2020 CFA®
PROGRAM EXAM PREP

SchweserNotes™   Level III

Institutional Investors; Trading, Performance Evaluation, and Manager Selection; and Case Studies

eBook 5

KAPLAN) SCHWESER

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READING 33: PORTFOLIO MANAGEMENT FOR INSTITUTIONAL INVESTORS

Study Session 14

EXAM FOCUS

This reading addresses the investment policy statement (IPS) of the major types of institutional investors. As seen in the reading on individual investors, the IPS contains a formal statement of investment objectives (i.e., return and risk tolerance) and constraints applying to the client. The exam is likely to present a case study with one or more of these types of institutional clients, and you will be asked to prepare or evaluate parts of the IPS, effectively advising the institutional client on how to structure their investment portfolio. It is crucial that you approach this material from this perspective. The key to scoring well on this portion of the exam is to understand what the various institutions are trying to achieve with their investment portfolios and which risk considerations and constraints apply when meeting these goals.

MODULE 33.1: OVERVIEW OF INSTITUTIONAL INVESTORS

▶

Video covering this content is available online.

Common Characteristics

LOS 33.a: Discuss common characteristics of institutional investors as a group.

CFA® Program Curriculum, Volume 6, page 7

Types of institutional investors considered in this reading include defined benefit and defined contribution pension plans, sovereign wealth funds (SWFs), university endowments, private foundations, banks, and insurance companies. Before discussing the details of the IPS for each type of institution, we note the following five common characteristics that cause institutional investors to differ from individual investors:

1. **Scale (size).** Institutions tend to be larger than individual investors. The largest institutions may be too large for investments or managers with low capacity, such as small-cap equity or venture capital. These large institutions may therefore choose to directly access investments and manage them in-house. Smaller institutions may have issues diversifying across asset classes that have high minimum investment sizes (e.g., private equity or real estate). They may also face issues with hiring skilled investment professionals and instead choose to outsource to external managers and consultants.

2. **Long-term investment horizon.** With some exceptions, institutional investors tend to have longer time horizons than individual investors because institutional investors are driven by the need to meet specific liabilities that are relatively low.

3. **Regulatory framework.** Institutions are subject to different legal, regulatory, accounting, and tax rules than individual investors with the differences among institutional investors based on national jurisdiction. Regulations have been tightened since the 2007–2009 global financial crisis in an attempt to lower leverage, increase centralized clearing, and improve reporting transparency.

4. **Governance framework.** Institutions typically operate under a formal governance structure, whereas governance structures for individuals tend to be less formal. Governance structures are typically composed of a *board of directors* and an *investment committee,* which may be a subcommittee of the board. The board often sets the long-term strategic asset allocation of the institution, with the board and/or investment committee establishing the IPS and monitoring investment performance. The investment committee oversees investment policy. Investment strategy is implemented by an investment office typically headed by a chief investment officer; the investment management takes place either in-house by internal investment staff or is outsourced to external asset managers.

5. **Principal-agent issues.** The principal-agent conflict occurs when a principal (i.e., the owner of assets) appoints an agent to act on their behalf and the agent's interests are not aligned with the principal's interests. For institutions, this conflict occurs internally through the appointment of the investment committee and investment staff and occurs externally through the use of outsourced investment managers. The classic example of an external principle-agent conflict is a high management fee paid to third-party investment managers regardless of performance.

Investment Policy Statement

LOS 33.b: Discuss investment policy of institutional investors.

CFA® Program Curriculum, Volume 6, page 11

The IPS should include:

- The institution's *mission* and *investment objectives* (i.e., return and risk tolerance).
- Discussion of the *investment horizon* and *liabilities* that need to be paid by the institution.
- *External constraints* that affect the asset allocation (legal, regulatory, tax, and accounting).
- An asset allocation policy (i.e., portfolio weights) with ranges and asset class benchmarks.
- A rebalancing policy.
- Reporting requirements.

The IPS should be reviewed annually, and revisions should be made when necessary due to material changes in investor circumstances and/or market environment.

While each institution has unique features, four models have evolved as different general approaches to asset allocation. Three of these models are named after approaches used by Norway's sovereign wealth fund, the Yale University endowment, and the Canada Pension Plan, while the fourth model is liability driven. Details of the four models are outlined in Figure 33.1.

Figure 33.1: General Asset Allocation Approaches

Model	Description
Norway's sovereign wealth fund	*Asset allocation:* ■ Passively managed allocation to public equities and bonds (with traditional 60% equity/40% bonds base case allocation) ■ Little or no exposure to alternative assets ■ Tight tracking error limits *Advantages*: ■ Low costs and fees ■ Easy for board to comprehend *Disadvantages*: ■ No opportunity for outperformance of markets
Yale University endowment	*Asset allocation:* ■ High allocation to alternatives ■ Significant active management ■ Externally managed assets *Advantages*: ■ Potential for outperformance of markets *Disadvantages*: ■ Difficult for small institutions without expertise in alternatives ■ May also be difficult for large managers due to capacity issues of external managers ■ High fees/costs
Canada Pension Plan	*Asset allocation:* ■ High allocation to alternatives ■ Significant active management ■ Internally managed assets ■ Uses a reference portfolio of passive public assets as benchmark that can be easily understood/communicated *Advantages*: ■ Potential for outperformance of markets and development of internal capabilities *Disadvantages*: ■ Potentially expensive and difficult to manage
Liability driven	*Asset allocation:* ■ Focus is on maximizing expected surplus (assets − liabilities) return and managing surplus volatility *Advantages*: ■ Explicitly recognizes liabilities as part of investment process *Disadvantages*: ■ Certain risks of liabilities (e.g., longevity) are difficult to hedge

PROFESSOR'S NOTE

The liability-driven investing (LDI) model is the same as the model discussed in detail in the asset allocation section of the curriculum.

MODULE QUIZ 33.1

To best evaluate your performance, enter your quiz answers online.

1. Eris Private Wealth, Inc., (EPW) provides investment advice to high-net-worth individuals. After a recent merger, EPW acquired some institutional clients. The board of EPW has asked the post-merger management team to prepare a report detailing the key differences between institutional clients and individual clients. The report makes the following two statements:

Statement 1: It is likely that the different scale of institutional clients versus individual clients will narrow the available investment universe.

Statement 2: The governance structure of institutional clients is likely to be more formal than the governance structure of the investment account of an individual client.

How many of the post-merger management team's statements are correct?
   A. Only one statement is correct.
   B. Neither statement is correct.
   C. Both statements are correct.

2. The board of the SJT Foundation has specified the following objectives:
   - Make an aggressive allocation to alternative investments in order to diversify and hedge against long-term inflation risk.
   - Outsource investment management to external managers due to the lack of experience by internal investment staff in investing in alternative investments.
   - Pursue actively managed strategies to generate long-term outperformance of benchmarks.

   The investment approach *most likely* to meet these objectives is:
   A. the Canada Pension Plan model.
   B. the Yale University endowment model.
   C. the Norway sovereign wealth fund model.

LOS 33.c: Discuss the stakeholders in the portfolio, the liabilities, the investment time horizons, and the liquidity needs of different types of institutional investors.

LOS 33.d: Describe the focus of legal, regulatory, and tax constraints affecting different types of institutional investors.

LOS 33.f: Prepare the investment objectives section of an institutional investor's investment policy statement.

LOS 33.g: Evaluate the investment policy statement of an institutional investor.

LOS 33.h: Evaluate the investment portfolio of a private DB plan, sovereign wealth fund, university endowment, and private foundation.

CFA® Program Curriculum, Volume 6, pages 16, 23, 29, 31

The remainder of this reading addresses the details of IPSs of different types of institutional investors. The general outline for each type of institution will be as follows:

- The main features/mission of the institution.
- The stakeholders (i.e., parties impacted by the success/failure of the institution).
- The key elements of the IPS, usually in the following order:
  - Liabilities and investment horizon.
  - Liquidity needs.
  - External constraints.
  - Investment objectives.
  - Asset allocation.

MODULE 33.2: PENSION FUNDS

Main Features/Mission

Pension funds are plans designed to save and invest in order to provide income for plan beneficiaries upon retirement. The entity that sets up the plan is referred to as the plan sponsor and is usually an employer. There are two major types of pension plans: (1) **defined benefit (DB)**, in which a plan sponsor defines the *benefit* that will be paid to beneficiaries upon retirement in the future and (2) **defined contribution (DC)**, in which *contributions* to plan assets today are defined, but there is no guarantee of ultimate benefits paid to beneficiaries.

While the exact nature of plans varies depending on jurisdiction, the main differences between DB and DC plans are displayed in .

Figure 33.2: Defined Benefit vs. Defined Contribution

Feature	Defined Benefit	Defined Contribution
Benefit payments	Contractually defined (usually dependent on final salary) Creates a measurable **liability** for the plan sponsor	Depends of the performance of investments Once promised contributions have been met, there is no liability for the plan sponsor
Contributions	Primarily by employer (employee may contribute also)	Primarily by employee (employer may contribute also)
Investment decision-making	Pension fund (sponsor and investment staff)	Sponsor provides suite of available investment funds Employee decides level of investment and asset allocation
Investment risk	Faced by sponsor	Faced by beneficiary
Mortality/longevity risk	Pooled at the fund level—beneficiaries who live longer than expected are funded by those who die earlier than expected Risk of general increases in life expectancy faced by sponsor	Employee faces the longevity risk of outliving their own savings

Over recent decades, there has been a move from DB to DC plans driven by the plan sponsors' preference for lower financial risk and the fact that DC plans are portable (i.e., they can move with beneficiaries when they change jobs).

Hybrid plans also exist that exhibit features of both DB and DC plans. For example, a cash balance plan involves a sponsor defining contributions to assets, which are then pooled; the sponsor faces some of the investment risk, as per a DB plan.

We will now focus on DB plans and DC plans individually.

DB Pension Plan

Stakeholders

The following are stakeholders in a DB pension scheme:

- *Plan sponsors (employers)* must make contributions to plan assets. Poor investment performance will result in sponsors having to make extra contributions to an underfunded plan (i.e., when assets are lower than liabilities).

- *Plan beneficiaries (employees and retirees)* face the ultimate risk that an employer defaults on contributions to plan assets.
- *The investment staff, the investment committee, and/or the board* are directly impacted by the success or failure of the plan.
- *Governments* are stakeholders in that they provide tax incentives for employees to save for retirement, and taxpayers will ultimately face the costs of providing welfare for those that have failed to adequately save for retirement.
- *Shareholders* in the corporate employer are stakeholders since an underfunded plan will cause a balance sheet liability and lower income for the company. It will also lead to higher financial risk, which will likely increase share price volatility.

Liabilities and Investment Horizon

The liabilities of a DB pension plan are the present value of the future benefits promised to plan participants. Employees usually only qualify to receive these benefits after meeting certain requirements called *vesting* conditions—typically a required minimum number of years of service.

The funded status of the plan can be measured using the funded ratio, or vested benefit index:

funded ratio = fair value of plan assets / PV of DB obligations

The major factors affecting the size of the liability are summarized in .

Figure 33.3: DB Pension Plan Liability Factors

Factor	Impact of *Increase* in Factor	Rationale
Service/tenure (years worked)	Increases liability	Benefits are usually linked directly to years of service by the employee.
Salary	Increases liability	Benefits are usually linked to final salary.
Longevity	Increases liability	Plan participants are paid benefits for every year they live in retirement. If they live longer in retirement, they will receive more years of benefits.
Employee turnover	Lowers liability	Higher employee turnover means fewer employees are likely to work the number of years of service required for vesting of benefits.
Additional/matching contributions	Increases liability	Additional/matching contributions usually increases the benefits promised to employees.
Expected investment return	Potentially lowers liability	In some cases, an increase in expected returns increases the discount rate used for liabilities, lowering liabilities.
Discount rate	Lowers liability	A higher discount rate will give a lower present value of benefits, hence a lower liability.

The plan beneficiaries can be split into *active lives* (those still employed and earning benefits) and *retired lives* (those receiving benefit payments). The higher the proportion of retired lives in the plan, the shorter the investment horizon of the plan, which lowers the risk tolerance of the plan. Plans that are frozen (i.e., closed to new participants) will also have shorter investment horizons due to the lack of new active lives joining the plan.

Risk Considerations

CFA® Program Curriculum, Volume 6, page 26

Key considerations that drive the risk tolerance of the DB pension plan are summarized in Figure 33.4.

Figure 33.4: DB Pension Plan Risk Considerations

Consideration	Rationale
Plan funded status	Higher funded status potentially increases risk tolerance since the plan will have the ability to absorb short-term losses
Sponsor financial status	Lower debt ratios and higher profitability of sponsor increase risk tolerance since sponsor will have capacity to make contributions in the event of losses in plan assets
Size of plan compared to sponsor	Smaller plans (relative to the size of the sponsor) have greater risk tolerance since the sponsor can tolerate more volatility in contributions should plan assets underperform
Common risk exposures	The lower the correlation of sponsor operating results and the returns of pension assets, the greater the risk tolerance of the plan because the low correlation implies that in times of plan underperformance, the sponsor is likely to be profitable and able to increase plan contributions
Provision for early retirement/lump-sum distributions	Such plan features generally imply a lower risk tolerance, as the shorter investment horizon means the plan has less time to recover from short-term losses
Workforce characteristics	The younger the workforce and the higher the proportion of active lives, the greater the duration of plan liabilities—increases risk tolerance since the plan has time to recover from short-term losses

PROFESSOR'S NOTE

While a general comment about a higher funded status implying a greater ability to take risk is true, it might still be the case that willingness to take risk remains low for the plan. For example, if the plan is in surplus and the sponsor wishes to remain in surplus to minimize contributions to the plan, then minimization of surplus volatility through LDI would be most appropriate. On the exam, make sure you read the information in the question and respond to it in the most appropriate way. In recent years, the factors discussed in Figure 33.4 have been a source of institutional IPS questions on the essay portion of the exam.

EXAMPLE: Viewpoint Research Corporation (defined benefit plan)

Viewpoint Research is a leading U.K. producer of polling and survey-based market research. Viewpoint is a relatively new company that has taken advantage of new online methods of collecting research data. Viewpoint's costs are largely related to wages and technological support in the U.K., while revenues are generated from clients across Europe. Five years ago, the company introduced a DB pension plan. All participants of the plan are currently either still working for the company or have left the company for alternative employment. The plan currently has a small deficit. While similar plans often offer early retirement and lump-sum distributions as options to plan participants, Viewpoint's plan does not offer such options.

The company has seen rapid growth in earnings over the previous year, with return on equity being higher than the industry average. The company employs significant leverage, with a debt-to-assets ratio 50% higher than that of established industry competitors.

Based solely on the information provided, **discuss** two factors that increase the plan's ability to take risk and two factors that decrease the plan's ability to take risk.

Answers:

Two factors that *increase* the plan's ability to take risk are:

1. The plan has zero retired lives, since all participants are either still working for the company or are working in alternative employment. This means the plan liabilities have a relatively long duration; hence, the plan has time to recover from short-term underperformance, which increases the ability of the plan to take risk.

2. The plan does not offer early retirement or lump-sum distribution options to plan participants. This increases the duration and predictability of liabilities, increasing the ability of the plan to take risk since it has time to recover from short-term falls in funded status.

Two factors that *decrease* the plan's ability to take risk are:

1. The company has higher debt levels than the industry average. This lowers the ability of the sponsor to increase contributions to the plan if investment performance is poor, which in turn lowers the risk tolerance of the plan.

2. The plan is running at a deficit. All else equal, this lowers the ability of the plan to take risk since further underperformance of plan liabilities may have a significantly negative impact on the ability of the plan to meet its future liabilities (i.e., make pension payments as required).

PROFESSOR'S NOTE

It might be tempting to simply copy the curriculum and say that the company has a high return on equity and, therefore, has good profitability, which increases the plan's ability to take risk. This is not a good response, since this high profitability is stated for the last year only and it has come at a time when the company has high debt levels; hence, it may simply be a reflection of the leverage of the company. There is no guarantee this short-term profitability can be maintained over the long term—the two answers previously given are better answers based on the case facts.

Liquidity Needs

Pension plans must maintain enough liquidity to pay their liabilities (i.e., pension benefits) as they come due. It is important to remember that the liquidity needs of the pension plan are a function of both the benefits being paid to retired lives *and* the sponsor contributions being made to the plan. Liquidity needs are generally *higher* when:

- The proportion of retired lives in the plan is higher, since retired lives are receiving benefit payments. Frozen plans will have higher liquidity needs than nonfrozen plans due to benefits exceeding contributions.
- The workforce of the employer is older, since the time to pay benefits will be shorter.
- The plan has higher funded status, since this will likely lead to lower sponsor contributions and more benefit payments will need to be met from existing plan assets.
- The plan participants have the ability to switch or withdraw from the plan, an event that usually triggers payments to participants.

A plan with lower liquidity needs can generally invest larger amounts in more risky asset classes.

External Constraints

Regulations vary by country; however, there are similar themes in global regulation. Many regulators now require extensive reporting on fees and costs incurred by plans both internally and externally. Personal liability for pension trustees has been increased to ensure they act in the best interests of plan beneficiaries. In Europe, updates to the Institutions for Occupational Retirement Provision (IORP II) Directive is introducing enhanced requirements regarding governance, risk management, and disclosure. In the United States, the Employee Retirement Income Security Act of 1974 (ERISA) regulates investing, funding requirements, and payouts of corporate pension plans. ERISA established the Pension Benefit Guaranty Corporation, a U.S. government agency that protects beneficiaries of terminated plans. The U.S. Pension Protection Act of 2006 established minimum funding ratios for DB plans, and a later revision of the act raised the rates corporations could use to discount their liabilities by using an average high-grade bond yield over 25 years rather than the existing market yield. While this has led to lower liabilities, it may also lead to higher risk taking in order to generate the higher returns needed to maintain funded status, since the value of liabilities will grow at this higher discount rate over time.

From a *tax* perspective, rules once again vary by country; however, pension funds are often treated favorably by governments in order to encourage individuals to save for retirement. Funds that are subject to taxation should consider the tax implications of their investment decisions. For example, lower longer-term capital gains tax rates may incentivize lower turnover strategies. Higher tax rates on profits from derivatives versus rates of returns from the underlying securities may preclude the use of derivatives. When investing internationally, funds should be aware of when and how to benefit from double-taxation treaties between countries, which may offer domestic tax credits when withholding taxes are suffered in foreign markets.

Accounting rules, again, differ by country. In the United States, corporate DB pension plans must follow GAAP, particularly Accounting Standards Codification (ASC) 715, Compensation—Retirement Benefits, which requires that funded status be shown as an asset or liability on the balance sheet. Public pension plans must follow Governmental Accounting Standards Board (GASB) rules, which require assets to be reported at market values and liabilities to be reported using a blended approach. The blended approach for liabilities uses the expected return on plan assets as the discount rate for the funded portion of the liability, and a lower discount rate—the yield on tax-exempt municipal bonds—for the unfunded portion. Using a higher discount rate for the funded liabilities could incentivize plans to take more risk in order to maintain the funded status of the plan over time.

> **PROFESSOR'S NOTE**
>
> The focus on the exam is on portfolio management rather than a forensic discussion of regulations, taxation, and accounting. Take away the broad points here and be led by the case study in the question in the exam. It is likely that if there is a significant external constraint that needs to be addressed, it will be referenced in the case.

Investment Objectives

For DB pension plans, the primary objective is to achieve a target return over a specified long-term horizon, while assuming a level of risk that is consistent with meeting its contractual liabilities. A secondary objective could be to minimize (in present value terms) the cash contributions the sponsor will be required to provide.

