests that they use a wide variety of valuation methods and that, from one deal to the next, valuations can be rather idiosyncratic. As in all other areas of financial valuation, however, venture capitalists employ the basic valuation process of investing in those ventures expected to earn returns in excess of the appropriate risk-adjusted return, which is typically in the range of 30–50%. The key distinction of VC investment is that the expected return must be quite high because the risk of most VC investments is also much higher than in other areas. The following example illustrates one common valuation approach.

Assume that the president and founder of the start-up company Biotech Concepts Corporation (BCC) approaches a technology-oriented venture capital fund for \$5 million in new funding to support her company's rapid growth. After intense negotiations, the parties agree that BCC is currently worth \$10 million and that the risk of the company is such that the venture capitalist is entitled to a 50% compound annual (expected) return. To arrive at the \$10 million estimate, the VC may compare the candidate company's sales (or earnings, if there are any) to those of similar public companies and then apply a pricing multiple. Assume further that both parties agree that BCC should plan to execute an IPO in five years, at which time the company is expected to have net profits of \$4 million and to sell at a price/earnings multiple of 20, valuing the company at \$80 million. To calculate the value of its stake in the candidate company as of the IPO date, the VC uses basic future value techniques. The initial investment, A , equals \$5 million; the required rate of return, r , is 50%; and the time horizon, n , is five years. Therefore, the future value (rounded to the nearest million) is:

(Eq. 20.1)

$$FV = A(1 + r)^n = \$5,000,000(1.50)^5 = \$5,000,000(7.6) = \$38,000,000$$

To determine what fraction of BCC's equity it will receive now, the VC divides the future value of its stake by BCC's expected market valuation at the IPO:

$$(Eq. 20.2) \quad \text{Equity fraction} = \frac{FV}{\text{Expected market valuation}} = \frac{\$38,000,000}{\$80,000,000} = 0.475$$

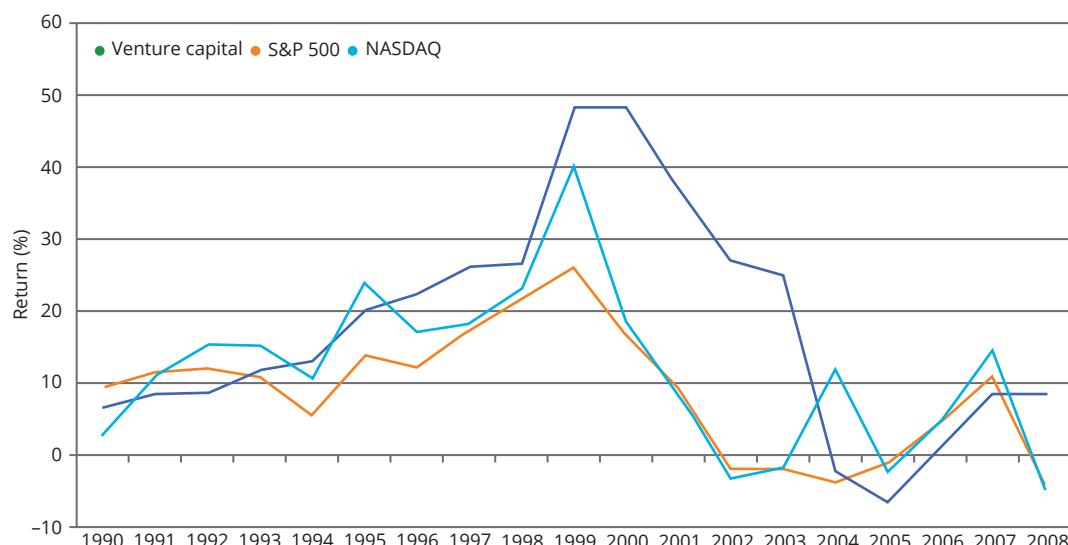
This means that the venture capital fund will receive 47.5% of BCC's equity in exchange for its \$5 million investment. If the VC agrees to accept a lower return, say 40%, then the VC's expected IPO payoff will be \$26.9 million and the VC would require a 33.6% equity stake up-front to achieve this return. When the VC requires a higher return, the entrepreneur must relinquish a larger fraction of the company.

20.3e THE PROFITABILITY OF VENTURE CAPITAL AND PRIVATE EQUITY INVESTMENTS

Interpreting the data on venture capital and private equity returns is controversial, and industry assessments tend to differ significantly from those presented by academics. **Figure 20.7** describes five-year rolling average annual returns for venture capital funds, the S&P 500, and the Nasdaq 100 Index over the period 1990–2008, as presented in the *National Venture Capital Association (NVCA) Yearbook 2009*. This chart suggests that VC funds outperformed US-listed equities in most years. Repeated examples of boom-and-bust investment cycles in which very high realised returns prompt excessive new capital inflows into venture capital funds, which in turn cause returns to drop sharply over the next harvest cycle, have been documented in the academic literature. Although a 30% compound annual return was typical for venture capital funds during the late 1970s and early 1980s, returns fell short of this every year from 1984 to 1994. Returns were again at target levels in 1995 and 1996, and then surged in 1999. However, more recent returns following the collapse of the Nasdaq market in March 2000 – and then again in 2008 during the global financial crisis – have been

FIGURE 20.7 US RETURNS TO VENTURE CAPITAL INVESTING VS. US PUBLIC MARKETS

This figure details US five-year rolling average annual returns at 31 December 2008.



Note: The returns on venture capital investments tend to outperform investments in listed shares, according to industry sources.

Source: *National Venture Capital Association Yearbook 2009*, National Venture Capital Association.

disappointing. Even so, the returns on VC investments during 2008 were better than the -38.5% return posted by the S&P 500 that year.

Researchers have found a strong positive correlation between US venture returns and returns on US small share mutual funds. This relationship highlights the importance of a healthy public share market for new ventures in general, and for IPOs in particular. Because VCs prefer to exit via an IPO, and because the returns from these IPOs partially flow into new venture investments, any decline in the share market's appetite for new issues has an immediate negative effect on the venture capital industry.

Figure 20.8 compares the performance of the Australian PE and VC markets to Australian equity and bond markets over the previous quarter, year to 30 September 2019 (YTD) and the past one-, three-, five-, 10-, 15- and 20-year periods. It shows that the Australian PE and VC sector (measured in Australian dollar returns) significantly outperformed the equity and bond sectors, over the three-, five-, 10-, 15- and 20-year periods, suggesting that it might provide good medium- to long-term portfolio risk diversification opportunities for equity and bond investors. Over the shorter term, the sector appears to have been underperforming. In contrast to US data, Australian PE, VC and small-cap equity asset classes seem to bear little resemblance in their performance over different time frames.

FIGURE 20.8 THE COMPARATIVE PERFORMANCE OF AUSTRALIAN PRIVATE EQUITY AND VENTURE CAPITAL TO 30 SEPTEMBER 2019

This table summarises the performance of the Australian PE and VC industry (represented by the Cambridge Associates LLC indices in Australian dollars and US dollars) compared to the equity and bond sectors.

FUND INDEX SUMMARY: HORIZON POOLED RETURN

Net to Limited Partners

INDEX	1-QUARTER	YTD	1-YEAR	3-YEAR	5-YEAR	10-YEAR	15-YEAR	20-YEAR
AUSTRALIA PRIVATE EQUITY & VENTURE CAPITAL INDEX (AUD) ¹	1.28	7.79	7.65	12.49	13.84	13.13	11.66	13.22
AUSTRALIA PRIVATE EQUITY & VENTURE CAPITAL INDEX (USD) ¹	-2.66	3.35	0.40	8.45	7.53	10.91	11.32	13.24
S&P/ASX 300 Index	2.55	22.90	12.57	11.85	9.55	8.05	8.67	8.91
S&P/ASX Small Ordinaries Index	3.11	20.45	3.95	8.80	9.61	4.55	5.56	5.57
Bloomberg Australia Bank Bill Index	0.29	1.26	1.74	1.79	2.01	2.94	3.95	4.30
Bloomberg Australia Composite Bond Index	1.98	8.70	11.13	4.59	5.27	5.99	5.95	6.11

Note: The index is a horizon calculation based on data compiled from 106 Australia private equity & venture capital funds, including fully liquidated partnerships, formed between 1997 and 2018.

1 Private indexes are pooled horizon internal rate of return (IRR) calculations, net of fees, expenses, and carried interest. The timing and magnitude of fund cash flows are integral to the IRR performance calculation. Public indexes are average annual compounded return (AACR) calculations which are time weighted measures over the specified time horizon, and are shown for reference and directional purposes only. Due to the fundamental differences between the two calculations, direct comparison of IRRs to AACRs is not recommended.

Source: *Australia Private Equity & Venture Capital Index and Selected Benchmark Statistics*, 30 September 2019, Cambridge Associates LLC, p. 6, <https://www.avcal.com.au/common/Uploaded%20files/Research%20-%20Performance%20Benchmarks/2019%20Q3%20Website%20Australia%20PEVC%20-%20AIC.pdf>. Accessed on 9 February 2020.

20.3f EXIT STRATEGIES EMPLOYED BY VENTURE CAPITALISTS AND PRIVATE EQUITY MANAGERS

VCs are not long-term investors (although non-VC PE investors can be longer-term investors than pure VC investors). They seek to add value to a private company and then to harvest their investment. VCs use four principal methods to exit an investment: (1) through an initial public offering (IPO) of shares to outside investors; (2) through a sale of the company they hold directly to another company in a *trade sale*; (3) through

redemption option

Option for venture capitalists to sell a company back to its entrepreneur or founders

secondary investment

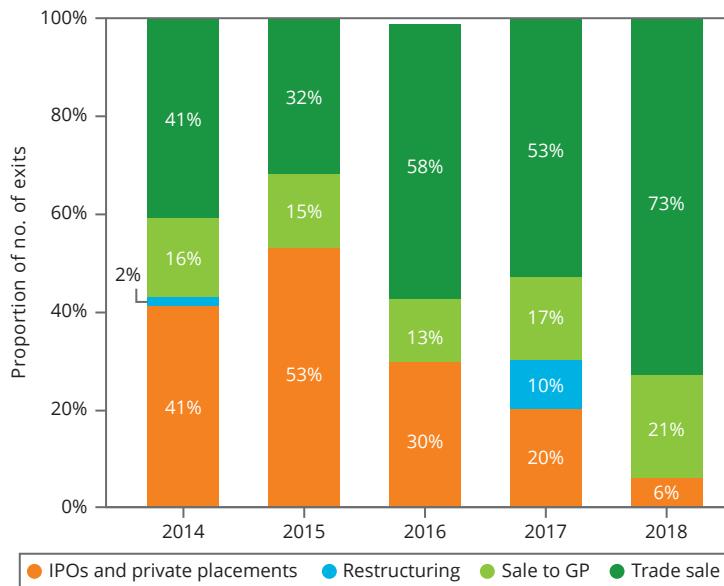
A stake in a PE or VC fund purchased from an existing investor. Since this is the only means of liquidating a PE or VC investment before the end of the fund's term, an initial limited partner will probably have to sell its stake for a significant discount to its true value

selling the company they hold back to the entrepreneur or founders, known as the **redemption option**; or (4) by selling their stake to another PE investor or fund – known as a **secondary investment**. IPOs are by far the most profitable (and glorious) exit option for venture capitalists, though trade sales are also quite profitable on average.

During 1980–2004, 3,374 venture capital-backed IPOs were executed on US capital markets and raised \$155.1 billion. In the midst of the global financial crisis and recession, in 2008–2009, IPO activity declined steeply. Only 21 VC-backed IPOs took place in 2008–2009, though a slight rebound occurred in 2010, with 39 VC-backed companies going public.

As can be seen in **Figure 20.9**, over the period from 2014 to 2018, the largest proportion of Australian exits (or divestments) were via either IPOs and private placements, or trade sales. In 2018, trade sales accounted for around 73% of the number of total divestments.

FIGURE 20.9 PROPORTION OF PRIVATE-EQUITY BACKED EXITS IN AUSTRALIA BY TYPE (2014–2018)



Note: GPs are general partners – a term used to describe the fund manager that makes investment decisions for the fund on behalf of limited partners (LPs).

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Perhaps surprisingly, VCs do not exit immediately at the time of an IPO. Instead, they retain shares for several months or even years before either distributing them to the limited partners or selling the shares on the open market and then distributing the cash proceeds to those partners. The distributions usually occur after a period of sharply rising share prices, and the average share price response to distribution announcements is significantly negative. In some markets, VCs are embargoed from exiting their entire investment stake in an investee company via an IPO. For example, until March 2002, Australian VCs were required to hold their VC investments in escrow for two years after an IPO, rather than selling these down via the IPO. These restrictions helped to prevent VC investors from overvaluing their listing price to inflate their returns via IPO exits – a problem that occurred with the Facebook IPO, discussed below.



THE FACEBOOK IPO DEBACLE

Following the success of Amazon's and Google's IPOs, the public listing of Facebook was eagerly anticipated. Many were expecting spectacular investment returns, but the IPO process was riddled with drama. The saga, in fact, is still proving to be an endless source of intrigue.

The shares were listed on 18 May 2012, following weeks of investors' jostling to buy shares. At the IPO, Facebook (which traded as 'FB' on Nasdaq) sold 421.2 million shares at a price of US\$38 each, raising over US\$16 billion. However, even by the end of the first day of trading, investors were left very much underwhelmed. Technical glitches on the exchange delayed trading for almost half an hour, and there were further issues throughout the day, leaving investors unsure of whether their trades had been successful. By the end of the day, the share price had only risen by 32 cents, and things took a drastic turn for the worse after that. Rumours of insider trading began to leak out. By August, the share price had fallen to below US\$19 per share – a loss of over 50% compared to its listing price.

In addition, it was revealed that unfair listing practices had occurred. Just before the listing, Facebook revised its profit forecasts, which should have resulted in a reduction in its expected valuation. However, this information was not revealed to all investors. It appears that the information was only selectively revealed to institutional investors, leaving retail investors out of the loop and overpaying at the time of the IPO. All of these problems left Facebook, Nasdaq, the banks involved in the issue and the listing underwriter, Morgan Stanley, facing litigation. In mid-December 2012, the Massachusetts financial regulator fined Morgan Stanley US\$5 million for violating securities laws.

Although Facebook's share price did start to recover, progress was slow, and in early January 2013 the shares were trading at between US\$27 and US\$28 per share – around a 28% loss from the IPO price. Three years later, in early January 2016, shares were trading at around US\$97.

Sources: The information on the Facebook IPO story is drawn from 'Going Public: Key Developments in Facebook's IPO', *ABC News*, 18 December 2012; the Facebook share price data was drawn from <http://www.nasdaq.com/symbol/fb>. Accessed 8 January 2016.

LO20.3

CONCEPT REVIEW QUESTIONS

- 5 Why do venture capitalists almost always use *staged financing* and convertible securities to finance entrepreneurial companies?
- 6 Entrepreneurs often refer to venture capitalists as 'vulture capitalists', because of the amount of equity they demand before investing. Do you think the standard venture capital pricing formula is a justifiable compensation for risk, or is it exploitative?

THINKING CAP QUESTION

- 2 A company has decided to invest in young, rapidly growing investee companies with new technologies compatible with the company's products. Once you determine the companies' values and the amount to be invested, how can you determine the percentage of the investee companies' equity the company should receive for its investment? (Assume they require a 45% return.)

LO20.4

20.4 INTERNATIONAL MARKETS FOR VENTURE CAPITAL AND PRIVATE EQUITY

Although ‘classic’ venture capital investment by privately financed partnerships has its origins in the US, private equity financing has long been an established financial specialty in other developed countries, especially in Western Europe. Because Europe is the birthplace not only of the Industrial Revolution but also of modern capitalism, it is not surprising that a highly sophisticated method of funnelling growth capital to private (often family-owned) businesses evolved there. In fact, private equity fundraising and investment in Europe compares quite well with that in the United States, and shows far less annual variability. The chief differences between European and American venture capital involve: (1) the principal sources of funds for venture capital investing; (2) the organisation of the venture funds themselves; (3) the development stage of the companies that are able to attract venture financing; and (4) the principal method of harvesting venture capital investments.

Before proceeding, we should point out a difference in the definition of the term *venture capital* in Europe and the US. Whereas American commentators tend to refer to all professionally managed, equity-based investments in private, entrepreneurial growth companies as venture capital, European commentators apply the term only to early- and expansion-stage financing. Later-stage investments and funding for management buyouts are called *private equity investment* in Europe. This is similar to the definitions applied to the Australian market, discussed earlier. In the US, ‘private equity’ refers only to buyout funds. Where necessary, we maintain this distinction, but in general we shall refer to both venture capital and private equity investment simply as *European venture capital*.

20.4a EUROPEAN VENTURE CAPITAL AND PRIVATE EQUITY FUND RAISING AND INVESTMENT

As in the United States, venture capital fundraising and investment in Europe grew very rapidly during the late 1990s; since 2000, it has remained fairly stable at between €8 billion and €17 billion. Also as in the US, a majority of European venture capital investment during recent years was funnelled into life sciences, followed by energy and environmental services, computer and consumer electronics and communications. In one other important respect, venture capital investment patterns in Europe and the US have long been similar: both are highly concentrated geographically. Almost one-quarter (23.8%) of year-2008 total investment was targeted at British companies, and 59% of European private equity funding originated in the United Kingdom. Germany and France followed with (respectively) 16.3% and 16.1% of European investment; Italy came in fourth with 9.6%. As in the US, the fraction of European venture capital allocated to early- versus later-stage companies fluctuates significantly from year to year, though truly early-stage (seed and start-up) investments rarely account for more than one-third of the VC total.

One of the greatest disappointments of European policymakers wishing to duplicate the success of the United States in high-technology development has been the continent’s failure to establish a large, liquid market for the shares of entrepreneurial growth companies. Although several share markets exist that collectively rival US exchanges in total capitalisation of listed companies, no European market emerged as a serious alternative to America’s Nasdaq or NYSE as a market for IPOs until the German Neuer Markt, the pan-European Easdaq and other markets, such as the French Nouveau Marché, reached critical mass in the late 1990s. The number of European IPOs surged after these markets matured – especially the Neuer Markt, which had attracted over 300 listings by early 2000. Unfortunately, the Neuer Markt collapsed almost as fast as it took off. The European IPO market is now effectively closed to all but the most profitable and established companies, though a few European (and a great many Israeli) technology companies have been able to execute IPOs on US markets. Unfortunately, this is not a viable option for most entrepreneurial companies and, as noted previously, US markets are no longer especially receptive even to homegrown IPOs.

20.4b VENTURE CAPITAL AND PRIVATE EQUITY MARKETS OUTSIDE THE UNITED STATES AND WESTERN EUROPE

The key venture capital and private equity markets outside the United States and Western Europe are Canada, Israel, Japan, China and India. The venture capital industries of Israel and Canada differ dramatically from those of other advanced countries. Canadian government policies led to its venture capital system, which is based on funds sponsored by labour unions, though this has changed over the past decade. In a relative sense, Israel has achieved the greatest success in venture capital because it routinely has the highest level of R&D spending as a per cent of GDP. As the 'Finance in the Real World' box shows, in 2005 Israel's R&D spending represented slightly more than 5% of its GDP. About 17% of Israel's R&D spending was funded with venture capital. Part of Israel's success can be traced to deliberate policy decisions in the early 1990s by the Likud government, which took concrete steps to commercialise defence-related technology developed with public funding.

FINANCE IN THE REAL WORLD



THE ROLE OF VENTURE CAPITAL AND PRIVATE EQUITY INVESTMENT IN FINANCING A NATION'S R&D EXPENDITURES

COUNTRY	VENTURE CAPITAL AND PRIVATE EQUITY INVESTMENT		R&D SPENDING AS A % OF GDP
	\$US BILLION	% OF GDP	
United States	\$46.41	0.37%	2.52
United Kingdom	27.92	1.25	1.44
China	8.80	0.36	1.13
France	8.55	0.40	1.89
Japan	7.95	0.17	2.59
Singapore	4.41	3.77	2.62
Sweden	3.52	0.99	3.19
Germany	3.16	0.11	2.22
Spain	3.12	0.28	1.17
Netherlands	2.74	0.44	1.52
Italy	2.56	0.14	1.01
Australia	2.32	0.31	1.57
Korea	2.10	0.27	4.08
India	1.94	0.24	0.74
Denmark	1.24	0.48	1.76
Canada	1.24	0.11	2.01
Israel	1.08	0.88	5.15
South Africa	0.89	0.37	2.00
New Zealand	0.75	0.68	0.99
Indonesia	0.56	0.19	–

The above table details how a country's venture capital and private equity investment and R&D spending related to its GDP in 2005. A review of the table shows that, whereas Singapore had the



highest level of venture capital and private equity investment as a percentage of its GDP (3.77%), Israel had the highest levels of R&D spending as a percentage of GDP (5.15%). Other countries with high levels of VC and private equity investment relative to GDP include the United Kingdom, Sweden, Israel and New Zealand. Countries exhibiting high levels of R&D spending relative to GDP include Korea, Sweden, Singapore, Japan and the United States. Comparing each country's VC and private equity investment as a percentage of GDP to its R&D spending as a percentage of GDP, it is clear that most countries finance well below half of their R&D expenditures with venture capital and private equity. Clearly, much of the R&D financing must come from company and government sources.

Sources: Venture capital and private equity investment data, PricewaterhouseCoopers, *Global Private Equity Report 2006* (<http://www.pwcmoneytree.com>), gross domestic product data for OECD countries from Organization for Economic Co-operation and Development (<http://www.oecd.org>); other nations' data from World Bank (<http://www.worldbank.org>), R&D spending data, OECD statistics (<http://www.oecd.org>), except India, whose research spending value is from a report by a national science administrator.

Venture capital fund raising and investment in Asia grew significantly between 1995 and 2000, though much less rapidly than in Europe or the United States. Japan has a financial specialty referred to as 'venture capital', but most of the companies involved are commercial or investment bank subsidiaries that make few truly entrepreneurial investments. Although China is the fastest-growing major economy in the world, venture capital and private equity have traditionally played a small role in its development, mainly because the country lacks the basic legal infrastructure needed to support a vibrant VC market and because access to a listing on a Chinese share market is severely restricted. Nonetheless, many VC-backed US manufacturing ventures have a Chinese sourcing and production component. In addition, China has started to attract more PE funding; according to Bain and Company,¹¹ the PE market in China attracted US\$43 billion in funding over the five-year period to the third quarter of 2011. In addition, over recent years, many Chinese VC investors have started to look at other markets, such as the Australian share market, as a means of exiting their investments via IPOs. India is another interesting and promising private equity market in the world today. India's history as a former British colony gave it a legal system similar to the US multiple stock exchanges, as well as a heritage of using English as the official business language. India's rapid economic development since 1991 has been propelled both by the macroeconomic and market-opening reforms adopted that year and by relatively large inflows of foreign investment, which were attracted by India's vast potential and by the quality of the graduates of its elite universities and technical institutes. Crucially, much of India's growth has been in the information technology (IT) sector, the traditional target of venture capital investment. For all these reasons, India should become one of the five leading venture capital markets globally within a few years. According to the Bain and Company report, India attracted over US\$17 billion in PE funding for the year 2010.

LO20.4

CONCEPT REVIEW QUESTIONS

- 7 Why do you think European governments and stock exchanges are so keen to promote a vibrant entrepreneurial sector? Can you think of any competitive advantages that might accrue to Europe because of its relatively late start in developing IPO markets?
- 8 What are some of the competitive strengths and weaknesses of venture capital as practised in Europe, Japan and Canada when compared with practices in the United States?
- 9 What type of growth in venture capital funding and investment have China and India experienced during recent years? What is their future outlook for venture capital growth?

¹¹ Bain and Company, *Global Private Equity Report 2012*.

STUDY TOOLS

SUMMARY

LO20.1

- Entrepreneurial finance requires specialised financial management skills because entrepreneurial growth companies (EGCs) are unlike other private or publicly traded companies. In particular, EGCs must finance much higher asset growth rates than other companies and tap external financial markets much more frequently.
- In addition to providing risk capital to entrepreneurial growth companies, professional venture capitalists (VCs) provide managerial oversight, coupled with technical and business advice, assistance in developing and launching new products and valuable help recruiting experienced management talent.

LO20.2

- Venture capital investments are often highly concentrated both geographically and industrially. Furthermore, the most successful VC funds are almost always organised as limited partnerships and follow distinctive investment strategies (staged investment) using unique financial instruments (convertible preferred shares).

LO20.3

- Venture capitalists endeavour to make intermediate-term, high-risk investments in entrepreneurial growth companies and then to exit these investments, either by selling the companies they hold to another company or by executing an initial public offering. Phenomenal growth in venture capital fund raising and investment has occurred since the mid-1990s in the United States, Western Europe and certain Asian countries, but not in Japan or most developing countries. In recent years, the two largest venture capital markets (the United States and Europe) have seen significant convergence in contracting practices, investment patterns and returns.

LO20.4

- The Australian PE market is one of the largest in the world, outside of the US. Canada and Israel have had great success in venture capital funding and investment, as have China and India – but growth in venture capital elsewhere in Asia has lagged behind that in the United States and Western Europe. Venture capital investment in developing countries has been growing from a low base during recent years.

IMPORTANT EQUATIONS

TABLE OF IMPORTANT EQUATIONS

20.1 $FV = A(1 + r)n$

20.2 Investment stake (Equity fraction) = $\frac{FV}{\text{expected market valuation}}$

SELF-TEST PROBLEMS

Answers to these 'Self-test problems' and the 'Concept review' questions throughout the chapter appear on the Student Companion Website (<http://login.cengagebrain.com>) or via your instructor.

ST20-1 You are seeking \$1.5 million from a venture capitalist to finance the launch of your online financial search engine. You and the VC agree that your venture is currently worth \$3 million and that, when the company goes public in an IPO five years hence, it will have an expected market capitalisation of \$20 million. Given the company's stage of development, the VC requires a 50% return on investment. What fraction of the company will the VC receive in exchange for its \$1.5 million investment in your company?

ST20-2 An entrepreneur seeks \$12 million from a VC fund. The entrepreneur and fund managers agree that the entrepreneur's venture is currently worth \$30 million and that the company will likely be ready to go public in four years. At that time, the company is expected to have a net income

of \$6 million, and comparable companies are expected to be selling at a price/earnings ratio of 25. Given the company's stage of development, the venture capital fund managers require a 40% compound annual return on their investment. What fraction of the company will the fund receive in exchange for its \$12 million investment?

- ST20-3** Suppose that six out of 10 investments made by a VC fund are a total loss, meaning that the return on each is -100%. Of the remaining investments, three breakeven (earning a 0% return) and one pays off spectacularly by earning a 650% return. What is the realised return on the VC fund's overall portfolio?

QUESTIONS

- Q20-1** List and describe the key financial differences between *entrepreneurial growth companies (EGCs)* and large publicly traded companies.
- Q20-2** How does the financing of EGCs differ from that of most companies in mature industries? Under what circumstances can EGCs obtain debt financing from banks or other financial institutions?
- Q20-3** What is an *angel capitalist*? How do the financing techniques used by angels differ from those employed by professional venture capitalists?
- Q20-4** Distinguish between the basic types of venture capital funds. Which type has emerged as the dominant organisational form? Why?
- Q20-5** What are some of the common characteristics of those entrepreneurial growth companies that are able to attract venture capital investment? In which industries and states is the majority of venture capital invested?
- Q20-6** What is meant by *early-stage* and *later-stage* venture capital investment? What proportions of venture capital have been allocated between the two in recent years? Which stage requires a higher expected return? Why?
- Q20-7** What are the responsibilities and typical payoff for a general partner in a venture capital limited partnership?
- Q20-8** Define *staged financing*. Why is this an efficient risk-minimising mechanism for venture capitalists?
- Q20-9** List and briefly describe some of the more popular *covenants* included in venture capital investment contracts. What is their general purpose?
- Q20-10** What is the most popular form of financing (or security type) required by venture capitalists in return for their investment? Why is this form of financing optimal for both the entrepreneur and the venture capitalist?
- Q20-11** List the major differences between venture capital financing in the United States and in Western Europe. What major changes have been occurring recently in the European venture capital industry?
- Q20-12** Why is a vibrant IPO market considered vital to the success of a nation's venture capital industry? What impact did the collapse of Germany's Neuer Markt have on the European venture capital industry?

PROBLEMS

THE ORGANISATION AND OPERATIONS OF VENTURE CAPITAL AND PRIVATE EQUITY COMPANIES

P20-1 An entrepreneur seeks \$4 million from a venture capitalist. They agree that the entrepreneur's venture is currently worth \$12 million and that, when the company goes public in an IPO three years hence, it will have an expected market capitalisation of \$70 million. Given the company's stage of development, the VC requires a 40% return on investment. What fraction of the company will the VC receive in exchange for its \$4 million investment?

P20-2 An entrepreneur seeks \$10 million from a VC fund. The entrepreneur and fund managers agree that the entrepreneur's venture is currently worth \$25 million and that the company will likely be ready to go public in five years. At that time, the company is expected to have net income of \$7.5 million, and comparable companies are expected to be selling at a price/earnings ratio of 30. Given the company's stage of development, the venture capital fund managers require a 50% compound annual return on their investment. What fraction of the company will the fund receive in exchange for its \$10 million investment?

P20-3 The venture capital fund Techno Fund II made a \$4 million investment in Optical Fibres Corporation five years ago and, in return, received 1 million shares representing 20% of Optical Fibres' equity. Optical Fibres is now planning an initial public offering in which it will sell 1 million newly created shares for \$50 per share. Techno has chosen to exercise its demand registration rights and will sell its shares – alongside the newly created shares – in Optical Fibres' IPO. The investment banks underwriting Optical Fibres' IPO will charge a 7% underwriting spread, so both the company and Techno Fund II will receive 93% of the \$50-per-share offer price. Assuming the IPO is successful, calculate the compound annual return that Techno will have earned on its investment.

P20-4 High-Tech Fund III made a \$3 million investment in Internet Printing Company (IPC) six years ago and received 2 million shares of series A convertible preferred shares. Each of these shares is convertible into two IPC ordinary shares. Three years later, High-Tech III participated in a second round of financing for IPC and received 3 million shares of series B convertible preferred shares in exchange for a \$15 million investment. Each series B share is convertible into one IPC ordinary share. Internet Printing Company is now planning an IPO, but it must convert all its outstanding convertible preferred shares into ordinary shares before the offering. After conversion, IPC will have 20 million ordinary shares outstanding and will create another 2 million ordinary shares for sale in the IPO. The underwriter handling IPC's initial offering expects to sell these new shares for \$45 each, but has prohibited existing shareholders from selling any of their shares in the IPO. The underwriter will keep 7% of the offer as an underwriting discount. Assume that the IPO is successful and that IPC shares sell for \$60 each immediately after the offering.

- Calculate the total number of IPC ordinary shares that High-Tech III will own after the IPO. What fraction of IPC's total outstanding ordinary equity does this represent?
- Using the post-issue market price for IPC shares, calculate the (unrealised) compound annual return that High-Tech III earned on its original and subsequent investments in IPC shares.
- Now assume that the second-round IPC financing had been made under much less favourable conditions and that High-Tech III paid only \$1 million instead of \$15 million for the 3 million series B shares. Assuming that all the other features of IPC's initial offering described earlier hold true, calculate the (unrealised) compound annual return High-Tech III earned on this second investment in IPC shares.

P20-5 Suppose that five out of 10 investments made by a VC fund are a total loss, meaning that the return on each of them is -100%. Of the 10 investments, three breakeven, earning a 0% return. If the VC fund's expected return equals 50%, what rate of return must it earn on the two most successful deals in order to achieve a portfolio return equal to expectations?

CASE STUDY

ENTREPRENEURIAL FINANCE AND VENTURE CAPITAL

Through your financial services company, Vestin Capital, you have raised a pool of money from clients. You intend to invest it in new business opportunities. To prepare for this endeavour, you decide to answer the following questions.

ASSIGNMENT

- 1 What are some of the challenges of financing *entrepreneurial growth companies (EGCs)*?
- 2 What are the different types of venture capital funds?
- 3 What are some choices for organising a venture capital company?
- 4 In what ways should a venture capital company structure its investments?
- 5 Should venture capital companies use convertible securities?
- 6 What are some of the exit strategies that may be available to a venture capital company?



CASH CONVERSION, INVENTORY AND RECEIVABLES MANAGEMENT*

21

WHAT COMPANIES (SHOULD) DO

FIVE RULES

Cash management may not be the most exciting topic to consider in business, but it is generally agreed that maintaining good management of corporate cash flows is very important for any business. The quotation below from 2018 illustrates key points that the analysis of this chapter underpins and examines in more detail:

'Here are five rules for managing your cash flow and getting your invoices paid faster:

- 1 Keep your books accurate and up to date: Your cash flow is only as good as your accounting and reporting. Don't let this get out of hand. Make sure your accounting information is updated regularly. Then you can see the financial state of your business at a glance.
- 2 Don't be too lenient with your customers: Be direct and fair without being a pushover. A clever but polite invoicing strategy will usually get you a long way. But don't be afraid to take more formal action if you need to.

Keep a close watch on your accounts receivable turnover at all times. If it's trending up, it might be time to step up your efforts at chasing payment. As receivables age, their quality goes down, so you should act sooner rather than later.

- 3 Keep your accounting simple: If you're not confident with numbers, hire a professional accountant. Use quality accounting software, so you always know your cash position. It will also help you forecast your cash flow for planning purposes.

For example, maybe you're expecting a big order next month. How will you know if you'll have the working capital needed to expand payroll? Or be able to buy the necessary inventory? Many small business owners get caught out when a large opportunity turns up. They are unable to take advantage of it due to a lack of cash. Don't let that happen to your business.

What's more, a reliable accounting system will help you track and report on key

* Professor Dubois J. Masson, CCM, CertCM, of Pepperdine University and The Resource Alliance, assisted in preparation of the first editions of this chapter for the US edition.



business metrics. These include accounts receivables aging, operating margins and inventory turnover. Having a good handle on these business metrics will help you manage your cash like a pro – and take advantage of new opportunities.

- 4 Keep your business and your personal finances separate: This is essential if you want to understand your business cash flow and forecast how it might change. Mixing your business and personal finances can leave you uncertain about business performance.

So keep them separate. That way you'll know how much cash your company is generating. Then you'll be in a good position to properly pay yourself – and use excess cash to strengthen and grow your business.

- 5 Build a cash reserve: Access to cash will make or break your business. The ultimate step to managing cash flow like a pro is to build a cash reserve. A cash reserve

provides the cushion you need to manage unexpected events. It also gives you the confidence and finances you need to grow your business.

It's not always possible to build a large cash reserve. But if you do, it can insulate you from the economic cycle and the whims of banks and other lenders. It will also let you take advantage of opportunities when they present themselves.

For example, you may have the opportunity to pick up inventory at a deep discount, or take on a large order or new client. With a cash reserve, you can quickly take advantage of such events.

Building a cash reserve puts you in a position of strength. It might mean paying yourself a little less in the short term, but in the long term it will put your business on the path to success. That ultimately means more money in your pocket!

Source: <https://www.xero.com/au/resources/small-business-guides/business-management/managing-cashflow/>. Accessed 9 September 2019.

LEARNING OBJECTIVES

After studying this chapter, you should be able to:

- LO21.1 describe the cash conversion cycle, the company's objectives with regard to it and the actions the company can use to accomplish these objectives
- LO21.2 explain the cost trade-offs the company must consider when finding the optimal levels of operating assets and short-term financing
- LO21.3 discuss the key concerns of the financial manager with regard to inventory and some of the popular techniques used to manage it
- LO21.4 review the key aspects of a company's accounts receivable standards, including the five Cs of credit and the role of credit scoring
- LO21.5 understand the collection policy procedures used by companies, the techniques companies use in credit monitoring and the cash application process.

operating assets

Cash, marketable securities, accounts receivable and inventories necessary to support the day-to-day operations of a company

We now switch our focus from planning to operations, and in this chapter describe the company's cash conversion and key **operating assets** – the current assets needed to support a company's day-to-day operations. We discuss the two key operating assets, inventory and accounts receivable. Most companies work hard to reduce the size of their investments in these types of assets. Of course, it is necessary to keep inventory on hand to keep production flowing and to satisfy unanticipated customer needs, but a company that invests too much in inventory is not deploying its resources efficiently. Indeed, over the

past two decades, the percentage of total corporate assets tied up in inventory balances has been in decline, partly because of advances in information technology that allow companies to communicate more effectively with vendors and customers. Likewise, companies routinely sell to customers on credit (often for competitive reasons), but without careful analysis behind the decision to extend credit and monitoring to ensure that credits are collected, accounts receivable balances can become excessive.

This chapter focuses on the cash conversion cycle and the efficient management of inventory and accounts receivable. We begin with the cash conversion cycle and the actions that can be taken to manage it. Next, we describe the cost trade-offs in short-term financial management. We then briefly consider the key concerns of the financial manager with regard to inventory, before reviewing some popular inventory management techniques. Next, we discuss effective accounts receivable management and review two important related concepts, credit standards and credit terms. Finally, we briefly cover some other receivables management activities.

LO21.1

21.1 THE CASH CONVERSION CYCLE

21.1a OPERATING CYCLE

A central concept in short-term financial management is the notion of the operating cycle. A company's **operating cycle (OC)** measures the time that elapses from the company's receipt of raw materials to its collection of cash from the sale of finished products.

As you might expect, operating cycles vary widely by industry. For instance, a bakery company such as Bakers Delight in Australia – which uses fresh ingredients, keeps finished goods in inventory for only a day or two and generally sells its products for cash – will have a very short operating cycle. In contrast, Hyundai, a Korean car manufacturer, takes several months to convert raw materials into finished products, which are sold on credit. The operating cycle for such a company may extend to six months or longer.

The operating cycle influences a company's need for internal or external financing. In general, the longer a company's operating cycle, the greater its need for financing. For example, the bakery might pay its suppliers and its employees using the revenues generated each week. The car manufacturer probably cannot persuade suppliers and employees to wait several months for payment while the company collects cash from car sales. Therefore, the car company has a greater need for financing day-to-day operations.

The operating cycle encompasses two major short-term asset categories: inventory and accounts receivable. To measure the operating cycle, we use two ratios covered in Chapter 2. First, calculate the *average age of inventory (AAI)* and the *average collection period (ACP)*. Next, take the sum of these two items to determine the length of the operating cycle.

Figure 21.1 presents example operating cycles for some companies in different industries. Rows 1 to 5 present data available from balance sheets and income statements, and rows 6 to 8 calculate the time periods (in days) for AAI, ACP and *average payment period (APP)*, respectively. Using the AAI and ACP calculated in rows 6 and 7, row 9 shows the OC for each industry. Note that the baker has the shortest operating cycle, as one would expect because of the perishable nature of food products.

operating cycle (OC)

Measurement of the time that elapses from the company's receipt of raw materials to begin production to its collection of cash from the sale of the finished product

FIGURE 21.1 ANNUAL OPERATING CYCLE (OC) AND CASH CONVERSION CYCLE (CCC) FOR SELECTED COMPANY TYPES

	MOBILE TELEPHONE MANUFACTURER	CLOTHING MANUFACTURER	BAKER
DATA (\$ MILLIONS)			
(1) Sales	\$99,870	\$4,979	\$24,075
(2) Cost of sales	\$53,857	\$2,080	\$14,437
(3) A/P	\$19,060	\$ 747	\$ 2,916
(4) A/R	\$27,353	\$ 485	\$ 1,179
(5) Inventory	\$ 2,549	\$ 504	\$ 110
TIME PERIODS (DAYS)			
(6) AAI $\{[5] \div [(2) \div 365]\}$	17.3	88.4	2.8
(7) ACP $\{[4] \div [(1) \div 365]\}$	100.0	35.6	17.9
(8) APP $\{[3] \div [(2) \div 365]\}$	129.2	131.1	73.7
(9) OC $\{[(6) + (7)]\}$	117.2	124.0	20.7
(10) CCC $\{(9) - (8)\}$	-11.9	-7.1	-53.1

21.1b CASH CONVERSION CYCLE

cash conversion cycle (ccc)

The elapsed time between the points at which a company pays for raw materials and at which it receives payment for finished goods

The elapsed time between the points at which a company pays for raw materials and at which it receives payment for finished goods is called the **cash conversion cycle (CCC)**. The difference between the operating cycle and the cash conversion cycle indicates the amount of time for which suppliers are willing to extend credit. Most companies obtain a significant amount of their financing through trade credit, as represented by accounts payable. By taking advantage of trade credit, a company reduces the amount of financing it needs from other sources to make it through the operating cycle.

To calculate the cash conversion cycle, start with the operating cycle and then subtract the *average payment period (APP)* on accounts payable. Here is the formula for the cash conversion cycle:

(Eq. 21.1)

$$CCC = OC - APP = AAI + ACP - APP$$

As **Equation 21.1** shows, the cash conversion cycle has three main components: (1) average age of the inventory; (2) average collection period; and (3) average payment period. It also shows that, by changing these time periods, a company changes the amount of time its resources are tied up in day-to-day operations.

Again referring to **Figure 21.1**, we can see that the cash conversion cycle for each company is calculated (in row 10) by subtracting the average payment periods (in row 8) from the operating cycle (calculated in row 9). Reviewing the CCC values, we see that they have negative CCCs in this example. This indicates that these companies receive cash inflows before having to make the cash outflows needed to generate those inflows. This desirable state occurs in part because these companies do not keep inventory on hand for very long, but their vendors give them several months to settle their payables. Notice how the components of the cash conversion cycle vary considerably across industries. For example, the baker has a relatively short collection period of about 18 days and keeps much less than one month's worth of inventory on hand. That shouldn't be too surprising, given the perishable nature of the inventory (food) and given that most of the company's sales are done on a cash basis. Also notice that the clothing manufacturer's inventory age is about 90 days, or one season. Again, it should not be a surprise that a fashion retailer would completely turn over its inventory about once each season. A mobile telephone manufacturer may see a new model appear only every one to two years, so its inventory of its non-perishable parts would need to cover the longer period.

These calculations are based on data that would be available in the balance sheets and income statements of public organisations. Because annual purchases do not appear in published financial statements, the accounts payable period is found by using cost of sales – an approach commonly used by external analysts.

Because annual purchases are likely to be smaller than the cost of sales, these APPs may be understated.

EXAMPLE

Davis Corporation's Cycles

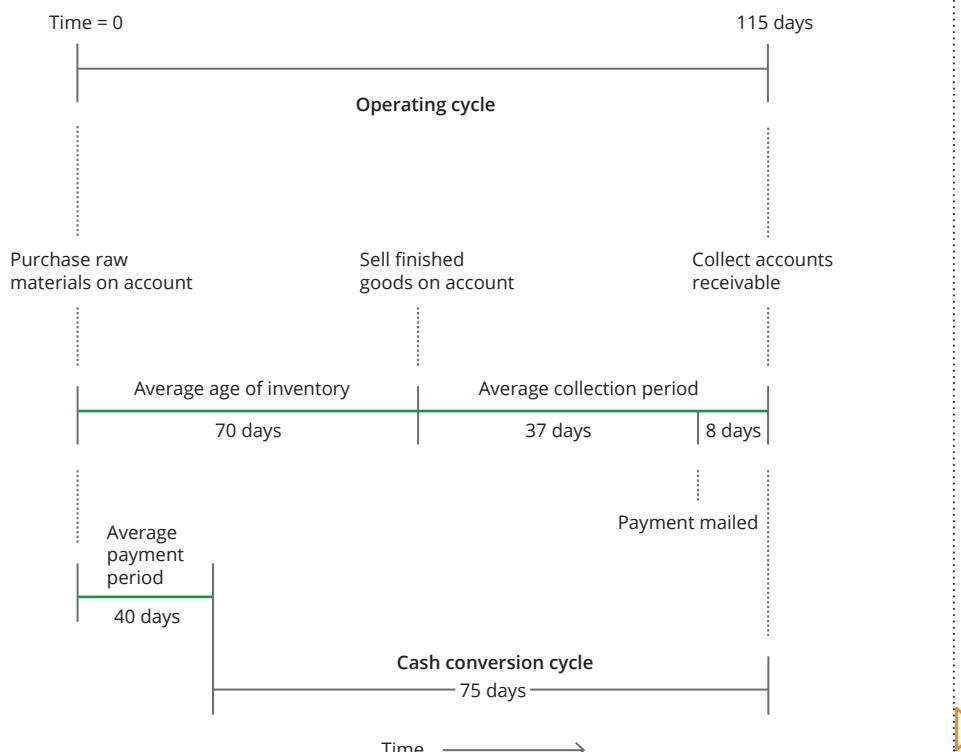
Davis Corporation has annual sales of \$5 billion, a cost of goods sold that is 70% of sales and purchases that are 60% of cost of goods sold. Davis has an AAI of 70 days, an ACP of 45 days and an APP of 40 days. The 45-day ACP can be broken into 37 days until the customer places the payment in the mail, and an additional eight days before the funds are available to the company in a spendable form. Thus, Davis' operating cycle is 115 days ($70 + 45$) and its cash conversion cycle is 75 days ($70 + 45 - 40$). **Figure 21.2** presents Davis' operating and cash conversion cycles on a time line.

Davis has invested the following resources in its cash conversion cycle, where 0.70 indicates that sales are 70% of cost of goods sold:

$$\begin{aligned} \text{Inventory} &= (\$5 \text{ billion} \times 0.70) \times (70/365) \\ &= \$671.2 \text{ million} \\ + \text{Accounts receivable} &= (\$5 \text{ billion}) \times (45/365) \\ &= \$616.4 \text{ million} \\ - \text{Accounts payable} &= (\$5 \text{ billion} \times 0.70 \times 0.60) \times (40/365) \\ &= \$230.1 \text{ million} \\ = \text{Resources invested} &= \$1,057 \text{ million} \end{aligned}$$

FIGURE 21.2 TIME LINE FOR THE OPERATING AND CASH CONVERSION CYCLES FOR DAVIS CORPORATION

Davis Corporation has an operating cycle of 115 days, and because it takes on average 40 days to pay its accounts payable, the company's cash conversion cycle is 75 days.





If Davis Corporation could reduce from eight days to three days the amount of time it takes to receive, process and collect payments after they are mailed by its customers, then it would reduce its average collection period from 45 days to 40 days ($37 + 3$). This would shorten the cash conversion time line by five days ($8 - 3$), and thus reduce the amount of resources that Davis Corporation has invested in operations. For Davis Corporation, a five-day reduction in the average collection period would reduce the resources invested in the cash conversion cycle by \$68.5 million [$\$5 \text{ billion} \times (5 \div 365)$].

21.1c SHORTENING THE CASH CONVERSION CYCLE

In order to maximise shareholder value, the financial manager should manage the company's short-term activities in a way that shortens the cash conversion cycle. This will enable the company to operate with minimum cash investment. The company can find alternative uses for any cash that it is not using to fund the cash conversion cycle – for example, using the cash to pursue more productive long-term investments, using it to pay down expensive long-term financing or distributing it to the owners as dividends.

A positive cash conversion cycle means that trade credit (credit granted to a company by its suppliers) does not provide enough financing to cover the company's entire operating cycle. In that case, the company must seek other forms of financing, such as bank lines of credit and term loans. However, the costs of these financing sources tend to be higher than the costs of trade credit. Thus, the company benefits by finding ways to shorten its operating cycle or to lengthen its payment period. Actions that accomplish these objectives include the following:

- 1 *Turn over inventory as quickly as possible* while avoiding stockouts that result in lost sales.
- 2 *Collect accounts receivable as quickly as possible* without losing sales because of high-pressure collection techniques.
- 3 *Pay accounts as slowly as possible* without damaging the company's credit rating, its relationships with suppliers or paying burdensome late fees.
- 4 *Reduce mail, processing and clearing time* when collecting from customers, but *increase* them when paying vendors.

Techniques for implementing the first two actions are the focus of the remainder of this chapter. Chapter 22 focuses on actions 3 and 4.

FINANCE IN THE REAL WORLD



WORKING (ON) CAPITAL

As the summaries below for Asia and Australasia (Australia and New Zealand) show, cash management through changes to accounts payable and receivable is an active topic for analysis in corporations. These data summaries are from the 2018 version of a regular global survey conducted by PwC, asking organisations about their use of net working capital and its drivers such as accounts payable and receivable.

'Asia'

Over the past five years, companies in Asia have increased their NWCD [Net Working Capital Deposits] by an average of 2.7 days. However, the past year has seen an improvement in the region's working capital performance, driven by decreasing asset days partially offset by a worsening payables performance. There's also a continuing trend in the region towards reducing investment and



debt levels. Now seems to be the perfect time for businesses in Asia to focus on releasing cash to reverse the current declines in Capex.

Australasia

Australasia has the best NWC performance globally. However, in the past year its performance has fallen back – underlining that

companies must not take their eye off the ball if they're to maintain their position as global leaders.'

Source: PriceWaterhouse Cooper, *Navigating Uncertainty: PwC's Annual Global Working Capital Study*, 2018/19, <https://www.pwc.com/gx/en/working-capital-management-services/assets/pwc-working-capital-survey-2018-2019.pdf>. Accessed 9 September 2019.

LO21.1

CONCEPT REVIEW QUESTIONS

- 1 What does a company's cash conversion cycle represent? Explain the financial manager's goal with regard to the CCC.
- 2 How should a company manage its inventory, accounts receivable and accounts payable in order to reduce the length of its cash conversion cycle?

THINKING CAP QUESTION

- 1 Why do companies try to shorten their cash conversion cycles?

LO21.2

21.2 COST TRADE-OFFS IN SHORT-TERM FINANCIAL MANAGEMENT

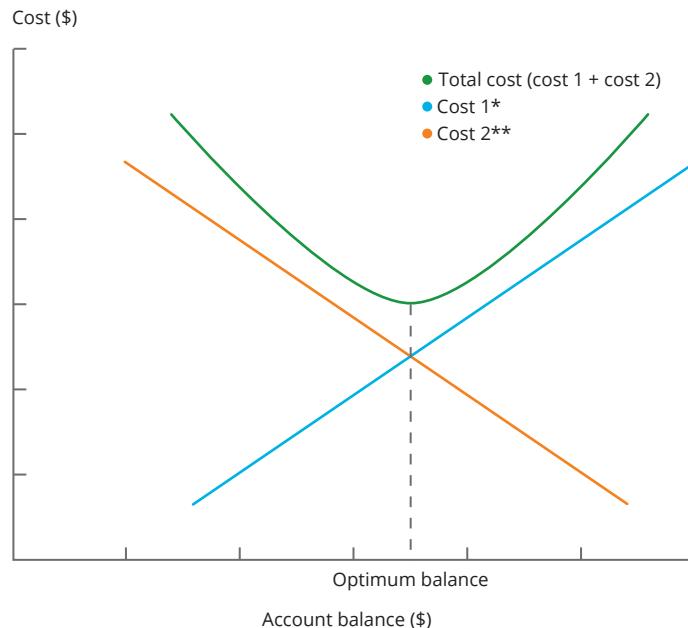
When attempting to manage the company's short-term accounts so as to minimise cash while adequately funding the company's operations, the financial manager must focus on competing costs. Decisions with regard to the optimum levels of both operating assets and short-term financing involve cost trade-offs. For convenience, we will view the current-account decision strategies as being revenue neutral, and thus will examine their cost trade-offs *solely in terms of minimising total cost*. Clearly, with revenue neutral, minimising total costs should increase the company's net cash flows and therefore its value.

The optimum levels of the key operating assets – cash and marketable securities, inventory and accounts receivable – involve trade-offs between the cost of holding the operating asset and the cost of maintaining too little of the asset. **Figure 21.3** depicts the cost trade-offs and optimum level of a given operating asset. Cost 1 is the holding cost, which increases with larger operating asset account balances. Cost 2 is the cost of holding too little of the operating asset, which decreases with larger operating asset account balances. The total cost is the sum of cost 1 and cost 2 associated with a given account balance for the operating asset. As noted, the optimum balance occurs at the point where total cost is minimised.

The table at the bottom of **Figure 21.3** provides more detail on the specific costs for each operating asset. For example, consider cash and marketable securities. As the balance of these accounts *increases*, the opportunity costs and tax costs (cost 1) of the funds held in the company rise. At the same time, the illiquidity and solvency costs (cost 2) fall; the higher the cash and marketable securities balance, the greater the company's liquidity and the lower its likelihood of becoming insolvent. Hence, the optimum balance of cash and marketable securities is the one that minimises the total of these two competing costs. We can evaluate the cost trade-offs for inventory and accounts receivable in a similar way, using the cost descriptions given

in the table and relating them to the two cost functions in the figure. Clearly, in all cases a *decrease* in the operating asset account balance would have the opposite effect.

FIGURE 21.3 TRADE-OFF OF SHORT-TERM FINANCIAL COSTS



Effect of an increase in account balance		
	*Cost 1	**Cost 2
Operating assets		
Cash and marketable securities	Opportunity cost of funds and tax costs	Illiquidity and solvency costs
Inventory	Carrying cost of inventory, including financing, warehousing, obsolescence costs, etc.	Order and setup costs associated with replenishment and production of finished goods
Accounts receivable	Cost of investment in accounts receivable and bad debts	Opportunity cost of lost sales due to overly restrictive credit policy and/or terms
Short-term financing		
Accounts payable, accruals and notes payable	Cost of reduced liquidity caused by increasing current liabilities	Financing costs resulting from the use of less expensive short-term financing rather than more expensive long-term debt and equity financing

The optimum level of short-term financing (accounts payable, accruals and notes payable) involves the same type of cost trade-offs as demonstrated in [Figure 21.3](#) for operating assets. As noted in the bottom portion of the accompanying table, as the short-term financing balance *increases*, the company faces an increasing cost of reduced liquidity (cost 1). At the same time, the company's financing costs (cost 2) decline;

short-term financing costs are lower than the alternative of using long-term debt and equity financing. The optimum amount of short-term financing is one that minimises total cost, as shown in the graph in [Figure 21.3](#). A decrease in the short-term financing balance would have the opposite effects on the competing costs.

The financial manager's primary focus when managing current accounts is to minimise total cost, and thereby increase shareholder value. Each of these account balances can be evaluated quantitatively using decision models. The remainder of this chapter, and the following chapter, emphasise effective techniques and strategies for actively managing the current accounts over which the financial manager has direct responsibility.

LO21.2

CONCEPT REVIEW QUESTIONS

- 3 What general cost trade-offs must the financial manager consider when managing a company's operating assets? How do these costs behave as a company considers reducing its accounts receivable by, say, establishing more restrictive credit terms? How can the company determine the optimum balance?
- 4 What general cost trade-offs are associated with a company's level of short-term financing? How do these costs behave when a company substitutes short-term financing for long-term financing? How would you model this decision quantitatively to find the optimal level of short-term financing?

LO21.3

21.3 INVENTORY MANAGEMENT

Inventory is an important current asset. For the typical manufacturer in a developed economy, inventory represents between 12% and 20% of total assets – a sizeable investment. Inventory consists of the company's stock of raw materials, work in process and finished goods. Although inventory management is the responsibility of operations and production managers, it is also a major concern of the financial manager because of the large investments involved.

The company's goal should be to move inventory quickly in order to minimise its investment. At the same time, it must be careful to maintain adequate inventory to meet demand and minimise lost sales caused by stock outages. The financial manager attempts to maintain optimal inventory levels that reconcile these conflicting objectives. Also, because obsolescence, due perhaps to the production of a new model of a manufactured good, can severely reduce the value of inventories, the company must carefully control inventory to avoid potential major losses in asset values.

Here we consider the aspects of inventory that concern the financial manager: the amount invested in inventory, and several popular techniques for controlling inventory.¹

21.3a INVESTING IN INVENTORY

A company must evaluate its inventory investment in terms of associated revenues and costs. Simply stated, additional investment must be justified by additional returns. From a financial point of view, constraining inventory levels improves returns by releasing funds that the company can use for more profitable

¹ For detailed discussions of these and other inventory management techniques, see Thomas E. Vollman, William Lee Berry, David Clay Whybark and R. Robert Jacobs, *Manufacturing Planning and Control for Supply Chain Management*, 5th edition, 2005, (Burr Ridge, IL: McGraw-Hill Irwin, p. 20).

investments. In contrast, the production and marketing perspectives are that expanding inventories provides for uninterrupted production runs, good product selection and prompt delivery schedules. The company needs to balance the conflicting preferences of finance, production and marketing managers in order to manage inventory effectively.

The financial manager should consider several specific factors when evaluating an inventory system. On the asset side of the balance sheet, inventories represent an important short-term investment. The smaller the level of inventory needed to support the company's sales, the faster the total asset turnover and the higher the return on total assets. (This is consistent with the DuPont system, discussed in Chapter 2.) More rapid inventory turnover also reduces the potential for obsolescence and resulting price concessions. On the liability side, smaller inventories reduce the company's short-term financing requirements and thereby lower financing costs and improve profits. The following example illustrates the key financial trade-off associated with inventory investment.

► EXAMPLE

Inventory Management and Production Volumes

Duntago Manufacturing, in New Zealand, is contemplating larger production runs to reduce the high setup costs associated with a major product. The company estimates the total annual savings in setup costs to be \$120,000. It currently turns this product's inventory six times a year; with the proposed larger production runs, this turnover should drop to five times a year. If the company's \$30 million cost of goods sold for this product is unaffected by the proposal, assuming the company's required return on investments of similar risk is 15%, then the analysis would proceed as follows:

Average investment in inventory = cost of goods sold ÷ inventory turnover

Proposed system	= \$30.0 million	÷ 5 = \$6.0 million
Less: Present system	= \$30.0 million	÷ 6 = <u>5.0 million</u>
Increased inventory investment		\$1.0 million
× required return		× 0.15
Annual cost of increased inventory investment		\$150,000
Less: Annual savings in setup costs		<u>120,000</u>
Net loss from proposed plan		\$ 30,000

Decision: Don't do it; an annual loss of \$30,000 will result from the proposed plan.

21.3b TECHNIQUES FOR CONTROLLING INVENTORY

Although inventory control is an operations/production management task, the financial manager serves as a watchdog over this activity. This monitoring role is important, given the company's typically sizeable investment in inventory. Companies commonly use a variety of techniques, discussed below, to control inventory. Although these techniques are typically used by operations and production managers, a good financial manager should understand them.

ABC system

An inventory control system that segregates inventory into three groups – A, B and C. A items require the largest dollar investment and the most intensive control, B items require the next largest investment and less intensive control and C items require the smallest investment and least intensive control

ABC System

A company, using the **ABC system**, segregates its inventory into three groups, A, B and C. The A items are the most costly inventory items, and the B group consists of items accounting for the next largest investment. The C group typically consists of a large number of items accounting for a small dollar investment. Separating inventory into A, B and C groups allows the company to determine the level and types of inventory control

procedures needed. Control of the A items should be most intensive because of the high dollar investments involved; the B and C items are subject to correspondingly less sophisticated procedures.

Basic Economic Order Quantity (EOQ) Model

A popular tool for determining the optimal order quantity for an inventory item is the **economic order quantity (EOQ) model**. This model could be used to control the company's big-ticket inventory items, such as those included in the A group of an ABC system. The EOQ model considers order costs and carrying costs, and determines the order quantity that minimises their total. Derived from a formal economic model, the *economic order quantity* for a given inventory item is given as

(Eq. 21.2)

$$EOQ = \sqrt{\frac{2SO}{C}}$$

where

S = inventory usage per period (typically one year)

O = order cost, a fixed cost associated with placing and receiving an order

C = carrying cost, a variable cost associated with holding an item in inventory.

Total cost of inventory equals the sum of the fixed cost of placing each order and the variable cost of holding each item in inventory. Assuming that inventory usage is constant, the larger the order quantity, EOQ, the fewer orders placed and, therefore, the *lower the total order cost*. But placing larger orders raises the average inventory, and therefore results in *higher total carrying cost*. So the EOQ mathematically balances the trade-off between decreasing total order costs and increasing total carrying costs, and calculates the order quantity that minimises the total of these two competing costs (as in [Figure 21.3](#)).

economic order quantity (EOQ) model

A common tool used to estimate the optimal order quantity for big-ticket items of inventory. It considers operating and financial costs and determines the order quantity that minimises overall inventory costs

total cost

The sum of the order costs and the carrying costs that is minimised using the economic order quantity (EOQ) model

order cost

The fixed dollar amount per order that covers the costs of placing and receiving an order; used in calculating the EOQ

carrying cost

The variable cost per unit of holding an item in inventory for a specified period of time. Used in calculating the EOQ



Calculating the EOQ

Auchenflower Producers currently uses 16,000 units of an expensive inventory item each year. The company estimates its order cost to be \$500 per order and carrying cost for this item to be \$100 per unit per year. Auchenflower wishes to estimate the optimal quantity in which to order this item.

By substituting $S = 16,000$, $O = \$500$ and $C = \$100$ into [Equation 21.2](#), we calculate the EOQ for this item as:

$$EOQ = \sqrt{\frac{2 \times 16,000 \times \$500}{\$100}} = \sqrt{160,000} = 400 \text{ units}$$

By ordering this item in quantities of 400 units, Auchenflower Producers will minimise its total inventory cost for this item.

Reorder Points and Safety Stock

The simple EOQ model just presented assumes that inventory is instantaneously replenished precisely at the time the inventory is exhausted. This model implies perfect certainty with regard to the rate of usage and the timing of receipt from suppliers. Assuming a constant rate of usage, a company can easily estimate a *reorder point* as follows:

$$\text{Reorder point} = \text{Lead time in days} \times \text{Daily usage}$$

For example, if Auchenflower Producers uses about 44 units per day ($16,000$ units per year \div 365 days), and if it typically takes the company four days to place and receive an order, then the company should place an order when its inventory falls to 176 units (four days \times 44 units).

To allow for faster-than-anticipated rates of usage and/or delayed deliveries, many companies maintain *safety stocks* of inventory. Management determines the size of these stocks by analysing the probabilities of both increased usage rates and delivery delays. For example, Auchenflower Producers estimates that a safety stock equal to 2% of its annual usage of the given item will adequately protect against stockouts due to faster-than-anticipated usage and/or order fulfilment delays. Given that estimate, Auchenflower will maintain a safety stock of 320 units ($0.02 \times 16,000$ units). A variety of more sophisticated models are available for setting both reorder points and safety stocks.

FINANCE IN THE REAL WORLD



SHOULD I BUY IN LARGE QUANTITIES?

The proliferation of superstores and warehouse clubs causes many individuals and families to buy large quantities of staple items such as paper goods, canned food and soft drinks in order to try to save money. The question is: does buying in large quantities make sense? This question can be answered by considering the cost trade-offs involved, similar to the basic EOQ model.

Let's assume that the local GoLo offers a box of 200 garbage bags for \$12. You currently buy a box of 50 similar garbage bags for \$6 at the nearby grocery store every three months (quarter of a year), so the 200 bags should last you an entire year. Because you routinely go to both the local grocery shop and to GoLo, your 'order costs', which would be the transportation costs and the value of your time, are virtually \$0. You won't have to make a special trip to either shop. Assuming you have adequate storage space at home, your holding costs are strictly financial and represent the

cost of having your money tied up in garbage bags. Let's assume you can earn 4% interest on your savings. Your average investment in each case would be one-half of the cost of the purchase as calculated below:

AVERAGE INVESTMENT

GoLo purchase = $\$12/2 = \6

Nearby grocery shop purchase = $\$6/2 = \3

The GoLo purchase would therefore cause you to have, on average, an extra \$3 (\$6 – \$3) invested in garbage bags. Given that you can earn 4% on your money, the annual cost of tying up \$3 in garbage bags is \$0.12 ($0.04 \times \$3$). But by buying the large quantity of garbage bags at GoLo, you save \$12, the difference between \$24 (four \$6 purchases at the nearby grocery shop) and the \$12 cost of the one-time purchase at GoLo. So does it make economic sense to incur annual holding costs of \$0.12 to save \$12 annually? Clearly, in this case, the large quantity purchase will save just under \$12 per year.

Material Requirements Planning

material requirements planning (MRP)

A computerised system used to control the flow of resources, particularly inventory, within the production-sale process

Many manufacturing companies use computerised systems to control the flow of resources, particularly inventory, within the production process. **Material requirements planning (MRP)** is one such system. MRP uses a master schedule to ensure that the materials, labour and equipment needed for production are at the right places, in the right amounts and at the right times. The schedule is based on forecasts of the demand for the company's products. The schedule says exactly what will be manufactured during the next few weeks or months and when the work will take place.

Sophisticated computer programs coordinate all the elements of MRP. The computer determines material requirements by comparing production needs to the materials the company already has in inventory. The programs place orders so that items will be on hand when they are needed for production. MRP helps ensure a smooth flow of finished products.

Manufacturing resource planning II (MRPII) expands on MRP. Using a complex computer system, it integrates data from many departments, including finance, marketing, accounting, engineering and manufacturing. MRPII can generate a production plan for the company, as well as management reports, forecasts and financial statements. It allows the company to track and manage key inventory items (typically A items) on a real-time basis. The system also enables managers to assess the impact of production plans on profitability. If one department's plans change, the system transmits the effects of these changes throughout the company.

Just-in-time System

An important and widely adopted inventory management technique is the **just-in-time (JIT) system**. This technique received a high profile in manufacturing after it was successfully developed and implemented in a large number of major Japanese companies, and then exported around the world. JIT is based on the belief that materials should arrive exactly when they are needed for production, rather than being stored onsite. Relying closely on computerised systems such as MRP and MRPII, manufacturers determine what parts will be needed and when, before ordering them from suppliers, so the parts arrive just in time.

Under the JIT system, inventory products are pulled through the production process in response to customer demand. JIT requires close teamwork among vendors and personnel in purchasing and production; any delay in deliveries of supplies could bring production to a halt. Clearly, unexpected events, such as a strike of staff at a shipping port or the earthquake in Christchurch, New Zealand, in February 2011, can cause problems for companies using a JIT system. In spite of such risks, a properly employed JIT system can significantly reduce inventory levels and carrying costs, thereby freeing funds for more productive uses.

manufacturing resource planning II (MRPII)

Expands on MRP by using a complex computerised system to integrate data from many departments and generate a production plan for the company along with management reports, forecasts and financial statements

just-in-time (JIT) system

An inventory management technique used to make sure that materials arrive exactly when they are needed for production, rather than being stored onsite

LO21.3

CONCEPT REVIEW QUESTIONS

- 5 How might the financial manager's view of inventory differ from that of managers in production and marketing? What is the relationship between inventory turnover and inventory investment? Explain.
- 6 What is the *ABC system*? What role does the *EOQ model* play in controlling inventory? What basic cost trade-off does the EOQ model address?
- 7 From the financial manager's perspective, describe the role of reorder points, safety stock, MRP, MRPII and a *just-in-time system* in managing a company's inventory.

THINKING CAP QUESTION

- 2 Why are financial managers in manufacturing companies concerned about inventory?

LO21.4

21.4 ACCOUNTS RECEIVABLE STANDARDS AND TERMS

Accounts receivable (A/R) result from a company extending trade credit to its customers by selling its products or services on credit. Receivables affect the cash conversion cycle through the average collection period (ACP). As noted in Chapter 2, this period is the average length of time from a sale on credit until the payment becomes usable funds for the company.

The ACP has two parts. The first, and generally the longer, is the credit period. It is measured as the time from the sale (or customer invoicing) until customers place their payments in the mail. The second is the time from when the customers place payments in the mail to when the company has spendable funds in its bank account. The first part of the average collection period involves managing the credit available to the company's customers. The second part involves receiving, processing and collecting payments. This section discusses customer credit; the next chapter discusses receiving, processing and collecting payments.

As with all current accounts, receivables management requires managers to balance competing interests. On the one hand, managers (generally the cash or treasury managers) prefer to receive cash payments sooner rather than later. That preference leads towards strict credit terms and strict enforcement of those terms. On the other hand, companies can use credit terms as a marketing tool to attract new customers (or to keep current customers from defecting to another company). This objective argues for easier credit terms and more flexible enforcement.

It is also important to understand that, in many companies, the credit policy is generally not under the control of the financial (cash or treasury) managers, but rather is part of the sales or customer-service functions. For many companies wishing to remain competitive, credit terms are a necessary part of determining the ultimate sales prices for their products and services.

21.4a EFFECTIVE ACCOUNTS RECEIVABLE MANAGEMENT

Effectively managing the credit and accounts receivable process involves cooperation among sales, customer service, finance and accounting staffs.

The key areas of concern involve:

- 1 setting and communicating the company's general credit and collections policies
- 2 determining who is granted credit and how much credit is extended to each customer
- 3 managing the billing and collection process in a timely and accurate manner
- 4 applying payments and updating the accounts receivable ledger
- 5 monitoring accounts receivable on both an individual and aggregate basis
- 6 following up on overdue accounts and initiating collection procedures, if required.

In the typical company, the credit and accounts receivable departments handle most of these tasks. The cash management or treasury area will usually be responsible for managing the actual receipt of payments. The cash manager usually will also have to collect and organise the remittance data that is sent along with the payments so that the A/R department can determine what invoices have been paid. We will cover this *cash application* process in greater detail later in the chapter.

The first decision a company must make is whether it will offer trade credit at all. There are many reasons for offering credit, including increasing sales, meeting terms offered by competitors, attracting new customers and providing general convenience. In a typical business-to-business environment, a company may have to offer trade credit just to generate sales. This is especially the case for a large company selling to smaller companies, where the smaller company needs the credit period in order to sell merchandise so it can pay the supplier. The small company would not usually have access to other types of credit, so if the supplier does not offer credit then there is no sale.

As mentioned previously, many companies see trade credit and credit terms as simply an extension of the sales price. They may use credit terms to motivate customers or to compete with other suppliers. In many cases, industry practices dictate whether companies offer credit and under what terms. In today's financial environment, there are also many opportunities for companies to outsource part or all of the credit

and accounts receivable process. Outsourcing alternatives include the use of credit cards, and third-party financing and **factoring**, which involves the outright sale of receivables to a third-party *factor* at a discount.

Once a company has decided to offer trade credit, it must do the following:

- 1 *Determine its credit standards:* Who is offered credit, and how much?
- 2 *Set its credit terms:* How long do customers have to pay and are any discounts offered for early payment?
- 3 *Develop its collection policy:* How should delinquent accounts be handled?
- 4 *Monitor its accounts receivable on both an individual and aggregate basis:* What is the status of each customer and the overall quality of its receivables?

In addition, the company must have effective cash application procedures in place (these are discussed in section 21.5c).

factoring
The outright sale of receivables to a third-party *factor* at a discount

21.4b CREDIT STANDARDS

The first and most important aspect of A/R management is setting credit standards. This process involves applying techniques for determining which customers should receive credit and how much credit should be granted. Much of the focus is on making sure that a company does not accept substandard customers – potential defaulters on trade credit. However, a company must take care not to set the standards so high that potential good customers are rejected. A company's accounts receivable default rates should generally be in line with those of other companies in the same industry if it wants to remain competitive.

Granting Credit to Customers

In analysing credit requests and determining the level of credit to be offered, the company can gather information from both internal and external sources. The usual internal sources of credit information are the credit application and agreement and, if available, the company's own records of the applicant's payment history. External sources typically include financial statements, trade references, banks or other creditors, and credit-reporting agencies. Each of these sources involves the internal costs of analysing the data; some sources, such as credit reporting agencies, also have explicit external costs (a charge for obtaining the data).

The company must also take into account the variable costs of the products it would be selling on credit. For example, a company selling a product with a low variable cost (such as magazine subscriptions) will often grant credit to almost anyone without a credit check. Such a company doesn't have much to lose if payment isn't made, but on the other hand, potential profits are great. Companies selling products with high variable costs (such as heavy-equipment manufacturers) will typically do extensive credit checks before granting credit and shipping merchandise.

The amount of the credit limit is also an important factor. To reduce some of the costs associated with making credit decisions, a company may routinely grant small levels of credit to new customers and then allow the credit limit to rise as the customer proves to be a good credit risk.

Two popular approaches to the credit-granting process are the five Cs of credit and credit scoring.

Five Cs of Credit

The **five Cs of credit** provide a framework for performing in-depth credit analysis, but they do not provide a specific accept-or-reject decision. This credit-selection method is typically used for high-dollar credit requests. Although applying the five Cs does not speed up collection of accounts, it does lower the probability of default. The five Cs are defined as follows.

five Cs of credit
A framework for performing in-depth credit analysis without providing a specific accept or reject decision

- 1 *Character* refers to the applicant's record of meeting past obligations. The lender would consider the applicant's payment history as well as any pending or resolved legal judgments against the applicant. The question addressed here is whether the applicant will pay its account, if able, within the specified credit terms.

- 2 *Capacity* is the applicant's ability to repay the requested credit. The lender typically assesses the applicant's capacity by using financial statement analysis focused on cash flows available to service debt obligations.
- 3 *Capital* refers to the financial strength of the applicant, as reflected by its capital structure. In assessing capital, the lender frequently analyses the applicant's debt relative to equity and its profitability ratios. The analysis of capital determines whether the applicant has sufficient equity to survive a business downturn.
- 4 *Collateral* consists of the assets the applicant has available for securing the credit. In general, the more valuable and more marketable the assets are, the more credit lenders will extend. However, trade credit is rarely a secured loan. Therefore, collateral is not the primary consideration in deciding to grant credit. Rather, it strengthens the creditworthiness of a customer who appears to have sufficient cash flows to meet its obligations.
- 5 *Conditions* refers to current general and industry-specific economic conditions. It also considers any unique conditions surrounding a specific transaction. For example, a company that has excess inventory of a given item may be willing to accept a lower price or extend more attractive credit terms in order to sell that item.

Credit Scoring

credit scoring

Applies statistically derived weights for key financial and credit characteristics to predict whether a credit applicant with specific scores for each characteristic will pay the requested credit in a timely fashion

Credit scoring is commonly used with high-volume-low-dollar credit requests. **Credit scoring** applies statistically derived weights for key financial and credit characteristics to predict whether a credit applicant with specific scores for each characteristic will pay the requested credit in a timely fashion. The weighted average score is the sum of the products of the applicant's score and the associated predetermined weight for each characteristic, and the resulting score determines whether to accept or reject the credit applicant. That is, the procedure results in a score that measures the applicant's overall credit strength, and the company uses that score to make the accept-or-reject decision for granting credit. Credit scoring is most commonly used by large credit card operations, such as those of banks, oil companies and department stores.



Calculating Consumer Credit Ratings

Redfern Refineries (RR), which sells oil products to retail as well as wholesale customers, uses credit scoring to make its consumer credit decisions. Each applicant fills out a credit application. RR enters data from the application into an expert system, and a computer generates the applicant's final credit score, creates a letter indicating whether the application was approved and (if approved) issues a credit card to the customer.

Figure 21.4 demonstrates the scoring of a consumer credit application, and **Figure 21.5** describes RR's predetermined credit standards. Because the applicant in **Figure 21.4** has a credit score of 83.25, he or she will be extended RR's standard credit terms (see **Figure 21.5**).

FIGURE 21.4 CONSUMER CREDIT APPLICATION CREDIT SCORE BY REDFERN REFINERIES

FINANCIAL AND CREDIT CHARACTERISTICS	(1) SCORE (0–100)	(2) PREDETERMINED WEIGHT	(3) WEIGHTED SCORE [(1) × (2)]
Credit references	80	0.15	12.00
Home ownership	100	0.15	15.00
Income range	75	0.25	18.75
Payment history	80	0.25	20.00
Years at address	90	0.10	9.00
Years on job	85	0.10	8.50
Total: 1.00		Credit score: 83.25	

Notes: In column (1), scores are assigned by an analyst or by a computer based on information supplied on the credit application; scores range from 0 (lowest) to 100 (highest). In column (2), weights are based on the company's analysis of the relative importance of each characteristic in predicting whether a customer will pay its account in a timely fashion; the weights must add up to 1.00.

FIGURE 21.5 REDFERN REFINERIES' CREDIT STANDARDS

Credit score	Action
Higher than 75	Extend standard credit terms
65–75	Extend limited credit; if account is properly maintained, convert to standard credit terms after one year
Lower than 65	Reject application

Changing Credit Standards

Most sales by corporations are made on credit. Thus, as a practical matter, it is important to understand how establishing and changing credit standards affect sales, costs and overall cash flows for a given company. As we discussed earlier, it is essential that companies accurately assess the creditworthiness of individual customers who buy on credit. This does not mean that a company should extend credit *only* to those customers who are certain to repay their debts. Following such an excessively conservative strategy will cost the company many profitable sales, especially if industry practice is to be more generous in extending credit. Instead, the company should accept a *degree* of default risk in order to increase sales – but not so much that the additional profit from sales is overwhelmed by additional accounts receivable investment and bad debts. The financial manager is typically responsible for estimating the cash flow and financial impact of a proposed change in credit standards.