The target return of the plan should reflect the fact that plan assets need to grow through contributions and investment returns in line with the growth in liabilities of the plan (i.e., the discount rate applied to these liabilities). If a plan is in deficit, then plan assets need to grow faster than the liabilities—how much of this growth in plan assets comes from investment return and how much comes from extra contributions by the company is driven by the plan's ability to take risk and the sponsor's ability to make further contributions to the plan.

We will now focus on DC plans.

DC Pension Plan

Stakeholders

The stakeholders in a DC pension scheme include the following:

- *Plan sponsors (employers),* while not facing the investment risk or longevity risk of the assets, retain important fiduciary responsibilities. These include contributing to the plan, overseeing the investment of plan assets, and offering suitable investment options to plan participants.

- *Plan beneficiaries (employees and retirees)* face the investment risk of contributions and investment returns not meeting retirement needs. They also face the longevity risk of living longer than expected and outliving their savings.

- *The board* must communicate with participants to keep them well informed, and these communications must consider the participants' level of sophistication. The board may be required to select a default investment option when participants are *disengaged* (i.e., do not make an explicit investment choice with their contributions).

- *Governments* are stakeholders in that they provide tax incentives for employees to save for retirement, and taxpayers will ultimately face the costs of providing welfare for those that have failed to adequately save for retirement.

Liabilities and Investment Horizon

The liabilities of a DC plan sponsor are the required contributions to plan assets; hence, unlike under a DB scheme, there is no liability associated with future benefits. Through pooling and increased scale, the DC plan may invest in alternative investments not usually available directly to retail investors. The DC plan sponsor bears the liquidity risk of any event that causes participants to exit the plan.

Individuals in a DC plan have an investment horizon linked to their age—older participants will have a shorter investment horizon because they will be retiring and drawing benefits sooner. Many DC plans offer a default *life-cycle option* (also called *target date option*) where asset mix is managed according to a desired retirement date. These life-cycle options can be either **participant-switching options**, which automatically switch members to a more conservative asset allocation as they age, or a **participant/cohort option**, which involves pooling the participant with other investors with a similar retirement date and the fund being managed more conservatively as the retirement date is approached.

Liquidity Needs

The primary drivers of liquidity needs are the age of the workforce and ability of participants to switch or withdraw from the plan. As is the case for DB schemes, if these factors are high, then liquidity needs of the fund will be high.

External Constraints

As per DB schemes, *regulations* vary by country. Regulators typically recognize that many DC plan participants have low levels of understanding about investments; therefore, there is a requirement that plan sponsors educate participants on saving for retirement, particularly with regard to default options for disengaged participants. In Australia and the United States, there is a requirement for the plan to offer a diversified default option for participants. This, however, does not absolve the DC plan trustees of their fiduciary duties to run the plan in the best interests of participants.

From a *tax* perspective, DC plans in the United States (referred to as 401(k) plans) are *tax deferred*. This means participants make pretax contributions and investment earnings are not taxable; however, benefits are taxed as ordinary income. Withdrawals before age 59½ are penalized with an additional 10% tax. A similar tax-deferral system operates in the U.K., with the first 25% of benefits being tax-free.

> **PROFESSOR'S NOTE**
>
> As introduced in the DB section, ERISA in the United States and IORP II in Europe are relevant to both DB and DC plans.

Investment Objectives

The main objective of DC plans is to prudently grow assets to meet spending needs in retirement. As already discussed, there is an onus on the plan sponsor to provide cost-efficient default options for disengaged participants. If the plan offers funds with active management, a secondary objective may be to outperform the passive asset class returns of the default option's strategic asset allocation. In environments where participants can voluntarily switch between competing DC plan providers, outperforming other DC plans may be an investment objective.

Asset Allocation by DB and DC Pension Plans

Aggregate data for both DB and DC plans together show:

- Asset allocation varies by region, largely driven by differences in external constraints, risk appetite, and stakeholder preferences.
- Over the past decade, there has been a rotation from equities into alternative assets and fixed income to try to lower the volatility of funded ratios. Within equities, there is some evidence of home bias to domestic equity markets.

> **MODULE QUIZ 33.2**
>
> *To best evaluate your performance, enter your quiz answers online.*
>
> 1. An increase in which of the following factors will *most likely* lead to a decrease in the liabilities of a DB pension plan?
>   A. Life expectancy.
>   B. Years of service.
>   C. Expected employee turnover.

2. Which of the following changes would *most likely* increase the risk tolerance of a DB pension plan?
   A. An increase in the average age of the workforce.
   B. Poor investment performance causing the plan to move from overfunded to underfunded status.
   C. An increase in allocation to asset classes that have a low correlation with the operating results of the sponsor.

MODULE 33.3: SOVEREIGN WEALTH FUNDS

Main Features/Mission

Sovereign wealth funds (SWFs) are investment funds owned by a government. The International Monetary Fund defines five broad categories of SWF, each with different missions:

1. **Budget stabilization funds.** These are set up when a nation's revenues are heavily linked to a natural resource or other cyclical industries to insulate government budgets from commodity price volatility or economic cycles.

2. **Development funds.** This investment prioritizes national socioeconomic projects, usually infrastructure or supporting key industries.

3. **Savings funds.** These funds invest revenues from nonrenewable assets for the benefit of future generations.

4. **Reserve funds.** These are designed to earn returns on excess foreign reserves held by central banks. Typically, foreign exchange reserves held by central banks are low-yielding assets relative to the yields offered by bonds issued by central banks that make up their liabilities. Reserve funds aim to reduce this negative cost of carry through boosting returns on reserves.

5. **Pension reserve funds.** These are used to save and invest to meet future pension liabilities of governments.

Stakeholders

The stakeholders in an SWF are as follows:

- *Current and future citizens* benefit from the fund's success either directly through receiving payments or indirectly through lower taxation or increased investment in the domestic economy.

- *Investment offices* invest SWF assets either directly in-house or appoint external managers.

- *The board* has a fiduciary duty to the ultimate beneficiaries of the fund.

- *Governments* are stakeholders in that they may rely on SWF returns to balance budget deficits.

Liabilities and Investment Horizon, and Liquidity Needs

The liabilities of SWFs are linked to their overall mission and generally are less well defined than other types of institutions. The liabilities and investment horizons of the five broad types of SWFs are listed in Figure 33.5.

Figure 33.5: SWF Liabilities and Time Horizons

SWF Type	Liabilities and Investment Horizon
Budget stabilization	■ Uncertain liabilities linked to commodity prices/cyclical industries ■ Short-term investment horizon because budget support required on a short-term basis
Development	■ Nature of liabilities linked to socioeconomic investments made by the fund ■ Some long-term horizons (e.g., infrastructure), some medium-term horizons (e.g., medical research)
Savings	■ Liabilities are linked to future generations; therefore, long term
Reserve	■ Liabilities are technically the yield promised on bonds issued by governments/central banks; however, funds will target higher returns ■ Investment horizons are very long, typically with no near-term liabilities
Pension reserve	■ Liabilities are linked to future pension payments; therefore, long term ■ Fund may have an *accumulation stage* in which contributions are made and a *decumulation phase* where benefits are drawn; time horizon will depend on when these stages occur

Liquidity Needs

■ **Budget stabilization funds.** These must maintain the *highest* liquidity level and invest in assets with low risk of significant loss in the short term, in order to meet short-term deficits caused by negative economic- or commodity-related events.

■ **Development funds.** Because infrastructure and research and innovation investments are long term, funds established to develop such projects generally have *low* liquidity needs.

■ **Savings funds.** The main objective is to accumulate wealth for future generations; hence, liquidity needs are *lowest*. Liquidity needs increase as the nation's natural resources become depleted and the government withdraws from the fund to meet budgetary needs.

■ **Reserve funds.** Liquidity needs are lower compared to stabilization funds but higher compared to savings funds. Liquid fixed-income securities are usually held that can be readily sold if there is a dramatic change in the reserves of the central bank.

■ **Pension reserve funds.** Liquidity needs vary, being lower during the accumulation stage and higher during the decumulation stage.

External Constraints

From a *legal and regulatory* perspective, SWFs are typically established by laws that give the SWF its mission and structure. This may involve clear rules of asset allocation, particularly in the case of a development fund with a specific socioeconomic mission. In order to avoid political influence, high-quality governance, independence, transparency, and accountability are crucial. The Santiago Principles, a best-practices framework established by the International Forum of SWFs (IFSWF), addresses such concerns alongside other key elements expected of a high-quality SWF, such as ethics, risk management, and regular monitoring for compliance with the principles.

SWFs are generally *tax exempt*. This may void the SWF's ability to claim withholding taxes or tax credits that are normally available to taxable investors. Care should be taken when investing internationally to ensure double-taxation treaties exist when subject to withholding

taxes abroad. SWFs should take care not to be perceived as using their status to avoid paying taxes in foreign jurisdictions in which they invest.

Figure 33.6: SWF Investment Objectives

SWF Type	Investment Objectives
Budget stabilization	■ Capital preservation ■ Aims to earn returns above inflation with a low probability of losses ■ Should avoid assets correlated with the source of government revenues
Development	■ Support a nation's economic development and increase long-run economic growth ■ Implicit objective is to earn a real rate of return greater than real domestic GDP growth or productivity growth
Savings	■ Maintain purchasing power of the assets over time while making ongoing spending on government budgetary needs
Reserve	■ Earn a rate of return in excess of the yield the government/central bank pays on bonds it has issued
Pension reserve	■ Earn returns to meet future unfunded pension and social care payments promised by the government

PROFESSOR'S NOTE

As will be discussed in the next section, savings funds share very similar objectives to endowments and foundations.

Asset Allocation by Sovereign Wealth Funds

Typical asset allocations differ by type of SWF as follows:

- **Budget stabilization funds.** The majority of fixed income and cash is due to the defensive nature of the fund.

- **Development funds.** These are driven by the socioeconomic mission of the fund (e.g., investment in local infrastructure projects).

- **Savings funds.** A long investment horizon means relatively high allocations toward equities and alternative investments, such as private equity and real assets.

- **Reserve funds.** Allocations are similar to those of savings funds, but with lower allocation to alternatives due to the potentially higher liquidity needs.

- **Pension reserve funds.** These have high allocations to equities and alternatives due to a long investment horizon and low liquidity needs in the accumulation phase.

As mentioned, savings funds and pension reserve funds typically follow the endowment model. Some may also adopt the Canadian model. Another general theme that drives asset allocation is fewer constraints leading to a broader investment mandate and longer time horizons than most institutional investors (e.g., pension funds) allowing for a higher allocation to alternative assets.

MODULE QUIZ 33.3

To best evaluate your performance, enter your quiz answers online.

1. A strategic asset allocation of 10% equities, 60% fixed income, and 30% cash is most appropriate for which type of SWF?
   A. Savings funds.
   B. Development funds.
   C. Budget stabilization funds.

MODULE 33.4: UNIVERSITY ENDOWMENTS AND PRIVATE FOUNDATIONS

While university endowments and private foundations have many similarities in their investment policies, they also have some key differences. We will consider these institutions individually, beginning with university endowments.

University Endowments

Main Features/Mission

University endowments are funds set up by gifts and donations, which are invested to earn returns that provide ongoing support to the university's operating budget. The main objective is to balance the needs of the university today against its needs in the future (i.e., to provide intergenerational equity).

One of the largest endowments is that of Harvard University with assets in excess of $30 billion in 2016.

Stakeholders

The stakeholders of a university endowment are current and future students, alumni who contribute gifts and donations, and university employees whose livelihoods depend on the university. Stakeholders often have representation on the endowment's board or investment committee, such as alumni who may be investment professionals.

Liabilities and Investment Horizon

The need to maintain intergenerational equity and the unlimited life of the university mean endowments have a perpetual investment horizon.

The endowment's liabilities are the future payouts promised to the university, presented in an official spending policy. The endowment's spending policy should ensure intergenerational equity while smoothing payouts to insulate the university from market volatility. To achieve this, the dollar amount of spending each year can be stated as a weighted average of the previous year's spending (adjusted for inflation) and a spending rate (usually between 4% and 6%) applied to a moving average of assets under management (AUM). This can be formulated as:

$$\text{spending}_{t+1} = w \times [\text{spending}_t \times (1 + \text{inflation})] + \{(1 - w) \times (\text{spending rate} \times \text{average AUM})\}$$

where:
w = weight of the prior year's spending amount

Three different types of spending policies result from different values of *w*:

1. **Constant growth rule (w = 1).** The endowment provides a fixed (real) annual payout to the university once adjusted for inflation by the Higher Education Price Index (HEPI). While this method gives more certainty to the university of the payouts that will be received, this means the percentage of endowment value paid out periodically will fluctuate with the endowment value. This spending rule often contains caps and

floors representing maximum and minimum percentage values of AUM over one or three years that can be paid out in any period.

2. **Market value rule (w = 0).** Annual payouts are a prespecified percentage (the *spending rate*, usually between 4% and 6%) of the three- to five-year moving average of asset values. Payouts under this method are procyclical in that spending will fluctuate in line with the moving average of asset values.

3. **Hybrid rule (0 < w < 1).** Spending is a weighted average of the previous two rules.

Other liability-related factors that need to be considered are as follows:

- **Fundraising from donors.** Gifts and donations coming into the endowment mean that the net spending rate is closer to 2% to 4% of assets rather than the 4% to 6% spending rate applied.

- **Reliance of the university on the spending from the endowment.** All else equal, if the endowment spending comprises a larger proportion of the university's operating budget, then the risk tolerance of the endowment is lower.

- **Capability of the endowment or university to issue debt.** Access to debt markets increases the risk tolerance of the endowment because the institution can borrow to meet spending in times of poor investment performance.

Liquidity Needs

As noted previously, the endowment's annual spending net of gifts and donations is usually very low (around 2% to 4% of assets). Low liquidity needs plus the perpetual time horizon mean endowments usually have a high risk tolerance and absorb relatively high volatility in the short term in pursuit of longer-term returns.

External Constraints

From a *legal and regulatory* perspective, regulation varies by jurisdiction; however, endowments are typically subject to laws that require:

1. Investment on a total return basis (i.e., earning returns from both income and capital gains, not simply generating spending through income returns) and diversification according to modern portfolio theory (MPT).

2. Investment committees or boards and staff who have a fiduciary duty of care in overseeing investments.

In the United States, the Uniform Prudent Management of Institutional Funds Act 2006 (UPMIFA) allows flexibility in spending decisions and enforces the adoption of MPT. In the U.K., the Trustee Act (2000) plays a similar role (relevant to endowments since they are often structured as trusts in the U.K.). The shift to MPT principles has allowed endowments to allocate to a broad range of asset classes.

> 🎓 **PROFESSOR'S NOTE**
>
> UPMIFA and the Trustee Act also apply to private foundations as discussed in the next section.

Endowments typically have *tax-exempt* status when generating investment returns. Universities are not typically taxed on payouts from the endowment, and donors to endowments usually can deduct gifts from their taxable income.

Investment Objectives

The investment objective is to preserve the purchasing power of the assets in perpetuity (i.e., grow in line with inflation) while achieving returns adequate to maintain the level of spending. As discussed previously, spending policy can be formulated in different ways; however, a typical spending rate target is 5% of average assets.

In practice, this means the university endowment has a primary objective to generate a real return (i.e., after inflation measured using the HEPI) of about 5% on average over a three- to five-year period. A reasonable volatility limit is typically 10% to 15%. There may be a secondary objective of outperforming a passive benchmark or even a tertiary objective of outperforming a peer group of similar endowments. An issue with the objective of outperforming a peer group is that it may lead to decisions becoming dislocated from the core mission of funding unique liabilities and may lead to *herding* by investment managers into similar investments.

Given endowments need to beat inflation, they tend to have a significant allocation to real assets with expected returns that meet or beat inflation. One lesson from the 2007–2009 financial crisis is that the liquidity risk of endowments' portfolios should be analyzed with detailed cash flow modeling. Some endowments use a liquidity *risk band* representing an upper bound for the fund's exposure to illiquid investments, including the endowment's uncalled commitments in illiquid alternative asset funds.

Asset Allocation by University Endowments

Most large U.S. university endowments follow the endowment model, which involves a majority (>50%) allocation to alternative investments, an allocation that has increased over the past two decades. Smaller U.S. university endowments tend to allocate less to alternatives and more to domestic equities and fixed income, with some evidence of home bias causing U.S. equities to be overweighted in these portfolios relative to non-U.S. equities.

> **EXAMPLE: The Capital University endowment**
>
> The Capital University endowment supports 10% of the university's operating budget. The investment office of the endowment is relatively small, and the endowment has an annual spending policy to pay out 4% of the five-year average asset value to the university.
>
> The endowment has historically allocated 30% to public U.S. equities and 70% of the portfolio to fixed income. The board has historically set the objective that annualized volatility should be no more than 15%, and this is not expected to change. A recent review of the endowment's investment policy yielded the following assumptions for expected asset class returns and recommended strategic asset allocation for the endowment:
>
> | Asset Class | 10-Year Nominal Expected Return | Recommended Strategic Asset Allocation |
> |---|---|---|
> | Fixed income | 3% | 25% |
> | U.S. equities | 6% | 35% |
> | International equities | 7% | 20% |
> | Real estate | 8% | 10% |
> | Private equity | 10% | 10% |
>
> Expected consumer price inflation over the next 10 years is 1% per year. Higher education price inflation, as measured by the HEPI, is expected to be 100 basis points per year above consumer price inflation.

1. **Formulate** the investment objectives for the Capital University endowment's IPS. **Calculate** the nominal required return of the endowment that is consistent with this objective.
2. **Discuss** whether the recommended shift in strategic asset allocation weights should be accepted based on the expected return.
3. **Discuss** one factor that could make the recommended strategic asset allocation inappropriate for the endowment.

Answers:

1. The mission of the Capital University endowment is to maintain the purchasing power of the endowment's assets while financing 10% of the operating budget of the university in perpetuity. The nominal required return consistent with this object is a return that meets the spending rate of 4% plus the relevant rate of inflation, namely the HEPI, which is expected to be 1% + 100 basis points = 2%. Hence, the nominal required return of the endowment is 4% + 2% = 6%. The annual volatility of returns should not exceed 15%.

2. Based on expected return alone, the recommended strategic asset allocation weights should be accepted since the current asset allocation fails to meet the nominal required return objective, but the new asset allocation does meet the objective.

   The current asset allocation is expected to earn a nominal return of $(0.3 \times 6\%) + (0.7 \times 3\%) = 3.9\%$. This falls far short of the required nominal return of 6%.

   The new asset allocation is expected to earn a nominal return of:

   $(0.25 \times 3\%) + (0.35 \times 6\%) + (0.2 \times 7\%) + (0.1 \times 8\%) + (0.1 \times 10\%) = 6.05\%$

   This meets the nominal required return objective of 6%.

3. Concerns regarding the new strategic asset allocation include the following:
   - The current investment office is described as small and appears to have no experience investing in alternative assets. The board should ensure that the investment staff have the skills, experience, and contacts to perform due diligence on the new asset classes—in particular, the alternative investment allocations to private equity and real assets.
   - The new strategic asset allocation must adhere to the risk objective of a maximum annual volatility of 15%. The investment staff should analyze whether the new asset allocation is going to meet this objective.

We now turn our attention to private foundations.

Private Foundations

Main Features/Mission

Foundations are nonprofit institutions set up to make grants to support specified charitable causes.

The focus of this reading is on *private* foundations set up by individual donors and their families, an example of which is the Bill & Melinda Gates Foundation, with focuses on global health and poverty. Foundations can also be *community* foundations set up by and for the good of the local community, *operating* foundations set up to fund a specific not-for-profit business, or *corporate* foundations set up from the profits of an existing company.