Fortunately, measuring the overall financial impact of changes in credit standards is fairly straightforward. Any change may yield both benefits and costs; the decision to change standards will depend on whether the benefits exceed the costs. We can describe the general impact of changes in credit standards as follows.

- *Relaxing credit standards* will generally yield increased unit sales and additional profits. The additional profit from relaxed credit standards assumes that each unit is sold at a positive contribution margin. The *contribution margin* is a product's price per unit minus variable costs per unit, and thus is a direct measure of gross profit per unit sold. Relaxing credit standards will also yield higher costs from additional investment in accounts receivable and additional bad debt expense.
- *Tightening credit standards* will generally yield reduced investment in accounts receivable and lower bad debt expense at the cost of lower sales and profits.

It is easiest to demonstrate how to calculate the net effect of changing credit standards by giving an example.



When We Change Credit Standards

Yunanderah Manufacturing Company (YMC) produces and sells a DVD organiser to video rental and sales stores within Australia. YMC charges \$20/unit, and all of its sales are on credit, with customers selected for credit on the basis of a scoring process. With its existing credit standards, YMC expects to sell 120,000 units over the coming year, yielding total sales of \$2,400,000 ($120,000 \text{ units} \times \$20/\text{unit}$). Variable costs are \$12/unit, and YMC has fixed costs of \$240,000 per year.

YMC is contemplating a relaxation of its credit standards, expecting the following effects: a 5% increase in sales to 126,000 units; an increase in the average collection period from 30 days (the current level) to 45 days; and an increase in bad debt expense from 1% (the current level) to 2% of sales. YMC plans to keep the product's sale price unchanged at \$20/unit, which implies that total sales will increase to \$2,520,000 ($126,000 \text{ units} \times \$20/\text{unit}$). If the company's required return on investments of equal risk is 12%, should YMC relax its credit standards? 



To make this decision, YMC's managers must calculate: (1) how much profits will increase from the additional sales that relaxed credit standards are expected to generate; (2) the cost of the marginal investment in accounts receivable; (3) the cost of marginal bad debts; and (4) whether the financial benefits exceed the costs. (Note: In this and subsequent accounts receivable policy change calculations, we use a single-period approach rather than specifying all subsequent cash flows and determining their present value. Prior research has shown that for the A/R decisions demonstrated in this chapter, the single-period model yields the same accept-or-reject decision as a more detailed present value approach. We therefore choose to keep it simple.)

- 1 *Marginal profit contribution from sales.* We are assuming that a 5% increase in sales volume will not cause YMC's fixed costs to increase. Thus, we need to account only for changes in revenues and variable costs. Specifically, we can compute the marginal increase in profits as the increased unit sales volume times the contribution margin per unit sold:

(Eq. 21.3)

$$\begin{aligned}\text{Marginal profit from increased sales} &= \Delta\text{Sales} \times \text{CM} \\ &= \Delta\text{Sales} \times (\text{Price} - \text{VC})\end{aligned}$$

where

ΔSales = change in unit sales resulting from the change in credit policies

CM = contribution margin

Price = price per unit

VC = variable cost per unit

With the assumptions just detailed for YMC, we can use **Equation 21.3** to determine that relaxing credit standards as suggested will yield a marginal profit of \$48,000:

$$\begin{aligned}\text{Marginal profit from increased sales} &= 6,000 \text{ units} \times (\$20/\text{unit} - \$12/\text{unit}) \\ &= 6,000 \text{ units} \times (\$8/\text{unit}) = \$48,000\end{aligned}$$

- 2 *Cost of the marginal investment in accounts receivable.* To determine the cost of the marginal investment in accounts receivable, we must calculate the cost of financing the current level of accounts receivable and compare it to the expected cost under the new credit standards. This is more complicated than it sounds. We must first calculate how much YMC currently has invested in accounts receivable based on its current annual sales, variable costs and accounts receivable turnover. We then repeat this process for the level of sales expected to result from a change in credit standards. **Equations 21.4, 21.5** and **21.6** present the steps required. Note that we use variable costs in calculating investment in accounts receivable because this is the company's actual cash expense incurred (and tied up in receivables).

average investment in accounts receivable (AIAR)

An estimate of the actual amount of cash (variable cost) tied up in accounts receivable at any time during the year

total variable cost (TVC) of annual sales

Calculated by multiplying the annual sales in units by the total variable cost per unit and used to estimate the average investment in accounts receivable under a stated policy

(Eq. 21.4)

$$\text{Average investment in accounts receivable (AIAR)} = \frac{\text{Total variable cost of annual sales}}{\text{Turnover of accounts receivable}}$$

(Eq. 21.5)

$$\text{Total variable cost of annual sales (TVC)} = \text{Annual unit sales} \times \text{Variable cost/unit}$$

(Eq. 21.6)

$$\text{Turnover of accounts receivable (TOAR)} = \frac{365}{\text{Average collection period (ACP)}}$$

We can use these equations to compute the **average investment in accounts receivable (AIAR)** for the current, AIAR_{current}, and proposed, AIAR_{proposed}, credit standards. First, we compute the **total variable cost (TVC) of annual sales** under the current credit standards, TVC_{current}, and the proposed plan, TVC_{proposed}, using **Equation 21.5**:

$$\text{TVC}_{\text{current}} = 120,000 \text{ units} \times \$12/\text{units} = \$1,440,000$$

$$\text{TVC}_{\text{proposed}} = 126,000 \text{ units} \times \$12/\text{units} = \$1,512,000$$





Next, we note that the 30-day average collection period under the current plan, $ACP_{current}$, is expected to rise to 45 days under the proposed plan, $ACP_{proposed}$. This allows us to use **Equation 21.6** to compute the **turnover of accounts receivable (TOAR)** under the current, $TOAR_{current}$, and proposed, $TOAR_{proposed}$, credit terms:

$$TOAR_{current} = \frac{365}{ACP_{current}} = \frac{365}{30 \text{ days}} = 12.2 \text{ times/year}$$

$$TOAR_{proposed} = \frac{365}{ACP_{proposed}} = \frac{365}{45 \text{ days}} = 8.1 \text{ times/year}$$

These turnover measures suggest that, if YMC relaxes its credit standards, then the turnover of its accounts receivable will slow down from 12.2 times per year to 8.1 times per year. Clearly, this slowing is attributable to the generally slower-paying additional credit customers generated by the relaxed credit standards. We now have all the inputs required to use **Equation 21.4** to compute the $AIAR_{current}$ and $AIAR_{proposed}$:

$$TOAR_{current} = \frac{365}{ACP_{current}} = \frac{365}{30 \text{ days}} = 12.2 \text{ times/year}$$

$$TOAR_{proposed} = \frac{365}{ACP_{proposed}} = \frac{365}{45 \text{ days}} = 8.1 \text{ times/year}$$

With these measures, we can now determine the **cost of the marginal investment in accounts receivable**. This amount is the marginal investment in accounts receivable required to support the proposed change in credit policy multiplied by the required return on investment, r . This important calculation recognises the company's opportunity cost – the cost of forgoing earning opportunities as a result of tying up additional money in accounts receivable.

(Eq. 21.7) Cost of marginal investment in accounts receivable = Marginal investment × Required return
 $= (AIAR_{proposed} - AIAR_{current}) \times r$
 $= (\$186,667 - \$118,033) \times 0.12$
 $= \$68,634 \times 0.12 = \$8,236$

This value of \$8,236 is a cost of adopting the relaxed credit standards; it represents the opportunity cost of investing an additional \$68,634 in accounts receivable rather than investing these funds in another earning asset.

- 3 *Cost of marginal bad debts.* YMC expects that relaxing its credit standards will increase its bad debt expense from 1% to 2% of sales. We can calculate the cost of this by subtracting the current level of bad debt expense from the expected level of bad debt expense under the proposed new credit standards. **Equation 21.8** shows the calculations required to determine bad debt expense, and **Equation 21.9** shows how to calculate the cost of marginal bad debts if YMC relaxes its credit standards:

(Eq. 21.8) Bad debt expense (BDE) = Annual sales (Sales) × Bad debt expense rate (%BDE)

$$\begin{aligned} BDE_{proposed} &= (Sales_{proposed}) \times (%BDE_{proposed}) \\ &= \$2,500,000 \times 0.02 = \$50,400 \end{aligned}$$

$$\begin{aligned} BDE_{current} &= (Sales_{current}) \times (%BDE_{current}) \\ &= \$2,400,000 \times 0.01 = \$24,000 \end{aligned}$$

turnover of accounts receivable (TOAR)
Three-hundred-sixty-five divided by the average collection period (ACP). Used to calculate the average investment in accounts receivable (AIAR) when evaluating accounts receivable policies

cost of marginal investment in accounts receivable
The marginal investment in accounts receivable required to support a proposed change in credit policy multiplied by the required return on investment



(Eq. 21.9)

$$\begin{aligned}\text{Cost of marginal bad debts} &= \text{BDE}_{\text{proposed}} - \text{BDE}_{\text{current}} \\ &= \$50,400 - \$24,000 = \$26,400\end{aligned}$$

- 4 *Net profit for the credit decision.* Now that we have calculated the individual financial benefits and costs of changing YMC's credit standards, we can use **Equation 21.10** to compute the overall net profit for the credit decision:

(Eq. 21.10) Net profit for the credit decision = (Marginal profit from increased sales)

$$\begin{aligned}&\quad - (\text{Cost of marginal investment in accounts receivable}) \\ &\quad - (\text{Cost of marginal bad debts}) \\ &= \$48,000 - \$8,236 - \$26,400 \\ &= \$13,364\end{aligned}$$

Because relaxing YMC's credit standards is expected to yield \$13,364 in increased profit, the company should implement the proposed change. The marginal profit from additional sales will more than offset the total cost of the marginal investment in accounts receivable and marginal bad debts.

21.4c CREDIT TERMS

credit terms

The terms of sale for customers

Credit terms are the terms of sale for customers. Terms of *net 30* mean that the customer has 30 days from the beginning of the credit period – typically *end of month (EOM)* or *date of invoice* – to pay the full invoice amount. Some companies offer cash discounts with terms, such as *2/10 net 30*. These terms mean the customer can take a *2% cash discount* from the invoice amount if the payment is made within the 10-day *cash discount period*, or the customer can pay the full amount of the invoice within the 30-day *credit period*.

The nature of a company's business influences its regular credit terms. For example, a company selling perishable items will have very short credit terms because its items have little long-term collateral value. These companies will typically offer short terms, by which the customer has seven to 10 days to make payment. A company in a seasonal business may tailor its terms to fit the industry cycles with terms known as *seasonal dating*. Most managers want their company's regular credit terms to be consistent with its industry's standards. A company will lose business if its terms are more restrictive than those of its competitors; if its terms are less restrictive than those of its competitors, then it will attract customers with poor financial histories that probably are unable to pay under the standard industry terms.

As briefly noted above, a popular method used to lower a company's investment in accounts receivable is to include a cash discount in the credit terms. The **cash discount** provides a cash incentive for customers to pay sooner. By speeding collections, the discount will decrease the company's investment in accounts receivable – which is the objective. But the discount will also decrease the per-unit profit because the customer pays less than the full invoice amount. Initiating a cash discount should reduce bad debts (because customers taking the cash discount pay a lower price for the product). Companies that consider offering a cash discount must perform a cost–benefit analysis to determine if the discount yields sufficient profits.



Cash Discount for Early Payment?

Leederville Industries has an average collection period of 45 days: 37 days until the customers place their payments in the mail; and a further eight days to receive, process and collect

payments. Leederville is contemplating a change in its credit terms from *net 30* to *2/10 net 30*. The change is expected to reduce the average collection period to 26 days.





Leederville currently sells 1,200 units of its product for \$2,500 per unit. Its variable cost per unit is \$2,000. It estimates that 70% of its customers will take the 2% discount, and that offering the discount will increase sales by 50 units per year, but will not alter its bad debt percentage for this product. Leederville's

opportunity cost of funds invested in accounts receivable is 13.5% per year. Should Leederville offer the proposed cash discount? The cost-benefit analysis, presented in **Figure 21.6**, shows that the net cost of the cash discount is \$2,846. Thus, Leederville should not implement the proposed cash discount.

FIGURE 21.6 ANALYSIS OF OFFERING A CASH DISCOUNT AT LEEDERVILLE INDUSTRIES

Marginal profit from increased sales [50 units × (\$2,500 – \$2,000)]	\$ 25,000
Current investment in accounts receivable (\$2,000 ^a × 1,200 units) × (45 ÷ 365)	\$295,890
New investment in accounts receivable (\$2,000 ^a × 1,250 units) × (26 ÷ 365) ^b	178,082
Reduction in accounts receivable investment	\$117,808
Cost savings from reduced investment in accounts receivable (0.135 × \$117,808) ^c	15,904
Cost of cash discount (0.02 × \$2,500 × 1,250 × 0.70)	(43,750)
Net profit (cost) from proposed cash discount	\$ (2,846)

a In analysing the investment in accounts receivable, we use the \$2,000 variable cost of the product sold, rather than its \$2,500 sales price because the variable cost represents the company's actual cash expense incurred and tied up in receivables.

b The new investment in accounts receivable is tied up for only 26 days instead of the 45 days under the original terms. The 26 days is calculated as $(0.70 \times 10 \text{ days}) + (0.30 \times 37 \text{ days}) + 8 \text{ days} = 26.1 \text{ days}$, which is rounded to 26 days.

c Leederville's opportunity cost of funds is 13.5% per year.

LO21.4

CONCEPT REVIEW QUESTIONS

- 8 Why do a company's regular credit terms typically conform to its industry's standards? On what basis other than credit terms should the company compete?
- 9 How are the *five Cs of credit* used to perform in-depth credit analysis? Why is this framework typically used only on high-dollar credit requests?
- 10 How is *credit scoring* used in the credit selection process? In what types of situations is it most useful?
- 11 What are the key variables to consider when evaluating the benefits and costs of *changing credit standards*? How do these variables differ when evaluating the benefits and costs of *changing credit terms*?
- 12 Why do we include only the variable cost of sales when estimating the average investment in accounts receivable? Why do we apply an opportunity cost to this investment when estimating its cost?
- 13 What are the key elements of a company's *credit terms*? What is a key determinant of the credit terms offered by a company?

THINKING CAP QUESTION

- 3 What financial trade-offs are typically involved when considering a change in credit standards?

LO21.5

21.5 COLLECTING, MONITORING AND APPLYING CASH TO RECEIVABLES

In addition to establishing the company's accounts receivable standards and terms, the financial manager's responsibilities include collecting and monitoring receivables. The collection and monitoring process is an ongoing operating activity that is also the responsibility of finance personnel. Here we consider collection policies, credit monitoring and cash applications.

21.5a COLLECTION POLICY

collection policy

The procedures used by a company to collect overdue or delinquent accounts receivable. The approach used is often a function of the industry and the competitive environment

A company must determine what its **collection policy** will be and how it will implement that policy. As with credit standards and terms, the approach to collections may be a function of the industry and the competitive environment. For many delinquent accounts, a reminder, form letter, telephone call or personal visit may initiate customer payment. At a minimum, the company should generally suspend further sales to the customer until the delinquent account is brought up to date.

If these actions fail to generate customer payment, it may be necessary to negotiate with the customer for past-due amounts or report the customer to credit bureaus. It is possible that the company sold the goods with a lien attached, obtained a pledge of collateral against the account or had other corporate or personal guarantees from the customer. In these cases, the company should utilise these options for obtaining payment. Generally, as a last resort, the account can be turned over to a collection agency or referred to an attorney for direct legal action. Obviously, a cost-benefit analysis should be made at each stage to compare the cost of further collection actions against the cost of simply writing off the account as a bad debt.

21.5b CREDIT MONITORING

credit monitoring

The ongoing review of a company's accounts receivable to determine if customers are paying according to the stated credit terms

Credit monitoring involves ongoing review of a company's accounts receivable to determine if customers are paying according to the stated credit terms. If customers are not paying on time, credit monitoring will alert the company to the problem. Companies must monitor credit on both an individual and an aggregate basis. Individual monitoring is necessary to determine if each customer is paying in a timely manner and to assess whether a customer is within its credit limits.

Credit monitoring on an aggregate basis indicates the overall quality of the company's accounts receivable. Slow payments are costly to a company because they increase the average collection period and thereby the company's investment in accounts receivable. If a company is also using its accounts receivable as collateral for a loan, then the lending institution will generally exclude any past-due accounts from those used as backup for the credit line. Therefore, changes in accounts receivable over time could diminish the company's overall liquidity and increase the need for additional financing. Analysis of accounts receivable payment patterns can also be essential for forecasting future cash receipts in the cash budget.

The three most frequently cited techniques for monitoring the overall quality of accounts receivable are: (1) the average collection period; (2) ageing of accounts receivable; and (3) payment-pattern monitoring.

Average Collection Period

The *average collection period (ACP)*, also known as *days' sales outstanding (DSO)*, is the second component of the cash conversion cycle. As noted in Chapter 2, it represents the average number of days that credit sales are outstanding. The average collection period has two components: (1) the time from sale until the customer

places the payment in the mail; and (2) the time to receive, process and collect the payment once it has been mailed by the customer. **Equation 21.11** gives the formula for determining the average collection period:

(Eq. 21.11)

$$\text{Average collection period} = \frac{\text{Accounts receivable}}{\text{Average sales per day}}$$

If we assume that the receipt, processing and collection time is constant, then the average collection period tells the company how many days (on average) it takes customers to pay their accounts. In applying this formula, analysts must be consistent in their use of the sales period and must adjust for known seasonal fluctuations.



Adjusting Average Collection Periods

GS Schofield Enterprises has an accounts receivable balance of \$1.2 million. Sales during the past 90 days were \$3.6 million for an average daily sales figure of \$40,000. Dividing \$1.2 million by \$40,000 yields Schofield's average collection period of 30 days.

However, a diligent analyst at Schofield notices that sales have been increasing recently, with average sales over the last 30 days of \$45,000 per day. Using this figure in the denominator of **Equation 21.11** results in an average collection period of 26.7 days.

The average collection period allows the company to determine whether there is a general problem with its accounts receivable. However, the ACP can also send misleading signals when daily sales fluctuate. In the preceding example, suppose that Schofield's credit terms are net 25. Using the most recent month to calculate average daily sales results in an average collection period of 26.7 days, which is right on target, given Schofield's credit terms. However, using average daily sales over the past three months yields the longer, 30-day collection period. Therefore, when using this ratio to assess the performance of the collections department, analysts have to be aware of the impact of sales fluctuations on their calculations.

If a company believes that it has a collections problem, a first step in analysing the problem is to age the accounts receivable. By doing so, the company can determine if the problem exists in its accounts receivable in general or rather is attributable to a few specific accounts or to a given time period.

Ageing of Accounts Receivable

The **ageing of accounts receivable** requires the company to break down its accounts receivable into groups based on the time of origin. Ageing results in a schedule indicating the portions of the total accounts receivable balance that have been outstanding for specified periods of time. The breakdown is typically made on a month-by-month basis, going back three or four months.

The purpose of ageing accounts receivable is to allow the company to pinpoint problems. For example, if a company with terms of net 30 has an average collection period (minus receipt, processing and collection time) of 50 days, then it will want to age its accounts receivable. If the majority of accounts are two months old, then the company has a general problem and should review its accounts receivable operations. If the ageing shows that the company collects most accounts in about 35 days, and that a few accounts are significantly past due, then the company should analyse and pursue collection of those specific past-due accounts. If the company has an abnormally high percentage of outstanding accounts initiated in a given month, it may be attributable to a specific event during that time period, such as hiring a new credit manager or selling a substandard product whose quality is being disputed by customers withholding payment.

ageing of accounts receivable

A schedule that indicates the portions of the total accounts receivable balance that have been outstanding for specified periods of time

Figure 21.7 provides an example of an *ageing schedule*. If the stated credit terms for the company in this example were net 60 days, then the ageing schedule would tell us that 80% of the company's receivables are current and 20% are past due.

FIGURE 21.7 SAMPLE AGEING SCHEDULE FOR ACCOUNTS RECEIVABLE

AGE OF ACCOUNTS	ACCOUNTS RECEIVABLE	PERCENTAGE OF ACCOUNTS RECEIVABLE
0–30 days	\$1,200,000	50%
31–60 days	720,000	30
61–90 days	336,000	14
91+ days	144,000	6
Total accounts receivable	\$2,400,000	100%

Payment-Pattern Monitoring

The average collection period and the ageing of accounts receivable are excellent monitoring techniques when sales are relatively constant. However, for cyclical or growing companies, both techniques provide potentially misleading results. For example, the average collection period divides the accounts receivable balance by the average daily sales. If the accounts receivable balance is measured during a cyclical company's high sales period, then the average collection period will be distorted by the cyclical sales peak. Use of the company's customer payment pattern avoids the problems of cyclical or growing sales when monitoring accounts receivable.

payment pattern

The normal timing in which a company's customers pay their accounts, expressed as the percentage of monthly sales collected in each month following the sale

The **payment pattern** is the normal timing in which a company's customers pay their accounts; it is expressed as the percentage of monthly sales collected in each month following the sale. Every company has a pattern in which its credit sales are paid. If the payment pattern changes, the company should review its credit policies.

One approach to determining this pattern is to analyse a company's sales and resulting collections on a monthly basis. That is, for each month's sales, the company computes the amount collected in the month of sale and each of the following months. By tracking these patterns over a period of time, the company can determine the average pattern of its collections using either a spreadsheet or regression analysis. For most companies, these patterns tend to be fairly stable over time – even as sales volumes fluctuate.



Forecasting Collections with Payment-Pattern Monitoring

Consider Korean Southern Manufacturing, which has determined that it collects, on average, 10% of credit sales in the month of sale, 60% in the month following the sale and the remaining 30% in the second month following the sale. Thus, if sales for the month of January were \$200,000,

the company would expect to collect \$20,000 in January, \$120,000 in February and the remaining \$60,000 in March. **Figure 21.8** shows an example of this approach, which can be extended to develop the cash receipts portion of the cash budget.





FIGURE 21.8 FORECAST COLLECTIONS FOR KOREAN SOUTHERN USING PAYMENT-PATTERN MONITORING

SALES FORECAST (\$)	FORECAST COLLECTIONS FOR KOREAN SOUTHERN				
	JANUARY	FEBRUARY	MARCH	APRIL	MAY
January: 200,000	\$20,000	\$120,000	\$ 60,000		
February: 150,000		15,000	90,000	\$ 45,000	
March: 300,000			30,000	180,000	\$ 90,000
April: 400,000				40,000	240,000
May: 250,000					25,000
Total projected collections for cash budget:			\$180,000	\$265,000	\$355,000

Notes: This table is created under the assumption that the company collects 10% of each month's sales in the month of sale, 60% in the month following sale and the remaining 30% in the second month following sale. The first column provides forecast sales for each month; the remaining columns total up the actual cash flows for each month. In a real-life application, the remaining collections from the prior year's last quarter would be included to complete the projected cash flows in January and February.

21.5c CASH APPLICATION

Cash application is the process through which a customer's payment is posted to its account and the outstanding invoices are cleared as paid. In most business-to-business environments, the typical application method is known as *open item*. In this approach, the company records each customer invoice in the A/R journal and later matches received payments to the invoices in order to clear them. This task is complicated by the usual practice of paying multiple invoices with a single cheque. Ideally, the remittance information accompanying the cheque should clearly indicate any adjustments, discounts or allowances taken related to each invoice in that remittance. Unfortunately, the remittance information is sometimes no more than barely legible copies of the invoices with handwritten notes on the adjustments stapled to the cheque. One of the critical tasks of the accounts receivable department, then, is to figure out what has been paid for so that the outstanding invoices can be closed out.

Some companies are able to use an alternative approach called *balance forward*. In this system, the company applies customer payments to outstanding balances and simply carries forward any unpaid amounts to the next billing period. Examples include credit card companies and those supplying public utility services such as water, electricity and gas, where the only remittance information needed is the customer's account number, the amount of payment and the date received. These systems generally utilise a scannable remittance document, which allows for automated capture of payment and account information. Automated processing reduces the costs of the cash application process.

cash application

The process through which a customer's payment is posted to its account and the outstanding invoices are cleared as paid

LO21.6

CONCEPT REVIEW QUESTIONS

- 14 What is a *collection policy*? What is the typical sequence of actions taken by a company when attempting to collect an overdue account?

- 15 Why should a company actively monitor the accounts receivable of its credit customers? Describe how each of the following credit monitoring techniques works: (a) average collection period; (b) ageing of accounts receivable; and (c) payment-pattern monitoring.

THINKING CAP QUESTION

- 4 What are some of the methods companies use to monitor their outstanding accounts receivable?

STUDY TOOLS

SUMMARY

- LO21.1** ■ The cash conversion cycle has three main components: (1) the average age of inventory (AAI); (2) the average collection period (ACP); and (3) the average payment period (APP). The operating cycle (OC) is the sum of the AAI and ACP. The cash conversion cycle (CCC) is OC minus APP. The length of the cash conversion cycle determines the amount of resources the company must invest in its operations.
- The financial manager's focus when managing the company's short-term activities is on shortening the cash conversion cycle. The basic strategies are to turn inventory quickly; collect accounts receivable quickly; pay accounts slowly; and manage mail, processing and clearing time efficiently.
- LO21.2** ■ When managing the company's short-term accounts, the financial manager must focus on competing costs. These cost trade-offs apply to managing cash and marketable securities; accounts receivable; inventory; and accounts payable, accruals and notes payable. The goal is to balance the cost trade-offs in a way that minimises the total cost of each of these accounts, thereby increasing net cash flows and value.
- LO21.3** ■ The large inventory investment made by most companies makes inventory a major concern of the financial manager, who must make sure that the amount of money tied up in inventory – raw materials, work in process and finished goods – is justified by the returns generated from such investment.
- Operations/production managers use a number of techniques to control inventory. These include the ABC system, the basic economic order quantity (EOQ) model, reorder points and safety stock, material requirements planning and the just-in-time (JIT) system. Financial managers tend to serve a watchdog role over these activities.
- LO21.4** ■ The objective for managing accounts receivable is to balance the competing interests of financial managers, who prefer to receive cash payments sooner, and those of sales personnel, who wish to use liberal credit terms to attract new customers. The key aspects of accounts receivable management include credit standards, credit terms, collection policy, credit monitoring and cash application.
- When analysing credit applicants, the company can gather information from both internal and external sources. Two popular approaches to granting credit to customers are the five Cs of credit and credit scoring (for high-volume-low-dollar requests), which is used to make relatively informed credit decisions quickly and inexpensively.
- Companies should perform a cost-benefit analysis of credit standards, credit terms and other accounts receivable changes to ensure that such policies are profitable. Key variables involved in such an analysis include the marginal profit contribution from sales, the cost of the marginal investment in accounts receivable and the cost of marginal bad debts. Cash discount decisions would also consider the cost of the cash discount.
- LO21.5** ■ The company's collection policy involves actions aimed at collecting delinquent accounts; these typically include reminders, form letters, telephone calls or personal visits. If these actions are ineffective, the company sends negative reports to credit bureaus and may turn over the account to a collection agency or an attorney.
- The three most popular techniques for credit monitoring are the average collection period, ageing of accounts receivable and payment-pattern monitoring. Companies typically make cash application of customer payments using either the open-item method or the balance-forward method.

IMPORTANT EQUATIONS

TABLE OF IMPORTANT EQUATIONS	
21.1	$CCC = OC - APP = AAI + ACP - APP$
21.2	$EOQ = \sqrt{\frac{2SO}{c}}$
21.3	Marginal profit from increased sales = $\lambda Sales \times CM$ = $\lambda Sales \times (Price - VC)$
21.4	Average investment in accounts receivable (AIAR) = $\frac{\text{Total variable cost of annual sales}}{\text{Turnover of accounts receivable}}$
21.5	Total variable cost of annual sales (TVC) = Annual unit sales \times Variable cost/unit
21.6	Turnover of accounts receivable (TOAR) = $\frac{365}{\text{Average collection period (ACP)}}$
21.7	Cost of marginal investment in accounts receivable = Marginal investment \times Required return = $(AIAR_{\text{proposed}} - AIAR_{\text{current}}) \times r$
21.8	Bad debt expense (BDE) = Annual sales (Sales) \times Bad debt expense rate (% BDE)
21.9	Cost of marginal bad debts = $BDE_{\text{proposed}} - BDE_{\text{current}}$
21.10	Net profit for the credit decision = (Marginal profit from increased sales) – (Cost of marginal investment in accounts receivable) – (Cost of marginal bad debts)
21.11	Average collection period = $\frac{\text{Accounts receivable}}{\text{Average sales per day}}$

SELF-TEST PROBLEMS

Answers to these 'Self-test problems' and the 'Concept review' questions throughout the chapter appear on the Student Companion Website (<http://login.cengagebrain.com>) or via your instructor.

ST21-1 Aztec Products wishes to evaluate its cash conversion cycle (CCC). One of the company's financial analysts has discovered that, on average, the company holds items in inventory for 65 days, pays its suppliers 35 days after purchase and collects its receivables after 55 days. The company's annual sales (all on credit) are about \$2.1 billion, its cost of goods sold represent about 67% of sales, and purchases represent about 40% of cost of goods sold. Assume a 365-day year.

- a What is Aztec Products', operating cycle (OC) and cash conversion cycle (CCC)?
- b How many dollars of resources does Aztec have invested in (1) inventory; (2) accounts receivable; (3) accounts payable; and (4) the total CCC?
- c If Aztec could shorten its cash conversion cycle by reducing its inventory holding period by five days, what effect would that have on its total resource investment found in part (b)?
- d If Aztec could shorten its CCC by five days, would it be best to reduce the inventory holding period, reduce the receivable collection period or extend the accounts payable period? Why?

ST21-2 Belton Company is considering relaxing its credit standards to boost its currently sagging sales. It expects its proposed relaxation will increase sales by 20% from the current annual level of \$10 million. The company's average collection period is expected to increase from 35 days to 50 days,

and bad debts are expected to increase from 2% of sales to 7% of sales as a result of relaxing the company's credit standards as proposed. The company's variable costs equal 60% of sales, and its fixed costs total \$2.5 million per year. Belton's opportunity cost is 16%. Assume a 365-day year.

- a What is Belton's contribution margin?
- b Calculate Belton's marginal profit from increased sales.
- c What is Belton's cost of the marginal investment in accounts receivable?
- d What is Belton's cost of marginal bad debts?
- e Use your findings in parts (b), (c) and (d) to determine the net profit (cost) of Belton's proposed relaxation of credit standards. Should it relax credit standards?

QUESTIONS

- Q21-1** Why would a company wish to minimise its cash conversion cycle (CCC) even though each of its components is important to the operation of the business? What key actions should the company pursue to achieve this objective?
- Q21-2** Describe the impact that aggressive action aimed at minimising a company's CCC would have on the following financial ratios: inventory turnover, average collection period and average payment period. What are the key constraints on aggressive pursuit of these strategies with regard to inventory, accounts receivable and accounts payable?
- Q21-3** What are the principal cost trade-offs that the financial manager must focus on when attempting to manage short-term accounts in a manner that minimises cash? Prepare a graph describing the general nature of these cost trade-offs and the optimal level of total cost.
- Q21-4** What is the financial manager's primary goal with regard to inventory management? How does this goal compare with the inventory goals of production and marketing?
- Q21-5** What trade-off confronts the financial manager with regard to inventory turnover, inventory cost and stockouts? In what way is inventory viewed as an investment?
- Q21-6** What role does the *ABC system* play in inventory control? What group of inventory items does the *EOQ model* focus on controlling? Describe the objective and cost trade-offs addressed by the EOQ model.
- Q21-7** Why would a company extend credit to its customers, given that such an action would lengthen its cash conversion cycle? What key cost trade-offs would be involved in this decision? What typically dictates the actual credit terms the company extends to its customers?
- Q21-8** Why is using the *five Cs* of credit appropriate for evaluating high-dollar credit requests but not high-volume-low-dollar requests (such as department-store credit cards)?
- Q21-9** What are the key variables to consider when evaluating potential changes in a company's credit standards? Why are only variable costs of sales included when estimating the company's average *investment in accounts receivable*?
- Q21-10** What is credit monitoring? How can each of the following techniques be used to monitor accounts receivable? What are their attributes?
 - a Average collection period
 - b Ageing of accounts receivable
 - c Payment-pattern monitoring

PROBLEMS

THE CASH CONVERSION CYCLE

- P21-1** Kiwi Products is concerned about managing its operating assets and liabilities efficiently. Inventories have an average age of 110 days, and accounts receivable have an average age of 50 days. Accounts payable are paid approximately 40 days after they arise. The company has annual sales of \$36 million, its cost of goods sold represents 75% of sales and its purchases represent 70% of cost of goods sold. Assume a 365-day year.
- a Calculate the company's operating cycle (OC).
 - b Calculate the company's cash conversion cycle (CCC).
 - c Calculate the amount of total resources Kiwi Products has invested in its CCC.
 - d Discuss how management might be able to reduce the amount of total resources invested in the CCC.
- P21-2** A company is weighing five plans that affect several current accounts. Given the five plans and their probable effects on inventory, receivables and payables (as shown in the following table), which plan would you favour? Explain.

PLAN	CHANGE		
	AVERAGE AGE OF INVENTORY (DAYS)	AVERAGE COLLECTION PERIOD (DAYS)	AVERAGE PAYMENT PERIOD (DAYS)
A	-35	+20	+10
B	+20	-15	+10
C	-10	5	0
D	-20	+15	+5
E	+15	-15	+20

- P21-3** Bradbury Corporation turns its inventory five times each year, has an average payment period of 25 days and has an average collection period of 32 days. The company's annual sales are \$3.6 billion, its cost of goods sold represents 80% of sales and its purchases represent 50% of cost of goods sold. Assume a 365-day year.
- a Calculate the company's operating cycle (OC) and cash conversion cycle (CCC).
 - b Calculate the total resources invested in the company's CCC.
 - c Assume that the company pays 18% to finance its resource investment. By how much could the company increase its annual profit if (1) it reduced its CCC by 12 days; and (2) this reduction were solely the result of extending its average payment period by 12 days?
 - d If part (c)'s 12-day reduction in the company's CCC could alternatively have been achieved by shortening either the average age of inventory or the average collection period by 12 days, would you have recommended one of those actions rather than the 12-day extension of the average payment period specified in part (c)? Which change would you recommend? Explain.

COST TRADE-OFFS IN SHORT-TERM FINANCIAL MANAGEMENT

- P21-4** Sheth & Sons is considering changing the pay period for its salaried management from every two weeks to monthly. The company's CFO, Ken Smart, believes that such action will free up cash that can be used elsewhere in the business, which currently faces a cash crunch. In order to avoid a strong negative response from the salaried managers, the company will simultaneously announce a new health plan that will lower managers' cost contributions without cutting benefits.

Ken's analysis indicates that the salaried managers' bimonthly payroll is \$1.8 million, and is expected to remain at that level for the foreseeable future. With the biweekly system, there were 2.2 pay periods in a month. Because the managers will be paid monthly, the monthly payroll will be about \$4.0 million ($2.2 \times \1.8 million). The annual cost to the company of the new health plan will be \$180,000. Ken believes that, because managers' salaries accrue at a constant rate over the pay period, the average salaries over the period can be estimated by dividing the total amount by 2. The company believes that it can earn 15% annually on any funds made available through the accrual of the managers' salaries.

- a How much additional financing will Sheth & Sons obtain as a result of switching the pay period for managers' salaries from every two weeks to monthly?
- b Should the company implement the proposed change in pay periods?

INVENTORY MANAGEMENT

P21-5 GEP Manufacturing is mulling over a plan to rent a proprietary inventory control system at an annual cost of \$4.5 million. The company predicts its sales will remain relatively stable at \$585 million and its gross profit margin will continue to be 28%. GEP expects that, as a result of the new inventory control system, its average age of inventory (AAI) will drop from its current level of 83 days to about 46 days. The company's required return on investments of similar risk is 12%. Assume a 365-day year.

- a Calculate GEP's average inventory investment both (1) currently; and (2) assuming it rents the inventory control system.
- b Use your findings in part (a) to determine the annual savings expected to result from the proposed inventory control system.
- c Based on your answer to part (b), would you recommend that GEP rent the inventory control system? Explain your recommendation.

P21-6 Iverson Industries uses 80,000 units of an A item of raw material inventory each year. The company maintains level production throughout the year, given the steady demand for its finished products. The raw material order cost is \$225 per order, and carrying costs are estimated to be \$10.50 per unit per year. The company wishes to maintain a safety stock of 10 days of inventory, and it takes five days for the company to receive an order once it is placed. Assume a 365-day year.

- a Calculate the economic order quantity (EOQ) for Iverson's raw material.
- b How large a *safety stock* (in units) of inventory should the company maintain?
- c What is Iverson's *reorder point* for this item of inventory? (Hint: be sure to include the safety stock.)

P21-7 Litespeed Products, from New Zealand, buys 200,000 electrical motors per year from a supplier that can fulfill orders within two days of receiving them. Litespeed transmits its orders to this supplier electronically so the lead time to receive orders is two days. Litespeed's order cost is about \$295 per order and its carrying cost is about \$37 per motor per year. The company maintains a safety stock of motors equal to six days of usage. Assume a 365-day year.

- a What is Litespeed's economic order quantity (EOQ) for the motors?
- b How large a safety stock (in units) of motors should Litespeed maintain?
- c What is Litespeed's *reorder point* for motors? (Hint: be sure to include the safety stock.)
- d If Litespeed has an opportunity to reduce either its order cost or its carrying cost by 10%, which of these would result in the lowest total cost at the associated new EOQ?

ACCOUNTS RECEIVABLE STANDARDS AND TERMS

- P21-8** International Oil Company (IOC) uses credit scoring to evaluate petrol credit card applications. The following table presents the financial and credit characteristics and weights (indicating the relative importance of each characteristic) used in the credit decision. The company's credit standards are to accept all applicants with credit scores of 80 or higher, to extend limited credit on a probationary basis to applicants with scores higher than 70 and lower than 80, and to reject all applicants with scores at or below 70.

FINANCIAL AND CREDIT CHARACTERISTICS	PREDETERMINED WEIGHT
Credit references	0.25
Education	0.10
Home ownership	0.10
Income range	0.15
Payment history	0.30
Years on job	0.10

The company needs to process three applications scored recently by one of its credit analysts. The scores for each of the applicants are summarised in the following table.

FINANCIAL AND CREDIT CHARACTERISTICS	APPLICANTS' SCORES (0-100)		
	X	Y	Z
Credit references	60	90	80
Education	75	80	80
Home ownership	100	90	60
Income range	70	70	80
Payment history	60	85	70
Years on job	50	60	90

- a** Use the data presented to find the credit score for each of the three applicants.
 - b** Recommend the action that the company should take for each of the three applicants.
- P21-9** Barans Company currently has an average collection period of 55 days and annual sales of \$1 billion. Assume a 365-day year.
- a** What is the company's average accounts receivable balance?
 - b** If the variable cost of each product is 65% of sales, what is the average *investment in accounts receivable*?
 - c** If the equal-risk opportunity cost of the investment in accounts receivable is 12%, what is the total annual cost of the resources invested in accounts receivable?
- P21-10** Davis Manufacturing Industries (DMI) produces and sells 20,000 units of a machine tool each year. All sales are on credit, and DMI charges all customers \$500 per unit. Variable costs are \$350 per unit, and DMI incurs \$2 million in fixed costs each year.
- DMI's top managers are evaluating a proposal from the company's CFO that the company relax its credit standards to increase its sales and profits. The CFO believes this change will increase unit sales by 4%. Currently, DMI's average collection period is 40 days, but the CFO expects this to increase to 60 days under the new policy. Bad debt expense is also expected to increase from 1% to 2.5% of annual sales. The company's board of directors has set a required return of 15% on investments with this level of risk. Assume a 365-day year.
- a** What is DMI's contribution margin? By how much will profits from increased sales change if DMI adopts the new credit standards?

- b** Under the current credit standards, what is DMI's average investment in accounts receivable? What would it be under the proposed credit standards? What is the cost of this additional investment?
- c** What is DMI's cost of marginal bad debts resulting from the relaxation of its credit standards?
- d** What is DMI's net profit (or loss) from adopting the new credit standards? Should DMI relax its credit standards?

P21-11 Webb Pty Ltd currently makes all sales on credit and offers no cash discounts. The company is considering a 2% cash discount for payments within 10 days. The company's current average collection period is 65 days, sales are 400,000 units, selling price is \$50 per unit and variable cost per unit is \$40. The company expects that the changes in credit terms will result in a sales increase to 410,000 units, that 75% of the purchases will be paid for at the discount and that the average collection period will fall to 45 days. Bad debts are expected to drop from 1.0% to 0.9% of sales. If Webb's required rate of return on investments of similar risk is 25%, should the company offer the proposed discount? Assume a 365-day year.

P21-12 Microboard, a major Chinese computer chip manufacturer, is contemplating lengthening its credit period from net 30 days to net 50 days. At present, its average collection period is 40 days; the company's CFO believes that, with the proposed new credit period, the average collection period will be 65 days. The company's sales are (in Australian dollars) \$900 million, but the CFO believes that the new credit terms will increase sales to \$980 million. At the current \$900 million sales level, the company's total variable costs are \$630 million. The company's CFO estimates that, with the proposed new credit terms, bad debt expenses will increase from the current level of 1.5% of sales to 2.0% of sales. The CFO also believes that the increased sales volume and accompanying receivables will require the company to add more facilities and personnel to its credit and collections department. The annual cost of the expanded credit operations resulting from the proposed new credit period is estimated to be \$10 million. The company's required return on similar-risk investments is 18%. Assuming a 365-day year, evaluate the economics of Microboard's proposed lengthening of the credit period and then make a recommendation to the company's management.

COLLECTING, MONITORING AND APPLYING CASH TO RECEIVABLES

P21-13 United Worldwide's accounts receivable totalled \$1.75 million on 31 August 2020. The table below gives a breakdown of these outstanding accounts on the basis of the month of the initial credit sale. The company extends credit terms of *net 30, EOM* to its credit customers.

- a** Prepare an *ageing schedule* for United Worldwide's 31 August 2020, accounts receivable balance.
- b** Using your findings in part (a), evaluate the company's credit and collection activities.
- c** What are some probable causes of the situation discussed in part (b)?

MONTH OF CREDIT SALE	ACCOUNTS RECEIVABLE
August 2020	\$640,000
July 2020	500,000
June 2020	164,000
May 2020	390,000
April 2020 or before	56,000
Total (31 August 2020)	\$1,750,000

P21-14 Big Air Board Company, an Australian manufacturer and distributor of both surfboards and snowboards, is in a seasonal business. Although surfboard sales are only mildly seasonal, the snowboard sales are driven by peak demand in the second and third calendar quarters of each

year. We are now in early July 2020. The following table gives the company's monthly sales for the immediate past quarter (April–June 2020) and its forecast monthly sales for the coming year (year 2020–21).

The company extends credit terms of *2/10 net 30, EOM* to all customers. It collects 98% of its receivables and typically writes off the other 2% as bad debts. Big Air Board's historic collection pattern, which is expected to continue through 2020–21, is 5% collected in the month of the sale, 65% collected in the first month following the sale, and 28% collected in the second month following the sale. Using the data given, calculate the *payment pattern* of Big Air Board's accounts receivable. Comment on the company's monthly collections during year 2020–21.

MONTH	SALES (\$ IN MILLIONS)
HISTORIC	
April 2020	\$3.7
May 2020	3.9
June 2020	4.3
FORECAST	
July 2020	\$3.8
August 2020	2.6
September 2020	2.2
October 2020	1.6
November 2020	1.8
December 2020	1.9
January 2021	2.0
February 2021	2.2
March 2021	2.4
April 2021	4.1
May 2021	4.6
June 2021	5.1

CASE STUDY

CASH CONVERSION, INVENTORY AND RECEIVABLES MANAGEMENT

Upon graduation, you receive a job offer from Pronto Manufacturing. In this position, you will be responsible for implementing the policy and management of cash conversion, inventory and receivables. To get ready for the start of this job, you decide to review the following topics.

ASSIGNMENT

- 1 What is the cash conversion cycle, and what is the difference between it and the operating cycle?

- 2 What are some ways of shortening the cash conversion cycle?
- 3 Discuss techniques for controlling inventory.
- 4 What aspects must managers consider when deciding on a trade credit policy for the company?
- 5 Describe the five Cs of credit.
- 6 What factors should managers consider when determining the company's *collection policy*?

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CASH, PAYABLES AND LIQUIDITY MANAGEMENT*

WHAT COMPANIES DO

LESSONS IN E-INVOICING

In the rapidly changing world of cash management, the concept of electronic invoicing or e-invoicing – a method discussed in this chapter – is growing by continental leaps. The article below observes how Asia may be able to learn from the recent South American experience of introducing e-invoicing.

In a survey conducted by ApexPeak, Gosocket Corp and Invoiceware International, [sic] were asked to share what Latin America can teach South-east Asian nations about moving toward mandatory ... e-invoicing.

WHAT DID LATIN AMERICA DO TO PREPARE FOR MANDATORY E-INVOICING?

Like paper invoices, e-invoices must be legislated. This requires legislators to think differently. The lawmakers need to understand technology such as XML and develop a standard format. The XML format adopted by each Latin American country is not identical.

'A new set of rules is required for e-invoicing. Rules regulate the e-invoicing process, such as the use of digital certificates in e-invoices and the way e-invoices are validated with the tax authorities,' said Mario Fernández, chief executive officer of Gosocket Corp.

Each South-east Asian nation needs to design a business process and put in place the technology to enable the process. There are several models available; each of the Latin American countries designed different systems. The systems in Chile and Brazil were designed with several shared features. A key difference between Chile and Brazil, however, is what happens once an invoice is submitted to the tax authority (SII). Mexico is different: It designed a system that outsources tasks to third parties called Authorized Certification Providers (Proveedores Autorizados de Certificación or PAC).



* Professor Dubos J. Masson, CCM, CertCM, of Pepperdine University and The Resource Alliance, assisted in the preparation of this chapter for the US edition.



Irrespective of how South-east Asian nations choose to design the process, the tax authority plays a pivotal role. The tax authority needs to sign, time-stamp and mark the e-invoice with a unique authorisation code, then send the e-invoice back to the supplier, all in a matter of seconds.

WHAT IS THE TIMEFRAME FOR MANDATING E-INVOICING?

E-invoicing does not occur at the snap of a finger ... China ... and Vietnam have reportedly conducted pilot programs to examine the effects of e-invoicing on both government and business.

'Almost all Latin American countries decided to implement a pilot program first. Government invites a select group of companies to participate and provide feedback. A pilot can take between 6 and 9 months, with the aim of creating a solid regulation that can be implemented for all companies. Some Latin American countries used advisors to assist in creating new regulations,' says Mario Fernández.

The second phase is a period where companies can voluntarily register e-invoices, followed by the last and final phase, where the majority of the businesses are required to register e-invoices. There is normally an amnesty period leading up to the date e-invoicing becomes mandatory.

According to Fernández, 'It can take between 2 and 5 years, during which time any company can implement e-invoicing, but it is not mandatory. And, after that, some Latin American countries have implemented a mandatory process.'

WHAT ARE THE CONSIDERATIONS WHEN TRANSITIONING TO E-INVOICING?

The devil is in the detail. ... There are many stakeholders to consider, and the timing of

each task is critical. The key is not to tackle too much, too soon.

Suppliers before buyers. It has been easier to mandate e-invoicing for small companies, as they have fewer processes and procedures. A portal and free hotline are good ways to provide education on e-invoicing. The larger companies, which buy services from suppliers, are better dealt with later, as these stakeholders require more lead-time to comply.

Allow exemptions. It is common for countries mandating e-invoicing to allow companies below a certain threshold of annual revenue to be exempt from registering e-invoices. Chile and Mexico have set thresholds, and Argentina has industries that are exempt.

Mandate fiscal reporting. Multinational corporations operating in Mexico [have been] required to file accounting information with the tax authority [since] 2015. The information required includes the chart of accounts, as well as monthly transaction details, including identification for third-parties involved. By tying e-invoicing and reporting together, companies are effecting a real-time audit.

Logistics last. An e-invoice can behave as the delivery docket. That means that authorities can seize goods immediately that are deemed smuggled.

What Latin America Can Teach Southeast Asia About E-invoicing – Part 3, by ApexPeak, Feb 26, 2015, Spend Matters.

LEARNING OBJECTIVES

After studying this chapter, you should be able to:

- LO22.1 understand float, its components and the financial manager's responsibilities with regard to cash position management
- LO22.2 review the objective of cash collections, the key types of collection systems and the role of lockbox systems in cash collection, and describe the role of cash concentration
- LO22.3 explain accounts payable management with regard to the average payment
- LO22.4 period and the effect of cash discounts on timing the payment of accounts payable, as well as discuss popular disbursement products and methods
- LO22.4 describe popular investment vehicles for short-term surpluses and the key sources of borrowing used to meet short-term deficits.

Chapter 21 described the operating and cash conversion cycles and then focused on management of the two key components of the operating cycle: inventory and accounts receivable. Here we shift focus to cash, accounts payable and liquidity. Clearly, cash is the lifeblood of the company. Thus it is a primary focus of the financial manager, who must conserve it by gathering cash receipts and making cash disbursements in a cost-effective manner. Additionally, the financial manager conserves cash by using efficient mechanisms for transferring it within and between the company's operating units. As noted in Chapter 18, short-term financing decisions should result from an analysis of cost trade-offs with the goal of minimising total costs and increasing shareholder value.

Accounts payable are also an important component of the cash conversion cycle. The company must manage them in a way that lengthens the payment period while preserving the company's credit reputation. This strategy will help shorten the cash conversion cycle and reduce the company's resource requirements. The financial manager also will use other strategies and tools to slow down disbursements.

Of course, these cash management strategies are based on the company's ability to maintain adequate liquidity to preserve the company's solvency. Specifically, the company must be able to both earn a positive return on idle excess cash balances and obtain low-cost financing for meeting unexpected needs and seasonal cash shortages. This important activity is commonly called **liquidity management**.

This chapter emphasises the key procedures for managing cash, payables and liquidity. We begin with a discussion of cash management that focuses on *float* in the cash collection and payment system and on the principles of managing the company's cash position. Next, we consider cash collection, placing emphasis on the types of collection systems, lockbox systems, cash concentration and various mechanisms for funds transfer. Then we review some key aspects of accounts payable and disbursements: the accounts payable process, cash discounts, disbursement products and methods, and developments in accounts payable and disbursements. Finally, we consider the company's use of short-term investing and borrowing to maintain adequate liquidity.

liquidity management
Activities aimed at both earning a positive return on idle excess cash balances and obtaining low-cost financing for meeting unexpected needs and seasonal cash shortages

cash manager
A financial specialist responsible for managing the cash flow time line related to collection, concentration and disbursement of the company's funds

22.1 CASH MANAGEMENT

Many companies employ financial specialists known as **cash managers**. One of their primary roles is to manage the cash flow time line related to collection, concentration and disbursement of the company's funds. The cash manager's job typically starts when a customer (the payer) initiates payment to the company (the payee) in any format (cash, cheque or electronic). Historically, most business-to-business payments were

made by sending a cheque in the mail, so collection processes tried to reduce delays in mail, processing and cheque collection. As we shall see, with greater use of electronic clearance of payments, the speed of collections has increased. Cash management still, however, matters.

The cash manager is also responsible for assembling or *concentrating* cash from remote collection points into a central account and for initiating payments from the company to its suppliers. The final stage of this process usually involves reconciling the company's various bank accounts and managing all the banking relationships. Any delay in timing on either the collection or disbursement side is generally referred to as *float*.

22.1a FLOAT

Float refers to funds that have been sent by the payer but are not yet usable funds to the payee. Float is important in the cash conversion cycle because its presence increases both the company's average collection period and its average payment period. The primary role of the cash manager on the collections side is to *minimise collection float* wherever possible. On the payments side, trying to *maximise disbursement float* is a common practice that raises an important question: is it ethical to intentionally pay a supplier after the term within which the company agreed to pay? This topic will be discussed in greater detail later in the chapter.

float
Funds that have been sent by the payer but are not yet usable funds to the payee

We can view float from either the receiving party's (the payee's) perspective or the paying party's (the payer's) perspective. The following list points out that mail float and processing float are generally the same from both perspectives, though the final outcomes are different. The four components of float are defined as follows:

- 1 **Mail float** is the time delay between when payment is placed in the mail and when payment is received.
- 2 **Processing float** is the time between receipt of the payment and its deposit into the company's account.
- 3 **Availability float** is the time between deposit of the cheque and availability of the funds to the company.
- 4 **Clearing float** is the time between deposit of the cheque and presentation of the cheque back to the bank on which it is drawn.

mail float
The time delay between when payment is placed in the mail and when payment is received

processing float
The time that elapses between the receipt of a payment by a company and its deposit into the company's account

availability float
The time between deposit of a cheque and availability of the funds to a company

clearing float
The time between deposit of the cheque and presentation of the cheque back to the bank on which it is drawn

In addition to managing the collection, concentration and disbursement of funds, the cash manager is also responsible for the following duties:

- *financial relationships*: managing relationships with banks and other providers of cash management services
- *cash flow forecasting*: determining future cash flows to predict surpluses or deficits
- *investing and borrowing*: managing the investing of short-term surpluses or borrowing for short-term deficits
- *information management*: developing and maintaining information systems to gather and analyse cash management data.

Cash management typically resides in the company's treasury area, along with such functions as external financing and risk management. In smaller companies, accounting or clerical staff may perform the cash management function. The staff's specific cash management tasks related to collection, concentration and disbursement of funds are described in the following sections.

cash position management
The primary cash management tasks that are performed daily and involve the collection, concentration and disbursement of company funds

22.1b CASH POSITION MANAGEMENT

On a daily basis, the primary cash management tasks related to the collection, concentration and disbursement of funds for the company are generally referred to as **cash position management**. That is, each day the cash manager must determine the amount of funds to be collected, move balances to the appropriate accounts and

fund the projected disbursements. The cash position can be managed with some degree of accuracy many weeks into the future, given proper forecasting of cash flows. Most of the cash management products and services offered by banks and other financial institutions are associated with some part of this process.

At the end of the day, the cash manager must determine: (1) whether the company will have a surplus or a deficit of funds in each cheque account; and (2) how to manage the difference. If the company has a *surplus* of funds, then the money may be placed in some type of short-term investment, such as an interest-bearing account at its bank or a portfolio of marketable securities. However, if the company has a *deficit*, then the cash manager must arrange either to transfer funds from investment accounts or to draw on a short-term credit agreement with the company's bank. The management of these short-term investing and borrowing arrangements is typically the responsibility of the cash manager.

target cash balance
A cash total that is set for cheque accounts to avoid engaging in cash position management

Many companies, especially smaller ones, do not actively engage in cash position management, but rather set a **target cash balance** for their cheque accounts. The primary approach to determining these target cash balances is based on transaction requirements or a minimum balance set by the bank. The transaction requirement is determined simply by how much cash a company needs to fund its day-to-day operations. Companies with a high volume of daily inflows and outflows will find that some balances remain in non-interest-bearing cheque accounts, regardless of forecasting ability. Many banks also require a specified minimum balance in customer cheque accounts. For smaller companies and banks, this minimum balance is designed to provide adequate compensation to the bank for the services it provides. For larger companies, most banks perform *account analysis*, which compares the value of the balances a company leaves on deposit to the value of the services it receives from the bank.

FINANCE IN THE REAL WORLD



HOW COMPANIES DETERMINE THE AMOUNT OF EXCESS CASH TO HOLD

Financial researchers have developed a clear picture of the working capital practices of US companies and, to a lesser extent, Australian companies. Less is known about how companies headquartered in other major countries manage their liquidity needs. A unique international survey from 2010 enriched our understanding of the factors that have an impact on how much cash and marketable securities international companies hold. Professors Karl Lins, Henri Servaes and Peter Tufano surveyed companies in 29 countries, and the results highlighted two important points. First, they suggested that international companies pursue liquidity management policies that are generally similar to those followed by US companies. Second, they revealed that corporations everywhere made an important distinction between cash and marketable securities held for operational purposes versus cash and liquid assets held for non-operational and safety reasons.

The following table summarises managerial responses about cash holdings. It describes the importance of various factors in determining how much excess cash – defined as holdings of cash and marketable securities in excess of operating needs – managers choose to hold. For the full sample of companies in the research, total cash holdings amounted to 9% of the book value of assets, but cash held for non-operational purposes amounted to only 40% of total cash holdings. The most important reason managers gave for holding excess cash was to serve as a buffer for possible future cash flow shortfalls, while the need to maintain adequate cash to ensure efficient running of the company was the second-most frequently mentioned reason. Managers were also concerned about ensuring the cost and potential availability of funds in case the company needed to obtain working capital quickly or during an emergency.



SURVEY RESPONSES TO QUESTIONS ABOUT NON-OPERATIONAL CASH

'In deciding how much excess cash to hold, how important are the following factors?'

FACTOR	PERCENTAGE RESPONDING 'IMPORTANT' OR 'VERY IMPORTANT'
Cash as a buffer against future cash flow shortfalls	47
Minimal cash ensures efficient running of the company	35
Difference between interest rate on cash and interest rate on debt	35
Time it takes to raise money when funds are needed	31
Level of uncertainty about future investment opportunities	31
Ability to issue debt at a 'fair' price when funds are needed	30
Difference between interest rate on cash and cost of capital	26
Size of the undrawn credit facility	23
Transactions costs of raising funds	22

Source: Karl V Lins, Henri Servaes and Peter Tufano, 'What Drives Corporate Liquidity? An International Survey of Cash Holdings and Lines of Credit,' Journal of Financial Economics, Volume 98, 1 October 2010, pp. 160–76.

A **bank account analysis statement** is a report (usually monthly) provided to a bank's commercial customers that specifies all services provided, including items processed and any charges assessed. It is basically a detailed invoice that lists all cheques cleared, account charges, lockbox charges, electronic transactions and so on. The statement also lists all balances held by the company at the bank, and includes a computation of the credit earned by the company on those balances. Most companies on account analysis will receive some credit for the transaction balances they leave in the account, and typically the credit will only partially offset the service fees. The balance of fees owed the bank will then be deducted as a service charge for the month in question.

bank account analysis statement

A regular report (usually monthly) provided to a bank's commercial customers that specifies all services provided, including items processed and any charges assessed

LO22.1

CONCEPT REVIEW QUESTIONS

- 1 What is *float*? What are its four components? What is the difference between *availability float* and *clearing float*?
- 2 What activities are involved in *cash position management*? How does the cash manager monitor and take actions with regard to the end-of-day cheque account balances?
- 3 How do smaller companies that do not engage in cash position management typically set their *target cash balance*? What is typically detailed in a *bank account analysis statement*?

THINKING CAP QUESTIONS

- 1 What are the cash manager's goals with regard to float when managing a company's cash receipts and cash disbursements?
- 2 Why might companies use cash at all for any of their payments?

LO22.2

22.2 COLLECTIONS

The primary objective of the collections process is to collect funds quickly and efficiently from customers and others. This process includes gathering and disseminating information related to the collections, and in some cases the information may be as important as the money itself. One key requirement is ensuring that the accounts receivable department has the remittance information needed to post receipts properly and update customer files. A secondary requirement is to provide audit trails for the company's internal and external auditors.

As discussed previously, a major delay in the collections process results from *collection float*, which is a function of the mail, processing and availability floats. The primary goal of collections is to reduce each of these float components as much as possible. Collection float is typically measured in *dollar-days*, or the number of dollars in the collection process multiplied by the number of days of float. For example, \$10 million of cheques with an average of five days of float would represent \$50 million dollar-days of float.

22.2a TYPES OF COLLECTION SYSTEMS

A company's collection system is primarily determined by the nature of its business. Many high-volume retail establishments, such as fast-food restaurants or convenience stores, receive the bulk of their payments in cash. Other types of retail operations, such as department and variety stores, collect most of their payments by credit card, debit card or cheque.

What can complicate the payment collection process is that one payment is often used to pay multiple invoices, and there may be adjustments or partial payments related to those invoices. For example, a single payment to a consulting firm for project work completed must then be split across several subcontractors and suppliers of materials. This makes the information collected by the cash manager of critical importance to the accounts receivable department. Collection systems must take into account the information management requirements related to the payment application process.

Some types of time-critical transactions, such as real-estate closings or high-dollar payments, may be received via wire transfers with same-day value. Other forms of high-volume, low-dollar receipts, especially those of a recurring nature (such as utility payments and insurance premiums), may come through the *automated clearinghouse (ACH) system*, which generally offers next-day settlement with fairly low transaction costs. The important thing to understand is that the type of collection system used by a company is usually a function of both the type of business and the customary methods of payment used by that business.

Most developed countries run organisations to support the domestic payments systems. For example, Australian businesses operate their payments mostly through the **Australian Payments Clearing Association (APCA)**. This is the self-regulatory body for Australia's payments industry. APCA was established in 1992 to manage and develop regulations, procedures, policies and standards governing payments clearing and settlement within Australia. In this role, APCA oversees five clearing systems covering cheques, direct debits and direct credits, aspects of electronic funds transfer at point of sale (EFTPOS) and automatic teller machine (ATM) transactions, high value payments and bulk cash exchanges between financial institutions.

In February 2010, Australian industry formally established a new communication 'network cloud', called the Community of Interest Network (COIN), to facilitate the exchange of low-value payments. APCA administers the COIN infrastructure system that provides network services and connectivity for retail payments. Together, these systems represent around 99% of all Australian non-cash payments.¹

The backbone of the national payments system is information management – that is, the company needs to know where the money is before it can make use of it. Most large retailers, such as Coles, David Jones or

Australian Payments Clearing Association (APCA)

A self-regulating body that oversees most of the payments systems for business in Australia

¹ APCA 2015 Annual Review. <http://www.apca.com.au/docs/default-source/annual-reviews/apca-annual-review-2015.pdf>. Accessed 4 January 2016.

Woolworths, utilise *point-of-sale (POS) information systems* that allow them to know, on a daily basis, how much money has been collected, in what formats (cash, cheque, debit card or credit card) it was received and how much of it was deposited at the local bank. The task of moving this money into a ‘concentration’ account is discussed in the section on cash concentration.

Mail-Based Collection System

In a **mail-based collection system**, the company typically has one or more collection points that process the incoming mail payments. These processing centres receive the mail payments, open the envelopes, separate the cheque from the remittance information, prepare the cheque for deposit and send the remittance information to the accounts receivable department for application of payment. Companies that utilise standardised, scannable remittance information, such as utilities and credit card processors, can often process the payments they receive quickly and efficiently using automated equipment. Although many high-volume processors can justify the cost of the equipment needed for automated processing, other companies may find that using a *lockbox* (discussed later) is more cost-effective. However, recent developments in payment processing equipment have made automated processing available to smaller companies at a reasonable price.

mail-based collection system

Collection system in which processing centres receive the incoming mail payments, separate cheques from remittance information, prepare cheques for deposit and send remittance information to the accounts receivable department

Electronic Systems

Electronic collection systems, first patented in 2000, continue to develop rapidly as both businesses and consumers better understand their benefits. Key developments in this area are **electronic invoice presentment and payment (EIPP)** or e-invoicing (introduced in the chapter-opening ‘What Companies Do’ box) in the business-to-business market, and **electronic bill presentment and payment (EBPP)** in the business-to-consumer market. In EIPP and EBPP systems, customers are sent electronic bills that they can pay electronically. Many of these systems are internet-based, and are gradually gaining acceptance in the marketplace. The most successful of the consumer systems offer a consolidator-type service, where customers can go to one site to view and pay all their bills rather than visiting individual billing sites. Electronic payment systems have also gained acceptance in the business-to-business environment.

electronic invoice presentment and payment (EIPP)

A collection system in business-to-business transactions, under which business customers are sent bills in an electronic format and can pay them via electronic means

electronic bill presentment and payment (EBPP)

A collection system in the business-to-consumer market, under which consumers are sent bills in an electronic format and can pay them via electronic means

Some of the primary advantages of using a system such as the EIPP for business-to-business payments are: (1) reduced float to the receiving party; (2) lower costs, both of receivables processing for the receiver and of payment initiation and reconciliation costs for the payer; and (3) better forecasting for both parties. Though there may be a need to negotiate payment dates and possible discounts for earlier payment, companies that have implemented electronic payments report significant overall savings as a result.

The future for electronic collections systems appears to look good, as more and more companies are implementing some form of electronic invoicing and payment. Many of these systems are implemented by large companies in order to streamline the billing of their (often smaller) customers and automate the payment process. Companies that must pay a large number of smaller suppliers are also implementing electronic systems as a means to reduce their overall costs of running accounts payable and disbursement systems.

22.2b LOCKBOX SYSTEMS

A **lockbox system** is a popular technique for speeding up collections because it affects three components of float. It works like this: instead of mailing payments to the company, customers mail payments to a post-office box, which is emptied regularly by the company’s bank. The bank processes each payment and deposits the payments into the company’s account. The bank sends (or transmits electronically) deposit slips and enclosures to the company so the company can properly credit its customers’ accounts.

lockbox system

A technique for speeding up collections that affects all three components of float. Customers mail payments to a post office box, which is emptied regularly by the company’s bank, which processes and deposits the payments

Lockboxes are typically dispersed geographically to match the locations of the company’s customers. The main banks in Australia offer lockbox services for their customers throughout the country. As a result of being near a company’s customers, lockboxes reduce mail time and clearing time. They reduce processing

time to nearly zero because the bank deposits payments before the company processes them. Obviously, a lockbox system reduces collection float, but not without a cost. Therefore, a company must perform a cost-benefit analysis to determine whether a lockbox system should be implemented. **Equation 22.1** presents a simple formula for the cost-benefit analysis of a lockbox system:

$$(Eq. 22.1) \quad \text{Net benefit or cost of lockbox} = (FVR \times r_a) - LC$$

where FVR = Float value reduction in dollars

r_a = Cost of capital

LC = Lockbox cost (annual operating cost of the system)

Thus, if the return on the float reduction exceeds the cost of the lockbox system, the company should implement the lockbox system.



Valuing a Lockbox System

Consider Reese Industries, from Chapter 21, which has \$5 billion in annual sales and eight days of customer collection float in its cash conversion cycle. Reese wants to determine if it should implement a lockbox system that reduces customer collection float to five days. The reduction in float value from decreasing customer float from eight days to five days is \$41.1 million

$[\$5 \text{ billion} \times (3 \text{ days} \div 365 \text{ days})]$. Reese has a cost of capital of 13.5% per year. Thus, the value to Reese of reducing customer float by three days is \$5.55 million ($0.135 \times \41.1 million). If the annual cost of the lockbox system is less than \$5.55 million, it would be beneficial to implement the system.

Although large companies whose customers are geographically dispersed commonly use a lockbox system, small companies may also find a lockbox system advantageous. The benefit to small companies often comes primarily from transferring the processing of payments to the bank.

Lockboxes are typically classified as either retail or wholesale. A *retail lockbox* uses standardised, scannable remittance documents in order to highly automate the processing of incoming payments. These types of systems are characterised by high volumes of low-dollar payments, and the key issue is processing the payments at a minimum cost per dollar collected. Given the low-dollar amounts of these payments, availability float is generally not a big issue.

Wholesale lockboxes, such as those provided by HSBC in Australia, primarily process high-dollar payments with non-standard remittance information. The key issues in this type of system are: (1) reducing the availability float related to the large cheques; and (2) quickly forwarding the remittance information to the accounts receivable (A/R) department for application of payment. The current practice for wholesale lockboxes is to make extensive use of imaging technology to relay, quickly and accurately, copies of the remittance information back to the A/R department.

22.2c CASH CONCENTRATION

cash concentration

The process of bringing the lockbox and other deposits together into one bank, often called the *concentration bank*

In the previous section, lockbox systems were discussed as a means to reduce collection float. With a lockbox system, the company has deposits in each lockbox bank. **Cash concentration** is the process of bringing the lockbox and other deposits together into one bank, commonly called the *concentration bank*.

Cash concentration has three main advantages. First, it creates a large pool of funds for use in making short-term cash investments. Because there is a fixed-cost component in the transaction cost associated with

making marketable security investments, investing a single pool of funds reduces the company's transaction costs. The larger investment pool also allows the company to choose from a larger variety of marketable securities. Second, concentrating the company's cash in one account improves the tracking and internal control of that cash. Third, having one concentration bank allows the company to implement more effective payment strategies that preserve its invested balances for as long as possible. As bank branch networks continue to expand, more and more companies are choosing banks with large geographic coverage that can simplify concentration by using deposit reconciliation services.

The configuration of a company's cash concentration system is generally a function of the collection system. For example, a company with several collection centres or lockboxes will typically use wire transfers to quickly move large balances from a limited number of collection points into its concentration account. The type of disbursement system (discussed in a later section) is also an important consideration because these accounts must be funded either by internal transfer or wire transfer.

22.2d FUNDS TRANSFER MECHANISMS

There are two commonly used mechanisms for transferring cash from the depository banks to the concentration bank: automated clearinghouse debit transfers and wire transfers.

Automated Clearinghouse Debit Transfers

The first mechanism is an **automated clearinghouse (ACH) debit transfer**, which is a pre-authorised electronic withdrawal from the payer's account, and is generally known within the cash management field as an **electronic depository transfer (EDT)**.

The ACH, a computerised clearing facility, makes a paperless transfer of funds between the payer and payee banks. An ACH settles accounts among participating banks; individual accounts are settled by adjustments to the respective bank balances. ACH transfers of this type generally clear in one day.

For cash concentration, an ACH debit is initiated by the concentration bank and sent to each deposit bank, with funds then moving from the deposit bank into the concentration bank. These transfers can be automatically created from deposit information, and can then be centrally initiated from the company's headquarters through its concentration bank. A large nationwide retailer such as Myer can easily concentrate deposits from many small deposit banks into its concentration account by using the daily deposit information gathered from its stores' point-of-sale systems.

automated clearinghouse (ACH) debit transfer

A pre-authorised electronic withdrawal from the payer's account

electronic depository transfer (EDT)

The term used in the cash management trade for an automated clearinghouse (ACH) debit transfer

Wire Transfers

The second funds transfer mechanism is a **wire transfer**. For investors and businesses in most developed economies, the transfer of funds 'by wire' is effectively an electronic movement of funds from one bank account to another, through a system of 'correspondent banks' that attach a fee for the service of transfer. The wire transfer is a communication from bank to bank that removes funds from the payer's bank and deposits funds in the payee's bank on a same-day basis.

wire transfer

An electronic communication that removes funds from the payer's bank and deposits funds in the payee's bank on a same-day basis via bookkeeping entries

Wire transfers may eliminate mail float and clearing float, and provide processing float reductions as well. For cash concentration, the company moves funds using a wire transfer from each deposit account to its concentration account. Wire transfers are a substitute for ACH debit transfers, but they are generally much more expensive: both the sending and receiving banks charge significant fees for the transaction. Wire transfers are usually used only for high-dollar transfers, where the investment value of the funds outweighs the cost of the transfer.

Selecting the Best Transfer Mechanism

The company must balance the benefits and costs of concentrating cash to determine the type and timing of transfers from its lockbox accounts to its concentration account. The transfer mechanism selected should be

the one that is most profitable (that is, profit per period equals earnings on the increased funds' availability minus the cost of the transfer system). In general practice, most companies use wire transfers for large transfers of funds from lockbox deposits, and use EDTs for high-volume, low-dollar transfers from small deposit banks.

EXAMPLE

Comparing Wire Transfers and EDTs

To demonstrate alternative transfer methods, we consider Wagga Wagga Manufacturing (WWM), which needs to transfer \$120,000 from its deposit account to its concentration account. It has two choices: an electronic depository transfer (EDT) with a total cost of \$1, or a wire transfer with a total cost of \$15. Because this would be a midweek transfer, the funds would be accelerated by one day using a wire transfer. (Note: a Friday transfer would represent three days of funds acceleration.) The company's opportunity cost for these funds is 7%.

In this example, the value of moving the funds via wire transfer is the one day of interest that could be earned if the funds arrived in the concentration account today rather than tomorrow. This amount is calculated to be

\$23.01 ($0.07 \div 365 \times \$120,000$). Because the differential cost of the wire transfer versus an EDT is \$14 ($\$15 - \1), the company should use a wire in this case: it would result in a net benefit of \$9.01 ($\$23.01 - \14.00).

Given the opportunity cost and transfer fees, we could also determine the minimum amount for which a wire transfer would be beneficial. Take the differential cost of a wire (\$14.00) and divide by the daily interest rate ($0.07 \div 365$); in this case, the minimum transfer amount would be \$73,000 [$\$14.00 \div (0.07 \div 365)$]. If WWM were transferring funds on a Friday and thus could earn three days of interest, then the minimum transfer amount would be one-third of the standard amount, or \$24,333 ($\$73,000 \div 3$).

LO22.2

CONCEPT REVIEW QUESTIONS

- 4 What is the company's objective with regard to *collection float*? What are the common types of collection systems?
- 5 What are the benefits of using a *lockbox system*? How does it work? How can the company assess the economics of a lockbox system?
- 6 Why do companies employ *cash concentration* techniques? What are some of the popular transfer mechanisms used by companies to move funds from depository banks to their concentration banks?
- 7 How can the cash manager model the benefits and costs of various funds transfer mechanisms to assess their economics? How can this analysis be used to determine the *minimum transfer amount*?

THINKING CAP QUESTION

- 3 What are some of the advantages to a company of using cash concentration procedures?

LO22.3

22.3 ACCOUNTS PAYABLE AND DISBURSEMENTS

The final component of the cash conversion cycle is the *average payment period (APP)*, which has two parts: (1) the time from the purchase of raw materials until the company places the payment in the mail; and (2) payment float time (disbursement float). The payment float is the time it takes after the company places its payment in the mail until the supplier has withdrawn funds from the company's account.

22.3a OVERVIEW OF THE ACCOUNTS PAYABLE PROCESS

Section 22.1 addressed issues related to payment float time. In this section, we discuss the management of the time that elapses between the purchase of raw materials and mailing the payment to the supplier. This activity is called **accounts payable management**.

Purpose of the Accounts Payable Function

The primary purpose of the accounts payable (A/P) function is to examine all incoming invoices and determine the proper amount to be paid. As part of this process, the cash manager matches the invoice to both the purchase order and the receiving information to ensure that the goods or services were ordered by an authorised person, and that they were actually received. The accounts payable clerk may make adjustments to the invoiced amount for price or quantity differences. Companies usually pay multiple invoices with a single cheque. A company has the right to make full use of any credit period offered, but intentionally delaying payments or increasing disbursement float is an unethical cash management practice. Once payment has been authorised (sometimes referred to as 'vouchering'), the cash manager is often responsible for the actual payment itself, either managing the preparation and mailing of cheques or initiating the electronic transfer of funds.

accounts payable management

A short-term financing activity that involves managing the time that elapses between the purchase of raw materials and mailing the payment to the supplier

Types of Payment Systems

The other issue involved with managing disbursements is the choice of a centralised or decentralised payables and payments system. In a *centralised system*, all invoices are sent to a central accounts payable department, where payment is authorised and cheques or other forms of payment are initiated. Centralised systems offer many advantages, including easier concentration of funds, improved access to cash position information, better control and reduced transaction and administrative costs. There are, however, several problems with centralised payables, such as slow payment times (which could damage relationships with vendors or cause missed opportunities for cash discounts) and the need to coordinate between central payables and field offices or managers to resolve any disputes.

Some companies utilise a more *decentralised system* to the payables and disbursement process in which payments are authorised and, in some cases, initiated at the local level. Although this approach generally helps to improve relationships with vendors and enhance local management autonomy, it makes it harder to concentrate funds and obtain daily cash position information, and it increases the chance of unauthorised disbursements.