The main objective of private foundations is typically to maintain purchasing power in perpetuity and earn returns sufficient to support the grant-making activities of the foundation (similar to a university endowment's objective).

Stakeholders

The stakeholders of a private foundation may include the founding family, donors to the foundation, recipients of grants from the foundation, and the wider community that the

foundation's activities may benefit. Intergenerational tensions may exist like those of an endowment where the needs of current recipients and future recipients of spending from the foundation need to be balanced. The government could also be considered a stakeholder due to the favorable tax treatment of foundations.

Board members of foundations are less likely to have professional investment experience than alumni on endowment boards. This difference in experience may result in less rigorous board oversight or greater delegation to investment staff. This may affect the quality of investment decisions, particularly in more sophisticated markets such as alternative investments.

Mission-related investing (also known as *impact investing*) is a technique increasingly adopted by foundations whereby investments are made into projects that promote the foundation's mission. The challenge with such investments is maintaining a sufficient return on assets to meet the foundation's long-term objectives.

Liabilities and Investment Horizon

Foundations typically have an investment horizon that is perpetual. There is a trend toward limited-life foundations that are mandated to spend down assets within a limited time frame of the founder's death, which would shorten the investment horizon.

In the United States, tax laws require private grant-making foundations to pay out *a minimum of 5% of assets (on a 12-month trailing basis) plus investment expenses*. Foundations must also spend any donations in the year the donation is received (known as flow through).

Unlike universities, which have other sources of revenue outside the spending of their endowment, foundations are relied upon almost exclusively to meet budgets. This, along with the higher liquidity requirements of foundations, means they typically have a lower risk tolerance than university endowments.

Liquidity Needs

As mentioned previously, U.S. foundations are legally required to spend 5% of assets. Foundations should maintain sufficient liquidity to meet near-term spending, capital calls from private limited partnership fund investments, and any margin calls on derivatives employed by the investment portfolio.

External Constraints

From a *legal and regulatory* perspective, foundations are subject to similar laws, such as UPMIFA in the United States and the Trustee Act in the U.K., which demand investment on a total return basis, diversification, and a duty of care from the board and investment staff.

Foundations typically have similar *tax-exempt* status to endowments, but this status depends on the minimum spending rules mentioned in the previous section. Failing to meet the spending requirement results in a 30% tax on undistributed income. Most U.S. foundations are also subject to a 2% tax on net investment income.

Investment Objectives

The investment objective is to generate a real return over consumer price inflation of the spending rate (minimum 5%) plus investment expenses, with expected annual volatility in a

reasonable range (approximately 10% to 15%) over a three- to five-year period.

There may be a secondary objective of outperforming a policy benchmark based on a tracking error budget.

Asset Allocation by Private Foundations

As mentioned, foundations have a lower risk tolerance than university endowments due to higher liquidity requirements and the heavy reliance on the foundation's spending. However, their overall risk tolerance remains high and, with a long-term objective of beating inflation, larger U.S. foundations allocate about half of the portfolio to alternative investments. Smaller foundations tend to have a higher allocation to domestic equities and fixed-income securities.

> **MODULE QUIZ 33.4**
>
> *To best evaluate your performance, enter your quiz answers online.*
>
> 1. A university endowment has an annual spending policy of 5% of the three-year rolling asset value. Consumer price inflation is expected to be 3% per annum, while the Higher Education Price Index (HEPI) is expected to be 2.5% per annum. The investment objective of the endowment should be to achieve a total real rate of return of at least:
>   A. 5.0%.
>   B. 7.5%.
>   C. 8.0%.

MODULE 33.5: BANKS AND INSURERS

We now turn our attention to banks and insurers; these institutions are different from other institutions in that they are financial intermediaries that are run *for profit*. It is important to remember throughout this discussion that we are advising the institution on *its investment portfolio*, not on its core business of being a bank or an insurance company (however, as we shall see, these two activities are interlinked with each other).

Banks

Main Features/Mission

The primary function of a bank is to earn profits by taking deposits from savers and making loans to borrowers. Other functions carried out by a bank are safeguarding assets, executing transactions in securities and derivatives, and advising and investing in securities.

Stakeholders

Most major large international banks are publicly listed, making shareholders a key external stakeholder with an interest in maximization of profits. Customers of a bank, such as depositors and borrowers, are also key external stakeholders. Depositors expect the bank to protect their assets over time, and they make up a majority of the liabilities of the bank. Retail borrowers rely on the bank to finance home purchases, and commercial borrowers rely on the bank to fund their operations. These loans make up a majority of the assets of the bank. Other external stakeholders include creditors, credit rating agencies, regulators, and communities where the bank operates.

Internal stakeholders include the bank's employees, managers, and directors.

Liabilities and Investment Horizon

Deposits constitute the majority of a bank's liabilities. This includes *demand deposits*—which can be withdrawn without notice and are therefore deemed short term in duration—and *time/term deposits* that require advance notice before withdrawal.

Other liabilities include short-term wholesale funding from other financial institutions, long-term debt, and trading/securities payables and repo finance payables.

The majority of the assets of a bank are comprised of longer-term illiquid mortgage and commercial loans.

The investment horizon for a bank portfolio is influenced by the difference between the long-term illiquid assets and the short-term liquid liabilities of the bank. Although banks are perpetual organizations, the instruments held in the investment portfolio of a bank are likely to be very short in nature, such that the bank can manage the volatility of shareholder capital on a medium- to short-term basis.

Liquidity Needs

With deposits as short-duration liabilities and the potential need to raise liquidity in adverse market conditions, liquidity management is a key focus for banks. Since the 2007–2009 financial crisis, regulations have been introduced that require banks to have sufficiently liquid assets to cover near-term expected cash outflows (liquidity coverage ratios, or LCRs) and to have adequate levels of capital from stable sources (net stable funding ratios, or NSFRs). This has led to the investment portfolios of banks being more liquid and banks relying less on the wholesale interbank funding markets.

Banks lending to commercial markets still tend to use wholesale funding markets more than banks lending to retail markets. Retail banks use a higher level of retail deposits in their funding, which have lower costs and tend to be more stable than wholesale funds, giving retail banks a better liquidity position than commercial banks.

External Constraints

From a *legal and regulatory* perspective, the risks that a systemic bank failure pose to critical economic functions such as payment processing and extension of credit mean that regulators are intensely focused on capital adequacy, liquidity, and leverage levels.

The main goal of regulators is to make sure that banks have adequate capitalization to absorb losses rather than the losses having to be faced by customers, creditors, or taxpayers. This can be achieved through requiring diversification, asset quality–based reserves, and diverse and stable sources of funding. As seen in the section on liquidity, regulators require that banks maintain LCRs and NSFRs.

> **PROFESSOR'S NOTE**
>
> When considering the impact of investment decisions on required regulatory reserves, it is important to understand that a quality-based reserves system will require that a bank provide for higher reserves when they hold more risky assets. For example, if a bank switched from less-risky investment-grade bonds to riskier high-yield bonds, the risk-weighted assets of the bank would increase in the eyes of the regulator, and required reserves would consequently be higher.

Economies of scale and the benefits of diversification encourage banks to increase their size, with the largest banks regarded by regulators as *systemically important financial institutions* (SIFIs). Since the global financial crisis, regulations for these SIFIs have:

- Increased capital required to absorb losses on assets.
- Placed limits on the amount of dividends and share buybacks since these payouts to shareholders effectively increase the leverage of the institution.
- Restricted the ability of subordinated debtholders and preferred shareholders to exert their claims in a bankruptcy, forcing them to bear more of the risk of the bank's activities.
- Restricted the use of derivatives, proprietary trading, and the use of off-balance sheet liabilities and guarantees.

From an *accountancy* perspective, three different accounting systems apply to financial institutions:

1. Standard financial reporting (GAAP or IFRS) is used to communicate results to shareholders. Due to the accruals process of accounting, this provides the smoothest reporting of income.
2. Statutory accounting is utilized by regulators and is comprised of a series of adjustments to make the accounts more conservative—for instance, removing intangible assets from the balance sheet, accelerating certain expenses and costs, and the recognition of reserves against unexpectedly large losses on assets or payments under guarantees.
3. True economic accounting uses market value for all assets and liabilities. This is likely to give the most volatile measure of income.

Banks typically are fully *taxable* entities; hence, they must consider the after-tax returns of their investment programs.

> **PROFESSOR'S NOTE**
>
> As will be seen later, this high-level discussion of regulation, accountancy, and tax also applies to insurance firms as well as banks.

Investment Objectives

The primary objective of a bank's investment portfolio is to manage liquidity and reduce risk mismatches between the bank's noninvestment assets and liabilities.

Banks establish an asset and liability management committee (ALMCo) to oversee investment activities. The ALMCo will set the IPS, monitor performance, and set risk limits regarding market, credit, liquidity, and solvency risks, with the authority to require changes on the asset and liability sides of the balance sheet. Having established these objectives, the investment team sets policy benchmarks, monitors performance, and reports to the bank's management and board.

We now turn our attention to the other major type of financial intermediary: insurers.

Insurers

Main Features/Mission

Insurers can be divided into the following two broad categories:

- **Life insurers.** They write insurance relating to whole life or term insurance with fixed payments, variable life insurance (with payouts linked to returns of investment funds chosen by the policyholder), annuity products, health insurance, and universal life insurance (with flexible premiums and benefit payouts).
- **Property and casualty (P&C) insurers.** They write insurance relating to commercial property and liability, home ownership, marine insurance, surety, and legal liabilities.

Stakeholders

Insurers tend to be organized as either publicly listed companies or mutual companies. For publicly listed companies, key external stakeholders are *shareholders* who require long-term maximization of the value of their capital while simultaneously honoring obligations to policyholders. Mutual companies are owned by their *policyholders*, either retaining profits as a surplus against potential losses or distributing them to policyholders through dividends or premium reductions. Other external stakeholders include derivatives counterparties, creditors, regulators, and rating agencies.

For traditional life insurance and annuity policies (including universal life), life insurers maintain a *general account* to fund the liabilities because the insurer bears the investment risk associated with meeting claims under these contracts. For variable life policies, the insurer operates a *separate account* in which assets are invested according to the investment choices of policyholders. For these policies, the policyholder bears the investment risk.

Internal stakeholders include an insurer's employees, management, and board of directors.

Liabilities and Investment Horizon

Insurance companies manage their investments with a focus on asset and liability management; therefore, the nature of the liabilities is crucial to the investment horizon of the investment portfolio.

Life insurers generally face a long duration liability stream through their contract payouts, although this can vary by product line. Because of this, life insurance companies have historically set investment horizons of 20 to 40 years.

P&C insurers generally face a liability stream with a shorter duration and higher uncertainty because claims are relate to unlikely, unpredictable events with high payouts, such as natural disasters.

In a similar way to banks, while the institution has a perpetual time horizon, the nature and timing of policy claims will strongly affect the time horizon of investments held. A key consideration for both life and P&C insurers is the frequently occurring underwriting cycle, which causes fluctuations in profitability driven by changes in the level of competition at different points of the insurance business cycle. For example, at times of intense competition and low profits from underwriting insurance contracts, insurers will be inclined to bear less underwriting risk, which may increase their appetite for investment risk, all else equal.

Liquidity Needs

An insurer needs to manage both *internal* liquidity (cash from operations and investing activities) and *external* liquidity (ability to borrow in debt markets). Liquidity needs are affected by the level of interest rates. In times of high interest rates, policyholders with historically low-yielding contracts may surrender (i.e., cash in) their policies in order to invest at higher yields in other investments, thereby increasing the net cash outflows of the life insurer.

As noted previously, P&C insurers face significant cash flow uncertainty due to the nature of their liabilities; hence, portfolios require the ample liquidity of high proportions of cash or cash equivalents and short-term fixed-income securities.

Insurers divide general account investments into two major components: the *reserve* portfolio and the *surplus* portfolio. Regulations require the insurer to maintain a reserve portfolio capable of meeting policy liabilities, and this is therefore managed conservatively. The surplus portfolio is used to generate higher returns, often by assuming liquidity risk and allocating to alternative investments.

External Constraints

From a *legal and regulatory* perspective, insurers, like banks, carry out crucial financial intermediary roles and can become large enough to be classified by regulators as SIFIs. Similar to banks, regulators will aim to ensure that insurers have sufficient capital to absorb losses in the business and losses from investments.

In the United States, the *National Association of Insurance Commissioners (NAIC)* is an association of state regulators that set accounting and reporting policies. In Europe, *Solvency II* is a framework being used to standardize regulation across member states.

From an *accountancy* perspective, standard financial reporting, statutory reporting, and true economic accounting rules apply to insurers just as they do to banks.

Insurers typically are fully *taxable* entities and must run their investment programs with consideration of after-tax returns.

> **PROFESSOR'S NOTE**
>
> The high-level discussion of regulation, accountancy, and tax in the section on external constraints for banks is also relevant to insurers. Once again, keep in mind that a switch into riskier investments will increase the regulatory required reserves of the institution.

Investment Objectives

Similar to banks, the primary objective of an insurer's *investment* portfolio is to manage liquidity and reduce risk mismatches between the institution's assets and liabilities. This process must therefore consider the general business conditions of the insurer and the expected external economic conditions.

The investment oversight function of an insurer is typically carried out by a board committee that is responsible for all investment policies and procedures and reports to regulators and external stakeholders.

Banks and Insurers: Balance Sheet Management and Investment Considerations

LOS 33.i: Describe considerations affecting the balance sheet management of banks and insurers.

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For both banks and insurance companies, the primary overall objective of the company is to maximize the market value of the institution's equity capital with a high level of assurance that the claims of depositors, creditors, and policyholders can be met.

An expression that captures how changes in the market value of assets, liabilities, and leverage levels affect the change in the market value of equity is:

$$\%\Delta E = \%\Delta A(M) - \%\Delta L(M - 1)$$

where:
$\%\Delta E$ = percentage change in the value of equity
$\%\Delta A$ = percentage change in the value of assets
$\%\Delta L$ = percentage change in the value of liabilities
M = leverage multiplier, A / E

> ### 🎓 PROFESSOR'S NOTE
>
> This equation makes intuitive sense—the first term on the right-hand side (A) reflects how asset returns are magnified by the leverage (M) used by the firm. The second term relates to the liabilities of the company—the negative sign reflects the fact that increases in liabilities cause equity levels to fall, all else equal. The *M − 1* term represents the size of liabilities relative to equity. For example, *M = 4* means that for every $4 of assets, the company has $1 of equity. Since assets are funded by equity and liabilities, liabilities must be $3 (i.e., M − 1).

> **EXAMPLE: Percentage change in the value of equity**
>
> A bank has an equity-to-assets ratio of 5%. **Calculate** the estimated percentage change in the market value of equity if liabilities rise by 1.5% and assets remain stable.
>
> **Answer:**
>
> With an equity-to-assets ratio of 5%, this means the bank has a leverage multiplier *M* of 1 / 0.05 = 20x.
>
> If liabilities rise by 1.5% and assets do not change, then using the equation, the percentage change in the market value of equity is estimated to be:
>
> $$\%\Delta E = (0\% \times 20) - (1.5\% \times 19) = -28.5\%$$

The previous equation can be tweaked slightly to assess the sensitivity of the institution's equity capital to a unit change in the reference yield, *y*, of the assets (i.e., the modified *duration* of the equity capital). This equation is:

$$D_E = D_A \left(M \right) - D_L \left(M - 1 \right) \left(\frac{\Delta i}{\Delta y} \right)$$

where:
D_E = modified duration of the institution's equity capital
D_A = modified duration of the institution's assets
D_L = modified duration of the institution's liabilities
M = leverage multiplier, A / E

$\dfrac{\Delta i}{\Delta y}$ = estimated change in yield of liabilities, i, relative to a unit change in yield of assets, y

EXAMPLE: Computing duration for life insurer

WellLife Holdings is a life insurer with equity capital to financial assets of 12.5%. In a recent report to the board by the investment committee, the duration of assets was listed as 3, with the duration of liabilities listed as 2. It is also estimated that the yield on the liabilities of the insurer is likely to move by 70 basis points for every 1% move in the yield of the asset portfolio.

1. **Calculate** the duration of the insurer's shareholder capital.

2. **Estimate** the impact of a 25-basis-point fall on the value of shareholder capital in yields of the asset portfolio.

3. Management of the insurer is considering changing the ratio of equity-to-assets to 10%. Assuming all else stays the same, **discuss** the resulting impact on the duration of shareholder capital.

Answers:

1. If equity-to-assets is 12.5%, then the leverage multiplier M = 1 / 0.125 = 8x. As per the information in the question, $D_A = 3$, $D_L = 2$, and $\dfrac{\Delta i}{\Delta y} = 0.70$.

   The modified duration of shareholders' equity is therefore calculated as:

   $D_E = (3 \times 8) - (2 \times 7 \times 0.70) = 14.2$

2. A modified duration of 14.2 implies that a 1% change in the level of yield of the asset portfolio will lead to approximately a 14.2% change in the value of equity. Hence, if the yield of the asset portfolio falls by 25 basis points, then the value of equity will increase by approximately 0.25 × 14.2 = 3.55%.

3. An equity-to-assets ratio of 10% implies a leverage multiplier, M, of 1 / 0.1 = 10x. If all other variables stay the same, then the new modified duration of shareholders' equity will be:

   $D_E = (3 \times 10) - (2 \times 9 \times 0.70) = 17.4$

This framework can be extended to consider the expected volatility (i.e., standard deviation) of the percentage changes in the market value of equity capital using the following formula:

$$\sigma_E^2 = M^2\sigma_A^2 + (M-1)^2\sigma_L^2 - 2(M)(M-1)\sigma_A\sigma_L\rho_{AL}$$

where:

σ_E = standard deviation of percentage change in the market value of equity

σ_A = standard deviation of percentage change in the value of assets

σ_L = standard deviation of percentage change in the value of liabilities

M = leverage multiplier, A / E

ρ_{AL} = correlation of percentage value changes in assets and liabilities

$$\sigma_{1+2}^2 = w_1^2\sigma_1^2 + w_2^2\sigma_2^2 + 2w_1w_2\sigma_1\sigma_2\,\rho_{12}$$

The equation for σ_E^2 is a simple application of this familiar formula to a *portfolio* with a weight, *M*, in the assets of the institution and a weight of *–(M – 1)* in the liabilities of the institution.

EXAMPLE: Computing volatility for life insurer

WellLife Holdings maintains a common equity-to-assets ratio of 12.5% and estimates that the annualized volatilities of assets and liabilities are 7% and 4% respectively. The investment committee estimates that the correlation between asset and liability returns is 0.3.

1. **Calculate** the standard deviation of changes in the value of shareholder capital.
2. New regulations are being introduced that will force WellLife to increase its equity-to-assets ratio to 20% and lower the volatility of its assets to 5%. **Calculate** the expected volatility of shareholder capital after the new regulations come into force, assuming all else stays the same.

Answers:

1. The leverage multiplier is 1 / 0.125 = 8x. With $\sigma_A = 0.07$, $\sigma_L = 0.04$, and $\rho_{AL} = 0.3$, the variance of shareholders' equity is given by:

   $$\sigma_E^2 = (8^2 \times 0.07^2) + (7^2 \times 0.04^2) - (2 \times 8 \times 7 \times 0.07 \times 0.04 \times 0.3)$$
   $$= 0.298$$

   The standard deviation of shareholders' equity is therefore $\sqrt{0.298} = 0.546$, or 54.6%.

2. The new leverage multiplier is 1 / 0.2 = 5x. Using a new figure of $\sigma_A = 0.05$, the variance of shareholders' equity is given by:

   $$\sigma_E^2 = (5^2 \times 0.05^2) + (4^2 \times 0.04^2) - (2 \times 5 \times 4 \times 0.05 \times 0.04 \times 0.3)$$
   $$= 0.0641$$

   The standard deviation of shareholders' equity is therefore $\sqrt{0.0641} = 0.253$, or 25.3%.