FINANCE IN THE REAL WORLD



FINDING CREDIT CARD FINANCE CHARGES AND MINIMUM PAYMENTS

Very few bank credit card users understand how the card issuer determines the finance charge and minimum payment. Assume that you have a SuperBank credit card that charges a monthly interest rate of 1.5% on the average daily balance (the most popular method) and requires a minimum payment equal to 5% of the new balance, rounded to the nearest dollar. Assume your statement extends from 10 October to 10 November – a total of 31 days – and your balance on 10 October was \$582. During the period, you made the following three transactions:

15 October	Purchase	\$350
22 October	Purchase	54
22 November	Payment	25

As a result, you have the following account balances:

- Average daily balance = $\$28,068 \div 31 = \905.42
- Finance charge = $\$905.42 \times 0.015 = \13.58
- New balance = $\$961 + \$13.58 = \$974.58$
- Minimum payment = $0.05 \times \$974.58 = \48.73 , which rounds to \$49.00

DATES	NUMBER OF DAYS (1)	BALANCE (2)	(1) × (2) (3)
11–15 Oct.	5	\$582	\$ 2,910
16–22 Oct.	7	$\$582 + \$350 = 932$	6,524
23 Oct.–6 Nov.	15	$932 + 54 = 986$	14,790
7–10 Nov.	4	$986 - 25 = 961$	3,844
Total	31		\$28,068

The calculations above show that your finance charge was \$13.58 (1.5% of your average daily balance of \$905.42). Adding it to the end-of-month account balance of \$961, your new balance was \$974.58. The minimum payment of \$49 equalled 5% of the new balance – \$48.73 – rounded to the nearest dollar. Note that if you pay the \$49 minimum payment, \$13.58 of it will cover the finance charge and the remaining \$35.42 (\$49.00 – \$13.58) will be applied to the balance outstanding when the payment is received.

22.3b CASH DISCOUNTS

When suppliers offer *cash discounts* to encourage customers to pay before the end of the credit period, it may not be in the company's best financial interest to pay on the last day of the credit period. Accounts payable with cash discounts have stated credit terms, such as *2/10 net 30*, which means the purchaser can take a 2% discount from the invoice amount if the payment is made within 10 days of the beginning of the credit period; otherwise, it must pay the full amount within 30 days of the beginning of the credit period. The credit period begins at a specific date set by the supplier, typically either the end of the month in which the purchase is made (noted as 'EOM') or on the *date of the invoice*. Taking the discount is at the discretion of the purchaser.

When a company is extended credit terms that include a cash discount, it has two options: (1) pay the full invoice amount at the end of the credit period; or (2) pay the invoice amount less the cash discount at the

end of the cash discount period. In either case, the company purchases the same goods. Thus, the difference between the payment amount without and with the cash discount is, in effect, the interest payment made by the company to its supplier.

A company in need of short-term funds must therefore compare the interest rate charged by its supplier to the best rate charged by lenders of short-term financing (typically banks) and then choose the lowest-cost option. This comparison is important because by taking a cash discount, the company will shorten its average payment period and thus increase the amount of resources it has invested in operating assets, which will require additional negotiated short-term financing.

To calculate the relevant cost, we assume that the company will always render payment on the *final day of the specified payment period* – credit period or cash discount period. **Equation 22.2** presents the formula for calculating the interest rate, r_{discount} , associated with *not taking the cash discount and paying at the end of the credit period* when cash discount terms are offered:

(Eq. 22.2)

$$r_{\text{discount}} = \frac{d}{(1-d)} \times \frac{365}{(CP - DP)}$$

where d = % discount (in decimal form)

CP = Credit period

DP = Cash discount period



Valuing Cash Discounts, Again

Assume that a supplier to Leederville Industries (Chapter 21) has changed its terms from net 30 to 2/10 net 30. Leederville has an overdraft with a bank, and the current interest rate on that

overdraft is 6.75% per year. Should Leederville take the cash discount or continue to use 30 days of credit from its supplier? The interest rate from the supplier is calculated using **Equation 22.2**:

$$r_{\text{discount}} = \frac{0.02}{1-0.02} \times \frac{365}{30-10} = 0.372 = 37.2\% \text{ per year}$$

Thus, the annualised rate charged by the supplier to those customers not taking the cash discount is 37.2%, whereas the bank charges

6.75%. Leederville should take the cash discount and obtain any needed short-term financing by drawing on its bank overdraft.

22.3c DISBURSEMENT PRODUCTS AND METHODS

Zero-Balance Accounts

Zero-balance accounts (ZBAs) are disbursement accounts that always have an end-of-day balance of zero. The purpose is to eliminate non-earning cash balances in corporate cheque accounts. A ZBA is often used as a disbursement account under a cash concentration system.

A ZBA is designed as follows. Once all of a given day's cheques are presented to the company's ZBA for payment, the bank notifies the company of the total amount to be drawn, and the company transfers funds into the account to cover the amount of that day's cheques. This leaves an end-of-day balance of \$0 (zero dollars). The ZBA allows the company to keep all operating cash in an interest-earning account, thereby eliminating idle cash balances. Thus, a company that uses a ZBA in conjunction with a cash concentration system would need two accounts. The company would concentrate its cash from the lockboxes into an interest-earning account and write cheques against its ZBA. The company would cover the exact dollar amount of cheques

zero-balance accounts (ZBAs)

Disbursement accounts that always have an end-of-day balance of zero. The purpose is to eliminate non-earning cash balances in corporate cheque accounts

presented against the ZBA with transfers from the interest-earning account, leaving the end-of-day balance in the ZBA at \$0. In many cases, funding of the ZBA is made automatically and involves only an accounting entry on the part of the bank.

A ZBA is a disbursement management tool that allows the company to *maximise the use of float on each cheque*. The company accomplishes this by keeping all its cash in an interest-earning account instead of leaving non-earning balances in its cheque account to cover cheques that the company has written. This allows the company to maximise earnings on its cash balances by capturing the full float time on each cheque it writes.

We have discussed only ZBAs in this section. However, banks offer a variety of similar products. Another common product that achieves the same goal as a ZBA is a *sweep account*, in which the bank sweeps account surpluses into the appropriate interest-earning vehicle and liquidates similar vehicles in order to cover account shortages when they occur. Many banks also offer *multi-tiered ZBAs* that may be used by multidivisional companies or to segregate different types of payments (such as payrolls, dividends and accounts payable). This type of account allows the cash manager to better control balances and funding of the master account and associated ZBAs, thus reducing excess balances and transfers.

Controlled Disbursement

controlled disbursement

A bank service that provides early notification of cheques that will be presented against a company's account on a given day

positive pay

A bank service used to combat the most common types of cheque fraud. A company transmits a cheque-issued file, designating the cheque number and amount of each item, to the bank when the cheques are issued. The bank matches the presented cheques against this file and rejects any items that do not match

Controlled disbursement is a bank service that provides early notification of cheques that will be presented against a company's account on a given day. This allows the bank to let its controlled disbursement customers know as early as possible what will be presented to their accounts. This, in turn, allows customers to determine their cash position and make any necessary investment or borrowing decisions in the morning, before the cheques are presented for payment. Controlled disbursement accounts are often set up as ZBAs to allow for automatic funding through a company's concentration account.

Positive Pay

Positive pay is a bank service used to combat the most common types of cheque fraud. Given the availability of inexpensive computers, scanners and printers, it is not difficult to create excellent copies of corporate cheques or to change payees or amounts. The risk to a company issuing cheques is that the bank might pay fraudulent items and the fraud would not be revealed until the account is reconciled. When using a positive pay service, the company transmits a cheque-issued file, designating the cheque number and amount of each item, to the bank when the cheques are issued. The bank matches the presented cheques against this file and rejects any items that do not match. It is important to note that several US courts have ruled that positive pay is a 'commercially reasonable' measure to prevent cheque fraud. This means that a company that does not use this service when it is available may find itself liable for fraudulent items accepted by its bank. A recent development in this area is that more companies are using payee/beneficiary verification, or reverse positive pay, to make sure that the payee or beneficiary of the cheque has not been altered. Previously, more basic positive pay did not include this feature.

22.3d DEVELOPMENTS IN ACCOUNTS PAYABLE AND DISBURSEMENTS

We turn now to consider some recent methods for managing accounts payable and the attendant disbursements.

Integrated Accounts Payable

integrated accounts payable

Provides a company with outsourcing of its accounts payable or disbursement operations. Also known as *comprehensive accounts payable*

Integrated accounts payable, also known as *comprehensive accounts payable*, provides a company with outsourcing of its accounts payable or disbursement operations. The outsourcing may be as minor as contracting with a bank to issue cheques and perform reconciliations or as major as outsourcing the entire payables function.

One of the most typical approaches to A/P outsourcing is to send a bank (or other financial service provider) a data file containing a listing of all payments to be made. The bank will maintain a vendor file

for the company and send each vendor payment (in the preferred format) in accordance with the company's remittance advice.

Purchasing or Procurement Cards

Many companies are implementing **purchasing (or procurement) card programs** as a means of reducing the cost of low-dollar indirect purchases. Though companies have been using credit cards for travel and related expenses for many years, they have only recently begun using them to make routine purchases of supplies, equipment or services. A company issues purchasing cards to designated employees, but it limits the dollar amounts that may be spent and stipulates which vendors can be used. Companies that have implemented such programs report significant cost savings from streamlining the purchasing process for low-cost items. The other advantage is that the company can pay the issuer of the purchasing card in a single, large payment that consolidates many small purchases.

purchasing (or procurement) card programs

Programs in which a company issues designated employees purchasing cards with spending limits, usable only at stipulated vendors

Fraud Prevention in Disbursements

In recent years, disbursement fraud – especially related to cheque payments – has increased significantly. Fraudulent cheques can be created with inexpensive scanners, computers and laser printers. As a result, fraud prevention and control have become even more important in the accounts payable and disbursement functions. Some of the common fraud prevention measures include the following:

- creating and disbursing cheques according to written policies and procedures
- separating cheque-issuance duties (approval, signing and reconciliation)
- using safety features on cheques (such as microprinting, watermarks and tamper resistance)
- setting maximum dollar limits and/or requiring multiple signatures on cheques
- using *positive-pay* services
- increasing the use of electronic payment methods.

LO22.3

CONCEPT REVIEW QUESTIONS

8 What is the primary purpose of the accounts payable function? Describe the procedures used to manage accounts payable. What are the key differences between *centralised* and *decentralised* payables and payment systems?

9 When is it advantageous for a company to pay early and take an offered cash discount? Under what circumstance would the company be advised to always take any offered cash discounts?

10 What is the difference between a ZBA and a *controlled disbursement account*? Are they direct substitutes?

11 What are some of the recent developments in the accounts payable and disbursements area? What role does new technology play in preventing disbursement fraud?

THINKING CAP QUESTION

4 What is the financial trade-off involved when a company evaluates whether or not to take an offered cash discount?

LO22.4

22.4 SHORT-TERM INVESTING AND BORROWING

After determining the company's cash position, the cash manager will generally have either surplus funds to invest or a deficit of funds to replenish via short-term borrowing. Clearly, the goal is to earn relatively safe returns on short-term surpluses and to borrow at reasonable cost to meet short-term deficits. The company's motive for holding cash will have a significant impact on both its short-term investing and its borrowing decisions. This section reviews the key motives for holding cash and short-term investment balances, and some of the options available to the financial manager for investing short-term surpluses. In addition, it describes some key aspects of borrowing to meet short-term deficits.

22.4a MOTIVES FOR HOLDING CASH AND SHORT-TERM INVESTMENTS

There are three basic motives for holding cash and short-term investments (also called *marketable securities*). In a more general sense, these are the *motives for maintaining liquidity*. Each motive can be addressed in two ways: (1) the appropriate degree of liquidity; and (2) the appropriate mix of cash and short-term investments.

Transactions Motive

transactions motive

A motive for holding cash and short-term investments in order to make planned payments for items such as materials and wages

A company maintains cash and short-term investments to satisfy the **transactions motive**, which is to make planned payments for items such as materials and wages. Generally, because these balances are held to make planned near-term payments, companies fulfil this motive primarily by holding cash balances. If the company's cash inflows and cash outflows are closely matched, its transactions balances can be minimised. Although companies *must* fulfil this cash need, typically they hold liquid balances to meet the following two motives as well.

Safety Motive

safety motive

A motive for holding cash and short-term investments in order to protect the company against being unable to satisfy unexpected demands for cash. Sometimes called the *precautionary motive*

speculative motive

A motive for holding, typically in short-term as well as long-term investments, funds that are currently unneeded or can be used to take advantage quickly of opportunities that may arise

The **safety motive**, sometimes called the *precautionary motive*, for holding cash and short-term investments exists to protect the company against being unable to satisfy unexpected demands for cash. This motive is fulfilled by maintaining a pool of liquid funds that can quickly be accessed in an emergency. Generally, the company will hold highly liquid short-term investments that can immediately be converted into cash.

Speculative Motive

Companies sometimes hold cash and short-term investments for speculative reasons. This **speculative motive** exists because the company has no other use for certain funds, or because it wants to be able to take advantage quickly of opportunities that may arise. Typically, this motive is pursued only after the company meets its safety motive. Funds held for speculative reasons are often invested in short-term as well as long-term instruments.

22.4b SHORT-TERM INVESTING

Making sure that the company has access to liquid assets when and where they are needed is one of the critical tasks for the cash manager. Although the primary form of liquidity will generally be a company's cheque or demand deposit accounts at its banks, these accounts usually do not earn interest, and the company should not hold excess balances in them. To earn some type of short-term return, a company will hold some near-cash assets in the form of short-term investments, often labelled *marketable securities*. These investments may be either a source of reserve liquidity or a place to maintain temporary surplus funds.²

² *Temporary surplus funds* may result from ongoing operations, seasonal performance, sales of large assets or proceeds from a large securities issue.

Because such short-term investments are essentially a substitute for cash, *providing liquidity* and *preserving principal* should be the primary concerns. Earning a competitive return is also a consideration; however, care must be taken not to place the underlying principal at risk. Remember that the primary purpose of short-term investments is to maintain a pool of liquid assets as a substitute for cash, not to generate profits for the company. Towards this end, it is important that a company establish policies and guidelines for the management of short-term investments; these should clearly specify the purpose of the investment portfolio and provide recommendations and/or restrictions on acceptable investments and the amount of diversification.

Money Market Mutual Funds

Many large companies will manage their own portfolios of short-term investments, but most companies (especially small ones) use money market mutual funds as an alternative. Originating in the US in the 1970s, **money market mutual funds** are professionally managed portfolios that invest in the same types of short-term instruments in which cash managers invest. They are now widely used in developed banking systems. They may, in fact, offer even more flexibility and stability than self-managed funds. Using these types of funds can make sense, especially when the costs of running and managing a short-term portfolio are considered.

In most cases, these funds set their *net asset value (NAV)* at a fixed \$1 per share in order to preserve the principal value of the fund. As the value of the fund increases, the fund pays investors in additional shares rather than allowing the share price to increase. Commercial money market mutual funds are available from independent companies as well as from most large banks.

money market mutual funds
Professionally managed short-term investment portfolios used by many small companies and some large companies

22.4c SHORT-TERM BORROWING

For many companies, a primary source of liquidity is access to short-term overdrafts or commercial bills (unsecured short-term bond issues) programs to provide needed funds. This is especially the case for companies in seasonal businesses where large amounts of operating capital may be needed for only a few months of the year. The role of the cash manager in establishing short-term borrowing arrangements is to ensure that the company has credit facilities sufficient to meet short-term cash requirements. Obviously, these arrangements should provide maximum flexibility at a minimum cost. Access to credit can be a major issue for companies in a time of financial crisis. For example, many creditworthy companies in Australia had difficulty getting the credit they needed as the global financial and credit crisis deepened in late 2008 and early 2009, even though the Australian government provided guarantees for bank loans and deposits for retail and corporate customers. Both bank lending and access to commercial paper markets were severely constrained for most companies until early 2010, when credit markets began to thaw.

Most short-term borrowing is done on a variable-rate basis, with rates quoted in terms of a base rate plus a spread. The spread is essentially an adjustment for the relative riskiness and overall creditworthiness of the borrower. The base rate plus the spread are referred to as the **all-in rate**.

Typical base rates include the *prime rate* or *SOFR (Secured Overnight Financing Rate)* in the US, *SONIA (Reformed Sterling Overnight Index Average)* in the UK or the *BBSW (Bank Bill Swap Rate)* in Australia. These rates are the rates of interest charged by the largest banks on short-term loans to the best business borrowers.

For *bank overdrafts or lines of credit*, lending agreements may require *commitment fees* (fees paid for the bank's agreement to make money available) and/or *compensating balance requirements* (minimum deposit balances that must be maintained by the borrower at the lending bank). These agreements may also be set up on a multi-year, revolving basis, and may use current assets such as receivables or inventory as collateral. In any type of bank lending, most of the terms and conditions result from negotiations between the borrower and the bank.

all-in rate
The base rate plus the spread on a short-term variable rate loan

Bank Bill Swap Rate (BBSW)
This is the average mid-point of banks' bid and offer rates in the bank bill secondary market in Australia



DRAWING CONCLUSIONS ABOUT LINES OF CREDIT

Although we consider the issues of credit lines in a 'typical' economic environment in this book, CFOs become much more concerned about the use of credit lines when the economy is behaving uncertainly. The period of the global financial crisis (2007–2011) tested the importance of lines of credit for many US companies. Research on this topic by Jose Berrospide and Ralf Meisenzahl of the Federal Reserve Board drew the following conclusions:

'We show that firms use credit line drawdowns to finance investment, thereby verifying that credit lines function as insurance against adverse shocks. The effects of credit line drawdowns on investment are economically large and statistically significant. A one standard deviation increase in the size of the drawdown is associated with an 11 percent increase in average capital expenditures (an increase of 0.15 percent of total assets).

The financial crisis amplified the effect of drawdowns on investment significantly. The effect of drawdowns on investment increases by 40 percent in the full sample and more than doubles for financially constrained firms. However, we find only weak evidence that firms draw on their lines to increase precautionary cash holdings. Finally, we document that credit line drawdowns of financially unconstrained firms reduce the drawing firms' stock returns, indicating that investors infer adverse information about these firms from credit line drawdowns.'

Source: Used with permission. 'The Real Effects of Credit Line Drawdowns', Jose M. Berrospide and Ralf R. Meisenzahl, Working Paper, Federal Reserve Board, April 2013.

Bank Overdraft or Line of Credit

bank overdraft or line of credit

An up-front commitment by a bank to lend to a borrower in the future

A **bank overdraft or line of credit** is an up-front commitment by a bank to lend to a borrower in the future. For example, a company may arrange to borrow up to \$10,000,000 from a bank at any time during the next 30 months. The company must pay a commitment fee to establish this option to borrow, a fee that might cost one-quarter per cent (such as \$25,000 to establish a \$10,000,000 overdraft facility). When a company borrows through the overdraft, it must also pay interest on the amount borrowed, usually a variable interest rate of approximately 100 to 200 basis points (one to two percentage points) above the BBSW.

Bank overdrafts are designed for temporary borrowing. A company experiencing slow collections one month may draw on the line to pay end-of-month payroll, rather than arrange a new, short-term loan. Or a seasonal company may draw on the overdraft during its slow quarter, planning to pay back the borrowings plus interest the following quarter. Overdrafts are also used as bridge financing for long-term investing. For example, a company may initially fund the purchase of a 10-year asset with an overdraft, retiring the line quickly as longer-term financing is finalised. More generally, overdrafts are a fairly low-cost form of liquidity insurance, as an alternative to a company needing to accumulate large cash balances. Overdrafts usually remain open for two to three years, assuming that the company does not violate a loan covenant before then.

The **effective borrowing rate (EBR)** on a bank overdraft is generally determined as the total amount of interest and fees paid, divided by the average usable loan amount. This rate is then adjusted for the actual number of days the loan is outstanding. A demonstration of this calculation follows.

effective borrowing rate (EBR)

Generally determined as the total amount of interest and fees paid, divided by the average usable loan amount

 **EXAMPLE**

Effective Borrowing Rate Calculation

We can determine the effective borrowing rate on a one-year overdraft with the following characteristics:

- CL = credit line, \$500,000 total
- AL = average loan outstanding, \$200,000

- CF = commitment fee, 0.35% (35 basis points) on the unused portion of the overdraft
- IR = interest rate, 2.5% over LIBOR (assumed to be 5.75%), which equals 8.25%.

If we use a 365-day year and assume that no compensating balances are required, then the calculations proceed as follows:

$$\begin{aligned} &= \frac{(0.0825 \times \$200,000) + [0.0035 \times (\$500,000 - \$200,000)]}{\$200,000} \times \frac{365}{365} \\ &= \frac{\$16,500 + \$1,050}{\$200,000} \times \frac{365}{365} = \frac{\$17,550}{\$200,000} \times 1 = 8.775\% \end{aligned}$$

The effective borrowing rate of 8.775% is about 50 basis points (0.50%) above the 8.25% interest rate as a result of the commitment fee paid on the unused portion of the overdraft.

As an example, in Australia there is an extensive and well-established commercial bill market to enable companies to borrow funds for short terms from the general money market. The market was established by the Commonwealth *Bills of Exchange Act 1909*. Commercial bills, like overdrafts, allow companies to borrow in the short term without having to specify the particular purpose for the funds. Commercial bills are categorised into bank-accepted bills, bank-endorsed bills and non-bank bills.

A commercial bill is called a **bank-accepted bill** when a bank puts its name on the face of the bill, thereby increasing the bill's creditworthiness. This should lower the cost of borrowing for the bill issuer, since the entity that buys the bill (lends the money sought by the bill) now knows both that a bank is confirming that the borrower has the funds to pay the bill when it comes due (matures) and that the loan has to be repaid.

Bank-endorsed bills are those in which the bank confirms that it is willing to pay the face value of the bill at maturity even if the borrower defaults. This occurs when the bank sells the bill on to an investor.

Bill financing has several advantages over other forms of business finance. The bills may be cheaper funding than an overdraft or term loan from a bank because a bank does not have to fund the bill on its balance sheet. A bank can accept a bill issued by a company and make some income from charging a fee for this service. The bank can then sell on the bill to an investor, thereby making a margin on the sale of the bill.

The issuer of the bill has certainty about the amount to repay and the interest rate on the borrowing, for the life of the bill. Most commercial bills have maturities ranging up to 180 days, for which the conditions are fixed; but many bills can also be rolled over into another borrowing period, thereby lowering the cost of renewal. The interest rate on the renewal period may differ from that of the original borrowing period; but this exposure is normal market risk.

Companies can also establish a 'bill line' with a bank to enable them to draw on the facility as required to issue bills as funds are required. This combines the concept of an overdraft and a commercial bill facility, and usually lowers the overall cost of fund raising because of reduced issuance costs.

bank-accepted bill
A commercial bill on which a bank places its name together with that of the issuer of the bill, to indicate the borrower has sufficient funds to repay the borrowing

bank-endorsed bill
A commercial bill in which a bank has signed that it will pay the funds at maturity to any investor to whom it has sold the bill once issued by the original borrower

LO22.4

CONCEPT REVIEW QUESTIONS

- 12** What are the basic motives for holding cash and short-term investments? Why are *providing liquidity* and *preserving principal* the primary concerns in choosing short-term investments?
- 13** What are the key base rates used in variable rate short-term borrowing, and how do they factor into the all-in rate? What other charges might be applicable to short-term borrowing? What effect do they have on the *effective borrowing rate (EBR)*?

STUDY TOOLS

SUMMARY

LO22.1

- The cash manager's job is to manage cash flow related to collection, concentration and disbursement of the company's funds. Float can be viewed from the perspective of either the receiving party or the paying party. Mail float and processing float are viewed the same from both perspectives. The third float component is availability float (to the receiving party) and the fourth is clearing float (to the paying party). The receiving party's goal is to minimise collection float, whereas the paying party's goal is to maximise disbursement float.
- Cash managers are also responsible for identifying and quantifying financial relationships, forecasting cash flow, investing and borrowing and information management. In large companies, they must manage the company's cash position; in small companies, they set target cash balances based on transactions requirements and minimum balances set by their bank.

LO22.2

- In managing collections, the cash manager attempts to reduce collection float using various collection systems, which include mail-based systems and electronic systems. Large companies whose customers are geographically dispersed commonly use lockbox systems, although small companies can also benefit from them.
- Companies use cash concentration to bring lockbox and other deposits together into one bank, often a concentration bank. Companies often use *automated clearinghouse (ACH) debit transfers* (also known as *electronic depository transfer (EDT)*) and wire transfers to transfer funds from the depository bank to the concentration bank.

LO22.3

- The objective of managing the company's accounts payable is to pay accounts as slowly as possible without damaging the company's credit rating and supplier relations. If a supplier offers a cash discount, the company in need of short-term funds must determine the interest rate associated with not taking the discount (and paying at the end of the credit period) and then compare this rate with the company's lowest-cost short-term borrowing alternative. If it can borrow elsewhere at a lower cost, the company should take the discount and pay early; otherwise, it should not.
- Financial managers use such disbursement products and methods as *zero-balance accounts (ZBAs)*, controlled disbursement and positive pay. Some of the key developments in accounts payable and disbursements are integrated accounts payable, use of purchasing or procurement cards, imaging services and a number of measures for preventing fraud.

LO22.4

- The cash manager will meet the company's transactions, safety and speculative motives by holding cash and short-term investments (often called *marketable securities*). The short-term investments allow the company to earn a return on temporary cash balances. Investment policies and guidelines for management of short-term investments should be established.
- Small companies are likely to invest their short-term surpluses in money market mutual funds. Larger companies will invest in any of a variety of short-term, fixed-income securities.
- Short-term borrowing can be obtained through the issuance of commercial paper, primarily by large companies, and through overdraft lines of credit. Most short-term borrowing occurs at a base rate – usually, the prime rate or LIBOR – plus a spread reflecting the borrower's relative riskiness. The effective borrowing rate (*EBR*) can be calculated to capture both the interest costs and other fees associated with a short-term loan.
- Companies can also issue short-term commercial paper, in the form of bills of exchange. If these are commercial bills, they allow companies to raise funds for non-specific purposes. The costs of these unsecured borrowings can be reduced if the bills are accepted by a bank or endorsed by a bank.

IMPORTANT EQUATIONS

TABLE OF IMPORTANT EQUATIONS

$$22.1 \text{ Net benefit (cost) of lockbox} = (FVR \times r_d) - LC$$

$$22.2 r_{\text{discount}} = \frac{d}{(1-d)} \times \frac{365}{(CP - DP)}$$

SELF-TEST PROBLEMS

Answers to these 'Self-test problems' and the 'Concept review' questions throughout the chapter appear on the Student Companion Website (<http://login.cengagebrain.com>) or via your instructor.

ST22-1 Gale Supply estimates that its customers' payments are in the mail for three days and, once received, are processed in two days. After the payments are deposited in the company's bank, the bank makes the funds available to the company in 2.5 days. The company estimates its total annual collections from credit customers, received at a constant rate, to be \$87 million. Its annual opportunity cost of funds is 9.5%. Assume a 365-day year.

- How many days of *collection float* does Gale Supply have?
- What is the current annual dollar cost of Gale Supply's collection float?
- If the installation of an *electronic invoice presentment and payment (EIPP)* system would result in a four-day reduction in Gale's collection float, how much could the company earn annually on this float reduction?
- Based on your findings in part (c), should Gale install the EIPP system if its annual cost is \$85,000? Explain your recommendation.

ST22-2 Derson Manufacturing wishes to evaluate the credit terms offered by its four biggest suppliers of raw materials. The prime rate is currently 7.0%, and Derson can borrow short-term funds at a spread of 2.5% above the prime rate. Assume a 365-day year, and that the company always pays its suppliers on the last day allowed by their stated credit terms. The terms offered by each supplier are as follows:

Supplier 1: 2/10 net 40

Supplier 2: 1/15 net 60

Supplier 3: 3/10 net 70

Supplier 4: 1/10 net 50

- a Calculate the interest rate associated with not taking the discount from each supplier.
- b Assuming the company needs short-term financing and considering each supplier separately, indicate whether the company should take the discount from each supplier.
- c If the company did not need any short-term financing, when should it pay each of the suppliers?
- d If the company could not obtain a loan from banks and other financial institutions and needed short-term financing, when should it pay each of the suppliers?
- e Suppose that Derson could stretch its accounts payable to Supplier 1 (net period only) to 90 days without damaging its credit rating. What impact, if any, would this have on your recommendation with regard to Supplier 1 in part (b)? Explain your answer.

- ST22-3** Rosa Pty Ltd has arranged a one-year, \$2 million overdraft with its lead bank. The bank set the interest rate at the prime rate plus a spread of 1.50%. The prime rate is expected to remain stable at 5.25% during the coming year. In addition, the bank requires Rosa to pay a 0.50% commitment fee on the average unused portion of the line. Assume a 365-day year.
- a Calculate the *effective borrowing rate (EBR)* on Rosa's overdraft during the coming year assuming the average loan balance outstanding during the year is \$1.8 million.
 - b Calculate Rosa's EBR on the overdraft during the coming year, assuming the average loan balance outstanding during the year is \$0.8 million.
 - c Compare and contrast the EBRs calculated for Rosa Pty Ltd in parts (a) and (b). Explain the causes of the differences in EBRs.

QUESTIONS

- Q22-1** What is *float*? What are its four basic components? Which of these components is the same from both a collection and a payment perspective? What is the difference between *availability float* and *clearing float*, and from which perspective – collection or payment – is each relevant?
- Q22-2** What is cash *position management*? What types of companies set a target cash balance? Why? What is a bank's purpose in requiring the company to maintain a minimum balance in its cheque account? How does this relate to a *bank account analysis statement*?
- Q22-3** What is the company's goal with regard to cash collections? Describe each of the following types of collection systems:
- a mail-based collection system
 - b electronic system.
- Q22-4** What is a *lockbox system*? How does it typically work? Briefly describe the economics involved in performing a cost–benefit analysis of such a system.
- Q22-5** What is the goal with regard to managing accounts payable as it relates to the *cash conversion cycle*? Briefly describe the process involved in managing the accounts payable function.
- Q22-6** How can a company in need of short-term financing decide whether or not to take a *cash discount* offered by its supplier? How would this decision change if the company has no alternative source of short-term financing? How would it change for a company that needs no additional short-term financing?
- Q22-7** Briefly describe each of the following disbursement products/methods:
- a Zero-balance accounts (ZBAs)
 - b Controlled disbursement
 - c Positive pay.
- How does a ZBA relate to the company's *target cash balance*?

- Q22-8** Briefly describe each of the three basic motives for a company holding cash and short-term investments. For each of the motives indicate the general form in which the funds are typically held.
- Q22-9** What is the company's goal in short-term investing?
- Q22-10** How are the rates on short-term borrowing typically set? What role does the *SOFR*, *BBSW* or *SONIA* play in this process? What is the *effective borrowing rate (EBR)*? How does the *EBR* differ from the stated *all-in rate*?

PROBLEMS

CASH MANAGEMENT

- P22-1** Nickolas Industries has daily cash receipts of \$350,000. A recent analysis of the company's collections indicated that customers' payments are in the mail an average of two days. Once received, the payments are processed in 1.5 days. After the payments are deposited, the receipts clear the banking system, on average, in 2.5 days. Assume a 365-day year.
- a** How much *collection float* (in days) does the company have?
 - b** If the company's opportunity cost is 11%, would it be economically advisable for the company to pay an annual fee of \$84,000 for a lockbox system that reduces collection float by 2.5 days? Explain why or why not.

COLLECTIONS

- P22-2** Company A has annual revenues of \$1.6 billion and can reduce its float by four days using a lockbox system. Due to A's significant risk, A has a high cost of capital of 22%. Company B has annual revenues of \$850 million, and can reduce its float by three days using a similar lockbox system. Company B is less risky than Company A, as evidenced by B's cost of capital of 10%. Assuming the lockbox system costs \$2 million, which company benefits more from using the system? If the two companies merge, making it necessary to have only one lockbox system for the combined company, then how much is the net benefit of having the lockbox system under this circumstance?
- P22-3** Quick Burger, a national chain of hamburger restaurants, has accumulated a \$27,000 balance in one of its regional collection accounts. It wishes to make an efficient, cost-effective transfer of \$25,000 of this balance to its corporate concentration account, thus leaving a \$2,000 minimum balance in the regional collection account. It has the following options:
- Option 1:* Electronic depository transfer (EDT) at a cost of \$2.50 and requiring one day to clear.
 - Option 2:* Wire transfer at a cost of \$12 and clearing the same day (zero days to clear).
- a** If Quick Burger can earn 6% on its short-term investments, then which of the options would you recommend to minimise the transfer cost? (Assume a 365-day year.)
 - b** Compare options 1 and 2, and determine the minimum amount that would have to be transferred in order for the wire transfer (Option 2) to be more cost-effective than the EDT (Option 1).

ACCOUNTS PAYABLE AND DISBURSEMENTS

- P22-4** Assume a 365-day year and that a company receives the following credit terms from six suppliers.

Supplier 1: 2/10 net 50

Supplier 2: 1/10 net 30

Supplier 3: 2/10 net 150

Supplier 4: 3/10 net 60

Supplier 5: 1/10 net 45

Supplier 6: 1/20 net 80

- a** Determine the interest rate associated with not taking the cash discount and instead paying at the end of the credit period for each of the six suppliers' credit terms.
- b** In part (a), you calculated the interest rate associated with not taking the discount for each supplier's credit terms. Now you must decide whether or not to take the cash discount by paying within the discount period. To pay early, you will need to borrow from your company's overdraft at the local bank. The interest rate on the overdraft is the prime rate plus 2.5%. Suppose the prime rate is currently 5% per annum. For each supplier's terms, use the current prime rate to determine whether the company should borrow from the bank or, in effect, borrow from the supplier.

- P22-5** Access Enterprises is vetting four possible suppliers of an important raw material used in its production process, all offering different credit terms. The products offered by each supplier are virtually identical. The following table shows the credit terms offered by these suppliers. Assume a 365-day year.

SUPPLIER	CREDIT TERMS
A	1/10 net 40
B	2/20 net 90
C	1/20 net 60
D	3/10 net 75

- a** Calculate the interest rate associated with not taking the discount from each supplier.
- b** If the company needs short-term funds (which are currently available from its commercial bank at 11%) and if each of the suppliers is viewed separately, then which, if any, of the suppliers' cash discounts should the company not take? Explain why.
- c** Suppose that the company could stretch its accounts payable to supplier A (net period only) by 20 days. How would this affect your answer in part (b) concerning this supplier?

SHORT-TERM INVESTING AND BORROWING

- P22-6** Matthews Manufacturing is negotiating a one-year overdraft with its bank, Worldwide Bank. The amount of the overdraft is \$6.5 million with an interest rate set at 1.5% above the prime rate. A commitment fee of 0.50% (50 basis points) will be charged on the unused portion of the overdraft. No compensating balances are required, and the loan is made on a 365-day basis.

- a** If the prime rate is assumed to be constant at 4.25% during the term of the loan and if Matthews' average loan outstanding during the year is \$5.0 million, then calculate the company's *effective borrowing rate (EBR)*.

- b** What effect would an increase in the prime rate to 4.75% for the entire year have on Matthews' EBR calculated in part (a)?
- c** What effect would a decrease in Matthews' average loan outstanding during the year to \$4.0 million have on the EBR calculated in part (a)?
- d** Using your findings in parts (a), (b) and (c), discuss the effects on Matthews' EBRs of interest-rate changes versus changes in the average loan outstanding.

CASE STUDY

LIQUIDITY MANAGEMENT

Foah's Designs sells precious metal jewellery throughout the east coast of Australia. It is based in Hobart, Tasmania, and currently, all customers mail their payments to the Hobart office. The average amount of float is 6.5 days. The company is considering implementing a lockbox system in Melbourne. Total annual sales that are expected to be routed to the Melbourne lockbox are \$68,000,000, with an average cheque amount of \$1,300. The lockbox system would be administered by Bank of Melbourne, which will charge a fee of \$0.25 per cheque and an annual fixed charge of \$10,000. Foah's Designs has a cost of capital of 12% per year, and the lockbox is expected to reduce float to four days. However, there is some chance that the lockbox will only reduce float to five days.

The company must also decide between using EDT or wire transfers when transferring funds between Bank of Melbourne and its local bank, Hobart Savings Bank. Using the wire transfer method would cost \$20 per transfer, whereas the EDT method would cost only \$1.50 per transfer. However, the wire transfer method would result in the funds arriving at Hobart Savings Bank one day sooner.

Foah's Designs is also faced with a decision concerning its accounts payable. Foah's purchases its inventory from Jewellery Findings on credit. Jewellery Findings' terms of

trade are 3/15 net 45, and Foah's Designs normally pays after exactly 45 days. However, it has been considering accessing an overdraft from Hobart Savings Bank to pay its accounts payable after exactly 15 days instead. The commitment fee on the unused portion of the credit line is 0.3%, and the interest rate on the loan from Hobart Savings Bank is 8.9%. There are no compensating balance requirements. Assume a 365-day year.

ASSIGNMENT

- 1** Should Foah's Designs implement the lockbox system?
- 2** Suppose Foah's Designs plans to transfer money on a weekly basis (every Tuesday) from Bank of Melbourne to Hobart Savings Bank. Which transfer method should it use if the interest paid on its funds in Hobart Savings Bank is 0.5% higher than what it earns from Bank of Melbourne?
- 3** Assuming that Foah's Designs has a \$2 million overdraft and that its accounts payable average \$1,417,000, determine whether the company should continue paying Jewellery Findings after 45 days, or instead should begin accessing the overdraft from Hobart Savings Bank.

23

INSOLVENCY AND FINANCIAL DISTRESS¹

WHAT COMPANIES DO

[Australian Securities and Investments Commission] ASIC's quarterly insolvency statistics for the last quarter of the 2018/19 financial year, shows a relative increase from the previous quarter of 12.4% in companies entering external administration (EXAD). Appointments [for administration] totalled 2,038 compared to 1,813 in the previous quarter. The quarterly total was 7.3% lower

than the 2017 June quarter (2,198) ... The percentage of companies entering EXAD for the quarter, relative to new incorporations, continues to remain below 4%.'

Source: Australian Securities and Exchange Commission, 'Corporate Insolvencies: June Quarter 2018', Press Release, <https://download.asic.gov.au/media/4900841/201806-june-qtr-2018-summary-analysis.pdf>. Accessed 20 February 2020; for further information, also see <https://asic.gov.au/regulatory-resources/find-a-document/statistics/insolvency-statistics/how-to-interpret-asic-insolvency-statistics>. Accessed 16 September 2019.

LEARNING OBJECTIVES

After studying this chapter, you should be able to:

- LO23.1 describe and differentiate between business failure, insolvency, financial distress and bankruptcy, and discuss why companies may seek insolvency
- LO23.2 explain how companies in Australia undertake the process of appointing an administrator and what that role entails
- LO23.3 describe the alternatives that are available to companies that find themselves in financial distress
- LO23.4 review the tools used by many analysts in attempts to predict the occurrence of insolvency.