There are many strategies that the management of a bank or an insurance company can use to change the factors driving the volatility of shareholders' equity. These strategies could relate to the investment portfolio assets or the nature of the liabilities created by the operations of the company. A summary of these strategies is displayed in <u>Figure 33.7</u>.

Figure 33.7: Strategies for Changing Volatility

Strategy	Impact on Factor	Impact on σ_E	Comments
Hold diversified fixed-income investments	Lowers σ_A	Falls	Diversified fixed income has a lower standard deviation than other riskier asset classes.
Hold high-quality fixed-income investments	Lowers σ_A	Falls	There's a lower chance of significant loss in asset value.
Maintain similar asset and liability durations, and match asset/liability exposure to borrower and claimant options	Increases ρ_{AL}	Falls	Regulators penalize institutions with high asset/liability mismatches.
Hold common stock investments	Increases σ_A Lowers ρ_{AL}	Rises	Most regulators require reserves of 100% to be held against investments in common stock.
Derivatives transparency and collateralization	Lowers σ_A and σ_L	Falls	The more understood and protected against counterparty default the institution is, the less chance there is of unexpected losses.

	Increases ρ_{AL}		
Hold more liquid portfolio investments	Lowers σ_A	Falls	
Surrender penalties for insurance contracts	Lowers σ_L	Falls	Penalties cushion losses when policyholders cash in after interest rates have risen.
Prepayment penalties on debt investments	Increases ρ_{AL}	Falls	Prepayments will occur in a low interest rate environment. Penalties on prepayments help offset rising liabilities in a falling rate environment.
Catastrophic insurance risk	Increases σ_L	Rises	Such losses are large and unpredictable and will cause regulators to demand higher reserves, investment in more liquid assets, and more robust reinsurance agreements.
Predictability of underwriting losses	Decreases σ_L	Falls	Total insurance liabilities are less uncertain.
Diversifying insurance business	Decreases σ_L	Falls	Total insurance liabilities are less uncertain.
Variable annuities	Increases ρ_{AL}	Falls	Asset investment gains and losses are passed through to policyholders due to the nature of the contract.

Asset Allocation for Banks and Insurers

In the case of banks and insurers, optimal investment management simultaneously focuses on the investment portfolio and the liabilities of the business, all within the context of external economic conditions and regulatory reserve requirements. The investment manager also needs to be conscious of the factors that affect the volatility of shareholders' equity and optimal levels of leverage as discussed previously.

PROFESSOR'S NOTE

While it might seem daunting that so many factors need to be considered when drafting an investment policy for banks and insurers, keep in mind that exam questions are likely to be very focused on a particular scenario. Often, a very basic knowledge of duration, credit risk, and liquidity of fixed-income securities—as well as the impact a change in these factors will most likely have on earnings, volatility of shareholder capital, and regulatory required reserves—is enough to answer the case study–related questions in the curriculum, as evidenced by the next example.

EXAMPLE: Switching to riskier investments

The ALMCo of SJT Bank recently conducted a quarterly review of business and investment conditions. The main findings are as follows:

- There is evidence that current corporate spreads are significantly below historical norms. It is expected that economic conditions are likely to deteriorate with corporate spreads widening.
- The bank expects disruption in the securitization and secondary loan markets to lower the liquidity of the bank's loan book. They also expect that withdrawals from depositors are likely to become larger and less predictable as economic conditions worsen.

As a result of these findings, the investment management team plans to switch a large portion of its investment portfolio from high-yield corporate floating-rate securities into investment-grade fixed-rate government securities. The team also plans to enter a plain vanilla pay-fixed/receive-floating interest rate swap under standard mark-to-market collateral terms with counterparties.

1. **Discuss** how the planned investment switch addresses the two main findings of the quarterly review conducted by the ALMCo.

MODULE QUIZ 33.5

To best evaluate your performance, enter your quiz answers online.

1. Capital requirements for banks and insurance companies are typically set with reference to:
   A. statutory reporting.
   B. true economic reporting.
   C. standard financial reporting.

2. SAJ Assurance (SAJ) is a life insurance company that underwrites a diverse range of life assurance and annuity products. The following is an excerpt from the IPS of SAJ:

   SAJ splits the firm's general account into two components: the reserve portfolio and the surplus portfolio. The objective of the reserve portfolio is to provide liquidity to pay policyholder claims in the normal course of insurance operations. The objective of the surplus portfolio is to hedge interest rate mismatches that occur between the reserve portfolio and the liabilities of the firm.

   This excerpt is *best described* as:
   A. correct.
   B. incorrect because it is the separate account of the life insurer that is broken down into the reserve and surplus portfolios, not the general account.
   C. incorrect with respect to the objective of the surplus portfolio. The surplus portfolio should be run with the objective of taking higher risk in order to earn higher returns to grow the surplus over the long term.

3. A bank has an equity capital ratio of 20%. Assets are expected to have a standard deviation of 7%, and liabilities are expected to have a standard deviation of 5%. The correlation of

assets and liabilities is estimated to be 0.5. The volatility of shareholder capital for the bank is *closest* to:

    A. 9.3%.

    B. 16.3%.

    C. 30.4%.

KEY CONCEPTS

LOS 33.a

The five common characteristics of institutional investors are their larger size, long-term investment horizons, regulatory frameworks, governance frameworks, and principal-agent issues.

LOS 33.b

The investment policy statement (IPS) of an institution formally sets out the institution's mission and objectives, liabilities, investment horizon, external constraints (regulatory, accounting, and tax), asset allocation, and rebalancing and reporting policies.

Four common models used in institutional investing are the Norway model, the endowment model, the Canada model, and the liability-driven investing (LDI) model.

LOS 33.c, 33.d, 33.f, 33.g

The stakeholders and key elements of the IPS for defined benefit (DB) pension plans versus defined contribution (DC) pension plans are described in the following table.

	DB Plan	DC Plan
Stakeholders	Employers, plan beneficiaries, investment staff, investment committee/board, governments, shareholders	Employers, plan beneficiaries, investment staff, investment committee/board, governments
Liabilities	Present value of future benefits promised to plan participants Higher when: ■ Employees work longer ■ Salaries are higher ■ Participants live longer ■ Lower employee turnover leads to higher vesting ■ Discount rate is low	No liability to plan sponsor once required contribution to plan has been met
Investment time horizon	Longer if proportion of active lives is higher	Dependent on the age of participant (longer if younger)
Liquidity needs	Higher with: ■ More retired lives ■ Older workforce ■ Higher funded status (may reduce contributions) ■ Flexibility of participants to switch plans	Higher with: ■ Older workforce ■ Flexibility of participants to switch plans
External constraints	■ Regulations vary by country: IORP II in Europe, ERISA in United States ■ Tax treatment favorable ■ Accounting rules: ASC 715 requires funded status to be shown on balance sheet (U.S. GAAP); public pension plans follow GASB	■ Regulations vary by country: IORP II in Europe, ERISA in United States ■ Sponsor must offer appropriate default option to disengaged participants ■ Plans are tax deferred
Investment objectives	Achieve a long-term target return over a specified horizon with appropriate risk to meet contractual liabilities	Prudently grow assets to meet spending needs in retirement

The stakeholders and key elements of the IPS for the five types of SWFs are described in the following table.

	Budget Stabilization	Development	Savings	Reserve	Pension Reserve
Stakeholders	Country's citizens, the government, external and internal investment management				
Liabilities	Uncertain: linked to commodity prices/economic cycle	Linked to socioeconomic investments	Spending on future generations	Yield promised on central bank/government bonds	Future pension payments
Investment time horizon	Short term	Long/medium term depending on investment projects	Long term	Long term	Long term
Liquidity needs	Highest	Generally low	Lowest	Intermediate	Varies: low during accumulation stage, higher during decumulation stage
External constraints	Established by national legislation. Best practice set by IFSWF's Santiago Principles. Generally tax exempt.				
Investment objectives	Capital preservation	Real growth higher than real GDP growth	Maintain real perpetual spending	Grow faster than yield on central bank/government bonds	Earn returns to meet future unfunded government pension payments

The following table describes the stakeholders and key elements of the IPS for university endowments and private foundations.

	University Endowments	Private Foundations
Stakeholders	Current and future students, alumni, university employees	Founding family, donors, grant recipients, broader community, governments
Liabilities	- Set by the future spending promised to the university - Spending policy should consider: - Ongoing donations - Reliance of university on spending - Ability to issue debt - Spending may use a rule that takes a weighted average of last period's spending (adjusted for inflation) and a fixed spending rate applied to average AUM	- U.S. tax rules require minimum spending of 5% of assets plus investment expenses - Must also spend donations in the same year they are received
Investment time horizon	Perpetual	Typically perpetual, but shortened for limited-life foundations
Liquidity needs	Spending rate net of donations is very low at 2%–4% of assets	Higher than endowments—legally required to spend 5% of assets

		▪ Reliance on spending by foundation is usually higher than the reliance of a university on endowment spending
External constraints	Typically tax exempt. Regulation varies by jurisdiction but generally requires a total return approach and prudence in investing (UPMIFA in United States, the Trustee Act in the U.K.).	
Investment objectives	Generate a total real return (after inflation measure by the HEPI) of about 5% on a three- to five-year rolling basis, with reasonable annual volatility in the range of 10%–15%	Generate a real return over consumer price inflation of the spending rate (minimum 5%), plus investment expenses, on a three- to five-year rolling basis, with reasonable annual volatility in the range of 10%–15%

The stakeholders and key elements of the IPS for banks and insurers are described in the following table.

	Banks	**Insurers**
Stakeholders	▪ External: shareholders, depositors, borrowers, creditors, credit rating agencies, regulators, communities ▪ Internal: employees, management, board	▪ External: shareholders, policyholders, derivatives counterparties, creditors, regulators, credit rating agencies ▪ Internal: employees, management, board
Liabilities	▪ Primarily deposits that are short term	▪ Life Insurers: long duration contract payouts ▪ P&C insurers: shorter and less certain contract payouts
Investment time horizon	While perpetual organizations, investments are run on a short- or medium-term LDI basis.	
Liquidity needs	▪ Driven by deposit withdrawals and potential need to raise liquidity in adverse market conditions. ▪ Regulators apply liquidity coverage ratios and net stable funding ratios	▪ Varies by product line: P&C liquidity needs generally higher than life ▪ Liquidity needs will increase in times of high interest rates due to policyholders surrendering in search of high yields elsewhere
External constraints	Highly regulated due to importance to real economy and systemic risk, particularly SIFIs. Main goal of regulators is to ensure the institution holds sufficient risk-based capital to absorb losses. Three different types of accounting systems apply: 1. Standard financial reporting (GAAP or IFRS) 2. Statutory accounting for regulators (more conservative than financial reporting) 3. True economic accounting (marked-to-market) Banks and insurers are fully taxable.	
Investment objectives	Manage liquidity and risk mismatches between the institution's noninvestment assets and liabilities. This needs to be done in the context of the institution's overall profit maximization objective.	

LOS 33.e

The risk tolerance of a defined benefit pension plan is generally higher when:

- Funded status is higher.
- The sponsor has lower debt levels and is more profitable.
- The plan is small relative to the size of the sponsor's business.
- The correlation between the plan assets and the business of the sponsor is low.

- The plan has no provisions for early retirement or lump-sum options.
- The workforce is young and the plan has a high level of active lives.

LOS 33.h

Aggregated data of both DB and DC plans show that asset allocation varies by country due to differences in regulation, tax constraints, investment objectives, risk appetite, and demographics.

Typical asset allocation by SWF type include:

- Budget stabilization funds (mainly bonds and cash).
- Development funds (depends on socioeconomic causes supported).
- Savings and pension reserve funds (higher levels of equities and alternatives).
- Reserve funds (equities, alternatives with significant allocation to bonds).

Typical asset allocation for endowments and private foundations include the following:

- **University endowments.** Large U.S. endowments use the endowment model with a majority allocation to alternatives. Smaller U.S. endowments tend to hold more domestic equities and fixed income, with a lower allocation to alternatives.
- **Private foundations.** Large foundations allocate approximately 50% to alternatives. Smaller foundations allocate more to public equities and fixed income.

LOS 33.i

The change in the market value of equity is given by:

$$\%\Delta E = \%\Delta A(M) - \%\Delta L(M - 1)$$

where:
$\%\Delta E$ = percentage change in the value of equity
$\%\Delta A$ = percentage change in the value of assets
$\%\Delta L$ = percentage change in the value of liabilities
M = leverage multiplier, A / E

The duration of the equity of a bank or insurer is given by:

$$D_E = D_A \left(M \right) - D_L \left(M - 1 \right) \left(\frac{\Delta i}{\Delta y} \right)$$

where:
D_E = modified duration of the institution's equity capital

D_A = modified duration of the institution's assets

D_L = modified duration of the institution's liabilities

M = leverage multiplier, A / E

$\dfrac{\Delta i}{\Delta y}$ = estimated change in yield of liabilities, *i*, relative to a unit change in yield of assets, *y*

The expected volatility (i.e., standard deviation) of the percentage change in the market value of equity capital is given by:

$$\sigma_{\mathrm{E}}^2 = \mathrm{M}^2\sigma_{\mathrm{A}}^2 + (\mathrm{M}-1)^2\sigma_{\mathrm{L}}^2 - 2(\mathrm{M})(\mathrm{M}-1)\sigma_{\mathrm{A}}\sigma_{\mathrm{L}}\rho_{\mathrm{AL}}$$

where:

σ_{E} = standard deviation of percentage change in the market value of equity

σ_{A} = standard deviation of percentage change in the value of asset holdings

σ_{L} = standard deviation of percentage change in the value of liabilities

M = leverage multiplier, A / E

ρ_{AL} = correlation of percentage value changes in assets and liabilities

The volatility of equity of a bank or insurer can be lowered by:

- Reducing the volatility of assets.
- Reducing the volatility of liabilities.
- Lowering leverage.
- Increasing the correlation of assets and liabilities.
- Diversifying assets and liabilities.
- Increasing the liquidity and quality of investment assets.
- Accessing stable funding sources.

ANSWER KEY FOR MODULE QUIZZES

Module Quiz 33.1

1. **A** The first statement is incorrect. Institutional clients are generally larger in scale than individual clients. While this may cause some smaller asset classes or strategies to be inaccessible due to capacity issues, generally, the larger scale of institutional clients opens up more asset classes (e.g., private equity and real estate) that are not generally available to individual investors.

   The second statement is correct. Institutional investment programs tend to have more formal governance structures than the investment programs of individual investors, including an investment committee, board, and investment staff. (LOS 33.a)

2. **B** The endowment model is the approach most likely to meet the objectives of the foundation because it involves a large allocation to alternative investments and uses externally managed investment funds that employ active management. The Norway model is inappropriate because it uses largely passive strategies and provides little or no allocation to alternatives. The Canada model is inappropriate because it relies on internally managed assets rather than outsourcing to external managers. (LOS 33.b)

Module Quiz 33.2

1. **C** An increase in expected employee turnover would reduce the expected vesting of benefits with plan participants, since fewer employees are likely to complete minimum service conditions required to become eligible to receive benefits. This will lower the liabilities faced by the pension plan. An increase in years of service would lead to higher liabilities because benefits are usually linked directly to years of service. An increase in the life expectancy of plan participants will increase the liabilities of the plan because benefits are paid in every year of retirement. (LOS 33.c)

2. **C** Allocating to asset classes with returns that have a low correlation with the operating performance of the sponsor increases the plan's ability to take risk because it is more likely that the sponsor will be able to make contributions in times of poor investment performance. The fund moving from overfunded to underfunded status is most likely to lower the risk tolerance of the plan since continued underperformance may jeopardize the ability of the plan to meet future benefit payments. An increase in the average age of the workforce will shorten the time before benefits need to be paid. This is likely to lower the risk tolerance of the plan assets since there is less time to recover from any short-term poor performance. (LOS 33.e)

Module Quiz 33.3

1. **C** Budget stabilization funds are defensive in nature and are therefore largely fixed income and cash. Development funds would be expected to investment in projects and investments that promote the socioeconomic goals of the fund, while savings funds would allocate a higher weight to alternative investments and equities in order to meet their objective of beating inflation over the long term. (LOS 33.h)

Module Quiz 33.4

1. **A**   In order to preserve the purchasing power of the endowment, the real required rate of return (i.e., excluding inflation) should be equal to the spending rate of 5%. Note that the nominal required rate of return would include inflation as measured by the HEPI, totaling 5% + 2.5% = 7.5%. (LOS 33.f)

Module Quiz 33.5

1. **A**   Statutory reporting is required by regulators, which involves a series of adjustments to standard financial reporting that remove low-quality assets and accelerate certain expenses in order to set the level of required reserves. (LOS 33.d)

2. **C**   The excerpt is incorrect with regard to the objective of the surplus portfolio. The surplus portfolio represents investment funds of the company in excess of those required to meet the expected claims of policyholders. As such, the usual objective with the surplus portfolio is to take higher risk to earn higher returns in order to grow the surplus, maximize value for shareholders, and remain competitive as a life insurance company from a pricing perspective. (LOS 33.g)

3. **C**   The expected variance of the percentage changes in the market value of equity capital is given by:

$$\sigma_E^2 = M^2\sigma_A^2 + (M-1)^2\sigma_L^2 - 2(M)(M-1)\sigma_A\sigma_L\rho_{AL}$$

where:
σ_E = standard deviation of percentage change in the market value of equity
σ_A = standard deviation of percentage change in the value of assets
σ_L = standard deviation of percentage change in the value of liabilities
M = leverage multiplier, A / E
ρ_{AL} = correlation of percentage value changes in assets and liabilities

In this case, σ_A = 0.07, σ_L = 0.05, and ρ_{AL} = 0.5. The equity capital ratio of 20% implies that E / A = 0.20; hence A / E = 1 / 0.2 = 5x. Using the formula:

$$\sigma_E^2 = 5^2(0.07)^2 + (5-1)^2(0.05)^2 - 2(5)(5-1)(0.07)(0.05)(0.5)$$

$$= 0.1225 + 0.04 - 0.07 = 0.0925$$

Then, $\sigma_E = \sqrt{0.0925} = 0.304$ or 30.4%. (LOS 33.h)

READING 34: TRADE STRATEGY AND EXECUTION

EXAM FOCUS

This topic review evaluates the trade execution component of the portfolio management process. Understand trade motivations, trade characteristics, and how these—in conjunction with market conditions—determine the most appropriate approach for a trade. Crucial to determining the optimal trading approach are the costs of trading, which are both explicitly observable (i.e., commissions and fees) and implicitly part of the trading strategy (i.e., execution cost and opportunity cost). It is vital that you can calculate the total costs of trading using the implementation shortfall metric and decompose trading costs into component parts due to delay, trading, opportunity, and fixed fees. Finally, understand the areas addressed by the formal trade policy of an asset manager.

MODULE 34.1: TRADE MOTIVATIONS

LOS 34.a: Discuss motivations to trade and how they relate to trading strategy.

Video covering this content is available online.

CFA® Program Curriculum, Volume 6, page 116

The four categories of trade motivation include the following:

1. **Profit seeking.** Active portfolio managers seek to outperform their benchmark (i.e., generate alpha) trading securities they believe to be mispriced.
   - Managers need to act on their insight before the rest of the market; hence, a key consideration is the rate of **alpha decay**. Alpha decay is deterioration in alpha once an investment decision has been made. Managers with higher rates of alpha decay (e.g., managers trading on daily news flow) need to trade in shorter time frames; therefore, they have greater trade *urgency*. Other managers (e.g., managers with insights based on long-term company fundamentals) will have lower rates of alpha decay and therefore a lower trade urgency.
   - To minimize **information leakage** (i.e., alert the market to the security mispricing through their trading activity), managers may execute their trade in multiple venues. This may include less transparent venues called **dark pools**, which are trading systems with low pretrade transparency. Orders entered into a dark venue cannot be seen by other market participants before the trade occurs; hence, users know that there is no risk of information leakage. The disadvantage of dark pools is that traders can't see orders on the other side of the trade, so they do not know the pretrade likelihood of execution. Dark pools are referred to as alternative trading systems (ATSs) in the United States. In Europe, dark pools

may be multilateral trading facilities (MTFs) bringing together buyers and sellers, or systematic internalizers (SIs), which are single-dealer liquidity pools. An execution venue with high pretrade transparency is called a lit venue. National stock exchanges are examples of lit venues.

2. **Risk management and hedging needs.** Portfolios need to be traded to maintain targeted risk exposures. This may be simply rebalancing the portfolio after a change in market conditions (e.g., a fixed income manager targeting a fixed duration level), or hedging to remove a risk factor from a portfolio (e.g., an equity manager hedging foreign exchange exposure). Derivatives trades may be used to facilitate risk management; however, this does require that appropriate liquid derivative contracts exist and that the fund mandate permits their use. When these conditions are not satisfied, trades in underlying securities will be required. Funds that use leverage need to monitor risk levels closely, since leverage magnifies risk.

3. **Cash flow needs.** These trades are primarily caused by investor subscriptions into, and redemptions out of, the fund.
   - The urgency of the trades depends on the nature of the cash flow, the liquidity of fund investments, and the liquidity terms promised to fund investors. For example, a manager investing in listed securities might promise daily liquidity to investors, whereas a hedge fund manager using less liquid securities might require a one-month notice for redemptions.
   - Funds with less liquid holdings will find it difficult to invest new client funds in a short time frame. This may lead to *cash drag*, where the low returns of cash cause the fund to underperform the benchmark. To avoid cash drag, a manager may engage in *equitization* strategies where liquid securities such as exchange-traded funds (ETFs) or derivatives are used to gain market exposure while the investment in underlying securities occurs over time.
   - Client redemptions are usually based on the fund's net asset value (NAV) using the closing prices of securities. Liquidating securities at closing prices, therefore, eliminates the risk of selling at prices different to those needed to meet redemptions. When determining which securities to sell to meet redemption requests, managers should consider both liquidity and tax implications.

4. **Corporate actions, margin calls, and index reconstitution.**
   - Corporate actions on portfolio holdings such as mergers, acquisitions, or spinoffs may require portfolio trading. Income-related corporate actions such as dividends or coupons income may need reinvesting. Funds that make regular distributions to investors may have to sell securities when income from investments is insufficient to meet these distributions.
   - Margin calls on leveraged positions as well as derivatives positions that are suffering losses may require urgent sales of portfolio holdings.
   - When the benchmark index is reconstituted, managers may need to execute trades to reflect the change. This is particularly important for index-tracking funds. Since the value of the index benchmark usually is based on closing prices, trading at closing prices minimizes the fund's tracking error to the benchmark.

Trading Strategy Inputs

LOS 34.b: Discuss inputs to the selection of a trading strategy.

Once the decision to invest has been made by the portfolio manager, the executing trader and the portfolio manager must work together to identify the optimal trading strategy given the manager's objectives. Key factors that dictate the appropriate trading strategy are (1) order characteristics, (2) security characteristics, (3) market conditions, and (4) individual risk aversion. These factors are discussed as follows:

1. **Order characteristics.** These include side, absolute size, and relative size.
    - **Side** refers to the direction of the order (buy, sell, short buyback (cover), or short sell). This is particularly important when there is price momentum expected where securities are moving in one direction. For example, it will be more costly to purchase securities in a rising market than to sell them. A list of only buy orders or only sell orders will have greater market risk exposure compared to a list of buys and sells with offsetting market risk exposures.
    - **Absolute size** refers to the number of securities being traded. Larger orders will have a higher *market impact cost* than smaller orders. Market impact cost is the adverse effect of the order on prices—the act of buying (selling) puts upward (downward) pressure on prices. Managers will generally trade larger orders with less urgency (if possible) to mitigate the market impact of the order.
    - With **relative size**, managers will often consider order size as a percentage of **average daily volume (ADV)**. Orders that constitute a higher percentage of ADV are expected to have higher market impact costs.

2. **Security characteristics.** These include security type, short-term alpha, price volatility, and security liquidity.
    - **Security type.** Different security types [e.g., underlying securities, ETFs, American depositary receipts (ADRs), global depositary receipts (GDRs), derivatives, and foreign exchange (FX) contracts] trade in different markets with different costs, regulations, and liquidity.
    - **Short-term alpha.** For active managers, a high rate of alpha decay requires a more urgent trade strategy. A manager will also have higher urgency in adverse market conditions (i.e., buying into a rising market or selling into a falling market).
    - **Price volatility.** High price volatility implies high *execution risk,* defined as the risk that an adverse price movement will occur over the trading horizon.
    - **Security liquidity.** Greater liquidity decreases execution risk and market impact cost. Narrow bid-ask spreads and large volume available for trading (i.e., market depth) are two key indicators of high liquidity.

3. **Market conditions.** Key market conditions that affect trading cost are volatility and liquidity levels. These can both change adversely (increased volatility and lower liquidity) in times of market crisis, such as the credit crisis of 2008. This can also occur for individual strategies. For example, quantitative equity fund managers experienced a liquidity shock in August 2007 due to managers, having herded into similar trades, attempting to liquidate at the same time. Even in normal market times, volatility and liquidity will be dynamically changing, and traders need to reflect this in their expectations. Lower liquidity suggests longer trading horizons; however, higher volatility might cause investors to speed up trades and incur higher costs to avoid execution risk of adverse price movements.

4. **Individual risk aversion.** A portfolio manager/trader with higher risk aversion is typically more concerned about the market risk of adverse movements in security prices than market impact costs and therefore will trade with more urgency.

These trade strategy inputs are key factors driving the two major costs of trading: market impact and execution risk. Market impact comes from trading too quickly, causing adverse price movements and information leakage as the market notices the liquidity imbalance in the market. On the flip side, execution risk, the risk of adverse price movements over the trading horizon, is caused by trading too slowly. Therein lies the **trader's dilemma**—alleviating market impact causes execution risk, and vice versa. Skillful traders will use their experience and judgment to balance these costs of trading.

EXAMPLE: Trading costs

A portfolio manager is discussing a list of buy and sell orders with the firm's head trader. The trader is specifically interested in how order size, security liquidity, and rate of alpha decay affects market impact risk and execution risk, respectively.

1. For each of the factors listed (order size, security liquidity, and rate of alpha decay), briefly **describe** how the factor affects the *market impact cost* of the trade. (Note: Consider each factor in isolation.)

2. The portfolio manager makes the following two statements:

    Statement 1: High market impact costs could be mitigated by executing the order over a longer trading horizon.

    Statement 2: If done correctly, this will not lead to an increase in any other types of trading cost.

    Discuss whether the two statements are true or false. Briefly **justify** your response.

Answers:

1. A larger order size will most likely lead to a higher market impact cost; the trader will have to trade at more adverse prices to execute a larger transaction.

    Higher liquidity results in narrower bid-ask spreads and higher market depth, both contributing to lower market impact cost; the trader will likely be able to execute the trade close to current market prices.

    Higher alpha decay prompts traders to trade quickly, leading to a higher market impact cost.

2. Statement 1 is true. Executing the order over a longer trading horizon will mean the manager can break the order up into smaller parts and therefore lower the market impact cost of the trade.

    Statement 2 is false. Executing a trade over a longer time horizon will lead to higher execution risk; the risk of an adverse price movement increases with the trading horizon.

MODULE QUIZ 34.1

To best evaluate your performance, enter your quiz answers online.

1. Which of the following motivations to trade is *most likely* to require the executing trader to target closing prices?
    A. Margin calls.
    B. Profit seeking.
    C. Cash flow needs (redemption).

2. An increase in security liquidity is *most likely* to decrease:
    A. execution risk only.
    B. market impact only.
    C. both execution risk and market impact.

MODULE 34.2: REFERENCE PRICE BENCHMARKS FOR TRADE EXECUTION

LOS 34.c: Compare benchmarks for trade execution.

CFA® Program Curriculum, Volume 6, page 126

Reference prices are used to determine expected trading costs, which enables managers/traders to select the optimal strategy for a trade. Reference prices are also a key input in the calculation of the actual cost of trading for posttrade evaluation.

Reference prices can be categorized as pretrade, intraday, posttrade, or price target. Details of these categories are as follows.

- **Pretrade benchmarks** are known before the start of trading. These include:
  - *Decision price*. This is the price at the time the portfolio manager made the investment decision.
  - *Previous close*. This is the closing price on the previous day (often used as a proxy for decision price by quantitative managers using systematic rules-based, data-driven strategies).
  - *Opening price*. This is the opening price on the day (often used as a proxy for decision price for subjective fundamental managers investing in securities for a long-term alpha, since it does not punish or reward traders for news released overnight when markets were closed). Note that if a trade is to be entered into an opening auction, which sets the day's opening price of a security at a trading venue, then this opening auction price is *not* a good benchmark since it can be affected by the trade.
  - *Arrival price*. This is the price of the security when the order is sent to the market for execution. Active portfolio managers trying to generate alpha will often specify a benchmark for an arrival price.
- **Intraday benchmarks** are based on prices during the trading period. These are used by managers who trade passively over a day or funds that may be rebalancing or minimizing risk. Intraday benchmarks include:
  - *Volume-weighted average price (VWAP)*. This is defined as the average price of all trades, weighted by volume, over the trading horizon. Managers may use the VWAP benchmark when they want to participate with volume patterns over a day (e.g., when rebalancing a portfolio over a day). Managers specify VWAP to help achieve the objective of using the cash received from sell orders to fund buy orders of the rebalancing.
  - *Time-weighted average price (TWAP)*. This is the equal-weighted average price of all trades executed over the trading horizon (i.e., TWAP ignores volume). TWAP may be appropriate for managers who wish to remove the impact of outliers (i.e., large trades that occur at the highs or lows of the day) since they believe they are less able to participate in these extreme trades. It is also appropriate in market environments with highly fluctuating volume throughout the day.
- **Posttrade benchmarks** are determined after trading has been completed. The most frequently used posttrade benchmark is the closing price, often used by managers who wish to execute at the closing price to reduce the tracking error of the fund. A drawback of this benchmark is that since the closing price is not known until after the trading is completed, a manager cannot assess trading performance during the trading horizon.

- **Price target benchmarks** are prices used by profit-seeking managers aiming to earn short-term alpha, related to the manager's view of the fair value of the security. For example, a manager may believe that a security that is currently priced at $10 has a true fair value of $10.50. This manager could use a price target benchmark of $10.50 in a strategy that purchases as many shares as possible below this level.

Trading Strategy Selection

LOS 34.d: Select and justify a trading strategy (given relevant facts).

CFA® Program Curriculum, Volume 6, page 129

The trading strategy selected by the manager and trader should reflect the costs and risks discussed in the previous section and be consistent with the manager's objectives. Examples of some common trade types and their most appropriate trading strategy are shown here:

Trade Type	Description
Short-term alpha	**Objective**: Trade short-term mispricing in a liquid equity market (e.g., overreaction to news flow). **Urgency**: High **Reference prices:** Price target benchmark linked to the manager's estimate of fair value combined with an *arrival price benchmark* for orders when placed in the market **Execution method:** Computer algorithm (discussed later)
Long-term alpha	**Objective**: Trade over the long term due to changes in fundamental conditions (e.g., sell average-sized positions in illiquid bonds that are expected to experience deteriorating credit conditions over the next year). **Urgency**: Low **Reference prices:** Difficult to use in practice **Execution method:** Sell securities gradually over a few weeks in small parts to avoid information leakage and pressure on dealer's prices.
Risk rebalance	**Objective**: Rebalance or hedge risk exposure (e.g., reduce risk levels in liquid FX markets by liquidating long and short positions to bring fund volatility down to a target level). **Urgency**: It is low, since the trader is both buying and selling, which lowers execution risk. Execution risk would be higher for trades on only one side of the book since then the trader has directional exposure. **Reference prices:** TWAP **Execution method:** Algorithmically target TWAP over the next couple of days.
Cash flow driven (client redemption)	**Objective:** Liquidate the holding to meet client redemptions (e.g., liquidate small-cap fund to meet redemptions, which will be calculated using the closing prices of securities in the portfolio). The fund bears the risk that liquidations are not made at the closing prices used to calculate the redemption. **Urgency:** The trade needs to be completed by the end of the trading day. **Reference prices:** Closing price **Execution method:** Execute a reasonable amount of liquidity in the closing auction; execute the remainder before the close of trading (e.g., at VWAP).
Cash flow driven (new trade mandate)	**Objective:** Invest new client funds (e.g., invest large amount with a mandate to track a small-cap index with a 3% tracking error). Performance measurement will begin at the current day's closing price. **Urgency:** Liquidity is too low to execute in underlying securities by the end of the day, but immediate exposure is required by the client. Liquid index futures contracts exist. **Reference prices:** Closing price **Execution method:** Obtain immediate exposure to index through a long position in index futures to eliminate cash drag. Build underlying stock positions over time to reduce market impact, while simultaneously unwinding the futures position. There are two issues with this method:

- There may not be a closing auction for the futures contract, in which case the futures trade would need to be done as close to the market close as possible.
- The mandate must allow derivatives positions.

MODULE 34.3: TRADE EXECUTION AND STRATEGY IMPLEMENTATION

▶

Video covering this content is available online.

LOS 34.e: Describe factors that typically determine the selection of a trading algorithm class.

CFA® Program Curriculum, Volume 6, page 134

Once an appropriate trading strategy has been identified, the trade must be implemented. Trade implementation choices are described as follows:

High-touch approaches involve high levels of human involvement. This is usually required for large trades (known as block trades), since finding the other side to larger trades is more difficult, or in less liquid markets. High-touch approaches include:

- **Principal trades (broker risk trades).** This is where dealers or market makers assume all or some of the risk relating to executing the order, which is priced into their spread. *Quote-driven, over-the-counter (OTC), or off-exchange markets* are primarily principal trade markets. Principal trades also include *request-for-quote (RFQ)* markets where market makers do not provide continuous quotes, but only do so on request.

- **Agency trades.** This is where the broker finds the other side of the trade, and risk for order execution remains with the portfolio manager/trader.

Electronic trading involves trading via computer and is used in more liquid markets. Trading here is typically *order driven* in that electronic systems allow buyers and sellers to advertise their limit orders in a central limit order book. A limit order is an order to trade at a certain (limit) price or better. For example, a trader may execute a buy order with a limit of $20. This means the trader will buy the security for any price up to $20, but not pay more than $20. Similarly, a seller limited at $20 will sell at any price above $20, but not lower. Electronic trading generally involves **direct market access (DMA)** and/or **algorithmic**

trading (defined next). DMA allows buy-side portfolio managers/traders to access the order book of the exchange directly through a broker's technology infrastructure.

Algorithmic trading is the use of programmed rules to electronically trade orders, primarily used for two purposes: *profit seeking and trade execution*.

Profit-seeking algorithms use real-time market data to determine which securities to buy and sell, and are employed by electronic market makers, quantitative funds, and high-frequency traders.

Execution algorithms trade according to the rules specified by the manager to meet their objectives. Types of execution algorithms include the following:

- *Scheduled algorithms—percent-of-volume (POV), VWAP, and TWAP algorithms.* These execute trades using rules driven by historical volumes or specified time periods.
    - *POV algorithms* (a.k.a. participation algorithms) send orders according to a volume participation schedule (e.g., "participate as 5% of traded volume").
        - Advantage: They automatically exploit increased liquidity when available.
        - Disadvantage: They continue to trade at any (potentially adverse) price, and may not fill the order in a specified time if there is a lack of trading.
    - VWAP and TWAP algorithms are *time-slicing algorithms*. VWAP algorithms attempt to match the VWAP price for the period by carving up the trade and sending orders based on *historical* intraday volumes. The usual intraday volume profile is to trade more at the open and close and less in the middle of the day. TWAP algorithms perform a similar task; however, they ensure an equal number of shares is traded in each time period (e.g., each hour).
        - Advantage: They ensure that a specified number of shares are executed in a specified time period.
        - Disadvantage: They may force trades in times of low liquidity or trade too little in times of high liquidity.
- *Liquidity-seeking algorithms* (a.k.a. opportunistic algorithms) aim to take advantage of favorable liquidity conditions when offered by the market. For example, for a buyer, this algorithm would wait until a large seller appeared and then enter a market order. These orders use both lit and dark venues.
- *Arrival price algorithms* seek to trade close to market prices prevailing at the time the order is entered. These algorithms will trade more aggressively (i.e., faster) than other algorithms to trade more shares at close to the arrival price.
- *Dark strategies/liquidity aggregators* execute trades in dark pools, with aggregator algorithms attempting to optimize trading across multiple dark venues.
- *Smart order routers (SORs)* are algorithms that determine the best destination (either lit or dark) to route an electronic order to get the best result. SORs focus on getting the best price for market orders, or the highest probability of execution for limit orders.

> **PROFESSOR'S NOTE**
>
> While the descriptions just listed are important, the LOS requires you to select which algorithm is most appropriate for a given order or set of orders. We will discuss this exam-critical information next.

Which Algorithm?

Scheduled algorithms are appropriate for relatively small orders in liquid markets for managers with less urgency (i.e., greater risk tolerance for longer execution periods) and/or who are concerned with minimizing the market impact (e.g., a risk rebalancing trade executed over a trading day).

Liquidity-seeking algorithms are appropriate for larger orders in less liquid markets with higher urgency while trying to mitigate the market impact. They are also appropriate when a manager is concerned that displaying limit orders may lead to information leakage, or when liquidity is typically thin with sporadic episodes of high liquidity.

Arrival price algorithms are appropriate for relatively small orders in liquid markets for managers who believe prices are likely to move against them during the trade horizon, and therefore wish to trade more aggressively (e.g., a profit-seeking manager). They are also appropriate for more risk-averse managers who want to minimize execution risk.

Dark strategies/liquidity aggregators are appropriate for large orders in illiquid markets, and arrival price or scheduled algorithms would likely lead to high market impact. Since there is a lower chance of execution in dark pools, these strategies are for managers that do not need to execute the full order immediately.

SORs are appropriate for small market orders with low market impact where the market can move quickly, or for small limit orders with low information leakage where there are multiple potential execution venues.

EXAMPLE: Selection of appropriate algorithm

A portfolio manager wishes to execute three trades as follows:

Stock	Side	Share Price	Order Size (Shares)	Average Volume	Urgency
SFDL	Buy	$8.50	10,000	20,000	High
TWEL	Buy	$32.31	5,000	100,000	Low
UDSL	Sell	$2.05	1,000,000	1,000,000	Low

The manager considers executing the orders using the following strategies:

- Scheduled algorithm.
- High-touch principal approach.
- Liquidity-seeking algorithm.

Recommend the most appropriate implementation strategy for each order. (Note: Each strategy should only be used once.)

Answer:

SFDL should be purchased using a liquidity-seeking algorithm. The low liquidity in the market and the high order size make minimization of market impact a key consideration, which a liquidity-seeking algorithm will achieve since it only trades when liquidity is offered by the other side of the market. The high urgency of the trade also makes a liquidity-seeking algorithm appropriate since execution should occur relatively quickly.

TWEL should be purchased using a scheduled algorithm. The low urgency of the trade suggests that concerns about longer trading horizons and adverse price movements are low. With low order size and relatively high liquidity, a scheduled algorithm such as POV, VWAP, or TWAP is most appropriate. These strategies trade passively throughout the day, which minimizes market impact costs.