¹ Joseph A. Guzinski assisted in preparing this chapter for the US edition. Much of the analysis of insolvency and financial distress depends on specific legal restrictions or rules covering organisations in particular countries. To avoid making this chapter too long, we will focus on Australian legal requirements, although we shall make references to other national rules as appropriate. The Australian material is drawn extensively from documents available from the Australian Securities and Investments Commission (ASIC) designed to guide companies, managers, shareholders, employees and creditors with respect to issues of external administration, financial distress and insolvency. These are available at the ASIC website under the insolvency heading: <http://asic.gov.au/regulatory-resources/insolvency/> (accessed 14 September 2019).

A **business failure** or insolvency is an unfortunate outcome. Although most companies that fail do so within the first few years of their lives, other companies grow, mature and then fail much later. The failure of a business can be viewed in a number of ways, and can result from many different causes. The impact of the insolvency on the company tends to depend on its cause, and in this chapter we will examine the alternatives that companies in a number of different Asia-Pacific countries, with a focus on Australia, may follow if they are heading into failure.

business failure
A company's inability to stay in business

Insolvency is a term that can apply to either an individual or a business, but is more often used in relation to a business or company (bankruptcy usually refers to a person). A business is said to be insolvent when it cannot pay its debts when they are due. It is commonly held as an offence under many corporations laws (see **Corporations Act 2001** in Australia) if the directors continue to operate and incur more debts when a company is insolvent.

Corporations Act 2001
The Commonwealth Act regulating, among other matters, corporate insolvency in Australia

If a company is facing financial difficulties and the directors or creditors believe that it is, or may become, insolvent, it may end up in one of the following types of formal administration:

- liquidation, also known as winding up
- voluntary administration or deed of company arrangement
- receivership.

LO23.1

23.1 INSOLVENCY AND BUSINESS FAILURE

A headline blares that a company has filed for liquidation or has 'gone into receivership'. The words themselves signify failure, but they do not describe *how* the company failed. Is the company insolvent in the sense that its liabilities exceed its assets? Or does the company have a liquidity problem and is unable to pay its debts? Perhaps the filing is the result of both these factors, or of other factors entirely.

financial distress
The situation in which a company's cash flows are insufficient to pay its current obligations

As a working definition, **financial distress** occurs when a company's cash flows are insufficient to pay its current obligations. Although a company usually becomes insolvent because its finances are distressed, the term insolvent does not really describe a financial condition. Instead, *insolvency* refers to a legal process.

voluntary administration
Occurs when a company allows an administrator to investigate and report on the company to creditors and make a recommendation about the future of the company

Typically, companies that become insolvent have been in financial distress. As noted in the discussion of capital structure in Chapter 13 of this text, the threat of insolvency frequently discourages the use of debt financing. The costs associated with the threat of insolvency can lower the value of a levered company below its unlevered value despite the tax benefits that accompany debt financing. So the costs associated with financial distress may reduce the optimal debt ratio. Clearly, a close link exists between the costs of insolvency and a company's capital structure decisions.

deed of company arrangement
A procedure that permits a company in distress to make a compromise or arrangement that is binding on all creditors. Subject to the terms of the arrangement, the company may then be saved and continue to operate

Insolvency is only one of many avenues a company may employ to address its problems. When a company experiences financial distress, it may try to solve that problem through changes in operations (such as reducing expenditures, selling assets or even merging with a healthy company) or through financial actions (such as raising new capital by selling new securities, exchanging debt securities for equity, reducing payout or renegotiating with creditors). The company may go into **voluntary administration**, a formal standstill-type administration where the voluntary administrator investigates and reports on the company's history and financial position to creditors and makes a recommendation about its future. Creditors then decide whether to accept a deed of company arrangement, if one is proposed by the directors; liquidate the company; or return the company to the control of the directors. A **deed of company arrangement** is a procedure that permits a company to make a compromise or arrangement that is binding on all creditors. Subject to the

terms of the arrangement, the company may then be saved and continue to operate. Declaring insolvency is typically a last resort.

Despite the publicity that cases receive, business insolvencies in general do not typically involve many of the larger companies in the economy – although a number of high-profile, large-scale insolvencies, such as those of Lehman Brothers and Enron in the US, and Ansett Airlines, HIH Insurance and One.Tel in Australia, have occurred. A great deal of publicity has been given to large bankruptcies in the US. **Figure 23.1** lists the 10 all-time largest bankruptcies through 2018.

FIGURE 23.1 10 LARGEST BANKRUPTCIES AS AT 2018

COMPANY	BANKRUPTCY DATE	TOTAL ASSETS PRE-BANKRUPTCY (IN MILLIONS)
Lehman Brothers Holdings, Inc.	15/9/2008	\$691,063
Washington Mutual, Inc.	26/9/2008	327,913
Worldcom, Inc. ¹	21/7/2002	103,914
General Motors Corporation	1/6/2009	91,047
CIT Group Inc.	1/11/2009	80,448
Enron Corp. ²	2/12/2001	65,503
Conseco, Inc.	17/12/2002	61,392
MF Global Holdings Ltd.	31/10/2011	40,541
Chrysler LLC	30/4/2009	39,940
Thornburg Mortgage, Inc.	1/5/2009	36,521

1 Worldcom, Inc. assets taken from the audited annual report dated 31/12/2001.

2 The Enron assets were taken from the tax documents filed on 19/11/2001. The company has announced that the financials were under review at the time of filing for Chapter 11.

Source: New Generation Research, Inc. <http://www.bankruptcydata.com>.

Why do businesses declare themselves to be insolvent? Financial distress does not automatically mean insolvency. A company may try to work out a deal with its creditors by negotiating out of court, rather than undertaking the legal process to become insolvent. Indeed, in the simplest possible case of a single debtor and a single creditor, a threat of default by the debtor should be an event in which control of the assets shifts from the debtor to the creditor, so the creditor becomes the new owner of the assets.² In this case, there is little need for a formal bankruptcy procedure. If, however, we are dealing with many creditors, it is no longer clear what a ‘transfer of ownership and control to all the creditors’ may mean. This is where the legal system can come into play.

In the absence of a formal bankruptcy procedure, a legal system can provide a single creditor with two main remedies in the event of a default by a single debtor. For a secured (collateralised) loan – one that was set up with the assurance that a creditor would obtain ownership of assets from the debtor in the case of the latter’s default – the creditor simply takes ownership of the assets. For an unsecured loan, the creditor may sue the debtor and seek court support to enforce the seizure of assets.

If there are many creditors, then without a defined orderly process for making claims on remaining assets, the creditors may waste resources fighting among themselves for priority of claims; and, as Hart notes, the execution of many claims on corporate assets may dismantle the debtor’s assets and lead to a loss of value for

2 Hart, Oliver, *Firms, Contracts and Financial Structure*, Oxford: Clarendon Press, 1995, p. 157.

all creditors if ‘the assets are worth more as a whole than as a collection of pieces’.³ These possible outcomes encourage creditors and debtors to establish orderly processes for managing assets following a declaration of default; and in the British-based legal system, the state (government) comes into the decision process with laws and procedures.

We may note that *potential* insolvency gives a debtor company a major bargaining advantage. Before insolvency, creditors may threaten litigation or aggressive collection actions. A declaration of insolvency means the debtor does not have to respond to these immediate threats. Without the threat of imminent litigation or collection, the debtor may be in a better position to bargain with its creditors and to restructure its operations.

Thus, while insolvency is not a dominant force in the overall economy, it often plays a significant role for companies facing financial failure. An open question is whether reorganisations from financial distress can be considered successful. Answering that question requires an understanding of the basic principles of insolvency and how a company may employ them when it faces failure.

LO23.1

CONCEPT REVIEW QUESTIONS

- 1 What is the difference between financial distress and insolvency?
- 2 Does a company cease to exist when it declares itself to be insolvent?

LO23.2

23.2 INSOLVENCY PROCESSES

Corporate insolvency law took form in the UK in association with the legislation that introduced the limited liability concept and the registered company in the mid-nineteenth century. The modern scheme of winding-up legislation based on the separate legal personality of the company was first established in the Joint Stock Companies Act 1856 (UK) and included in the consolidating Companies Act 1862 (UK). The UK Companies Act was progressively adopted by the Australian colonies throughout the 1860s, and throughout other British colonial dependencies over time.⁴

Because the process of managing insolvency in particular countries is so closely dictated by the specific laws of those countries, it is increasingly difficult to outline a universally applicable insolvency process. For example, insolvency processes in Japan favour extant creditors over existing management, whereas many US laws give more support to incumbent management. The detailed process of managing an insolvency or liquidation then depends critically on which country is chosen for the resolution of the bankruptcy.

As this is a finance text concentrating on the Asia-Pacific region, we shall focus on the insolvency rules in Australia, in part because they are clearly stated and historically appear to satisfy most parties to an insolvency; and in part because they do reflect legal processes from other (former British colonial) countries such as the US, Canada, South Africa and, of course, the UK.

The Australian Securities and Investments Commission (ASIC) has published several useful documents providing clear descriptions of the insolvency process in Australia. We borrow extensively from its documents,

3 Hart, Oliver, *Firms, Contracts and Financial Structure*, Oxford: Clarendon Press, 1995, p. 158.

4 Source: https://www.aph.gov.au/Parliamentary_Business/Committees/Joint/Corporations_and_Financial_Services/Completed_inquiries/2002-04/ail/index. Accessed 16 September 2019.

especially Information Sheet 74 *Voluntary Administration: A Guide for Creditors*, Information Sheet 45 *Liquidation: A Guide for Creditors*, Information Sheet 54 *Receivership: A Guide for Creditors* and Information Sheet 85 *Approving Fees: A Guide for Creditors*. There are also information sheets for employees, shareholders and directors. The links to these documents may be found at <http://www.asic.gov.au/regulatory-resources/insolvency/>.

23.2a THE VOLUNTARY ADMINISTRATOR'S ROLE (AUSTRALIA)

Voluntary administration is designed to resolve a company's future direction quickly once financial distress is confirmed and the likelihood of insolvency is considered high. An independent and suitably qualified person (the voluntary administrator) takes full control of the company to try to work out a way to save either the company or its business.

If it is not possible to save the company or its business, then the aim is to administer the affairs of the company so that there is a better return to creditors than they would have received if the company had instead been placed straight into liquidation.

A voluntary **administrator** is usually appointed by a company's directors, after they decide that the company is insolvent or likely to become insolvent. Less commonly, a voluntary administrator may be appointed by a liquidator, provisional liquidator or secured creditor.

Figure 23.2 gives a schematic view of the voluntary administration process in Australia.

Countries with legal systems derived from English law (such as the US, Canada, Hong Kong, Singapore, India, Australia, New Zealand and other former British colonies) have very similar processes for voluntary administration. For example, in Singapore, the following process is used:

Voluntary Arrangement (VA)⁵

Apart from the DRS [Debt Repayment Scheme], the other alternative is to arrange for a Voluntary Arrangement (VA).

A VA is essentially a formal arrangement between you and your creditors to repay the debt, with the supervision by a nominee. The nominee must be a:

- Registered public accountant;
- A lawyer; or
- A person gazetted by the Minister who has consented to being appointed.

On this note, the main reason why a VA is more advantageous than filing for bankruptcy is that it does not come with the restrictions that a bankruptcy order would impose on you. For example, the restrictions on overseas travel.

If you intend to pursue VA as an alternative, you may apply for an interim order to the court to suspend all bankruptcy proceedings against you.

After the interim order is granted by the court, you must disclose all assets and liabilities and make a proposal on how you intend to settle the debts with the creditors.

If the VA is accepted by the creditors during the creditors' meeting, the VA will be successfully implemented and you will be able to begin repaying the debts as per the approved proposal.

⁵ Source: 'Filing for Bankruptcy in Singapore and What Happens After That', Singapore Legal Advice, 15 November 2019, <https://singaporelegaladvice.com/law-articles/filing-for-bankruptcy-singapore>. Accessed 20 February 2020.

FIGURE 23.2 THE VOLUNTARY ADMINISTRATION PROCESS IN AUSTRALIA

A company in voluntary administration may also be in receivership: see Information Sheet 54 *Receivership: A Guide for Creditors* (INFO 54).

STEP	WHAT HAPPENS
Appointment of voluntary administrator	<p>A decision to appoint a voluntary administrator for a company can be made by:</p> <ul style="list-style-type: none"> • the directors (by resolution of the board and in writing) • a secured creditor (with a security interest in all or substantially all of the company's property), or • a liquidator (or provisional liquidator). <p>Voluntary administration begins on the appointment of the voluntary administrator.</p>
First meeting of creditors	<p>The voluntary administrator must hold the first meeting of creditors within eight business days of being appointed, unless the court allows an extension of time.</p> <p>At least five business days' notice of the meeting must be given to creditors.</p> <p>Creditors can vote at this meeting to:</p> <ul style="list-style-type: none"> • replace the administrator, and/or • create a committee of inspection.
Voluntary administrator's investigation and report	<p>The voluntary administrator must investigate the company's affairs and report to creditors on alternatives.</p>
Second meeting of creditors – meeting to decide company's future	<p>The voluntary administrator must hold the meeting to decide the company's future within 25 business days of being appointed (or 30 business days if the appointment is around Christmas or Easter), unless the court allows an extension of time.</p> <p>At least five business days' notice of the meeting must be given to creditors.</p> <p>Creditors can decide at this meeting to:</p> <ul style="list-style-type: none"> • return the company to the control of the directors • accept a deed of company arrangement (the deed must be signed by the company within 15 business days following the meeting, unless the court allows an extension of time), or • put the company into liquidation (this happens immediately, and the administrator becomes the liquidator).

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In contrast, we may observe the bankruptcy process in Japan. The process of moving a company into administration or declared bankruptcy is driven almost entirely by the debtors, and the creditors do not play a role: the debtor or trustee appointed by the company controls the process, making Japan a very 'debtor-friendly' country.

In Australia, after taking control of the company, the voluntary administrator investigates and reports to creditors on the company's business, property, affairs and financial circumstances, and on the three options available to creditors. These are:

- 1 end the voluntary administration and return the company to the directors' control
- 2 approve a deed of company arrangement, through which the company will pay all or part of its debts and then be free of those debts; or
- 3 wind up the company and appoint a liquidator.

The voluntary administrator must give an opinion on each option and recommend which option is in the best interests of creditors. In doing so, the voluntary administrator tries to work out the best solution to the company's problems, assesses any proposals put forward by others for the company's future and compares the possible outcomes of the proposals with the likely outcome if liquidation took place.

A creditors' meeting is usually held about five weeks after the company goes into voluntary administration. This meeting will decide on the best option for the company's future. In complex administrations, this meeting may be held later if the court consents.

The voluntary administrator has all the powers of the company and its directors. This includes the power to sell or close down the company's business or sell individual assets in the lead-up to the creditors' decision on the company's future. Another responsibility of the voluntary administrator is to report to ASIC on possible offences by people involved with the company.

Although the voluntary administrator may be appointed by the directors, they must act fairly and impartially.

Effect of Appointment

The effect of the appointment of a voluntary administrator is to provide the company with breathing space while the company's future is resolved. While the company is in voluntary administration:

- unsecured creditors cannot start, continue or enforce their claims against the company without the administrator's consent or the court's permission
- owners of property (other than perishable property) used or occupied by the company, or people who lease such property to the company, cannot recover their property
- except in limited circumstances, secured creditors cannot enforce their charge over company property
- a court application to put the company in liquidation cannot be started
- a creditor holding a personal guarantee from the company's director or other person cannot act under the personal guarantee without the court's consent.

Voluntary Administrator's Liability

Any debts that arise from the voluntary administrator purchasing goods or services, or hiring, leasing, using or occupying property are paid from the available assets as costs of the voluntary administration. If there are insufficient funds available from asset realisations to pay these costs, the voluntary administrator is personally liable for the shortfall.

The voluntary administrator must also decide whether to continue to use or occupy property owned by another party that is held or occupied by the company at the time of her or his appointment.

Within five business days after appointment, the voluntary administrator must notify the owner of property whether she or he intends to continue to occupy or use the property. If the voluntary administrator decides to continue to do so, she or he will be personally liable for any rent or amounts payable arising after the end of the five business days.

Amounts that become due to employees after the date of the appointment of the voluntary administrator have a priority claim against the company's assets as a cost of the administration. However, the voluntary administrator does not become personally liable for such amounts unless the voluntary administrator adopts employees' contracts of employment or enters into new employment contracts with them.

Creditors' Meetings

Two meetings of creditors must be held during the voluntary administration.

First Creditors' Meeting

The voluntary administrator must call the first creditors' meeting within eight business days after the voluntary administration begins. At least five business days before the meeting, the voluntary administrator must notify as many creditors as practical in writing and advertise the meeting.

The voluntary administrator must send to creditors, with the notice of meeting, declarations about any relationships she or he may have, or indemnities she or he has been given, to allow creditors to consider the voluntary administrator's independence and make an informed decision about whether they want to replace her or him with another voluntary administrator of the creditors' choice.

The purpose of the first meeting is for creditors to decide two questions:

- 1 whether they want to form a committee of creditors, and, if so, who will be on the committee
- 2 whether they want the existing voluntary administrator to be removed and replaced by a voluntary administrator of their choice.

The role of a committee of creditors is to consult with the voluntary administrator about matters relevant to the voluntary administration and receive and consider reports from the voluntary administrator. The committee can also require the voluntary administrator to report to them about the voluntary administration. It may also approve the voluntary administrator's fees.

To be eligible to vote at this meeting, a creditor must lodge details of his or her debt or claim with the voluntary administrator.

Second Creditors' Meeting (to Decide the Company's Future)

After investigating the affairs of the company and forming an opinion on each of the three options available to creditors (outlined above), including an opinion as to which option is in the best interests of creditors, the administrator must call a second creditors' meeting. At this meeting, creditors are given the opportunity to decide the company's future.

This meeting is usually held about five weeks after the company goes into voluntary administration. However, in complex voluntary administrations, more time is often needed for the voluntary administrator to be in a position to report to creditors. In these circumstances, the court can approve an extension of time to hold the meeting. The voluntary administrator chairs this meeting.

In preparation for the second meeting, the voluntary administrator must send creditors the following documents at least five business days before the meeting:

- a notice of meeting
- the voluntary administrator's report
- a statement about any proposals for a deed of company arrangement.

These documents need to be accompanied by a claim form (usually a 'proof of debt' form) and a proxy voting form.

Voluntary Administrator's Report

This report is intended to give sufficient information to explain the company's business, property and affairs, and the reasons for the current financial situation, to enable creditors to make an informed decision about the company's future. The report should also provide an analysis of any proposals for the future of the company, including the possible outcomes, as well as a comparable estimate of what would be available for creditors in a liquidation.

Finally, the report should include the voluntary administrator's opinion on each of the options available to creditors, as well as an opinion on which is in the best interests of creditors. As noted above, the options are:

- end the voluntary administration and return the company to the directors' control
- approve a deed of company arrangement (if one is proposed); or
- put the company into liquidation.

Voluntary Administrator's Statement about Deed

If there are proposals for a deed of company arrangement, the voluntary administrator must provide creditors with a statement giving enough details of each proposal to enable creditors to make an informed decision. The types of proposals allowed in a deed of company arrangement are very flexible.

23.2b DEED OF ARRANGEMENT

Typically, a proposal will provide for the company to pay all or part of its debts, possibly over time, and then be free of those debts. It will often provide for the company to continue trading. How these things will happen varies from case to case, as the terms allowed in a deed of company arrangement are also very flexible. The contents of a deed of company arrangement are discussed below.

Company Returned to Directors

If the company is returned to the directors, they will be responsible for ensuring that the company pays its outstanding debts as they fall due. It is only in very rare circumstances that creditors will resolve to return the company to the control of its directors.

Liquidation

liquidation
The orderly winding up of a company's affairs involving the realisation of the company's assets, cessation or sale of its operations, distributing the proceeds of realisation among its creditors and distributing any surplus among its shareholders

If creditors resolve that the company go into liquidation, the voluntary administrator becomes the liquidator unless creditors vote at the second meeting to appoint a different liquidator of their choice. The liquidation proceeds as a creditors' voluntary liquidation, with any payments of dividends to creditors made in the order set out in the Australian *Corporations Act 2001*.

Deed of Company Arrangement

If creditors vote for a proposal that the company enter a deed of company arrangement, the company must sign the deed within 15 business days of the creditors' meeting, unless the court allows a longer time. If this does not happen, the company will automatically go into liquidation, with the voluntary administrator becoming the liquidator.

The deed of company arrangement binds all unsecured creditors, even if they voted against the proposal. It also binds owners of property, those who lease property to the company and secured creditors, if they voted in favour of the deed. In certain circumstances, the court can also order that these people are bound by the deed even if they did not vote for it. The deed of company arrangement does not prevent a creditor who holds a personal guarantee from the company's director or another person taking action under the personal guarantee to be repaid their debt.

Contents of the Deed

Whatever the nature of the deed of company arrangement, it must contain certain information, including:

- the name of the deed administrator
- the property that will be used to pay creditors
- the debts covered by the deed and the extent to which those debts are released
- the order in which the available funds will be paid to creditors
- the nature and duration of any suspension of rights against the company
- the conditions (if any) for the deed to come into operation

- the conditions (if any) for the deed to continue in operation
- the circumstances in which the deed terminates.

There are also certain terms that will be automatically included in the deed, unless the deed says they will not apply. These are called the *prescribed provisions*. They include such matters as the powers of the deed administrator, termination of the deed and appointment of a committee of creditors.

Monitoring the Deed

It is the role of the deed administrator to ensure the company (or others who have made commitments under the deed) carries through these commitments. The extent of the deed administrator's ongoing role will be set out in the deed.

Creditors can also play a role in monitoring the deed. Matters that may give rise for concern include deadlines for payments or other actions promised under the deed being missed.

Creditors also have the right, when a deed of company arrangement is proposed and considered at the second meeting, to negotiate into the terms of the deed any consequences of failure to meet such deadlines.

The deed administrator must lodge a detailed list of receipts and payments with ASIC every six months.

Varying the Deed

The deed administrator can call a creditors' meeting at any time to consider a proposed variation to the deed or a resolution to terminate the deed. The proposed resolutions must be set out in the notice of meeting sent to creditors.

Creditors owed at least 10% in value of all creditor claims can, by written request, also require the deed administrator to call such a meeting. However, it is unusual for this to happen, as those who make the request must pay the costs of calling and holding the meeting.

Payment of Dividends under a Deed

The order in which creditor claims are paid depends on the terms of the deed. Sometimes the deed proposal is for creditor claims to be paid in the same priority as in a liquidation. At other times, a different priority is proposed. The deed must ensure employee entitlements are paid in priority to other unsecured creditors unless eligible employees have agreed to vary their priority.

Establishing Your Claim under a Deed

How debts or claims are dealt with under a deed of company arrangement depends on the deed's terms. In Australia, sometimes the deed incorporates the *Corporations Act 2001* provisions for dealing with debts or claims in a liquidation.

Before any dividend is paid to creditors for their debt or claim, they will need to give the deed administrator sufficient information to prove their debt. They may be required to complete a claim form (this is called a *proof of debt* in a liquidation).

How a Deed Comes to an End

A deed may come to an end because the obligations under the deed have all been fulfilled and the creditors have been paid. Alternatively, the deed may set out certain conditions where the deed will automatically terminate. The deed may also provide that the company will go into liquidation if the deed terminates because of these conditions being met.

Another way for the deed to end is if the deed administrator calls a meeting of creditors, and creditors vote to end the deed. This may occur because it appears unlikely that the terms of the deed can be fulfilled. At the same time, creditors may be asked to vote to put the company into liquidation.

The deed may also be terminated if a creditor, the company, ASIC or any other interested person applies to the court and the court is satisfied that:

- creditors were provided false and misleading information on which the decision to accept the deed proposal was made
- the voluntary administrator's report left out information that was material to the decision to accept the deed proposal
- the deed cannot proceed without undue delay or injustice; or
- the deed is unfair or discriminatory to the interests of one or more creditors or against the interests of creditors as a whole.

If the court terminates the deed as a result of such an application, the company automatically goes into liquidation.

23.2c OTHER PROCESSES IN EXTERNAL ADMINISTRATION

Approval of Administrator's Fees

Both a voluntary administrator and deed administrator are entitled to be paid for the work they perform. Generally, their fees will be paid from available assets, before any payments are made to creditors. They may have also arranged for a third party to pay any shortfall in their fees if there are not enough assets. The fees cannot be paid until the amount has been approved by a creditors' committee, creditors or the court. Creditors, the voluntary administrator/deed administrator or ASIC can ask the court to review the amount of fees approved.

Apart from fees, the voluntary administrator and deed administrator are entitled to reimbursement for out-of-pocket expenses that have arisen in carrying out their administration. This reimbursement does not usually require approval.

FINANCE IN THE REAL WORLD



IS PERSONAL BANKRUPTCY AN OPTION FOR REDUCING YOUR DEBTS IN AUSTRALIA?

Like many students, you may well graduate from university and begin your working career burdened with personal debt. You may also then add to the existing burdens of repayment of government loan schemes and credit card debts by purchasing a new wardrobe, a new car or perhaps even a new home on credit as you settle into a new job. But what happens if you lose your job, are struck by a major illness that runs up large uninsured medical bills or become responsible for caring for an invalid parent (three of the most common causes of personal financial distress)? Would filing for personal bankruptcy be a possible solution for your debt problems in Australia?

Yes and no. The Australian legal system does allow for personal bankruptcy. Initial guidance from the Australian government is available from the Australia Financial Security Authority ([webpage https://www.afsa.gov.au/](https://www.afsa.gov.au/)), with specific details for personal bankruptcy procedures given at <https://www.afsa.gov.au/debtors/bankruptcy>. Personal bankruptcy differs from the corporate insolvency process managed through ASIC. Personal bankruptcy generally lasts for a period of three years, but can be extended in certain circumstances. There is a permanent record of your bankruptcy on the National Personal Insolvency Index (an electronic



public register which can be accessed by anyone for a fee).

Your creditors are notified of your bankruptcy, and unsecured creditors should stop pursuing you for payment of your debts. A **trustee**, as this person is called for personal bankruptcy, will be appointed to your case. In order to pay your creditors, this trustee will:

- sell your assets (although you will be able to keep certain types of assets)
- mandate contributions from your income once you earn over a certain amount
- investigate your financial affairs and may recover property or money that you have transferred to someone else for inadequate consideration.

The duties of a trustee in personal bankruptcy are specified in legislation, and trustees have to adhere to certain standards while administering your estate. You can choose to appoint a registered trustee by obtaining and providing their consent when you lodge your petition to become bankrupt. If you do not choose a trustee, the government's Official Trustee is initially appointed to administer your estate. Your creditors may choose to change the trustee at any time.

So it would seem that you will be committed to paying off your student loans whether you seek the protection of bankruptcy or not.

trustee

A person appointed to manage a case of personal bankruptcy

Creditors' Committee

A creditors' committee may be formed, following a vote of creditors, to consult with the voluntary administrator or deed administrator and receive reports on the conduct of their administration. A creditors' committee can also approve the administrator's fees.

In a voluntary administration, this committee is called a 'committee of creditors' and may be formed at the first creditors' meeting. While the company is under a deed of company arrangement, it is called a 'committee of inspection'.

All creditors, including a representative of the company's employees, are entitled to stand for committee membership to represent the interests of all creditors. If a creditor is a company, the creditor can nominate a director or employee to represent it on the committee.

23.2d AFFECTED PARTIES IN ADMINISTRATION

Employee Entitlements under Voluntary Administration

If the voluntary administrator continues to trade the business, she or he must pay out of the assets available to them ongoing wages for services provided and other employee entitlements that arise after the date of her or his appointment. These payments are treated as an expense of the voluntary administration. The appointment of a voluntary administrator does not automatically terminate the employment of the company's employees. As a result, unless the voluntary administrator adopts the employment contracts or enters into new contracts of employment with employees, she or he is not personally liable for any employee entitlements that arise during voluntary administration.

As voluntary administration is an interim form of external administration, employee entitlements that arose prior to voluntary administration are not usually paid during voluntary administration.

How and when these employee entitlements are paid depends on the option passed at the creditors' meeting – company returned to directors, a deed of company arrangement or liquidation.

Shareholders and Voluntary Administration

A voluntary administrator is not required to report to shareholders on the progress or outcome of a voluntary administration. Shareholders do not get to vote on the future of the company.

A transfer of shares in a company or alteration of status of shareholders during a voluntary administration will not be effective unless the voluntary administrator gives his or her written consent or the court permits. The voluntary administrator or the court will need to be satisfied that the transfer of shares, or the alteration in the status of shareholders, is in the best interest of the company as a whole and does not breach other sections of the Corporations Act that deal with the rights of shareholders.

Shareholders are bound by a deed of company arrangement approved by creditors. Also, the deed administrator may transfer shares in the company with the written consent of the shareholder or with the court's permission. A shareholder, a creditor, ASIC or any other interested person can oppose an application to the court by the deed administrator to approve a share transfer.

If a deed administrator makes a written declaration that he or she has reasonable grounds to believe there is no likelihood that shareholders will receive any further distribution at any time in the future, shareholders can realise a capital loss. To realise a loss, the shares in the company must have been purchased on or after 20 September 1985.

Similarly, under liquidation and receivership, the administrator or liquidator is not required to report to the shareholders about progress. The creditors, secured and unsecured, have prior claim, and are the main focus in the insolvency process.

Directors and Voluntary Administration

Directors cannot use their powers while the company is in voluntary administration. They must help the voluntary administrator, including providing the company's books and records and issuing a report about the company's business, property, affairs and financial circumstances, as well as disclosing any further information about these that the voluntary administrator reasonably requires.

Directors' Powers and Obligations

Directors of companies in voluntary administration or liquidation lose control of the company. If a company goes from voluntary administration into a deed of company arrangement, the powers of the directors depend on the deed's terms. When the deed is completed, the directors regain full control unless the deed provides for the company to go into liquidation on completion.

receivership

An insolvency procedure where a receiver, or receiver and manager, is appointed over some or all of the company's assets

In a **receivership**, the powers of the directors depend on the powers of the receiver, as detailed in the charge document, and the extent of the assets over which the receiver is appointed. If the receiver is appointed over all or most of the assets of a company, the receiver effectively has control, although the directors still have certain responsibilities and duties, and may retain residual control.

Generally, directors have an obligation to assist the external administrator by:

- advising the external administrator of the location of company property and delivering any such property in their possession to the external administrator
- providing the company's books and records to the external administrator (voluntary administration and liquidation) or giving access to the books and records to the external administrator (receivership)
- advising the external administrator of the whereabouts of other company records
- providing a written report about the company's business, property and financial circumstances within either five business days (voluntary administration), seven days (creditors' voluntary liquidation) or 14 days (receivership and court liquidation) of the appointment of the external administrator

- meeting with, or reporting to, the external administrator to help her or him with her or his enquiries, as reasonably required.

Directors, officers and other people with relevant books and records have a responsibility to the company and to creditors, and must not obstruct external administrators in carrying out their duties.

LO23.2

CONCEPT REVIEW QUESTIONS

- 3 Why is it necessary to have insolvency laws? How do they benefit companies in financial distress?
- 4 How does society benefit by allowing companies to declare themselves to be insolvent?
- 5 Under what circumstances would it make sense for a company to reorganise rather than liquidate?

THINKING CAP QUESTIONS

- 1 In considering how we pay external administrators, what do you think are the key factors to bear in mind?
- 2 What do you think are the benefits to the capital market from having a clearly defined method for declaring and managing insolvency? What are the costs?
- 3 A distressed company is considering whether to declare itself insolvent. What issues must a reorganisation plan address with respect to secured creditors? Under what conditions can existing equity holders receive some payment in the plan?

LO23.3

23.3 PRIORITY OF CLAIMS

In Australia, the priority of claims in insolvency is given as:

- 1 Secured creditors (with fixed charge over specific assets)
- 2 Preferential unsecured (notably employee entitlements and liquidation expenses)
- 3 Secured creditors (with floating charge over general assets)
- 4 Unsecured creditors
- 5 Subordinated debt
- 6 Shareholders (with preference shareholders ranking above ordinary shareholders).

This means that, in a liquidation, the secured creditors are paid first when they have a fixed claim over specific assets of the company, followed by preferential unsecured creditors (such as employees and those involved with managing the liquidation) and so on. Those listed *ahead* of the others are given priority in their claims, as illustrated in **Figure 23.3**.

FIGURE 23.3 CREDITOR PRIORITY IN INSOLVENCY

RANK	NAME	EXAMPLES	COMMENTS
1	Secured (fixed charge)	Mortgagee	Any shortfall between obligation and asset value becomes an unsecured claim.
2	Preferential unsecured	Employee entitlements Liquidation expenses	Liquidation expenses rank first. Accrued wages and superannuation contributions rank ahead of compensation for injury, any accrued leave entitlements and, last, retrenchment payments.
3	Secured (floating charge)	Debenture (with floating charge)	
4	Unsecured creditors	Trade creditors	
5	Subordinated debt		Explicit agreement to subordination of claims is recognised.
6	Shareholders		Preference shareholders rank (typically) above ordinary shareholders.

Source: Parliamentary Joint Committee on Corporations and Financial Services: PJCCFS, 2004 *Corporate Insolvency Laws: a Stocktake*, Parliamentary Joint Committee on Corporations and Financial Services June, Commonwealth of Australia, Senate Printing Unit, Parliament House, Canberra. http://www.aph.gov.au/Parliamentary_Business/Committees/Joint/Corporations_and_Financial_Services/Completed_inquiries/2002-04/ail/index. Accessed 16 September 2019.

In a liquidation, it is important to recognise that if any secured creditors have specific assets pledged as collateral, then they receive the proceeds from the sale of those assets. If these proceeds are inadequate to meet their claim, the secured creditors become unsecured (or general) creditors for the unrecovered amount because specific collateral no longer exists. These and all other unsecured creditors will divide up, on a pro rata basis, any funds remaining after all prior claims have been satisfied. If the proceeds from the sale of secured assets are in excess of the claims against them, the excess funds become available to meet claims of unsecured creditors.



Establishing Payouts on Liquidation

Figure 23.4 presents the balance sheet of Oxford Company, a manufacturer of computer drives. The administrator has liquidated the company's assets, obtaining the largest amounts possible. The administrator obtained \$2.1 million for the company's current assets and \$1.8 million for the company's fixed assets; thus, the total proceeds from the liquidation amounted to \$3.9 million. It is clear that the company is legally insolvent because its liabilities of \$5.5 million exceed the \$3.9 million asset sale proceeds.

The next step is to distribute the proceeds to the various creditors. The only liability that is not shown on the balance sheet is \$500,000 in expenses for administering the insolvency

proceedings and satisfying unpaid bills incurred between the time of declaring the insolvency and the finalisation of the payout schedule.

Figure 23.5 shows the distribution of the \$3.9 million among the company's creditors and illustrates that, once all prior claims on the proceeds to liquidation have been satisfied, the unsecured creditors get the remaining funds.

Figure 23.6 gives the pro rata distribution of the \$1 million among the unsecured creditors. The disposition of funds in the Oxford Company liquidation is shown in **Figures 23.5** and **23.6**. Because the claims of the unsecured creditors have not been fully satisfied, the preferred and ordinary shareholders receive nothing.





FIGURE 23.4 BALANCE SHEET FOR OXFORD COMPANY

ASSETS		LIABILITIES AND SHAREHOLDERS' EQUITY	
Cash	\$ 100,000	Accounts payable	\$ 200,000
Accounts receivable	1,200,000	Notes payable – bank	1,500,000
Inventories	3,150,000	Accrued wages ^a	100,000
Total current assets	<u>\$4,450,000</u>	Unpaid employee benefits ^b	110,000
Land	\$2,000,000	Unsecured customer deposits ^c	90,000
Net plant	1,500,000	Taxes payable	300,000
Net equipment	1,800,000	Total current liabilities	\$2,300,000
Total fixed assets	<u>\$5,300,000</u>	First mortgage ^d	\$1,400,000
Total	<u>\$9,750,000</u>	Second mortgage ^d	800,000
		Subordinated unsecured debt	1,000,000
		Total long-term debt	\$3,200,000
		Preferred shares (7,000 shares)	\$ 700,000
		Ordinary shares (20,000 shares)	\$ 200,000
		Paid-in capital in excess of par	300,000
		Retained earnings	\$2,350,000
		Total shareholders' equity	<u>\$3,550,000</u>
		Total	<u>\$9,750,000</u>

a Represents wages of \$4,000 or less per employee earned within 90 days of filing bankruptcy for 75 of the company's employees.

b These unpaid employee benefits were due in the 180-day period preceding the company's bankruptcy filing, which occurred simultaneously with the termination of its business.

c Unsecured customer deposits not exceeding \$1,800 each.

d The first and second mortgages are on the company's total fixed assets. The debentures are subordinated to the notes payable.

FIGURE 23.5 DISTRIBUTION OF THE LIQUIDATION PROCEEDS OF OXFORD COMPANY

Proceeds from liquidation	\$3,900,000
Expenses of administering insolvency and paying bills	\$500,000
Wages owed workers	100,000
Unpaid employee benefits	110,000
Unsecured customer deposits	90,000
Taxes owed governments	300,000
Funds available for creditors	\$2,800,000
First mortgage, paid from \$1.8 million proceeds of fixed asset sale	\$1,400,000
Second mortgage, partially paid from remaining asset sale proceeds	400,000
Funds available for unsecured creditors	\$1,000,000



FIGURE 23.6 PRO RATA DISTRIBUTION OF FUNDS AMONG THE UNSECURED CREDITORS OF OXFORD COMPANY

UNSECURED CREDITORS' CLAIMS	AMOUNT	SETTLEMENT AT 32% ^a	AFTER SUBORDINATION
Unpaid balance on second mortgage	\$ 400,000 ^b	\$ 129,032	\$ 129,032
Accounts payable	200,000	64,516	64,516
Notes payable – bank	1,500,000	483,871	806,452
Subordinated debentures	1,000,000	322,581	0
Totals	\$3,100,000	\$1,000,000	\$1,000,000

a The 32% rate is calculated by dividing the \$1 million available for the unsecured creditors by the \$3.1 million owed the unsecured creditors. Each is entitled to a pro rata share.

b This figure represents the difference between the \$800,000 second mortgage and the \$400,000 payment on the second mortgage from the proceeds from the sale of the collateral remaining after satisfying the first mortgage.

LO23.3

CONCEPT REVIEW QUESTIONS

- 6 What is the significance of subordinating a claim if a company is liquidated?
- 7 Why is payment of the expenses of administering the insolvency proceeding given the highest priority?