UDSL should be sold using a high-touch principal approach. This order represents 100% of the ADV; hence, using an algorithm is not appropriate due to the high possibility of information leakage and high

Recent developments in algorithmic trading include **clustering** and **high-frequency market forecasting**.

Clustering is a machine learning technique whereby a computer learns to identify which algorithm is optimal for different types of trades based on the key features of trades. The term *clustering* refers to the technique of grouping trades together with similar attributes (e.g., order size as a fraction of the ADV). Note this is similar to the approach used in the previous example to select optimal order; however, the difference is that clustering will quantitatively test factors for their impact on the performance of different algorithms. The machine learning nature of the process means clustering attempts to *identify* features of trades that determine optimal algorithm type that a human manager had not previously considered important.

High-frequency market forecasting attempts to model short-term market direction. One issue with this process is the (large) number of variables that could potentially explain market movements. The least absolute shrinkage and selection operator (LASSO) is a machine learning technique that helps to reduce the number of explanatory variables to a manageable number of significant variables.

Characteristics of Key Markets

LOS 34.f: Contrast key characteristics of the following markets in relation to trade implementation: equity, fixed income, options and futures, OTC derivatives, and spot currency.

CFA® Program Curriculum, Volume 6, page 142

Equities are usually traded on stock exchanges (lit markets) and dark pools. Equity markets are the most technologically advanced, with most of the trading executed electronically, and the use of algorithms is commonplace.

Fixed-income markets tend to trade in a large number of heterogeneous securities, as many issuers have multiple issues outstanding. While the fixed-income markets tend to have low liquidity, typical order size is large. Due to these characteristics, trading is mostly conducted in dealer-based, quote-driven markets. Electronic RFQ systems are becoming more common; however, algorithmic trading is largely limited to only the most liquid on-the-run (most recently issued) U.S. Treasuries and futures contracts. Electronic trading, while growing for corporate bonds, remains relevant for only a small fraction of the universe. Other fixed-income securities markets generally use high-touch execution methods—urgent trades would require a principal broker risk trade, while less urgent trades would use a broker-agent approach.

Electronic trading is common for exchange-traded derivatives. Algorithmic trading is not as common as for equities markets, and is used more for futures than for options. Buy-side traders generally use DMA.

OTC derivatives trading takes place in a dealer quote-driven market, usually implemented through high-touch approaches. Since the credit crisis of 2008, there has been a move by

regulators to increase transparency and central clearing of basic OTC derivatives such as interest rate swaps (e.g., the Dodd-Frank Act of 2010 in the United States).

Spot foreign exchange trading takes place in OTC markets that use both electronic trading and high-touch broker approaches. The market works in three tiers: interdealer, interbank, and bank-to-client, with decreasing trade sizes and increasing spreads, respectively. For large urgent trades, RFQs are used with brokers. For large non-urgent trades, scheduled algorithms or high-touch agency approaches are used. Small trades are usually implemented using DMA.

EXAMPLE: Trade approach by market

The trading desk of a large multiasset buy-side firm has received the following three orders:

Market	Size	Urgency
Futures	Small	High
Agency MBS	Medium	Low
Equity	Large	Low

The trading desk is considering executing the trades using DMA, scheduled algorithms, or high-touch broker risk approaches.

Recommend the most appropriate approach for each order. (Note: Each approach should only be used once.)

Answer:

The most appropriate approach for the futures trade is DMA. Futures markets have well evolved electronic trading, and it is likely that an urgent small trade in futures can be executed most effectively through accessing exchange systems directly. There is no need to employ the high-touch approach of a broker since the order size is small and can be executed on the exchange easily. Algorithmic trading is not well developed in derivatives markets, and scheduled algorithms would likely take too long to execute a high-urgency trade.

The most appropriate approach for the agency MBS trade is a high-touch brokered approach. Fixed-income markets outside of Treasuries and corporate bonds typically use high-touch brokered execution methods. There is unlikely to be algorithmic or DMA available for agency MBS.

The most appropriate approach for the equity trade is a scheduled algorithm. It is likely that the trade, being large, would have too much market impact if executed through DMA. It is unlikely that a high-touch broker trade would be appropriate since the trade is not urgent (hence, does not need immediate execution), and most trading in equity markets is conducted electronically.

MODULE QUIZ 34.3

To best evaluate your performance, enter your quiz answers online.

1. A trading desk has had the following orders submitted by the firm's portfolio managers:

Stock	Execution Risk Aversion	Market Impact	Order Size (% ADV)
PQR	Low	High	50%
STU	High	Low	10%
VWX	Low	Medium	20%

For which order is an arrival price strategy *most likely* to be most appropriate?
   A. PQR.
   B. STU.
   C. VWX.

2. Request-for-quote (RFQ) systems are *most likely* to be used to implement trading strategies in which of the following markets?
   A. Equities.

B. Fixed income.
C. Exchange-traded derivatives.

MODULE 34.4: TRADE COST MEASUREMENT

LOS 34.g: Explain how trade costs are measured and determine the cost of a trade.

CFA® Program Curriculum, Volume 6, page 145

Trading costs are either explicit in that they are easily visible (e.g., commissions and fees) or implicit in that they are embedded in the transaction (e.g., market impact/execution risk). Total costs of trading can be measured using **implementation shortfall (IS)**. At the highest level, the absolute value of IS is calculated as:

IS = paper return − actual return

The paper return is the return a hypothetical portfolio would have had if the trade were executed at the original decision price *with zero cost.* The actual portfolio return of the portfolio is net of all costs. The difference between these two amounts is the total cost of executing the trade.

Usually, IS is expressed as basis points of the total cost of the paper portfolio.

> **EXAMPLE: Implementation shortfall**
>
> A portfolio manager decides to buy 50,000 shares of stock SJB at 9:00 am when the stock price is $20.00 (this is the decision price for the trade) and submits instructions to the firm's trader. The trader uses a limit price of $20.50 and in total manages to purchase 40,000 shares at an average price of $20.34. The fund is charged a commission of $0.02 per share, and there are no other fees. At the end of the day, SJB closes at $20.55.
>
> **Calculate** (*in basis points*) the total IS for this trade.
>
> **Answer:**
>
> The paper portfolio is hypothetically assumed to fill the full order at the original decision price ($20.00). Hence, the paper return = 50,000 × ($20.55 − $20.00) = $27,500.
>
> The actual return of the portfolio reflects that the trader purchased 40,000 shares at $20.34, and paid 40,000 × $0.02 = $800 for the execution.
>
> Hence, the actual return = 40,000 × ($20.55 − $20.34) − $800 = $7,600.
>
> Therefore, in absolute value terms, IS = $27,500 − $7,600 = $19,900.
>
> The initial cost of the paper portfolio is 50,000 × $20 = $1,000,000, so IS in basis points is calculated as $19,900 / $1,000,000 = 0.0199, or 199 basis points.

🎓 **PROFESSOR'S NOTE**
Recall that a basis point is 1/100th of 1%. A decimal number is multiplied by 10,000 to convert it to basis points.

IS can be decomposed into the following parts:

- **Execution cost** occurs due to executing shares at a less favorable price than the original decision price. Execution cost can be further broken down into delay cost and trading cost.

- **Delay cost** is due to adverse price movements in the time between the portfolio manager submitting the order to the trader and the time the trader releases it to the market. This delay is usually due to the time it takes the trading desk to determine the optimal execution strategy for the trade.
    - **Trading cost** is due to the market impact of executing the trade.
  - **Opportunity cost** is the cost of *not* trading any unfilled part of the order. Recall that the paper portfolio assumes that all shares are executed immediately at the original decision price—the actual trade may have only filled part of the order, and the lost profit on the unfilled portion is the opportunity cost.
  - **Fixed fees** are any explicit commissions or fees incurred in executing the trade.

To demonstrate this decomposition, let us return to the previous example, which had a total IS of $19,900. Recall that the trader received the order at 9:00 am, when the stock price was at $20.00. Assume that the trader placed the order 30 minutes later in the market by which time the stock price had moved to $20.10 ($20.10 is referred to as the arrival price of the order). The decomposition of IS in dollar terms is as follows:

- *Delay cost* is the adverse movement from $20.00 to $20.10 for the 40,000 shares that were executed during the day:

  delay cost = 40,000 × ($20.10 − $20.00) = $4,000

- *Trading cost* is the difference between the execution price, $20.34, and the arrival price, $20.10, for 40,000 shares traded during the day:

  trading cost = 40,000 × ($20.34 − $20.10) = $9,600

- *Opportunity cost* is the paper profit on the 10,000 shares *not* purchased, which relates to the paper profit from buying these shares at $20.00 and the stock closing at $20.55:

  10,000 × ($20.55 − $20.00) = $5,500

- *Fixed fees* are the explicit commission paid on the execution of 40,000 shares:

  40,000 × $0.02 = $800

Then, the total IS value = $4,000 + $9,600 + $5,500 + $800 = $19,900.

> **PROFESSOR'S NOTE**
>
> All of the components of IS can be expressed (and usually are) in terms of basis points (bps) of the original cost of the paper portfolio, which in this case is $1,000,000. Hence, delay cost would be expressed as $4,000 / $1,000,000 = 0.004, or 40 bps. Similarly, the trading cost is 96 bps, the opportunity cost is 55 bps, and fixed fees are 8 bps—for a total IS of 199 bps.

Improving Execution Performance

Delay costs arise due to adverse price movement during the interval between the trader receiving an order from the portfolio manager and passing it on to a broker/market. Delay costs can be minimized with efficient trading practices that give traders the pretrade and posttrade analysis they need to make a swift decision on an optimal trading strategy.

A detailed analysis of opportunity cost can help managers deploy unused cash into the next-most attractive investment, thereby reducing the impact of opportunity cost on the portfolio. For example, a manager who recognizes that only 80% of an order is likely to be transacted due to a lack of liquidity can invest the remaining 20% of the order into the next-most attractive trade and avoid cash drag on uninvested funds.

Analysis of trading (market impact) costs can also help traders establish proper price benchmarks and appropriate urgency of trade.

> **EXAMPLE: Implementation shortfall detailed analysis**
>
> A portfolio manager decides to sell 100,000 shares of Future Recreation (FTRB) at 1:05 pm when the share price is £2.56. The trading desk of the firm receives the order and conducts a review of the trade details to determine the optimal trade strategy. Due to the low market volume, it is decided that a high-touch agency broker approach is optimal with a limit price of £2.50. The trader submits the order to a broker at 1:13 pm when the share price is £2.59. By the end of the day, the broker had executed 70,000 shares at an average price of £2.60. Commission for the trade is £400. At the end of the day, the stock closes at a price of £2.54 per share.
>
> 1. **Calculate** the total IS for the trade in basis points.
> 2. Decompose IS into the delay, trading, opportunity, and fixed-fee costs.
>
> **Answers:**
>
> 1. Note that because this is a sell order, positive returns are earned when the actual trading price rises above the decision price.
>
>   Return of the paper portfolio = 100,000 × (£2.56 − £2.54) = £2,000
>
>   Return of actual portfolio = 70,000 × (£2.60 − £2.54) − £400 = £3,800
>
>   IS = paper return − actual return = £2,000 − £3,800 = –£1,800
>
>   Original cost of paper portfolio = 100,000 × £2.56 = £256,000
>
>   IS in basis points = –£1,800 / £256,000 = –0.00703, or –70.3 basis points
>
> A negative cost is a benefit; it means that the trader's actions added value relative to the paper portfolio. If the trader had immediately executed the sell order (with no costs), the portfolio would be worse off than the actual portfolio (because prices subsequently rose, and the executions were made at higher prices). Negative IS indicates that the trader's actions benefited the portfolio.
>
> 2. Delay cost = 70,000 × (£2.56 – £2.59) = –£2,100
>
>   Delay cost (bps) = –£2,100 / £256,000 = –82.0 basis points
>
> Negative delay cost represents value added since the price movement during the time the trading desk received the order and submitted it to the market worked in favor of the seller.
>
>   Trading cost = 70,000 × (£2.59 − £2.60) = –£700
>
>   Trading cost (bps) = –£700 / £256,000 = –27.3 basis points
>
> Negative trading cost indicates that the execution price improved on the arrival price of the order.
>
>   Opportunity cost = 30,000 × (£2.56 − £2.54) = £600
>
>   Opportunity cost (bps) = £600 / £256,000 = 23.4 basis points
>
>   Fixed fees = £400 (given)
>
>   Fixed fees (bps) = £400 / £256,000 = 15.6 basis points
>
>   Total IS = –82.0 – 27.3 + 23.4 + 15.6 = –70.3 bps

MODULE 34.5: EVALUATING TRADE EXECUTION

LOS 34.h: Evaluate the execution of a trade.

CFA® Program Curriculum, Volume 6, page 153

Trade cost analysis is vital for portfolio managers to be able to assess the effectiveness of brokers, algorithms, and other strategies. Costs are evaluated versus specified price benchmarks, which vary depending upon the objectives of the manager/nature of the order.

This benchmark price could be an arrival price, VWAP, TWAP, or the closing market price. There can even be more than one relevant benchmark if the strategy has several objectives.

In general, buyers incur costs if they execute trades above relevant benchmark prices, while sellers incur costs if they execute below relevant benchmark prices. Trade costs are calculated such that a positive value represents underperformance against the benchmark, and can generally be formulated as follows:

absolute cost ($) = side × (execution price − benchmark price) × shares executed

where:
side = +1 for a buy order, −1 for a sell order

> ### 🎓 PROFESSOR'S NOTE
> This is a general formulation of the cost idea that was used in IS in the previous section. Keep in mind the intuition that we suffer costs (i.e., underperformance) when we buy high (execution price > benchmark price), or sell low (execution price < benchmark price).

These costs are often expressed in *basis points* of the original benchmark price, using the following expression:

$$\text{trade cost (bps)} = \text{side} \times \frac{(\text{execution price} - \text{benchmark price})}{\text{benchmark price}} \times 10{,}000$$

> **EXAMPLE: Trade cost**
>
> A portfolio manager is executing a buy order using a market on close (MOC) benchmark. The manager purchases at $25.50, and the closing price of the stock is $25.60. **Calculate** the cost (in basis points) based on the closing price benchmark.
>
> **Answer:**
>
> Since this is a buy order, side = +1. Using the formula for the absolute cost (per share), we find the following:
>
> absolute cost per share = +1 × ($25.50 − $25.60) = −$0.10
>
> In basis points, this cost is −$0.10 / $25.60 = −0.00391, or −39.1 basis points. The negative sign indicates that the trader's actions added value (*a negative cost is a benefit*). This can clearly be seen since the buy trade has been executed below the benchmark price, and buying low is adding value from a trading perspective.

Regardless of the skill of the trader, buy orders in a rising market and sell orders in a falling market incur positive trading costs due to adverse price movements. To remove the impact of market movements on trade cost, traders can use **market-adjusted cost**. The market-adjusted costs ensure a trader is not penalized or rewarded for general market movements over the trade horizon by subtracting the *index cost* adjusted for the security's beta. The index cost is a representation of the costs due to general market index movements, and is calculated as follows:

$$\text{index cost (bps)} = \text{side} \times \frac{(\text{index VWAP} - \text{index arrival price})}{\text{index arrival price}} \times 10{,}000$$

> ### 🎓 PROFESSOR'S NOTE
> Index cost is simply a measurement of how much VWAP has increased over the trading period versus the original arrival price of the index. Recall that the arrival price is the price of a security when an order is first submitted to a market. This is expressed in basis points as a proportion of the index arrival price.

The market-adjusted cost of the trade is given by the following expression:

market-adjusted cost (bps) = arrival cost (bps) − β × index cost (bps)

where:
arrival cost = the arrival cost of the trade based on an arrival price benchmark
β = beta of the security versus the index used to calculate index cost

---

EXAMPLE: Market-adjusted cost

A trader submits a buy order to a market when the security price is €10.00 and a relevant index price is €3,500. The order is executed over the next hour at an average price of €10.15. VWAP for the index over this period is €3,507, and the beta of the security is 1.5.

Calculate the market-adjusted cost of this trade in basis points.

Answer:

Since the order is a buy, side = +1. The index cost in basis points is given by:

$$\text{index cost (bps)} = +1 \times \frac{(€3,507 - €3,500)}{€3,500} \times 10{,}000 = 20 \text{ bps}$$

The arrival cost of the trade is given by:

$$\text{arrival cost (bps)} = +1 \times \frac{(€10.15 - €10.00)}{€10.00} \times 10{,}000 = 150 \text{ bps}$$

Then, the market-adjusted cost is given by:

market-adjusted cost (bps) = 150 bps − (1.5 × 20 bps) = 120 bps

---

Added Value

A different method of trade cost analysis is comparing the arrival cost to the estimated pretrade cost. The estimated pretrade cost is calculated using a model that incorporates key trade cost variables such as order size, liquidity of the market, and so on. If a fund executes at less than the pretrade cost estimate, then the trader has added value. More formally:

added value (bps) = arrival cost (bps) − estimated pretrade cost (bps)

In the previous example, the arrival cost of the trade was 150 bps. If the pretrade cost estimate was 160 bps, then the added value for the trade is 150 bps − 160 bps = −10 bps. Again, be careful with signs here—*remember that a negative cost is a benefit*, and this trader has added value through his trading decisions.

Trade Governance

LOS 34.i: Evaluate a firm's trading procedures, including processes, disclosures, and record keeping with respect to good governance.

CFA® Program Curriculum, Volume 6, page 159

It is both a good practice, and is usually required by regulation, that an asset manager has a formal written trade policy that clearly spells out trade procedures. Trade policy has four key areas: (1) the meaning of *best execution*, (2) the factors that determine the optimal trading

approach, (3) a listing of approved brokers and execution venues, and (4) details of the monitoring processes used by the asset manager. These areas are further discussed as follows:

1. **Meaning of best execution.** *Best execution* is a general term used by regulators to describe the duty of asset managers to seek the best possible *result* for clients when trading their assets. Trade policy should define *best execution* within the applicable regulatory framework. Generally, the factors that determine best execution include:
   - Execution price.
   - Trading costs.
   - Speed and likelihood of execution and settlement.
   - Order size and liquidity.
   - Nature of the trade (e.g., urgency of the trade).

   Note that best execution does *not* simply mean seeking the best price or trading at the lowest cost. For example, a manager with a large stake in a company that the manager is confident is going to file for bankruptcy would likely achieve a better *result* for clients if the manager sold a block with a trusted dealer at a significantly discounted price, even if there were higher bids for small quantities at other lit execution venues. This could be justified as *best execution* because of the execution risk of adverse market movements and the risk of information leakage if the manager began hitting the bids at the execution venues (though these prices are initially higher than the broker price).

2. **Factors that determine the optimal execution approach.** The trade policy needs to communicate these criteria, which usually include:
   - Urgency and size of order.
   - Liquidity of security (ADV) and the nature of security (e.g., standardized vs. customized).
   - Characteristics of available execution venues.
   - Investment strategy objectives (e.g., long term vs. short term in nature).
   - Reason for the trade.

   These factors will need to reflect both the relevant regulations and market trading conventions for different asset classes used by the manager. For example, new regulations called MiFID II (Markets in Financial Instruments Directive) have effectively prohibited the use of soft-dollar arrangements in Europe. Soft-dollar arrangements are arrangements whereby an asset manager can pay for goods or services using rebates from client commissions offered in return for executing a high amount of volume with the broker, which may jeopardize the best execution if the manager uses the client's soft dollars for the manager's own benefit.

   As discussed earlier, different asset classes have different methods of trading. For example, equities and exchange-traded derivatives are more likely to be traded using algorithms than fixed-income products, which are likely to be traded using a more high-touch approach.

3. **List of eligible brokers and execution venues.** Trade policy should include a list of approved brokers and a description of the process used to create it. The best practice is to establish a **best execution monitoring committee (BEMC)** consisting of portfolio execution, compliance, and risk personnel that is responsible for maintaining, updating, and distributing the list to parties involved in trade execution. Due diligence of brokers

is particularly important for OTC trades where there is no protection of exchange rules, low transparency, and no central clearing to mitigate counterparty risk. General principles for approval to the list include:

- High quality of service in terms of competitive execution price or speed of service/trade size capacity.
- Financial stability to mitigate counterparty risk.
- Good reputation for ethical behavioral.
- Adequate settlement facilities.
- Competitive explicit costs such as commissions.
- Willingness to commit capital to principal trades when required for less liquid securities.

4. **Process for monitoring execution arrangements.** The approved broker list should be constantly monitored for reputational issues, trading error frequency, criminal actions, and financial stability. Any brokers who fail to meet the required standard should be removed promptly. Execution quality should also be monitored on an ongoing basis. Trading records should be kept in order to facilitate this analysis and to address any client or regulator concerns regarding the executions or trade allocations made by an asset manager to her clients.

MODULE QUIZ 34.4, 34.5

To best evaluate your performance, enter your quiz answers online.

1. A portfolio manager submits an order to sell 10,000 shares of stock STU to the trading desk when the price is $32.50. After careful analysis of the trade details, the trading desk submits the order to the market when the price is $32.60 with a limit of $32.60. The trader executes 4,000 shares at a price of $32.65 and commissions are $0.03 per share. The stock closes at the end of the trading day at $32.35. The total implementation shortfall (IS) for this trade, in basis points, is *closest* to:
   - A. 9.23 bps.
   - B. 9.85 bps.
   - C. 33.23 bps.

2. A portfolio manager executes a sell order at an average price of $8.38. The arrival price of the order was $8.40. The relevant index value at the time of order entry was 3,000 and the VWAP for the index over the trading period was 3,050. If the stock has a beta of 1.3, the market-adjusted cost of the trade is *closest* to:
   - A. –142.5 bps.
   - B. 23.8 bps.
   - C. 240.5 bps.

3. The trade policy of an investment firm makes the following two statements:

   Statement 1: The head trader is exclusively responsible for firm-wide trade execution monitoring and implementation of sound trade governance.

   Statement 2: A list of eligible brokers used by the firm is created and maintained by the BEMC of the firm. This committee ensures that only brokers who execute with the lowest implicit and explicit trading costs are admitted to the list.

   How many of the statements are in line with trade governance best practice?
   - A. Zero.
   - B. One.
   - C. Two.

KEY CONCEPTS

LOS 34.a

The four motivations for a portfolio manager to trade are as follows:

Motivation	Impact on Trading Strategy
Profit seeking	■ High alpha decay → high urgency ■ Low alpha decay → low urgency ■ May use dark pools to mitigate information leakage
Risk management/hedging	■ Derivatives could be used if contracts exist and mandate permits
Cash flow needs	■ Cash drag on inflows into funds with illiquid holds could be mitigated through *equitization* strategies ■ Client redemptions are usually based on closing NAV (hence, managers will typically target closing prices as execution benchmarks)
Corporate actions/index reconstitutions/margin calls	■ Income may need reinvesting ■ Index reconstitutions are usually based around closing prices (hence, managers will typically target closing prices as execution benchmarks) ■ Margin calls will likely require high urgency

LOS 34.b

Key factors that dictate the appropriate trading strategy are as follows:

- Order characteristics: These are side, quantity, and percentage of ADV.
  - Larger trades are normally executed over longer time horizons to lower market impact.
- Security characteristics: These are type, short-term alpha, volatility, and liquidity.
  - Higher volatility implies a higher urgency to lower execution risk.
- Market conditions: A crisis can adversely impact volatility and liquidity.
- Individual risk aversion: Higher risk aversion implies higher urgency to lower execution risk.

The trader's dilemma is balancing the market impact cost of trading too quickly versus the execution risk of trading too slowly.

LOS 34.c

Reference price benchmarks include the following:

Reference Price	Examples
Pretrade	■ Decision price ■ Previous close: often used by quantitative managers ■ Opening price: often used by longer-term fundamental managers ■ Arrival price: used by profit-seeking managers
Intraday	■ VWAP: used when managers want to participate with volume ■ TWAP: used when managers want to trade evenly and mitigate the impact of outliers, and for markets with unpredictable trading volumes
Posttrade	■ Closing price: used by index-tracking managers ■ Price target benchmarks: usually based on the manager's view of fair value

Price target	■ Usually based on the fair value estimate of an active manager

LOS 34.d

The primary goal of a trading strategy is to balance expected costs, risks, and alpha decay in line with the manager's objectives, risk aversion, and other constraints.

LOS 34.e

Trade implementation choices include the following:

Approach	Appropriate For
Higher touch— principal	Large urgent trades in illiquid securities
Higher touch— agent	Large trades in illiquid securities that are less urgent
DMA	Small trades in liquid electronic markets
Profit-seeking algorithms	Used by electronic market makers, quantitative funds, and high-frequency traders
Scheduled algorithms: POV, VWAP, TWAP	Relatively small orders in liquid electronic markets for managers with less urgency (e.g., portfolio rebalancing)
Liquidity-seeking algorithms	Larger orders in less liquid electronic markets with higher urgency, or when liquidity is sporadic
Arrival price algorithms	Relatively small orders in liquid electronic markets with high urgency (e.g., profit-seeking managers)
Dark strategies	Large orders in illiquid markets and arrival price or scheduled algorithms would likely lead to high market impact
SORs	Small market orders with low market impact where the market can move quickly, and small limit orders with low information leakage where there are multiple potential execution venues

LOS 34.f

The main characteristics of key markets are as follows:

- Equities are mostly traded electronically on lit exchanges and dark pools. Algorithmic trading is common.

- Fixed-income securities are typically traded in dealer-driven, high-touch principal markets. Clients use electronic RFQ systems to access quotes from dealers. Algorithmic trading is limited to the most liquid on-the-run U.S. Treasuries.

- Exchange-traded derivatives are largely traded electronically, though algorithmic trading is less common than for equity markets. Buy-side traders generally use DMA.

- OTC derivatives historically have been traded in high-touch dealer markets. Since the credit crunch, there has been a move to increase transparency and force basic OTC derivatives to be centrally cleared.

- Spot foreign exchange trading takes place in OTC markets that use both electronic (algorithms and DMA) and high-touch approaches for larger trades.

LOS 34.g

The total implicit and explicit costs of trading are measured by the implementation shortfall (IS):

IS = paper return − actual return

Usually, IS is expressed as basis points of the total cost of the paper portfolio.

IS can be decomposed into the following parts:

- **Execution cost** is when the execution price is worse than the decision price and comprises:
  - **Delay cost**, which is when the arrival price is worse than the decision price.
  - **Trading cost**, which is when the execution price is worse than the arrival price.
- **Opportunity cost** occurs on unexecuted shares when the closing price is worse than the decision price.
- **Fixed fees** are any explicit commissions or fees incurred in executing the trade.

LOS 34.h

When performing trade cost analysis:

$$\text{trade cost (bps)} = \text{side} \times \frac{\text{(execution price − benchmark price)}}{\text{benchmark price}} \times 10{,}000$$

where:
side = +1 for a buy order, and −1 for a sell order

Benchmark price could be the arrival price, VWAP, TWAP, or closing price of the stock.

To not reward or punish a manager for the market movement over the trading horizon, market-adjusted cost removes the cost associated with the market move as follows:

market-adjusted cost (bps) = arrival cost (bps) − β × index cost (bps)

where:

$$\text{index cost (bps)} = \text{side} \times \frac{\text{(index VWAP − index arrival price)}}{\text{index arrival price}} \times 10{,}000$$

When a pretrade estimate of cost is available, the added value of the trader's actions is given by:

added value (bps) = arrival cost (bps) − estimated pretrade cost (bps)

LOS 34.i

An asset manager should have a formal written trade policy which clearly sets out its procedure. Trade policy has four key areas: (1) the meaning of best execution, (2) the factors that determine the optimal trading approach, (3) a listing of approved brokers and execution venues, and (4) details of the monitoring processes used by the asset manager.

ANSWER KEY FOR MODULE QUIZZES

Module Quiz 34.1

1. **C**   Client redemptions from investment funds are usually based on the fund's net asset value, which is calculated using closing prices of securities. In this case, trading at the closing price eliminates the risk to the fund of executing liquidating sales at price different to those used to calculate the redemption proceeds required for investors. The target price for a profit-seeking trade will depend on the urgency of the trade. Trades with a high rate of alpha decay will require immediate execution; trades with a low rate of alpha decay will require less urgent execution. Trades to meet margin calls usually need to be executed immediately. (LOS 34.a)

2. **C**   Market impact is the adverse movement in price caused by submitting an order to the market and forcing prices up as a buyer, or down as a seller. For a given order size, impact is higher in less liquid markets than it is in more liquid markets. Hence, an increase in security liquidity will lower market impact costs. Execution risk is the risk of an adverse movement in a share price in the time it takes to execute an order. In a more liquid market, a given order size can be executed in a shorter time horizon; hence, execution risk is also lower. (LOS 34.b)

Module Quiz 34.2

1. **A**   A manager who wishes to trade passively over a trading day will want to execute at the average price over the day (hence, will choose TWAP or VWAP). If a manager wants to minimize the impact of outliers, the manager should use TWAP as a benchmark since this will not overweight large buy or sell orders at extreme prices over the day. Arrival price benchmarks are relevant for managers trading short-term alpha opportunities (hence, not relevant for a manager wishing to trade passively).
(LOS 34.c)

2. **C**   Executing the trading list as close to the closing market prices of the securities on the trading day is the most appropriate strategy, since this will best align the trade execution prices with the closing prices used to calculate fund NAV and reconstitute the benchmark. This will minimize the tracking error of the fund versus the benchmark as per the low tracking error mandate of the fund. (LOS 34.d)

Module Quiz 34.3

1. **B**   Arrival price strategies will execute orders with high urgency, or when the manager has high risk aversion against the execution risk associated with longer execution time periods. They are not appropriate for orders with high market impact or relatively illiquid markets. Therefore, the best answer choice here is STU because it is an order with high execution risk aversion, low market impact, and the order size is a small percentage of average daily volume (ADV). An arrival price strategy is not appropriate for orders in PQR or VWX due to the lower risk aversion, higher market impact, and higher order sizes. (LOS 34.e)

2. **B** RFQ systems are systems used by investors to request prices from dealers in less liquid quote-driven markets. Fixed-income markets are most likely to use RFQ systems since these markets are less liquid and driven by dealer quotes. Due to higher liquidity levels and more advanced technology, equity markets and exchange-traded derivatives markets are more likely to be electronic and order driven rather than quote-driven markets using RFQ systems. (LOS 34.f)

Module Quiz 34.4, 34.5

1. **B** The paper portfolio assumes that all the shares are immediately sold at the original decision price with no trading costs. The paper return is as follows:

   paper return = 10,000 × ($32.50 − $32.35) = $1,500

   The actual portfolio return reflects the actual P/L generated by the trading of the order, after commissions of 4,000 × 0.03 = $120. In this case, the actual return is as follows:

   actual return = 4,000 × ($32.65 − $32.35) − $120 = $1,080

   Hence, the IS in dollars is $1,500 − $1,080 = $320. As a proportion of the initial paper portfolio, this is $320 / (10,000 × $32.50) = 0.000985, or 9.85 basis points.
   (Module 34.4, LOS 34.g)

2. **C** The market-adjusted cost of an execution is given by:

   market-adjusted cost (bps) = arrival cost (bps) − β × index cost (bps)

   The arrival cost of the trade is given by:

   $$\text{arrival cost (bps)} = \text{side} \times \frac{(\text{execution price} - \text{arrival price})}{\text{arrival price}} \times 10{,}000$$

   Since this order is a sale, 'side' = –1 and the arrival cost is:

   $$\text{arrival cost (bps)} = -1 \times \frac{(\$8.38 - \$8.40)}{\$8.40} \times 10{,}000 = 23.8 \text{ bps}$$

   The index cost is given by:

   $$\text{index cost (bps)} = \text{side} \times \frac{(\text{index VWAP} - \text{index arrival price})}{\text{index arrival price}} \times 10{,}000$$

   For this order:

   $$\text{index cost (bps)} = -1 \times \frac{(3{,}050 - 3{,}000)}{3{,}000} \times 10{,}000 = -166.7 \text{ bps}$$

   Then, the market-adjusted cost is:

   market-adjusted cost (bps) = 23.8 − (1.3 × −166.7) = 240.5 bps

   (Module 34.5, LOS 34.h)

3. **A** Neither statement is best trade governance practice.

   Statement 1 is not best practice since a firm should establish a BEMC, which should collaborate with portfolio managers, risk management, and legal/compliance to enact trade governance.

   Statement 2 is not best practice since best execution does not simply relate to the lowest-cost broker. Best execution needs to consider the overall result from executing trades, which goes beyond prices and costs; it also needs to consider factors such as speed of execution, likelihood of execution and settlement, order size, and the nature of trades. (Module 34.5, LOS 34.i)

READING 35: PORTFOLIO PERFORMANCE EVALUATION

EXAM FOCUS

Performance evaluation of a portfolio is important to managers, sponsors, and clients who need to quantify performance and understand key drivers of both risk and return. Some of the calculations in the reading, if done in full, can be extremely tedious and are best left to spreadsheets and software programs. For the exam, expect the calculations to be reasonable. Also expect a fair balance of testing on both the calculations and the qualitative concepts. There is a sizable amount of material in the reading that overlaps with previous readings as well as the subsequent reading on investment manager selection.

MODULE 35.1: PERFORMANCE EVALUATION

Video covering this content is available online.

In a large institutional portfolio, it is common to have multiple investment managers where decisions are made by both the fund sponsor as well as by individual managers within the fund that affect portfolio performance. Performance evaluation can deconstruct returns to quantify which decisions added or subtracted value for the fund.

The fund sponsor's perspective will capture all value added or lost, while the manager's perspective will focus only on what a manager did to add or lose value for the fund. The material presupposes a large investor (e.g., a pension fund, endowment, or foundation) selects several investment managers to meet their investment goals and objectives.

The objective of the reading is to provide the tools necessary to evaluate active investment decisions made by plan sponsors and portfolio managers.

Components of Performance Evaluation

LOS 35.a: Explain the following components of portfolio evaluation and their interrelationships: performance measurement, performance attribution, and performance appraisal.

CFA® Program Curriculum, Volume 6, page 174

Performance evaluation consists of three interrelated components that build upon each other:

- **Performance measurement** serves as the initial foundation phase and calculates both the return and the risk of the fund over specified time periods. It is imperative to determine, before any performance evaluation analysis, if the portfolio will be

compared to a benchmark (relative performance) or to a target return percentage that is specified in advance by the portfolio manager (absolute performance).

- **Performance attribution** determines the key drivers that generated the account's performance. Performance attribution expands upon the risk and return that was quantified through performance measurement and explains how the return was achieved given the risk taken by the portfolio manager. Also, performance attribution can explain both relative and absolute returns.

- **Performance appraisal** determines whether the performance was affected primarily by investment decisions, by the overall market, or by chance. Performance appraisal combines output from both performance measurement and performance attribution to render a professional judgment on the quality of the performance. If a fund's performance is attributed to luck, we cannot expect the portfolio manager to exhibit similar returns in the future.

In summary, performance evaluation answers three questions regarding a portfolio's performance:

1. What performance did the fund achieve during the period (performance measurement)?
2. How did the fund manager achieve their performance (performance attribution)?
3. Did the fund manager achieve their performance via skill or luck (performance appraisal)?

Performance Attribution

It is crucial to analyze the results of performance attribution as part of the portfolio evaluation process. As data is becoming more readily available, performance attribution has become more frequently used by many types of industry practitioners, including individual clients, who want to better understand the portfolio manager's investment process. For performance attribution to be a useful tool, it is imperative that the attribution process account for all aspects of the fund's risk and return. An attribution that does not account for the total risk and return of the fund is misleading and cannot be relied upon for any meaningful analysis.

LOS 35.b: Describe attributes of an effective attribution process.

CFA® Program Curriculum, Volume 6, page 176

An effective performance attribution process includes:

- A reflection of 100% of the portfolio's return or risk exposure.
- The portfolio manager's current decision-making process.
- The active investment decisions taken by the portfolio manager.
- A full explanation of the portfolio's excess return and risk.

The attribution analysis must account for 100% of the portfolio's risk and return and adequately represent the portfolio manager's current investment process. If the fundamental investment process of the fund has recently changed, then that attribution analysis must be updated to reflect those changes in the investment process.

Performance Attribution—Return Attribution & Risk Attribution

LOS 35.c: Distinguish between return attribution and risk attribution and between macro and micro return attribution.

CFA® Program Curriculum, Volume 6, page 176

Return attribution evaluates the impact of the active portfolio management decisions on the fund's investment returns.

Risk attribution is the parallel of return attribution but analyzes the impact of the portfolio manager's active investment decisions on portfolio risk.

Risk is generally compared to the portfolio's appropriate benchmark, but it can also be calculated in absolute terms, independent of a benchmark. For example, a relative-based risk attribution analysis would not be appropriate for a portfolio manager who has predetermined an absolute target return investment goal. Unfortunately, many investors often compare their portfolio's performance to a widely quoted passive index such as the S&P 500. A widely quoted index may or may not be an appropriate benchmark for their portfolio.

After a 10-year bull market in the S&P 500, performance attribution is likely to become even more important as portfolio managers justify their performance and fees during periods of negative returns. An additional benefit of performance attribution is its function as a form of quality control when reviewing an active portfolio. Basically, did the fund manager do what they said they were going to do?

Micro Attribution vs. Macro Attribution

Performance attribution is extremely flexible and can be analyzed at both the fund sponsor and the individual portfolio manager level.

Micro attribution analyzes the portfolio at the portfolio manager's level and seeks to verify that the portfolio manager did what they said they would and to understand the drivers of the portfolio's return.

Macro attribution analyzes investment decisions at the fund sponsor's level; it's commonly used with institutional investing. Macro attribution quantifies the fund sponsors' decisions to deviate from their strategic asset allocation and the timing when they made those decisions.

Performance Attribution—Returns-Based, Holdings-Based, and Transactions-Based

LOS 35.d: Describe returns-based, holdings-based, and transactions-based performance attribution, including advantages and disadvantages of each.

CFA® Program Curriculum, Volume 6, page 177

There are multiple methods used in performance attribution, including returns-based, holdings-based, and transactions-based attribution.

The primary drivers that determine which method to select for performance attribution depend upon the availability of the portfolio data and the investment process that is being

measured.

Returns-based attribution uses regressions to analyze the portfolio returns over some period and isolates the asset class components through indexes that would have generated these returns. There is no attempt to determine the actual holdings of the portfolio. Instead, regressions of broad market indexes are run against the portfolio returns to decompose investment performance. Frequently, returns-based attribution is used in analyzing alternative investments (e.g., hedge funds) where it is difficult to obtain the actual holdings of the fund. Returns-based attribution is the easiest attribution method to implement, the least reliable of the methods, the slowest to detect style drift, and the easiest to manipulate.