23.4 PREDICTING INSOLVENCY

Many analysts attempt to predict the occurrence of insolvency using a tool like Altman's Z-score, named after Professor Edward Altman of New York University who developed it.

Z-score

The product of a quantitative model for forecasting insolvency that uses a blend of traditional financial ratios and a statistical technique known as *multiple discriminant analysis*. In some tests, the Z-score has been found to be about 90% accurate in forecasting insolvency one year in the future and about 80% accurate in forecasting it two years in the future.

The **Z-score** is the output of a quantitative model that uses a blend of traditional financial ratios and a statistical technique known as *multiple discriminant analysis*. In some tests, the Z-score has been found to be about 90% accurate in forecasting insolvency one year in the future and about 80% accurate in forecasting it two years in the future. The model was estimated for US manufacturing companies for recent times up to 2000 as follows:

$$Z = 1.2(X_1) + 1.4(X_2) + 3.3(X_3) + 0.6(X_4) + 1.0(X_5)$$

where: X_1 = Working capital ÷ Total assets

X_2 = Retained earnings ÷ Total assets

X_3 = Earnings before interest and taxes ÷ Total assets

X_4 = Market value of equity ÷ Book value of total liabilities

X_5 = Sales ÷ Total assets

The guidelines for classifying businesses are: Z-score less than or equal to 1.8, high probability of insolvency; Z-score between 1.81 and 2.99, unsure; and Z-score of 3.0 or higher, insolvency unlikely.

 **EXAMPLE****Calculating a Z-score**

Figure 23.7 presents the balance sheet and Figure 23.8 depicts the income statement for Poff Industries, a manufacturer of computer power supplies. The company's share price currently is \$3.50 per share.

The company's Z-score can be calculated as follows:

$$z = 1.2(0.052) + 1.4(0.095) + 33(0.086) + 0.6(0.418) + 1.0(0.431) = 1.157$$

The Z-score of 1.157 indicates that the probability that Poff Industries will fail is quite high.

FIGURE 23.7 BALANCE SHEET FOR POFF INDUSTRIES

ASSETS		LIABILITIES AND SHAREHOLDERS' EQUITY	
Cash	\$100,000	Accounts payable	\$2,000,000
Accounts receivable	1,000,000	Notes payable – bank	1,500,000
Inventories	3,000,000	Total current liabilities	3,500,000
Total current assets	4,100,000	Mortgage	
Land	2,000,000	Unsecured bonds	3,000,000
Net plant	2,500,000	Total long-term debt	5,000,000
Net equipment	3,000,000	Ordinary shares (1,000,000 shares)	1,000,000
Total fixed assets	7,500,000	Paid-in capital in excess of par	1,000,000
Total	11,600,000	Retained earnings	1,100,000
		Total shareholders' equity	3,100,000
		Total	11,600,000

FIGURE 23.8 INCOME STATEMENT FOR POFF INDUSTRIES

Sales	\$5,000,000
Less: Cost of goods sold	3,000,000
Less: Selling and administrative expenses	1,000,000
Earnings before interest and taxes	\$1,000,000
Less: Interest	500,000
Earnings before taxes	\$500,000
Less: Taxes (40%)	200,000
Net income	\$300,000

LO23.4

 **CONCEPT REVIEW QUESTIONS**

- 8 Why is predicting insolvency useful?
- 9 How are the five factors that determine a Z-score related to the financial health of a business?

THINKING CAP QUESTION

- 4 Your company is considering lending money to a new customer. What factors might you consider in determining whether or not to lend to this customer?

STUDY TOOLS

SUMMARY

- LO23.1
 - *Financial distress* refers to the condition that a company's cash flows are insufficient to pay its current obligations.
- LO23.2
 - *Insolvency* refers to the legal process that companies go through to resolve financial distress. It gives the debtor company (and its management) an opportunity to renegotiate with creditors.
 - Valuation disputes are common in insolvency, since each party has incentive for the company's assets to be valued in a way that is favourable to its own priority status.
- LO23.3
 - Alternatives to the voluntary administration are liquidation and receivership.
- LO23.4
 - Quantitative models have been developed to predict the likelihood that an individual company may become insolvent. The best-known model for predicting insolvency calculates the company's Z-score, which results from application of a statistical technique to traditional financial ratios.

SELF-TEST PROBLEMS

Answers to these 'Self-test problems' and the 'Concept review' questions throughout the chapter appear on the Student Companion Website (<http://login.cengagebrain.com>) or via your instructor.

- ST23-1** A company has \$8 million in funds to distribute to its unsecured creditors. Three possible sets of unsecured creditor claims are presented. Calculate the settlement, if any, to be received by each creditor in each case shown in the following table.

UNSECURED CREDITORS' CLAIMS	CASE I	CASE II	CASE III
Unpaid balance of second mortgage	\$ 2,000,000	\$ 2,500,000	\$ 5,000,000
Accounts payable	2,500,000	3,000,000	4,000,000
Notes payable – bank	3,500,000	3,500,000	1,500,000
Unsecured bonds	4,000,000	5,000,000	5,500,000
Total	\$12,000,000	\$14,000,000	\$16,000,000

- ST23-2** Oxygen Filtration Systems recently failed, and will be liquidated by a court-appointed administrator, who will charge \$500,000 for his services. The pre-liquidation balance sheet follows. Assume that the administrator liquidates the assets for \$10.2 million, with \$5.8 million coming from the sale of current assets and \$4.4 million coming from fixed assets. Also assume that the unsecured bonds are subordinate to the notes payable. Prepare a table indicating the amount to be distributed to each claimant. Do the company's owners receive any funds?

OXYGEN FILTRATION SYSTEMS BALANCE SHEET AS AT 31 DECEMBER 2019			
ASSETS	LIABILITIES AND SHAREHOLDERS' EQUITY		
Cash	\$ 600,000	Accounts payable	\$ 2,500,000
Marketable securities	750,000	Notes payable – bank	4,000,000
Accounts receivable	1,750,000	Accrued wages ^a	750,000
Inventories	2,250,000	Unpaid employee benefits ^b	500,000
Prepaid expenses	900,000	Unsecured customer deposits ^c	500,000
Total current assets	\$ 6,250,000	Taxes payable	1,000,000
		Total current liabilities	\$ 9,250,000





Land	\$ 3,000,000	First mortgage ^a	\$ 3,000,000
Net plant	5,000,000	Second mortgage ^b	2,000,000
Net equipment	<u>6,250,000</u>	Unsecured bonds	<u>3,500,000</u>
Total fixed assets	<u>\$14,250,000</u>	Total long-term debt	<u>\$ 8,500,000</u>
Total	<u>\$20,500,000</u>	Preferred shares (10,000 shares)	\$ 500,000
		Ordinary shares (20,000 shares)	2,000,000
		Retained earnings	250,000
		Total shareholders' equity	\$ 2,750,000
		Total	<u>\$20,500,000</u>

- a Represents wages of \$ 4,000 or less per employee earned within 90 days of declaring insolvency for 200 of the company's employees.
b Unpaid employee benefits that were due in the 180-day period preceding the company's declaration of insolvency, which occurred simultaneously with the termination of its business.
c Unsecured customer deposits not exceeding \$1,800 each.
d First and second mortgages on the company's total fixed assets.

QUESTIONS

- Q23-1** Discuss why it makes sense to help companies attempt to reorganise rather than liquidate.
- Q23-2** Why do creditors usually accept a plan for financial rehabilitation rather than demand liquidation of a business?
- Q23-3** 'A certain number of insolvencies are good for the economy.' Discuss why you agree or disagree with this statement.
- Q23-4** What are the advantages and disadvantages of a voluntary administration to resolve financial distress? What are the advantages and disadvantages of claiming insolvency to resolve financial distress?
- Q23-5** A business can be liquidated for \$700,000, or it can be reorganised. Reorganisation would require an investment of \$400,000. If the company is reorganised, earnings are projected to be \$150,000 per year, and the company would trade at a price/earnings ratio of 8. Should the company be liquidated or reorganised?
- Q23-6** Explain why the priorities for liquidation are determined as they are. Do you agree with the order?
- Q23-7** Who would use Altman's Z-score to predict insolvency? Why would the ability to predict insolvency be useful to them?

PROBLEMS

INSOLVENCY AND BUSINESS FAILURE: PRIORITY OF CLAIMS

- P23-1** A company has \$450,000 in funds to distribute to its unsecured creditors. Three possible sets of unsecured creditor claims are presented. Calculate the settlement, if any, to be received by each creditor in each case shown in the following table.

UNSECURED CREDITORS' CLAIMS	CASE I	CASE II	CASE III
Unpaid balance of second mortgage	\$300,000	\$200,000	\$ 500,000
Accounts payable	200,000	100,000	300,000
Notes payable – bank	300,000	100,000	500,000
Unsecured bonds	100,000	200,000	500,000
Total	\$900,000	\$600,000	\$1,800,000

P23-2 Keck Business Forms recently failed and will be liquidated by a court-appointed administrator, who will charge \$300,000 for her services. The pre-liquidation balance sheet follows. Assume that the administrator liquidates the assets for \$4.8 million, with \$2.6 million coming from the sale of current assets and \$2.2 million coming from fixed assets. Also assume that the unsecured bonds are subordinate to the notes payable. Prepare a table indicating the amount to be distributed to each claimant. Do the company's owners receive any funds?

KECK BUSINESS FORMS BALANCE SHEET AS AT 31 DECEMBER 2019			
ASSETS		LIABILITIES AND SHAREHOLDERS' EQUITY	
Cash	\$ 100,000	Accounts payable	\$1,200,000
Marketable securities	50,000	Notes payable – bank	1,100,000
Accounts receivable	1,100,000	Accrued wages ^a	300,000
Inventories	2,400,000	Unpaid employee benefits ^b	200,000
Prepaid expenses	400,000	Unsecured customer deposits ^c	250,000
Total current assets	\$4,050,000	Taxes payable	100,000
		Total current liabilities	\$3,150,000
Land	\$1,000,000	First mortgage ^d	\$1,500,000
Net plant	2,100,000	Second mortgage ^d	1,000,000
Net equipment	2,300,000	Unsecured bonds	2,000,000
Total fixed assets	\$5,400,000	Total long-term debt	\$4,500,000
Total	\$9,450,000	Preferred shares (5,000 shares)	\$ 500,000
		Ordinary shares (10,000 shares)	1,000,000
		Retained earnings	300,000
		Total shareholders' equity	\$1,800,000
		Total	\$9,450,000

a Represents wages of \$4,000 or less per employee earned within 90 days of being declared insolvent for 200 of the company's employees.

b Unpaid employee benefits that were due in the 180-day period preceding the company's insolvency, which occurred simultaneously with the termination of its business.

c Unsecured customer deposits not exceeding \$1,800 each.

d First and second mortgages on the company's total fixed assets.

PREDICTING INSOLVENCY

P23-3 Sosbee Foods has a working capital/total assets ratio of 0.2, a retained earnings/total assets ratio of 0.1, an earnings before interest and taxes/total assets ratio of 0.25, a market value of equity/book value of total liabilities ratio of 0.6 and a sales/total assets ratio of 0.8. Calculate and interpret the company's Z-score.

P23-4 The following balance sheet and income statement are for Weber Industries. The company's shares are currently priced at \$6 per share. Calculate and interpret the company's Z-score.

WEBER INDUSTRIES BALANCE SHEET AS AT 31 DECEMBER 2019			
ASSETS		LIABILITIES AND SHAREHOLDERS' EQUITY	
Cash	\$ 400,000	Accounts payable	\$ 5,000,000
Accounts receivable	3,000,000	Notes payable – bank	1,000,000
Inventories	4,000,000	Total current liabilities	\$ 6,000,000
Total current assets	\$ 7,400,000	Mortgage	\$ 4,000,000
Land	\$ 1,000,000	Unsecured debt	6,000,000
Net plant	5,000,000	Total long-term debt	\$10,000,000
Net equipment	8,000,000	Preferred shares (100,000 shares)	\$ 1,000,000
Total fixed assets	\$14,000,000	Ordinary shares (500,000 shares)	1,000,000
Total	\$21,400,000	Paid-in capital in excess of par	2,000,000
		Retained earnings	1,400,000
		Total shareholders' equity	\$ 5,400,000
		Total	\$21,400,000

WEBER INDUSTRIES INCOME STATEMENT FOR THE YEAR ENDING 31 DECEMBER 2019	
Sales	\$6,000,000
Less: Cost of goods sold	3,500,000
Less: Selling and administrative expenses	1,000,000
Earnings before interest and taxes	\$1,500,000
Less: Interest	1,100,000
Earnings before taxes	400,000
Less: Taxes (30%)	120,000
Net income	\$ 280,000

P23-5 Compute the Z-score for Central Manufacturing Corporation (CMC), given the following information for year-end 2019.

CMC FINANCIAL INFORMATION (YEAR-END 2019)	
Current assets	\$ 41,224,000
Current liabilities	\$ 73,911,000
Retained earnings	-\$ 70,610,000
Total assets	\$ 91,047,000
Total liabilities	\$176,387,000
Shares outstanding	610,500,684
Share price	\$2.83
Sales	\$148,979,000
EBIT	-\$ 27,467,000

Note: All values in thousands except share price and shares outstanding.

Based on its Z-score, is CMC likely to go bankrupt in the near future?

P23-6 Compute the Z-score for Win-Mart, given the following information for year-end 2019.

WIN-MART FINANCIAL INFORMATION (YEAR-END 2019)	
Current assets	\$ 48,949,000
Current liabilities	\$ 55,390,000
Retained earnings	\$ 63,600,000
Total assets	\$ 163,429,000
Total liabilities	\$ 98,144,000
Shares outstanding	3,925,000,000
Share price	\$47.12
Sales	\$ 405,607,000
EBIT	\$ 22,798,000

Note: All values in thousands except share price and shares outstanding.

What proportion (measured as a percentage) of the Z-score is composed of 0.60(X4)? What proportion (measured as a percentage) of the Z-score is composed of 1.00(X5)? Is Win-Mart likely to fail in the near-future?

CASE STUDY

INSOLVENCY AND FINANCIAL DISTRESS

Flanan Photography Studios (FPS) is preparing for a court-ordered liquidation and has issued the following pre-liquidation financial statements.

FLANAN PHOTOGRAPHY STUDIOS BALANCE SHEET AS AT 31 DECEMBER 2019			
ASSETS		LIABILITIES AND SHAREHOLDERS' EQUITY	
Cash	\$ 800,000	Accounts payable	\$ 2,600,000
Marketable securities	24,000	Notes payable	2,200,000
Accounts receivable	3,500,000	Accrued wages	700,000
Inventories	4,000,000	Unpaid employee benefits	385,000
Prepaid expenses	1,000,000	Taxes payable	250,000
Total current assets	\$ 9,324,000	Total current liabilities	\$ 6,135,000
		First mortgage	\$ 8,500,000
Land	\$10,000,000	Second mortgage	27,000,000
Net plant	28,000,000	Unsecured bonds	28,000,000
Net equipment	32,000,000	Total long-term debt	\$63,500,000
Total fixed assets	\$70,000,000	Preferred shares (15,000 shares)	\$ 1,500,000
Total	\$79,324,000	Ordinary shares (1,500,000 shares)	7,500,000
		Retained earnings	689,000
		Total shareholders' equity	\$ 9,689,000
		Total	\$79,324,000

**FLANAN PHOTOGRAPHY STUDIOS INCOME STATEMENT FOR THE
YEAR ENDING 31 DECEMBER 2019**

Sales	\$14,420,000
Cost of goods sold	-7,210,000
Selling and administrative expenses	-787,000
Earnings before interest and taxes	\$ 6,423,000
Interest expense	-5,715,000
Earnings before taxes	\$708,000
Taxes (30%)	-283,200
Net income	<u><u>\$424,800</u></u>

TruValue Administration Services (TAS) has been appointed to oversee the sale and disbursement of funds from the liquidation and will charge \$450,000 for the

service. TAS can obtain \$7,250,000 from the sale of FPS's current assets and \$49,850,000 from the sale of fixed assets. Accrued wages represent wages of \$4,000 or less per employee, and the wages were earned within 90 days of insolvency being declared. Unpaid employee benefits represent an amount that was due within the 180-day period preceding the insolvency declaration. The first and second mortgages are secured by the company's total fixed assets. The company's shares are currently trading for \$3.25 per share.

ASSIGNMENT

- 1 Calculate the amount to be received by each claimant.
- 2 Calculate and interpret the company's Z-score.

SOUND BITES: ETHICS IN CORPORATE FINANCE – PART 5

WRITTEN BY BORIS BIELER

Boris Bieler has over twenty years of risk management experience mainly gained in senior audit leadership roles at foreign corporate and investment banks in Australia. For his full biography, please see p. 114.



THE PIPELINE – TRENDS IN BUSINESS ETHICS: ARTIFICIAL INTELLIGENCE (AI)

Three months into Jane's new role with the M&A advisory firm, she has been nominated by her manager for the company's taskforce on adopting AI technology. Jane's degree in data science and business ethics helps her understand and discuss the taskforce's workstreams in areas of use of AI in her company, the benefits and risks the M&A advisory firm might face in implementing the technology, and the current AI regulatory framework with which her organisation needs to comply.

AI is a set of technologies which perform tasks that would normally require human intelligence. Based upon large data sets, such computer systems learn and evolve over time. In the corporate finance industry, AI may be used for originating deals by identifying and match-making buyer and target companies; conducting the due diligence and company valuation process and compiling disclosure requirements by assessing large data sets; simulating financial performances of organisations; and performing assurance checks on the quality of voluntary and mandatory filings.

Key benefits of AI are enhanced capabilities in the firm's service offering, increased efficiency and cost savings. AI requires good data quality and thus data cleansing.

The risks of AI, however, are the potential harm and loss from AI exercising autonomous judgement. Specific to corporate finance, the complexity of large transactions and the lack of standardised deals may still require manual intervention.

Formal government regulation is yet to be widely implemented in the Asia-Pacific region and globally. Self-regulation and national non-binding ethical frameworks are filling the gap. The objective of such sets of principles is to promote an ethical use of AI technologies. People and organisations responsible for the development and implementation of AI should be identifiable and accountable for the impacts. AI processes need to be safe, robust, transparent, explained and constantly assessed by humans so that unintentional harm can be prevented, or at least minimised. As the evolution of AI is built upon large data sets, legitimate data access and data use is paramount for ensuring the trust in AI by customers and the public.

At the inaugural meeting of the taskforce, Jane and the other members found common ground that there is neither willingness nor need to change the overall risk appetite of the company and that any decision made by AI technology should be subject to the same ethical standards of the company as any actions taken by humans.



ASSIGNMENTS

- 1 Given your study of previous chapters of this book, what would you identify as areas of use of AI in corporate finance? While describing such AI processes, also assess any ethical concerns you might expect when implementing the technology, such as relating to accountability, privacy or transparency matters.
- 2 Regulatory frameworks are rapidly evolving in many countries. Between the publication time of this book and the time of your study, would you say that regulatory frameworks are sufficiently mature to govern AI, or are governments playing catch-up? To strengthen your case, please select as an example any regulatory framework in the Asia-Pacific region.
- 3 Do the opportunities of AI seem to outweigh the challenges? List pros and cons of using AI in the corporate finance field and explain your conclusion.
- 4 Let us assume that AI is used for assessing files in virtual data rooms and ultimately assists M&A analysts in evaluating the target company in an acquisition. Let us also presume that the AI program continuously improves by going through more and more past transactions. Please describe a scenario where data privacy may be challenged and potentially breached if no safeguards are in place.

NOTES

GLOSSARY

A

ABC system An inventory control system that segregates inventory into three groups – A, B and C. A items require the largest dollar investment and the most intensive control, B items require the next largest investment and less intensive control and C items require the smallest investment and least intensive control

accounting rate of return Return on investment calculated by dividing net income by the book value of assets

accounts payable management A short-term financing activity that involves managing the time that elapses between the purchase of raw materials and mailing the payment to the supplier

accredited investors Individuals or institutions that meet certain income and wealth requirements

accrual-based approach Revenues are recorded at the point of sale and costs when they are incurred, not necessarily when a company receives or pays out cash

acquisition The purchase of resources, assets or another company

actively managed A strategy in which an investor does research in an attempt to identify undervalued and overvalued shares

activity ratios A measure of the speed with which a company converts various accounts into sales or cash

administrator A person appointed to manage the process of resolving a company's future in place of the directors and management of the company

ageing of accounts receivable

A schedule that indicates the portions of the total accounts receivable balance that have been outstanding for specified periods of time

agency cost/contracting model

A theoretical model that explains empirical patterns in dividend payment and share repurchase data based on the belief that paying dividends allows a company to overcome agency problems between managers and shareholders

agency costs Costs that arise from conflicts of interest between shareholders and managers

agency costs of debt Costs that arise because shareholders and bondholders have different objectives

agency costs of (outside) equity

The value-reducing actions that managers take when ownership (by shareholders) is separated from control by managers

agency problems The conflict of interest between the goals of a company's owners and its managers

aggressive strategy Financing strategy in which a company relies heavily on short-term borrowing, not only to meet the seasonal peaks each year but also to finance a portion of the long-term growth in sales and assets

all-in rate The base rate plus the spread on a short-term variable rate loan

American call option An option that grants the right to buy an underlying asset on or before the expiration date

American depository receipts (ADRs)

Dollar-denominated claims, issued by US banks, that represent ownership of shares of a foreign company's equity held on deposit by the US bank in the issuing firm's home country

angel capitalists Wealthy individuals who make private equity investments on an ad hoc basis

announcement date The day a company declares the amount of the dividend, plus the dividend record and payment dates to the public

annual percentage yield (APY)

The annual rate of interest actually paid or earned, reflecting the impact of compounding frequency. The same as the *effective annual rate* (sometimes called the *effective APR*)

annuity A stream of equal periodic cash flows over a stated period of time

annuity due An annuity for which the payments occur at the beginning of each period

appreciate A currency appreciates when it buys more of another currency than it did previously

arbitrage The process of buying something in one market at a low price and simultaneously selling it in another market at a higher price to generate an immediate, risk-free profit

ask price The price at which a market maker offers to sell a security; the price at which an investor can purchase a security

asset sale Assets of one company are sold to another organisation, usually for cash

asset substitution When shareholders choose risky projects that benefit themselves but reduce the value of bondholders	automated clearinghouse (ACH) debit transfer A pre-authorised electronic withdrawal from the payer's account	during its life requires only periodic interest payments
assets-to-equity (A/E) ratio A measure of the proportion of total assets financed by a company's equity. Also called the <i>equity multiplier</i>	availability float The time between deposit of a cheque and availability of the funds to a company	bank-accepted bill A commercial bill on which a bank places its name together with that of the issuer of the bill, to indicate the borrower has sufficient funds to repay the borrowing
asymmetric information The situation that exists when managers of the company have more information about the company and its prospects than do investors	average age of inventory A measure of inventory turnover, calculated by dividing the turnover figure into 365, the number of days in a year	bank-accepted commercial bill A short-term bond issued at a discount by a company, paying no interest but repayment of the face value at maturity, with bank support
at the money An option is at the money when the share price equals the strike price	average annual percentage rate (AAPR) The stated annual rate calculated by multiplying the periodic rate by the number of periods in one year	bank account analysis statement A regular report (usually monthly) provided to a bank's commercial customers that specifies all services provided, including items processed and any charges assessed
Australian Payments Clearing Association (APCA) A self-regulating body that oversees most of the payments systems for business in Australia	average collection period The average amount of time that elapses from a sale on credit until the payment becomes usable funds for a company. Calculated by dividing accounts receivable by average daily sales. Also called the <i>average age of accounts receivable</i>	Bank Bill Swap Rate (BBSW) This is the average mid-point of banks' bid and offer rates in the bank bill secondary market in Australia
Australian Prudential Regulation Authority (APRA) The Australian regulatory body responsible for overseeing the activities of banks, credit unions, building societies, general insurance, life insurance and reinsurance companies, friendly societies and most members of the superannuation industry	average investment in accounts receivable (AIAR) An estimate of the actual amount of cash (variable cost) tied up in accounts receivable at any time during the year	bank-endorsed bill A commercial bill in which a bank has signed that it will pay the funds at maturity to any investor to whom it has sold the bill once issued by the original borrower
Australian Securities and Investments Commission (ASIC) The Australian government entity charged with enforcing and regulating company and financial services laws to protect Australian consumers, investors and creditors, and being the corporate, markets and financial services regulator for Australia	average payment period The average length of time it takes a company to pay its suppliers. It is calculated by dividing the company's accounts payable balance by its average daily purchases	bank overdraft or line of credit An up-front commitment by a bank to lend to a borrower in the future
Australian Securities Exchange (ASX) The primary stock exchange operating in Australia for trading shares in publicly listed companies	average tax rate A company's tax liability divided by its pre-tax income	basis In a futures contract, this is the difference between the futures price and the spot price
B		
	balloon payment A large lump-sum payment that pays back the entire loan principal at the maturity of a term loan that	basis point 1/100 of 1%; 100 basis points equal 1.000%
		basis risk The possibility of unanticipated changes in the difference between the futures price and the spot price
		bearer bonds Bonds that pay interest to the bearer and both shelter investment income from

taxation	and provide protection against exchange rate risk
beta	A standardised measure of the risk of an individual asset that captures only the systematic component of its volatility; it measures the sensitivity of the asset's return to movements in the overall market
bid price	The price at which a market maker offers to purchase a security; the price at which an investor can sell a security
binomial option pricing model	A model that uses the principle of 'no arbitrage' to calculate call and put values
board of directors	Elected by shareholders to be responsible for hiring and firing senior managers and for setting overall corporate policies
bond ratings	Letter ratings assigned to bonds by specialised agencies that evaluate the capacity of bond issuers to repay their debts. Lower ratings signify higher default risk
bonus share issue	The payment to existing shareholders of a dividend in the form of shares
book building	A process in which underwriters ask prospective investors to reveal information about their demand for the offering
book value	The value of equity as shown on the company's balance sheet
bottom-up sales forecast	A sales forecast that relies on the assessment by sales personnel of demand in the coming year on a customer-by-customer basis
breakeven point (BEP)	The level of sales or production that a company must achieve in order to fully cover all costs. Sales or production above the BEP results in profits
bulge bracket	Consists of firms that generally occupy the lead or co-lead manager's position in large, new security offerings
business failure	A company's inability to stay in business
business risk	The variability of a company's cash flows, as measured by the variability of EBIT
bust-up	The takeover of a company that is subsequently split up
C	
call option	An option that grants the right to buy an underlying asset at a fixed price
call premium	The amount by which the call price exceeds the face value of a bond. Paid by corporations to buy back outstanding bonds prior to maturity
call price	The price at which a bond issuer may call or repurchase an outstanding bond from investors
callable (bonds)	Bonds that the issuer can repurchase from investors at a predetermined price known as the call price
cancellation option	Option held by the venture capitalist to deny or delay additional funding for a portfolio company
cannibalisation	Loss of sales of a company's existing product when a new product is introduced
capital asset pricing model (CAPM)	States that the expected return on a specific asset equals the risk-free rate plus a premium that depends on the asset's beta and the expected risk premium on the market portfolio
capital budgeting	The process of determining which long-lived investment projects a company should undertake
capital budgeting function	The activities involved in selecting the best projects in which to invest the company's funds based on their expected risk and return. Also called the investment function
capital gain	The difference between the sale price and the initial purchase price of a capital asset, such as equipment or shares held as an investment
capital indexed bonds or inflation linked bonds	Bonds issued in which the face value is changed each year in line with inflation
capital loss	The loss resulting from the sale of a capital asset, such as equipment or shares held as an investment, at a price below its book, or accounting, value
capital rationing	The situation where a company has more positive-NPV projects than its available budget can fund. It should choose the combination of those projects that maximises shareholder wealth
carried interest	A performance or incentive fee, paid to the general partner, which is often equal to 20% on the realised return on the fund's investments
carrying cost	The <i>variable cost per unit</i> of holding an item in inventory for a specified period of time. Used in calculating the EOQ
cash application	The process through which a customer's payment is posted to its account and the outstanding invoices are cleared as paid
cash budget	A statement of a company's planned inflows and outflows of cash
cash concentration	The process of bringing the lockbox and other deposits together into one bank, often called the <i>concentration bank</i>

cash conversion cycle (CCC) The elapsed time between the points at which a company pays for raw materials and at which it receives payment for finished goods	chief financial officer (CFO) Top management position charged with developing financial policies and strategies covering all aspects of a company's financial management and accounting activities	equity investment, so may be classed as equities
cash disbursements All outlays of cash by a company in a given period	clearing float The time between deposit of the cheque and presentation of the cheque back to the bank on which it is drawn	company A legal entity, owned by the shareholders who hold its ordinary shares, with many of the economic rights and responsibilities enjoyed by individuals
cash discount A method of lowering investment in accounts receivable by giving customers a cash incentive to pay sooner	Clearing House Electronic Sub-register System (CHESS) The computer-based settlement and transfer system used by the ASX to finalise trades in shares and their payments	comparable multiples method A valuation method that calculates a valuation ratio or multiple for each company in a sample of similar companies, then uses the average or median pricing multiple for the sample companies to estimate a particular company's value
cash flow approach Used by financial professionals to focus attention on current and prospective inflows and outflows of cash	closing futures price The price used to settle all contracts at the end of each day's trading. Also called the <i>settlement price</i> or <i>settle price</i>	compound interest Interest earned both on the initial <i>principal</i> and on the interest earned in previous periods
cash flow from operations Cash inflows and outflows directly related to the production and sale of a company's products and services. Calculated as net income plus depreciation and other non-cash charges minus dividends	collateral The assets pledged to secure a loan	conglomerate merger Unrelated diversification mergers that occur between companies in completely different lines of business
cash manager A financial specialist responsible for managing the cash flow time line related to collection, concentration and disbursement of the company's funds	collateral trust bond A bond secured by financial assets held by a trustee	conservative strategy Financing strategy in which a company makes sure that it has enough long-term financing to cover its permanent investments in fixed and current assets as well as the additional seasonal investments in current assets that it makes during the various quarters each year
cash position management The primary cash management tasks that are performed daily and involve the collection, concentration and disbursement of company funds	collection policy The procedures used by a company to collect overdue or delinquent accounts receivable. The approach used is often a function of the industry and the competitive environment	consolidation A merger in which both the acquirer and target disappear as separate corporations, combining to form an entirely new corporation with new ordinary shares
cash rate The interest rate that Australian banks charge each other for overnight loans	collective action problem When individual shareholders bear all the costs of monitoring management, but the benefit of such monitoring accrues to all shareholders	constant dollar payment policy Dividend policy based on the payment of a fixed-dollar dividend in each period
cash receipts All of a company's cash inflows in a given period	common-size income statement An income statement in which all entries are expressed as a percentage of sales	constant payout ratio policy Dividend policy in which a company establishes that a certain percentage of earnings is
cash settlement An agreement between two parties, in which one party pays the other party the cash value of its option position, rather than forcing it to exercise the option by buying or selling the underlying asset	common stocks Common stocks are the US equivalent of Australian ordinary shares. Common stocks are usually considered to be a separate asset class, but they are a form of	
certification Assurance that the issuing company is in fact disclosing all material information		

paid to owners in each dividend period	corporate governance function The activities involved in developing company-wide structures and incentives that influence managers to behave ethically and make decisions that benefit shareholders	indicates that the variables have zero interdependence. In the context of portfolio management, the risk of the returns of a portfolio of two assets is reduced when it contains assets whose returns are negatively correlated with each other
constitution The legal document created at the company's inception to govern its operations	corporate venture capital funds Subsidiaries or stand-alone companies established by non-financial corporations to gain access to emerging technologies	cost of marginal investment in accounts receivable The marginal investment in accounts receivable required to support a proposed change in credit policy multiplied by the required return on investment
continuous compounding Interest compounds literally at every moment as time passes	corporation A legal entity set up to conduct business and usually regulated by a governmental authority. A corporation can be limited by share or by guarantee, or be a no-liability company, a proprietary limited company or a private company. Also referred to as a 'company'	counterparty risk The risk that the counterparty in an options transaction will default on its obligation
contribution margin The sale price per unit (SP) minus variable cost per unit (VC)	Corporations Act 2001 The Commonwealth Act regulating, among other matters, corporate insolvency in Australia	coupon The periodic interest payment that a bond pays to investors
controlled disbursement A bank service that provides early notification of cheques that will be presented against a company's account on a given day	corporation A legal entity set up to conduct business and usually regulated by a governmental authority. A corporation can be limited by share or by guarantee, or be a no-liability company, a proprietary limited company or a private company. Also referred to as a 'company'	coupon rate The rate derived by dividing the bond's annual coupon payment by its face value
conversion premium The percentage increase in the underlying stock that must occur before it is profitable to exercise the option to convert a bond into shares	Corporations Act 2001 The Commonwealth Act regulating, among other matters, corporate insolvency in Australia	coupon yield The amount obtained by dividing the bond's coupon by its current market price (which does not always equal its face value). Also called <i>current yield</i>
conversion price The market price of a convertible bond, divided by the number of shares that bondholders receive if they convert	corporation A legal entity set up to conduct business and usually regulated by a governmental authority. A corporation can be limited by share or by guarantee, or be a no-liability company, a proprietary limited company or a private company. Also referred to as a 'company'	coverage ratio A debt ratio that uses data from the <i>income statement</i> to assess the company's ability to generate sufficient cash flow to make scheduled interest and principal payments
conversion ratio The number of shares bondholders receive if they convert their bonds into shares	Corporations Act 2001 The Commonwealth Act regulating, among other matters, corporate insolvency in Australia	covered bonds These bonds are direct, unconditional obligations of the issuer
conversion value The market price of the shares, multiplied by the number of shares that bondholders receive if they convert	correlation coefficient A statistical measure of the degree of interdependence between two variables, indicating how they vary together. The correlation coefficient can range from -1 to $+1$. A value of $+1$ indicates the variables are perfectly correlated, while a value of -1 indicates they are perfectly negatively correlated. A value of zero	credit monitoring The ongoing review of a company's accounts receivable to determine if customers are paying according to the stated credit terms
convertible bond A bond that gives investors the option to convert it into the issuer's ordinary shares		credit scoring Applies statistically derived weights for key financial and credit characteristics to predict whether a credit applicant with specific scores for each characteristic will pay
corporate bonds Bonds issued by corporations		
corporate control The monitoring, supervision and direction of a corporation or other business organisation		
corporate finance The activities involved in managing cash (money) that flows through a business		
corporate governance The processes and rules that determine how a company is governed		

- D**
- date payable** The actual date on which the company makes the dividend payment to the holders of record entitled to receive dividends
- debentures** Bonds usually backed by a claim over tangible property
- debt capital** Long-term borrowed money
- debt capital market (DCM)** This refers to the market for raising debt capital. Financial institutions providing DCM services in Australia will often have separate divisions or teams focusing purely on these services, rather than covering both debt and equity markets
- debt ratio** A measure of the proportion of total assets financed by a company's creditors
- debt-to-equity ratio** A measure of the company's financial leverage, calculated by dividing long-term debt by shareholders' equity
- debtor days** A measure of the average time a company takes to collect payment from its debtors
- decision tree** A visual representation of the sequential choices that managers face with regard to a particular investment
- deed of company arrangement** A procedure that permits a company in distress to make a compromise or arrangement that is binding on all creditors. Subject to the terms of the arrangement, the company may then be saved and continue to operate
- default risk** The risk that the bond issuer may not make all scheduled payments
- deferred taxes** An account that reflects the difference between the taxes that companies actually pay and the tax liabilities they report on their public financial statements
- demand registration rights** Agreements giving the venture capitalists the right to demand that a portfolio company's managers arrange for a public offering of shares in the company
- depreciate** A currency depreciates when it buys less of another currency than it did previously
- depreciation tax shield** This is the tax deduction that comes from the depreciation of an asset. When this tax shield is applied, the book value of the asset is reduced by this amount
- derivative security** A security that derives its value from another asset
- diminishing value method** A method of depreciating assets, accepted by the Australian Taxation Office, whereby assets are depreciated by a set percentage of their remaining value every year. It is analogous to the reducing balance method used in accounting, and effectively means that, in theory, an asset will never have zero value. The percentage used to calculate the diminishing value is set at twice the prime cost rate. Thus, diminishing value rate = $(1/\text{effective asset life}) \times 200\%$
- direct insolvency costs** Include fees paid to lawyers, accountants, investment bankers and other professionals involved in insolvency proceedings in addition to other expenses directly tied to insolvency filing and administration
- direct lease** A lessor acquires the assets that are leased to a given lessee

direct quote An exchange rate quoted in terms of units of domestic currency per unit of foreign currency	before selling securities to the public	economies of scope Value-creating benefits of increased breadth of operations for merged companies
discount A bond trades at a discount when its market price is less than its face value	DuPont system An analysis that uses both income statement and balance sheet information to break the ROA and ROE ratios into component pieces	effective annual rate (EAR) The annual rate of interest <i>actually</i> paid or earned, reflecting the impact of compounding frequency. Also called the <i>true annual return</i>
discounted payback period The amount of time it takes for a project's discounted cash flows to recover the initial investment		effective borrowing rate (EBR) Generally determined as the total amount of interest and fees paid, divided by the average usable loan amount
discounting The process of calculating present values		efficient frontier The upper boundary created by charting the optimal investment combinations used to create portfolios that maximise expected returns for any level of expected risk, or that minimise expected risk for any level of expected return
diversification The act of investing in a variety of different assets rather than just one or two similar assets	earnings available for ordinary shareholders Net income net of preferred share dividends	efficient markets hypothesis (EMH) Asserts that financial asset prices rapidly and fully incorporate new information
divestiture Assets and/or resources of a subsidiary or division are conveyed to another organisation	earnings per share (EPS) Earnings available for ordinary shareholders divided by the number of ordinary shares outstanding	electronic bill presentment and payment (EBPP) A collection system in the business-to-consumer market, under which consumers are sent bills in an electronic format and can pay them via electronic means
dividend payout ratio The percentage of current earnings available for ordinary shareholders paid out as dividends. Calculated by dividing the company's cash dividend paid per share by its <i>earnings per share</i> in a given period	economic exposure The risk that a change in interest rates (or more broadly, a change in exchange rates or commodity prices) will have a negative impact on the future cash flows generated by the company	electronic depository transfer (EDT) The term used in the cash management trade for an <i>automated clearinghouse (ACH) debit transfer</i>
dividend per share (DPS) The portion of the earnings per share paid to shareholders	economic order quantity (EOQ) model A common tool used to estimate the optimal order quantity for big-ticket items of inventory. It considers operating and financial costs and determines the order quantity that minimises overall inventory costs	electronic invoice presentment and payment (EIPP) A collection system in business-to-business transactions, under which business customers are sent bills in an electronic format and can pay them via electronic means
dividend yield Annual cash dividend per share divided by the current share price	economic profit A profit that exceeds a normal, competitive rate of return in an industry or line of business	employee stock ownership plan (ESOP) The transformation of a public corporation into a private
dividends Periodic cash payments that companies make to shareholders	economic value added (EVA) A method of analysing capital investments which determines whether an investment produces net cash flow sufficient to cover the company's cost of capital	
dual-class recapitalisation Issuance of a new class of ordinary shares with the intent of concentrating control of voting rights in one group of investors	economies of scale Relative operating costs are reduced for merged companies because of an increase in size that allows for the reduction or elimination of overlapping resources	
due diligence Examination of potential security issuers in which investment banks are legally required to search out and disclose all relevant information about an issuer		

company by the employees of the corporation itself	equity multiplier A measure of the proportion of total assets financed by a company's equity. Also called the <i>assets-to-equity (A/E) ratio</i>	exercise the option Pay (receive) the strike price and buy (sell) the underlying asset
enterprise value The total value of the company (including debt, equity and other securities) that would need to be purchased to control the whole target entity	equivalent annual cost (EAC) method Represents the annual expenditure over the life of each asset that has a present value equal to the present value of the asset's annual cash flows over its lifetime	expectations theory In equilibrium, investors should expect to earn the same return whether they invest in long-term Treasury bonds or a series of short-term Treasury bonds
entrepreneurial finance Focuses on the special challenges and problems associated with the investment in and financing of risky businesses, typically start-ups	Eurobond A bond issued by an international borrower and sold to investors in countries with currencies other than that in which the bond is denominated	expected return A forecast of the return that an asset will earn over some future period of time
entrepreneurial growth companies (EGCs) Typically high-risk, technology-based start-ups that are commonly funded by venture capitalists	Eurocurrency loan market A large number of international banks that stand ready to make floating-rate, hard-currency loans to international corporate and government borrowers	expiration date The date on which the right to buy or to sell the underlying asset expires
equipment trust certificate A bond often secured by various types of transportation equipment	European call option An option that grants the right to buy the underlying asset <i>only</i> on the expiration date	external financing Raising money from sources external to the firm, such as banks or capital markets
equity capital An ownership interest purchased by an investor, usually in the form of ordinary or preferred shares, that is expected to remain permanently invested	exchange rate The price of one currency in terms of another currency	external funds required (EFR) The expected shortage or surplus of financial resources, given the company's growth objectives
equity capital market (ECM) The market for raising equity capital. Financial institutions providing ECM services in Australia will often have separate divisions or teams focusing purely on these services, rather than covering both debt and equity markets. Some broking firms get involved in this market	exchangeable bonds Bonds issued by corporations that may be converted into shares of a company other than the one that issued the bonds	extra dividend, or special dividend An additional dividend that a company may pay if earnings are higher than normal in a given period
equity carve-out (ECO) Occurs when a parent company sells shares of a subsidiary corporation to the public through an initial public offering	ex-dividend date The date on or after which a purchaser of a share does not receive the current dividend, usually two business days before the <i>record date</i>	
equity claimants Owners of a company's equity securities	executive compensation plans Incentives offered to a manager to encourage them to act in the best interests of the owners	
equity kickers Warrants attached to another security offering (usually a bond offering) that give investors more upside potential	exercise price The price at which an option holder can buy or sell the underlying asset	

F

face value (bonds) The nominal value of a bond, which the borrower repays at maturity
factoring The outright sale of receivables to a third-party <i>factor</i> at a discount
fallen angels Bonds that received investment-grade ratings when first issued but later fell to junk status
fiduciary A person or institution who invests and manages money on another's behalf
financial deficit Occurs when a corporation requires more financial capital for investment than it supplies in the form of retained earnings
financial distress The situation in which a company's cash flows

are insufficient to pay its current obligations	operations and investment programs	rate that remains constant throughout the issue's life
financial engineering The application of finance principles to design securities and strategies that help companies manage their risk exposures	firm A term generally used by economists to refer to a non-governmental entity that employs tangible or intangible resources as inputs to create outputs, representing a form of production function. In economics, a firm is often assumed to have a goal of maximising profits. In Australia, a firm is usually called a company	flip To buy shares at the offer price and sell them on the first trading day
financial intermediary An institution that raises capital by issuing liabilities against itself, and then uses the capital raised either to make loans to companies and individuals or to buy various types of investments	firm-commitment offering An offering in which the investment bank agrees to <i>underwrite</i> the company's securities, thereby guaranteeing that the company will successfully complete its sale of securities	float Funds that have been sent by the payer but are not yet usable funds to the payee
financial leverage Using fixed-cost sources of financing, such as debt and preferred shares, to magnify both the risk and the expected return on a company's securities	five Cs of credit A framework for performing in-depth credit analysis without providing a specific accept or reject decision	floating exchange rate An exchange rate system in which a currency's value is allowed to fluctuate in response to market forces
financial management function The activities involved in managing the company's operating cash flows as efficiently and effectively as possible	fixed asset turnover A measure of the efficiency with which a company uses its <i>fixed assets</i> , calculated by dividing sales by the number of dollars of net fixed asset investment	floating-rate bonds Bonds that make coupon payments that vary through time. The coupon payments are usually tied to a benchmark market interest rate. Also called <i>variable-rate bonds</i>
financial risk How a company's financing choices affect how its <i>business risk</i> is distributed to its shareholders and bondholders	fixed exchange rate An exchange rate system in which the price of one currency is fixed relative to another currency by government authorities	floating-rate issues Debt issues with an interest (coupon) rate that is a fixed spread above a base rate that periodically changes
financial risk management The process of identifying, measuring and managing all types of risk exposures, including interest rate, commodity and currency risk exposures	fixed-for-floating currency swap A combination of a currency swap and an interest rate swap	foreign bond A bond issued in a host country's financial market, in the host country's currency, by a non-resident corporation
financial slack Large cash and marketable security holdings in addition to a company's unused debt capacity	fixed-for-floating interest rate swap Typically one party will make fixed-rate interest payments to another party in exchange for floating-rate interest payments	forward discount When one currency buys less of the other currency on the forward market than it buys on the spot market
financial venture capital funds Subsidiaries of financial institutions, particularly commercial banks	fixed-price offer An offer in which the underwriters set the final offer price for a new issue weeks in advance	forward exchange rate The exchange rate quoted for a transaction that will occur on a future date
financing flows Cash flows that result from debt and equity financing transactions	fixed-rate offerings Debt issues that have a coupon interest	forward premium When one currency buys more of the other currency on the forward market than it buys on the spot market
financing function Raising capital to support a company's		forward price The price to which parties in a forward contract agree. The price at which a purchaser will buy a specified amount of an asset from the seller at a fixed date in the future
		forward rate The forward price in a currency forward contract
		forward rate agreement (FRA) A forward contract in which the

<p>underlying asset is not an asset at all but an interest rate</p>	<p>investment exit strategies and managing distributions of returns to the limited partners. The general partners have unlimited liability over the life of the fund</p>	<p>(also known as <i>junk bonds</i> or <i>speculative bonds</i>)</p>
<p>free cash flow (FCF) The net amount of cash flow remaining after the company has met all operating needs, including capital expenditure and working capital needs. It represents the cash amount that a company could distribute to investors after meeting all of its other obligations</p>	<p>general partners (limited partnership) One or more participants in a limited partnership who operate the business and have unlimited personal liability</p>	<p>horizontal merger A combination of competitors within the same industry</p>
<p>full disclosure Requires issuers to reveal all relevant information concerning the company selling the securities and the securities themselves to potential investors</p>	<p>Glass-Steagall Act US Congressional act of 1933 mandating the separation of investment and commercial banking (Act repealed 1999)</p>	<p>hostile takeover The acquisition of one company (the target) by another (the acquirer) through an open-market bid for a majority of the target's shares if the target company's senior managers do not support (or, more likely, actively resist) the acquisition</p>
<p>fundamental principle of financial leverage Substituting debt for equity increases expected returns to shareholders, but also increases the risk that equity investors bear</p>	<p>goodwill An intangible asset created if the restated values of the target in a merger lead to a situation in which its assets are less than its liabilities and equity</p>	<p>hubris hypothesis of corporate takeovers A theory that contends that some managers overestimate their own managerial capabilities and pursue takeovers with the belief that they can better manage their takeover target than the target's current management</p>
<p>fungibility The ability to close out a futures contract position by taking an offsetting position</p>	<p>Gordon growth model The valuation model that views cash flows as a <i>growing perpetuity</i></p>	<p>hurdle rate The minimum rate of return that must be achieved</p>
<p>future value The value of an investment made today measured at a specific future date, accounting for interest earned over the life of the investment</p>	<p>gross profit margin A measure of profitability that represents the percentage of each sales dollar remaining after a company has paid for its goods</p>	<p>in the money A call (put) option is in the money when the share price is greater (less) than the strike price</p>
<p>futures contract Involves two parties agreeing today on a price at which the purchaser will buy a given amount of a commodity or financial instrument from the seller at a fixed date in the future</p>	<p>growing perpetuity A cash flow stream that grows each period at a constant rate and continues forever</p>	<p>income bonds A type of life insurance policy only friendly societies issue. They are like a savings investment account, and distribute regular bonuses to the lenders</p>
<p>G</p>	<p>hedge To diversify risks by using financial instruments to offset market risks such as interest rate and currency fluctuations</p>	<p>incremental cash flows Cash flows triggered by an investment that would not have otherwise occurred</p>
<p>general cash offerings Share offerings sold to all investors, not just existing shareholders</p>	<p>hedge ratio A combination of shares and options that results in a risk-free payoff</p>	<p>indenture A legal contract between the borrower (issuer) and investor stating the conditions under which a bond has been issued</p>
<p>general partners The fund management company responsible for seeking out and managing investment opportunities, negotiating investment terms, monitoring performance, arranging</p>	<p>hedging Trading an asset for the sole purpose of reducing or eliminating the risk associated with some other asset</p>	<p>index fund A passively managed fund that tries to mimic the performance of a market index, such as the ASX 200</p>
<p>high-yield bonds Bonds rated below investment grade</p>	<p>indirect insolvency costs Include the loss of customers and</p>	

key suppliers	The time that managers spend managing the insolvency process rather than focusing on their business, the loss of key employees and missed opportunities to invest in positive-NPV projects
indirect quote	An exchange rate quoted in terms of foreign currency per unit of domestic currency
initial margin	The minimum dollar amount required of an investor when taking a position in a futures contract
initial public offering (IPO)	Companies offering shares for sale to the public for the first time by selling shares to outside investors and listing them for trade on a stock exchange
insolvency	Occurs only when a company enters the condition formally and effectively surrenders control of the company to an external administrator. It is a legal process rather than a financial condition
insolvency costs	The direct and indirect costs of the insolvency process
insolvent	The situation that exists when a company cannot meet its debt obligations
institutional venture capital funds	Formal business entities with full-time professionals dedicated to seeking out and funding promising ventures
integrated accounts payable	Provides a company with outsourcing of its accounts payable or disbursement operations. Also known as <i>comprehensive accounts payable</i>
interest differential	The difference between the fixed and floating interest rates that is exchanged in an interest rate
interest rate cap	A call option on interest rates
interest rate collar	A strategy involving the purchase of an interest rate cap and the simultaneous sale of an interest rate floor, using the proceeds from selling the floor to purchase the cap
interest rate floor	A put option on interest rates
interest rate parity	An equilibrium relationship that predicts that differences in risk-free interest rates in two countries must be tied to differences in currency values on the spot and forward markets
interest rate risk	The risk resulting from changes in market interest rates causing fluctuations in a bond's price. Also, the risk of suffering losses as a result of unanticipated changes in market interest rates
interest rate swap	A swap contract in which two parties exchange payment obligations involving different interest payment schedules
internal financing	Relying on internally generated cash flow (principally retained profits) as the dominant source of new financing
internal rate of return (IRR)	The compound annual rate of return on a project, given its up-front costs and subsequent cash flows
international ordinary equity	Equity issues sold in more than one country by non-resident corporations
intrinsic value	The profit that an investor makes from exercising an option, ignoring transaction costs and the option premium
inventory turnover	A measure of how quickly a company sells its goods
investee companies	Companies in which the fund invests. These are also called portfolio companies
investment banks	Financial institutions that assist companies in raising long-term debt and equity financing in the world's capital markets, advise companies about major financial transactions and are active in the business of selling and trading securities in secondary markets
investment flows	Cash flows associated with the purchase or sale of fixed assets
investment-grade bonds	Bonds rated Baa or higher by Moody's (BBB- or higher by S&P)
IPO initial return	The gain (or loss) when an allocation of shares from an investment banker is sold at the first opportunity
IPO underpricing	Occurs when the offer price in the prospectus is consistently lower than what the market is willing to bear
J	
joint and several liability	A legal concept that makes each partner in a partnership legally liable for all the debts of the partnership
junk bonds	Bonds rated below investment grade (also known as <i>high-yield bonds</i> or <i>speculative bonds</i>)
just-in-time (JIT) system	An inventory management technique used to make sure that materials arrive exactly when they are needed for production, rather than being stored onsite
K	
Kangaroo bonds	Bonds sold by foreign corporations to Australian investors, issued in the Australian market, denominated in Australian

dollars and subject to Australian laws and regulations

L

lead underwriter The investment bank that takes the primary role in assisting a company in a public offering of securities

lease-versus-purchase (or lease-versus-buy) decision The alternatives available are to: (1) lease the assets; (2) borrow funds to purchase the assets; or (3) purchase the assets using available liquid resources. Even if the company has the liquid resources with which to purchase the assets, the use of these funds is viewed as equivalent to borrowing

leasing Acquiring use of an asset by agreeing to make a series of periodic, tax-deductible payments

lessee Under a lease, the user of the underlying asset who makes regular payments to the *lessor*

lessor Under a lease, the owner of the asset who receives regular payments for its use from the *lessee*

leveraged lease A lease under which the lessor acts as an equity participant, supplying part of the cost of the asset, and borrowing the balance of the funds

leveraged recapitalisation When a company greatly increases the portion of debt in its capital structure, often retiring equity in the process

lien A legal contract specifying under what conditions a lender can take title to an asset if a loan is not repaid and prohibiting the borrowing company from selling or disposing of the asset without the lender's consent

limited liability company (LLC) A form of business organisation that combines the tax

advantages of a partnership with the limited liability protection of a company

limited partner (investment fund) An investor in the fund who makes capital commitments, which the general partner then draws on over time as the fund becomes fully invested

limited partners (limited partnership) One or more totally passive participants in a limited partnership, who do not take any active role in the operation of the business and do not face personal liability for the debts of the business

limited partnership (LP) A partnership in which most of the participants (the limited partners) have the limited liability of corporate shareholders, but their share of the profits from the business is taxed as partnership income

liquidation The orderly winding up of a company's affairs involving the realisation of the company's assets, cessation or sale of its operations, distributing the proceeds of realisation among its creditors and distributing any surplus among its shareholders

liquidation value The value that remains after a company's assets are sold and its liabilities are paid

liquidity management Activities aimed at both earning a positive return on idle excess cash balances and obtaining low-cost financing for meeting unexpected needs and seasonal cash shortages

liquidity preference theory States that the slope of the yield curve is influenced not only by expected interest rate changes, but also by the liquidity premium that investors require on long-term bonds

liquidity ratios Measure a company's ability to satisfy its

short-term obligations *as they come due*

loan amortisation Occurs when a borrower pays back the principal over the life of the loan, often in equal periodic payments

loan amortisation schedule Used to determine loan amortisation payments and the allocation of each payment to interest and principal

loan covenants Contractual clauses that limit the actions that a borrower can take, protecting the lender's wealth from being expropriated

loans Private debt agreements arranged between corporate borrowers and financial institutions, especially commercial banks

lockbox system A technique for speeding up collections that affects all three components of float. Customers mail payments to a post office box, which is emptied regularly by the company's bank, which processes and deposits the payments

long position To own an option or another security

long-term debt Debt that matures more than one year in the future

low-regular and extra payout policy Policy of a company paying a low regular dividend supplemented by an additional cash dividend when earnings warrant it

M

mail-based collection system Collection system in which processing centres receive the incoming mail payments, separate cheques from remittance information, prepare cheques for deposit and send

remittance Information to the accounts receivable department	by relating its market value per share to its book value per share	their investments into an equity stake and benefit from the upside of equity ownership, should the company become extremely successful
mail float The time delay between when payment is placed in the mail and when payment is received	market portfolio A portfolio that invests in every asset in the economy	mixed offerings A merger financed with a combination of cash and securities
maintenance clause A clause in a lease that specifies who is to maintain the assets and make insurance and tax payments	market risk premium The additional return earned (or expected) on the market portfolio over and above the risk-free rate	mixed stream A series of unequal cash flows reflecting no particular pattern
maintenance margin Margin level required in a futures contract to maintain an open position	marking-to-market The process of daily cash settlement applied to all futures contracts	money market mutual funds Professionally managed short-term investment portfolios used by many small companies and some large companies
managed floating rate system A hybrid currency system in which a government loosely fixes the value of the national currency relative to one or more other currencies	matching strategy Financing strategy in which a company finances permanent assets (fixed assets plus the permanent component of current assets) with long-term funding sources and finances its temporary or seasonal asset requirements with short-term debt	mortgage bond A bond secured by real estate or buildings
management buyout (MBO) The transformation of a public corporation into a private company by the current managers of the corporation purchasing the voting shares, often with the assistance of a private equity company	material requirements planning (MRP) A computerised system used to control the flow of resources, particularly inventory, within the production-sale process	multinational corporations (MNCs) Businesses that operate in many different countries
managing director or chief executive officer (CEO) The top company manager with overall responsibility and authority for managing daily company affairs and carrying out policies established by the board	maturity date The date when a bond's life ends and the borrower must make the final interest payment and repay the principal	mutually exclusive projects Two or more projects for which accepting one project implies that the others cannot be undertaken
manufacturing resource planning II (MRPII) Expands on MRP by using a complex computerised system to integrate data from many departments and generate a production plan for the company along with management reports, forecasts and financial statements	merger A transaction in which two or more business organisations combine into a single entity	N
margin account The account into which a futures contract investor must deposit the initial margin	merger of equals A merger of two companies that are roughly the same size; usually friendly	naked option position To buy or to sell an option, without a simultaneous position in the underlying asset
market/book (M/B) ratio A measure used to assess a company's future performance	mezzanine debt A hybrid form of debt funding that is structured with some sort of equity component – for example, a convertible structure, like a warrant. This allows mezzanine investors to be placed ahead of equity investors in terms of seniority, should the company receiving funding fall into financial difficulty. However, it also gives the mezzanine investors the option to convert	negotiated offer A process used by an issuer to hire an investment banker with whom it directly negotiates the terms of the offer
		net operating profits after taxes (NOPAT) The amount of earnings before interest and after taxes, which equals $EBIT \times (1 - T)$, where EBIT is earnings before interest and taxes and T equals the corporate tax rate
		net payoff The difference between the payoff received when the option expires and the premium paid to acquire the option
		net present value (NPV) The sum of the present values of all a project's cash flows, both inflows

and outflows, discounted at a rate consistent with the project's risk. NPV is also the preferred method for valuing capital investments

net present value (NPV) profile A plot of a project's NPV (on the *y*-axis) against various discount rates (on the *x*-axis). It is used to illustrate the relationship between the NPV and the IRR for the typical project

net profit margin A measure of profitability that represents the percentage of each sales dollar remaining after all costs and expenses, *including* interest, taxes and preferred share dividends, have been deducted

net working capital A measure of a company's liquidity calculated by *subtracting* current liabilities from current assets

nominal return The stated return offered by an investment; includes the real return plus any additional return due to expected inflation

non-cancellable lease A lease in which the lessee makes payments over a predefined period or *lease term*. These can only be cancelled under certain conditions

non-cash charges Expenses, such as depreciation, amortisation and depletion allowances, that appear on the income statement but do not involve an actual outlay of cash

non-cash expenses Tax-deductible expenses for which there is no corresponding cash outflow in the current period. They include depreciation and amortisation

O

open interest The number of a given type of futures contracts that are currently outstanding

opening futures price The price on the first trade of the day

operating assets Cash, marketable securities, accounts receivable and inventories necessary to support the day-to-day operations of a company

operating cash flow (OCF) The amount of cash flow generated by a company from its operations. Mathematically, it is the earnings before interest and taxes (EBIT) minus taxes plus depreciation

operating cycle (OC) Measurement of the time that elapses from the company's receipt of raw materials to begin production to its collection of cash from the sale of the finished product

operating flows Cash inflows and outflows directly related to the production and sale of a company's products or services

operating leverage Measures the tendency of operating cash flow volatility to increase with fixed operating costs

operating profit margin A measure of profitability that represents the percentage of each sales dollar remaining after deducting all costs and expenses *other than* interest and taxes

opportunity costs Forgone cash flows on an alternative investment that the company or individual decides not to make

option premium The market price of the option

order cost The fixed dollar amount per order that covers the costs of placing and receiving an order; used in calculating the EOQ

ordinary annuity An annuity for which the payments occur at the end of each period

ordinary corporate income Income resulting from the sale of the company's goods and services

ordinary shares The most basic form of corporate ownership

out of the money A call (put) option is out of the money when the share price is less (greater) than the strike price

oversubscribe When the investment banker builds a book of orders for shares that is greater than the number of shares the company intends to sell

ownership right

agreements Agreements between venture capital investors and portfolio-company managers allocating ownership stakes and voting rights to venture capitalists

P

paid-in capital in excess of par The number of ordinary shares outstanding multiplied by the original selling price of the shares, net of the par value

par value (ordinary shares); book value An arbitrary value assigned to ordinary shares on a company's balance sheet

participation rights Agreements giving the venture capitalists the right to participate in any sale of shares that a portfolio company's managers might arrange for themselves

partnership A proprietorship with two or more owners who have joined their skills and personal wealth

passively managed A strategy in which an investor makes no attempt to identify overvalued or undervalued shares, but instead holds a diversified portfolio

payback period The amount of time it takes for a project's cumulative net cash inflows to recoup the initial investment

payment pattern The normal timing in which a company's

customers pay their accounts, expressed as the percentage of monthly sales collected in each month following the sale

payoff The value received from exercising an option on the expiration date (or zero), ignoring the initial premium required to purchase the option

payoff diagrams A diagram that shows how the expiration date payoff from an option or a portfolio varies, as the underlying asset price changes

payout policy The choices managers make about distributing a company's cash, including whether to pay shareholders a regular or a 'special' dividend, whether to repurchase shares and what size the cash distribution should be

pecking-order theory A hypothesis that assumes managers are better informed about investment opportunities faced by their companies than are outside investors

percentage-of-sales method Method of constructing pro forma statements by assuming all items grow in proportion to sales

perpetuity A level cash flow stream that continues forever

plug figure A line item on the pro forma balance sheet that represents an account that can be adjusted after all other projections are made

portfolio weights The percentage invested in each of several securities in a portfolio. Portfolio weights must sum to 1.0 (or 100%)

positive pay A bank service used to combat the most common types of cheque fraud. A company transmits a cheque-issued file, designating the cheque number

and amount of each item, to the bank when the cheques are issued. The bank matches the presented cheques against this file and rejects any items that do not match

pre-emptive rights These hold that shareholders have first claim on anything of value distributed by a corporation

preferred habitat theory A theory that recognises that the shape of the yield curve may be influenced by investors who prefer to purchase bonds having a particular maturity; also called *market segmentation theory*

preferred shares A form of ownership that has preference over ordinary shares when the company distributes income and assets

premium A bond trades at a premium when its market price exceeds its face or par value

present value The value today of a cash flow to be received at a specific date in the future, accounting for the opportunity to earn interest at a specified rate

price/earnings (P/E) ratio A measure of a company's long-term growth prospects that represents the amount investors are willing to pay for each dollar of a company's earnings

primary issues Initial sale of securities by a firm to raise capital

primary-market

transactions Cash sales of securities to investors by a company to raise capital

prime cost method A method of depreciating assets, accepted by the Australian Taxation Office, whereby assets are depreciated by a set value every year. It is analogous to the reducing straight-line depreciation used

in accounting, and effectively means that the asset will be reduced by the same amount each year until it has zero value. The prime cost rate is calculated by obtaining the inverse of the effective asset life. Thus, prime cost rate = $(1/\text{effective asset life}) \times 100\%$

principal The amount of money borrowed on which interest is paid

private equity Financing provided either through capital investments by current owners or through funding by professional venture capitalists or private investors, rather than through public equity markets, as is typically the case for listed companies. Thus, the private equity asset class is an example of an unlisted asset class

private placement Unregistered security offerings sold directly to *accredited investors*

pro forma financial statements A forecast of what a company expects its income statement and balance sheet to look like a year or two ahead

processing float The time that elapses between the receipt of a payment by a company and its deposit into the company's account

profitability index (PI) A capital budgeting tool defined as the present value of a project's cash inflows divided by the absolute value of its initial cash outflow

project finance (PF) loans Loans usually arranged for infrastructure projects such as toll roads, bridges and power plants

Proposition I The famous 'irrelevance proposition', which asserts that the market value of any company equals the value of its assets and is independent of

- the company's capital structure. Company value is calculated by discounting the company's expected *EBIT* at the rate r_e , appropriate for the company's business risk
- Proposition II** Asserts that if we hold the required return on assets (r_a) and the required return on debt (r_d) constant, the expected return on levered equity (r_e) increases with the debt-to-equity ratio
- proprietary limited company** A company form with between two and five shareholders with limited liability that creates an organisational form separate from individuals
- prospectus** A document that contains extensive details about the issuer and describes the security it intends to offer for sale
- protective covenants** Provisions in a bond indenture that specify requirements the borrower must meet (positive covenants) or things the borrower must not do (negative covenants)
- protective put** A portfolio containing a share and a put option on that share
- proxy fight** An attempt by outsiders to gain control of a company by soliciting a sufficient number of votes to elect a new slate of directors and effect a change in company policy
- proxy statements** Documents that describe the issues to be voted on at an annual shareholders meeting
- public company** A company, the shares of which can be freely traded among investors without the permission of other investors, and whose shares are listed for trading in a public securities market
- public-to-private transactions** The transformation of a public corporation into a private company through issuance of large amounts of debt used to buy the outstanding shares of the corporation
- purchase option** An option allowing the lessee to purchase the leased asset when the lease expires
- purchasing (or procurement) card programs** Programs in which a company issues designated employees purchasing cards with spending limits, usable only at stipulated vendors
- pure discount bonds** Bonds that pay no interest and sell below face value. Also called *zero-coupon bond*
- pure share exchange merger** A merger in which shares are the only mode of payment – such acquisition bids are also known as *scrip bids*
- put option** An option that grants the right to sell an underlying asset at a fixed price
- putable bonds** Bonds that investors can sell back to the issuer at a predetermined price under certain conditions
- put-call parity** A relationship that links the market prices of shares, risk-free bonds, call options and put options
- Q**
- quarterly compounding** Interest compounds four times per year
- quick (acid-test) ratio** A measure of a company's liquidity that is similar to the current ratio except that it excludes *inventory*, which is usually the least-liquid current asset
- R**
- random walk** When next period's value for a variable equals this period's value plus or minus a random shock. When financial asset prices follow a random walk, future and past prices are statistically unrelated, and the best estimate of the future price is simply the current price
- ratchet provisions** Contract terms that adjust downward the par value of the share venture capitalists have purchased in a company in case the company must sell new shares at a lower price than the VC originally paid
- ratio analysis** Calculating and interpreting financial ratios to assess a company's performance and status
- real option** The right, but not the obligation, to take a future action (such as cancel or delay) when implementing a project. Note that these actions can change an investment's value
- real return** The inflation-adjusted return; approximately equal to the difference between an investment's stated or nominal return and the inflation rate
- recapitalisation** Alteration of a company's capital structure to change the relative mix of debt and equity financing
- receivership** An insolvency procedure where a receiver, or receiver and manager, is appointed over some or all of the company's assets
- record date** The date on which the names of all persons who appear as shareholders are entitled to receive a dividend (which will be distributed on the date payable)
- redemption option** Option for venture capitalists to sell a company back to its entrepreneur or founders
- refund** To refinance a debt with new bonds

renewal option An option that allows the lessee to renew the lease at its expiration	shareholders; also, <i>return on total assets (ROA)</i>	risk shifting When an organisation pays another entity or person to restore a loss of value due to unforeseen circumstances
repurchase rights Give the venture capitalists the right to force the company to buy back (repurchase) the shares held by the VC	return on ordinary equity (ROE) A measure that captures the return earned on the ordinary shareholders' (owners') investment in a company	risk spreading, or diversification When an organisation undertakes a number of risk ventures at the same time and the likelihood of all the ventures simultaneously failing and reducing organisational value is very low
required rate of return The rate of return that investors expect or require an investment to earn given its risk	return on total assets (ROA) A measure of the overall effectiveness of management in generating returns to ordinary shareholders with its available assets	road show A tour of major investors undertaken by a company and its bankers several weeks before a scheduled offering; the purpose is to pitch the company's business plan to the prospective investors
residual claimants Corporate investors – typically, ordinary shareholders – who have the right to receive cash flows after all other claimants have been satisfied in full	reverse LBO A formerly public company that has previously gone private through a leveraged buyout and then goes public again	Rule 144A offering A special type of offering in the US market, first approved in April 1990, that allows issuing companies to waive some disclosure requirements by selling stock only to sophisticated institutional investors, who may then trade the shares among themselves
residual income measure (RIM) The present value of the difference between the forecast expected future (accounting) income for equity in a company and the expected future required income. The measure can be used to value equity if the income measures and book values of equity are known, even if no dividends are being paid	reverse LBO (or second IPO) A formerly public company that has previously gone private through a leveraged buyout and then goes public again. Also called a <i>second IPO</i>	
residual theory of dividends Observed dividend payments are simply a residual, the cash left over after companies have funded all their positive-NPV investments	reverse share splits Occur when a company replaces a certain number of outstanding shares with just one new share to increase the share price	
resource complementarities A company with a particular operating expertise merges with a company with another operating strength to create a company that has expertise in multiple areas	reverse triangle merger When a subsidiary of the bidder merges with the target company	
retained earnings The cumulative total of the earnings that a company has reinvested since its inception	rights offerings A special type of seasoned equity offering that allows the firm's existing owners to buy new shares at a bargain price or to sell that right to other investors	
return on investment (ROI) A measure of a company's overall effectiveness in using its assets to generate returns to ordinary	risk management function The activities involved in identifying, measuring and managing the company's exposure to all types of risk to maintain an optimal risk-return trade-off, and therefore to maximise share value	
	risk premium The additional return offered by a more risky investment relative to a safer one	

a pro rata distribution of shares in the new company	Stock Exchange Automated Trading System (SEATS) The internet-based brokerage system operated by the ASX to allow investors to buy and sell their share orders electronically through their brokers	payment obligations on two underlying financial liabilities that are equal in principal amount but differ in payment patterns
split-off A parent company creates a new, independent company with its own shares, and ownership is transferred to certain shareholders only, in exchange for their shares in the parent		
split-up The division and sale of all of a company's subsidiaries, so that it ceases to exist	strategic plan A multi-year action plan for the major investments and competitive initiatives that a company's senior managers believe will drive the future success of the enterprise	syndicated loan A large-denomination credit arranged by a group (a syndicate) of institutional lenders, commonly commercial banks, for a single borrower
spot exchange rate The exchange rate that applies to immediate currency transactions	strike price The price at which an option holder can buy or sell the underlying asset	synergy A reduction in costs or increase in revenues that results from a merger
spot price The price that the buyer pays the seller today in a cash market transaction	subordinated bond A secured bond on which the creditors' claims are not satisfied until the senior bondholders' claims have been fully satisfied	systematic risk Risk that cannot be eliminated through diversification
spread The difference between the rate that a lender charges for a loan and the underlying benchmark interest rate. Also called the <i>credit spread</i>	subordinated unsecured debt Debt instruments issued by an entity which is backed only by the credit of the borrowing entity and which is paid only after senior debt is paid	
staged financing Method of investing venture capital in a portfolio company in stages, over time	subordination Agreement by all subsequent or more junior creditors to wait until all claims of the senior debt are satisfied in full before having their own claims satisfied	
stakeholders Those with a justified interest in, or claim on, a company, such as customers, employees, suppliers, creditors and shareholders	subsidiary merger A merger in which the acquirer maintains the identity of the target as a separate subsidiary or division	
stand-alone companies Companies created for the sole purpose of constructing and operating a single project	sunk costs Costs that have already been paid and are therefore not recoverable	
standard deviation A measure of volatility equal to the square root of the variance	sustainable growth model Derives an expression that determines how rapidly a company can grow while maintaining a balance between its outflows (increases in assets) and inflows (increases in liabilities and equity) of cash	
standard normal distribution A normal distribution with a mean of zero and a standard deviation of 1	swap contract Agreement between two parties to exchange	
stated annual rate The contractual annual rate of interest charged by a lender or promised by a borrower		
statutory merger A target integration in which the acquirer can absorb the target's resources directly with no remaining trace of the target as a separate entity		

term loan A loan made by an institution to a business, with an initial maturity of more than one year, generally three to seven years	total return A measure of the performance of an investment that captures both the income it paid out to investors and its capital gain or loss over a stated period of time	the value of that currency is too low and immediately sell the currency in another country where the currency value is too high, to make a risk-free profit
term sheet An investment proposal detailing all of the economic, control and ownership terms – including covenants – that is prepared and presented to an entrepreneur by a venture capitalist	total variable cost (TVC) of annual sales Calculated by multiplying the annual sales in units by the total variable cost per unit and used to estimate the <i>average investment in accounts receivable</i> under a stated policy	trustee A person appointed to manage a case of personal bankruptcy
term structure of interest rates The relationship between time to maturity and yield to maturity for bonds of equal risk	tracking stocks Equity claims based on (and designed to mirror, or track) the earnings of wholly owned subsidiaries of diversified firms	trustee (bond) A third party to a bond <i>indenture</i> that acts as a watchdog on behalf of the bondholders, making sure that the issuer does not default on its contractual responsibilities
terminal value The value of all a project's cash flows beyond a certain date in the future	trade-off model of corporate leverage According to this model, managers trade off the costs and benefits of using debt to choose the amount of debt that maximises company value as expressed in Equation 13.7b	turnover of accounts receivable (TOAR) Three-hundred-sixty-five divided by the <i>average collection period (ACP)</i> . Used to calculate the <i>average investment in accounts receivable (AIAR)</i> when evaluating accounts receivable policies
time line A graphical representation of cash flows over a given period of time	transactions exposure The risk that a change in prices will negatively affect the value of a specific transaction or series of transactions	
time value The difference between an option's market price and its intrinsic value	transactions motive A motive for holding cash and short-term investments in order to make planned payments for items such as materials and wages	
time value of money Financial concept that explicitly recognises that \$1 received today is worth more than \$1 received in the future	Treasury bills Treasury bills are the US equivalent of Australian Treasury notes. They are a form of debt investment and may be referred to as debt securities or fixed income assets	
times interest earned ratio A measure of the company's ability to make contractual interest payments, calculated by dividing earnings before interest and taxes by interest expense	treasury shares Ordinary shares that were issued and later reacquired by the company through share repurchase programs and are therefore being held in reserve by the company	
top-down sales forecast A sales forecast that relies heavily on macroeconomic and industry forecasts	triangular arbitrage A trading strategy in which traders buy a currency in a country where	
total asset turnover A measure of the efficiency with which a company uses all its assets to generate sales; it is calculated by dividing the dollars of sales a company generates by the dollars of total asset investment		
total cost The sum of the order costs and the carrying costs that is minimised using the economic order quantity (EOQ) model		

U

underinvestment When shareholders decide not to invest in a positive <i>NPV</i> project, and therefore 'underinvest' relative to choosing all positive <i>NPV</i> projects
underlying asset The asset from which an option or other derivative security derives its value
underwrite The investment banker purchases shares from a company and resells them to investors
underwriting spread The difference between the net price and the offer price of an underwritten security issue
unsecured debt Debt instruments issued by an entity which is backed only by the general faith and credit of the borrowing company
unsystematic risk Risk that can be eliminated through diversification

V

variable growth model Assumes that the dividend growth rate will vary during different periods of time, when calculating the value of a company's shares

variance A measure of dispersion of observations around the mean of a distribution; it is equal to the expected value of the sum of squared deviations from the mean, divided by one less than the number of observations in the sample

venture capital A professionally managed pool of money raised for the purpose of making actively managed direct equity investments in rapidly growing private companies

venture capital limited partnerships Funds established by professional venture capital companies, and organised as limited partnerships

venture capitalists Professional investors who specialise in making high-risk, high-return investments in rapidly growing entrepreneurial businesses

vertical merger Companies with current or potential buyer-seller relationships combine to create a more integrated company

voluntary administration Occurs when a company allows an

administrator to investigate and report on the company to creditors and make a recommendation about the future of the company

W

warrants Securities that grant rights similar to a call option, except that when a warrant is exercised, the company must issue a new share, and it receives the strike price as a cash inflow

weighted average cost of capital (WACC) The after-tax, weighted average required return on all types of securities issued by a company, where the weights equal the percentage of each type of financing in a company's overall capital structure

wire transfer An electronic communication that removes funds from the payer's bank and deposits funds in the payee's bank on a same-day basis via bookkeeping entries

Y

Yankee bonds Bonds sold by foreign corporations to US investors

yield curve A graph that plots the relationship between time to maturity and yield to

maturity for a group of equal-risk bonds

yield spread The difference in yield to maturity between a corporate bond and a government bond at roughly the same maturity

yield to maturity (YTM) The discount rate that equates the present value of the bond's cash flows to its market price

Z

zero-balance accounts

(ZBAs) Disbursement accounts that always have an end-of-day balance of zero. The purpose is to eliminate non-earning cash balances in corporate cheque accounts

zero growth model The simplest approach to share valuation that assumes a constant dividend stream

Z-score The product of a quantitative model for forecasting insolvency that uses a blend of traditional financial ratios and a statistical technique known as *multiple discriminant analysis*. In some tests, the Z-score has been found to be about 90% accurate in forecasting insolvency one year in the future and about 80% accurate in forecasting it two years in the future

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