Holdings-based attribution uses beginning-of-period portfolio assets; the accuracy of analysis improves as the time interval for the analysis becomes smaller (e.g., annual to monthly to weekly). Since holdings-based attribution does not adjust for any portfolio changes that are made after the initial period, this analysis frequently does not match the actual portfolio returns. The mismatch could be called a timing or trading effect. Consider that a frequently traded portfolio could have very different ending returns than would be predicted by the holdings-based attribution because of the many changes since the beginning-of-period holdings were determined. It is recommended that holdings-based analysis be used for passive funds (e.g., index funds) and other strategies that have very little turnover (e.g., buy and hold). Holdings-based attribution frequently offers a higher level of quality of attribution analysis than returns-based attribution and can detect style drift much faster.

Transactions-based attribution improves upon the holdings-based attribution by updating the attribution of the portfolio's beginning-of-period holdings with any subsequent trades. Both the weights and the returns of the portfolio will reflect the actual transactions, including any transaction costs. Transactions-based attribution is the most reliable of the measures. However, it is frequently the most complicated, time-consuming, and complex method to implement.

MODULE QUIZ 35.1

To best evaluate your performance, enter your quiz answers online.

1. Which component of performance evaluation attempts to determine whether performance was affected primarily by chance?
   A. Performance appraisal.
   B. Performance attribution.
   C. Performance measurement.

2. Which method of performance attribution is the *most* reliable?
   A. Returns-based.
   B. Holdings-based.
   C. Transactions-based.

MODULE 35.2: APPROACHES TO RETURN ATTRIBUTION

LOS 35.e: Interpret the sources of portfolio returns using a specified attribution approach.

CFA® Program Curriculum, Volume 6, page 179

Arithmetic Attribution and Geometric Attribution

Return attribution lets us identify which investment decisions taken by the fund manager were successful or unsuccessful in generating alpha (portfolio return versus appropriate benchmark return). Return attribution also introduces precision into the feedback loop between the portfolio manager and their clients.

Return attribution is a technique that can both identify and quantify the performance of an actively managed fund versus its benchmark. Two important equity return attribution methods are the Brinson-Fachler (Brinson model) and factor-based attribution. (Note: Fixed-income attribution methods are covered in the next LOS).

Arithmetic attribution is designed to explain any excess return—the differential between the return earned by the portfolio (R) and that of its appropriate benchmark (B). Geometric attribution improves upon the arithmetic approach by classifying the geometric excess return (G).

$$G = (1 + R) / (1 + B) - 1 = (R - B) / (1 + B)$$

In the derivation (for a given period), the geometric excess return (G) is equal to the ratio of the arithmetic excess return (R − B) over the wealth ratio of the portfolio's appropriate benchmark (1 + B).

No smoothing approaches are needed to adjust the geometric attribution for effects over multiple time periods. However, with arithmetic attribution, adjustments are needed to smooth the subperiod effects over longer time periods, but those techniques are not necessary to consider here given the limited scope of the reading.

In short, arithmetic attribution is best suited for use with nontechnical clients and in marketing reports, whereas geometric attribution is best suited for use with industry professionals.

Figure 35.1: Total Portfolio Return Attribution Analysis (Past 12 Months)

Portfolio Return	Benchmark Return	Excess Return	Allocation Effect	Selection Effect
8.05%	5.05%	3.00%	2.00%	1.00%

From [Figure 35.1](#), there is a 300 bps excess return. We can use return attribution analysis to examine how the portfolio manager was able to generate excess return. First, the portfolio manager earned most of their excess returns from allocation effects (2%) and earned a smaller, but still positive, excess return (1%) from selection effects. Insight from return attribution shows that the portfolio manager's ability to both overweight and underweight sectors was superior to their security selection (stock picking) over the past 12 months.

Equity Return Attribution—the Brinson Model

The history of return attribution traces its roots from two key papers, Brinson and Fachler (1985) and Brinson, Hood, and Beebower (1986); collectively, these two models are known as the **Brinson model** and will be the focus of this section.

It is assumed that the total returns of the portfolio and benchmark are computed by adding up the multiplicative of the sector weights and returns. The following equations illustrate the computations and a simple calculation using the Brinson model:

$$\text{portfolio return R} = \sum_{i=1}^{i=n} w_i R_i$$

$$\text{benchmark return B} = \sum_{i=1}^{i=n} W_i B_i$$

where:

w_i = portfolio weight of the ith sector

R_i = portfolio return in the ith sector

W_i = benchmark weight of the ith sector

B_i = benchmark return in the ith sector

n = number of sectors

Figure 35.2 provides data for a two-sector domestic equity portfolio, used to illustrate the Brinson attribution model.

Figure 35.2: Brinson Model Example

Sector or Industry	Weight in Portfolio	Weight in Benchmark	Return From Portfolio	Return From Benchmark
Financial	0.20	0.50	6%	4%
Technology	0.80	0.50	–12%	2%
Total	**1.00**	**1.00**	**–8.4%**	**3%**

Return from portfolio (R) = (0.20 × 6%) + (0.80 × –12%) = –8.4%

Return from benchmark (B) = (0.50 × 4%) + (0.50 × 2%) = 3%

Excess return = –11.4% (–8.4% − 3%)

The **Brinson model** approach quantifies the portfolio returns into three attribution effects: the allocation effect, the security selection effect, and the interaction effect.

The **allocation effect** refers to the portfolio manager's decision to overweight or underweight specific sector weightings in the portfolio versus the portfolio benchmark. For example, the portfolio manager may believe interest rates are falling and choose to underweight the portfolio's weighting in financial equities. The manager is making an active bet that the financial sector will perform worse than other sectors during periods of falling interest rates. The allocation effect will quantify whether the portfolio manager's decision to underweight the financial sector increased returns or lost value for the portfolio.

For a given sector, the contribution to allocation (A_i) is calculated as the difference between the portfolio and benchmark weights multiplied by the sector return for the benchmark.

$A_i = (w_i − W_i)B_i$

Using the data from Figure 35.2, sector allocation effects are calculated as follows:

- Financial: (0.20 − 0.50) × 4% = –1.2%
- Technology: (0.80 − 0.50) × 2% = 0.6%

The total portfolio allocation effect is simply calculated by adding up all of the contributions to allocation.

$$A = \sum_{i=1}^{i=n} A_i$$

Total allocation effect = –1.2% + 0.6% = –0.6%

Analyzing the results, we reach the following conclusions:

- The portfolio manager decided to underweight the financial sector compared to the benchmark (0.20 versus 0.50), and the portfolio return (6%) exceeded the aggregate benchmark return (3%). The decision to underweight financial lowered the overall excess return, resulting in a contribution to allocation of –1.2%.

- The portfolio manager decided to overweight the technology sector compared to the benchmark (0.80 versus 0.50), and the portfolio return underperformed the aggregate benchmark (–12% to 3%). The decision to overweight technology increased the overall excess return, resulting in a contribution to allocation of 0.6%.

- The combined effect of the portfolio manager's decisions to underweight financial and overweight technology negatively contributed to the performance of the portfolio, and the combined allocation effect was –0.6%.

The next attribution effect in the Brinson model focuses on **security selection** (stock picking) —the value the portfolio manager either added or detracted from the portfolio by selecting individual securities within the sector and weighting the portfolio differently compared to the benchmark's weightings.

For a given sector, the contribution to selection (S_i) is calculated as the benchmark weight multiplied by the difference between the portfolio and benchmark sector returns.

$$S_i = W_i(R_i - B_i)$$

Using the data from <u>Figure 35.2</u>, individual sector selection effects are calculated as follows:

- Financial: $0.50 \times (6\% - 4\%) = 1\%$
- Technology: $0.50 \times (-12\% - 2\%) = -7\%$

The total portfolio selection effect is simply calculated by adding up all of the contributions to the selection.

$$S = \sum_{i=1}^{i=n} S_i$$

Total selection effect = 1% − 7% = –6%

Analyzing the results, we reach the following conclusions:

- The portfolio's financial sector outperformed the benchmark's financial sector by 2% (6% − 4%); 2% × 0.50 benchmark weight = 1% contribution to selection.

- The portfolio's technology sector greatly underperformed the benchmark's technology sector by –14% (–12% − 2%); –14% × 0.50 benchmark weight = –7% contribution to selection.

- Overall, the combined selection effect for this portfolio was –6%.

The third component in the Brinson model is the **interaction effect**. It can be thought of as a residual amount (e.g., plug) that ensures the arithmetic return minus the relative benchmark is fully accounted for in the attribution analysis.

For a given sector, the contribution to interaction (I_i) is calculated as the difference between the portfolio and benchmark weights multiplied by the difference between the portfolio and benchmark sector returns.

$$I_i = (w_i - W_i)(R_i - B_i)$$

Using the data from , individual sector selection effects are calculated as follows:

- Financial: $(0.20 - 0.50) \times (6\% - 4\%) = -0.6\%$
- Technology: $(0.80 - 0.50) \times (-12\% - 2\%) = -4.2\%$

The total portfolio interaction effect is simply calculated by adding up all of the contributions to interaction.

$$I = \sum_{i=1}^{i=n} I_i$$

Total interaction effect = –0.6% − 4.2% = –4.8%

Analyzing the results, we reach the following conclusions:

- For the financial sector, the portfolio weight is less than the benchmark weight, and there was a –0.6% contribution to interaction.
- For the technology sector, the portfolio weight exceeds the benchmark weight, and there was a –4.2% contribution to interaction.

Equity Return Attribution—Factor-Based Return Attribution

In the previous section, we demonstrated that the Brinson model calculates the attribution of security selection, asset allocation, and their interaction effects. It is common to analyze additional investment manager decisions to better understand an investment strategy. A frequently used attribution model is the **fundamental factor model**, where a portfolio's sensitivity to additional factors can be tested.

The **Carhart model** calculates the excess return from active portfolio management investment decisions by determining the impact on the portfolio due to the following factors: (1) market index (RMRF), (2) market capitalization (SMB), (3) book value to price (HML), and (4) momentum (WML). For more in-depth analysis, the Carhart model allows practitioners to remove the effects of known market factors to quantify the excess returns from active management decisions that are not accounted for in the Carhart model.

$$R_p - R_f = a_p + b_{p1}RMRF + b_{p2}SMB + b_{p3}HML + b_{p4}WML + E_p$$

where:

R_p = portfolio return

R_f = risk-free rate

a_p = alpha or return above the expected return for the portfolio's level of systematic risk

b_p = various portfolio factor sensitivities

RMRF = return on a value-weighted equity index above that of the one-month T-bill rate

SMB = small minus big, a size (market-capitalization) factor; equal to the difference between the average return on three small-cap portfolios and the average return on three large-cap portfolios

HML = high minus low, a value factor; equal to the difference between the average return on two high-book-to-market portfolios and the average return on two low-book-to-market portfolios

WML = winners minus losers, a momentum factor; equal to the difference between the return on a portfolio of the past year's winners and the return on a portfolio of the past year's losers

E_p = error term to capture the part of the portfolio return unexplained by the model

In applying the Carhart factor model, consider the attribution results for a portfolio manager's investment decisions.

Figure 35.3: Sample Carhart Factor Model Attribution

	Factor Sensitivity				Contribution to Active Return	
	Portfolio	Benchmark	Difference	Factor Return	Absolute	Proportion of Total
Factor	1)	2)	3)	4)	3) × 4)	Active
RMRF	0.98	1.00	–0.02	4.62%	–0.09%	–5.59%
SMB	–1.10	–1.00	–0.10	–2.06%	0.21%	12.46%
HML	0.30	0.00	0.30	4.30%	1.29%	78.01%
WML	0.09	0.05	0.04	8.75%	0.35%	21.17%
				Factor tilts return	1.75%	106.05%
				+ Security selection	–0.10%	–6.05%
				Active return	**1.65%**	100%

Analyzing attribution analysis results is important in determining the manager's ability to consistently add value. To start the analysis, one can review either the portfolio or its benchmark. Looking at the benchmark (Figure 35.3, column 2) the sensitivity to RMRF of 1 suggests that the benchmark is a diversified index. The negative coefficient of the benchmark's sensitivity to SMB indicates the benchmark has a large-cap focus tilt. We can summarize the benchmark as large-cap blend (no tilt toward growth or value) that does not use momentum.

To analyze the investment decisions by the portfolio manager, review column 1 (portfolio) and column 3 (difference between portfolio and benchmark). The portfolio exhibits a value tilt but closely resembles the benchmark on the other factors.

The next step in the attribution analysis is to determine if the value tilt taken by the portfolio manager added or detracted value from the portfolio. From the factor sensitivities table, the value tilt contributed 1.29%, or over 78% of the total realized active return for the portfolio. The other effects were minor compared to the value tilt taken by the portfolio manager. Finally, the portfolio manager's effectiveness at stock picking (security selection) detracted slightly (–0.10%) from the portfolio's returns.

It is important to check if the portfolio manager's prospectus indicates that they follow a value-based strategy. If the prospectus indicates the manager is a growth investor, this was not demonstrated in the model attribution and further due diligence is required.

Fixed-Income Return Attribution

LOS 35.f: Interpret the output from fixed-income attribution analyses.

CFA® Program Curriculum, Volume 6, page 188

Three common methods of fixed-income attribution include:

- Exposure decomposition—duration based.
- Yield curve decomposition—duration based.
- Yield curve decomposition—full-repricing based.

> **PROFESSOR'S NOTE**
>
> For the exam, candidates are not responsible for fixed-income attribution calculations but are responsible for interpreting the results from any of the fixed-income attribution methods.

Exposure Decomposition—Duration

Exposure decomposition is a top-down approach that utilizes duration to quantify active portfolio manager decisions regarding interest rate decisions relative to the benchmark. Exposure decomposition is best thought of as a process that segments risk by some specific characteristic; in this case, duration is used to quantify the impact on the portfolio resulting from interest rate risk. Exposure decomposition using duration segments portfolios by their market value weight and assigns securities to duration buckets based on the security's maturity.

Yield Curve Decomposition—Duration

Yield curve decomposition can be either top-down or bottom-up and utilizes both duration and yield to maturity (YTM) in computing price return (as one component in calculating total return).

% total return = % income return + % price return

where:

% price return ≈ –duration − change in YTM

Yield curve decomposition based on duration looks at what factors drive returns when YTM changes. When used on both the portfolio and the benchmark, a comparison of the return drivers allows one to determine the impact of active management. Compared to exposure decomposition, this method requires more data (since attribution analysis must be performed on both the portfolio and the benchmark) and is more complex.

Yield Curve Decomposition—Full Repricing

As an alternative to the previous equation, securities can also be repriced based on zero-coupon curves, or spot rates. The use of spot rates is also known as the full-repricing method and is the most accurate measure of price changes in securities. However, since it requires an even more data-intensive process than the duration-based approach, the full-repricing method is frequently more difficult and expensive to use.

Figure 35.4 displays the portfolio and benchmark by weights, duration, and contribution to duration by each bucket. The buckets are segmented by short and medium durations.

Fixed Income Exposure Decomposition Analysis

Bucket	Duration
Short	2 or less
Medium	More than 2 and up to and including 8

Figure 35.4: Exposure Decomposition Example

	Portfolio Weights			Portfolio Duration			Portfolio Contribution to Duration		
	Short	Medium	Total	Short	Medium	Total	Short	Medium	Total
Corporate	20.00%	40.00%	60.00%	1.20	7.30	5.27	0.24	2.92	3.16
Government	20.00%	20.00%	40.00%	1.40	6.90	4.15	0.28	1.38	1.66
Total	40.00%	60.00%	100.00%	1.30	7.17	4.82	0.52	4.30	4.82

	Benchmark Weights			Benchmark Duration			Benchmark Contribution to Duration		
	Short	Medium	Total	Short	Medium	Total	Short	Medium	Total
Corporate	25.00%	25.00%	50.00%	1.20	7.30	4.25	0.3	1.825	2.125
Government	25.00%	25.00%	50.00%	1.40	6.90	4.15	0.35	1.725	2.075
Total	50.00%	50.00%	100.00%	1.30	7.10	4.20	0.65	3.55	4.2

	Portfolio Weights			Portfolio Return			Portfolio Contribution to Return		
	Short	Medium	Total	Short	Medium	Total	Short	Medium	Total
Corporate	20.00%	40.00%	60.00%	2.10%	2.18%	2.15%	0.4200%	0.8720%	1.29%
Government	20.00%	20.00%	40.00%	3.00%	2.76%	2.88%	0.6000%	0.5520%	1.15%
Total	40.00%	60.00%	100.00%	2.55%	2.37%	2.44%	1.0200%	1.424%	2.44%

	Benchmark Weights			Benchmark Returns			Benchmark Contribution to Return		
	Short	Medium	Total	Short	Medium	Total	Short	Medium	Total
Corporate	25.00%	25.00%	50.00%	2.10%	2.18%	2.14%	0.5250%	0.5450%	1.07%
Government	25.00%	25.00%	50.00%	3.00%	2.76%	2.88%	0.7500%	0.6900%	1.44%
Total	50.00%	50.00%	100.00%	2.55%	2.47%	2.51%	1.2750%	1.2350%	2.51%

From Figure 35.4, the active investment decisions were as follows:

- The portfolio manager likely was expecting a decline in medium-term rates and, as a result, overweighted the medium-term corporate bonds (40% versus 25% weight in the benchmark). The portfolio had a higher duration compared to the benchmark (4.82 versus 4.20).

- The portfolio manager overweighed the corporate sector (60% versus 50% for the benchmark), most likely expecting credit spreads to narrow.

- The total portfolio returns slightly underperformed compared to the benchmark (2.44% versus the benchmark of 2.51%).

From Figure 35.4, we can perform the portfolio's attribution results that are summarized in Figure 35.5.

Total interest rate allocation is defined as the contribution from a portfolio manager's exposures to duration and the shape of the interest rate curves. Sector allocation quantifies the portfolio manager's active investment decision regarding the weighting of corporate and government bonds in their portfolio relative to the benchmark.

Figure 35.5: Hypothetical Decomposition—Attribution Results

Duration Bucket	Sector	Duration Effect	Curve Effect	Total Interest Rate Allocation	Sector Allocation	Bond Selection	Total

Short	Corporate						
	Government						
	Total	0.10%	0.03%	0.13%	–0.18%	0.00%	–0.05%
Medium	Corporate						
	Government						
	Total	0.05%	0.02%	0.07%	–0.09%	0.00%	–0.02%
Total		0.15%	0.05%	0.20%	–0.27%	0.00%	–0.07%

From the results from <u>Figure 35.5</u>, we can make the following conclusions regarding the investment manager's active management decisions:

- The portfolio's performance underperformed that of its benchmark by 7 bps.
- There was a 15 bps gain by taking a medium-duration position when interest rates declined; the yield increase is demonstrated by the positive benchmark returns.
- Yield curve shape changes were minimal and resulted in only a 5 bps gain in the portfolio.
- There was a 27 bps loss because the manager overweighted corporate bonds and underweighted government bonds. In fact, the credit spreads widened as demonstrated by lower benchmark corporate returns compared to benchmark government returns.
- There was no gain or loss from bond selection in the portfolio.

Risk Attribution

LOS 35.g: Discuss considerations in selecting a risk attribution approach.

CFA® Program Curriculum, Volume 6, page 194

Selecting the most appropriate risk metric for attribution analysis requires an in-depth understanding of the investment process of the portfolio manager. It is critical to identify whether the portfolio manager follows a top-down or bottom-up investment process and to define the portfolio's appropriate benchmark.

While performance attribution is important in the overall portfolio analysis process, only looking at returns is insufficient to evaluate the complete investment process. The risk taken by the portfolio manager must also be analyzed to fully evaluate the investment management process. Risk attribution identifies the sources of risk taken by the investment manager that resulted in the fund's returns.

The following table summarizes investment process (row) and type of attribution analysis (column). The correct approach to risk attribution occurs at the intersection of the relevant row and column in the following table.

Investment Process	Type of Attribution Analysis	
	Relative	**Absolute**
Bottom up	Security's marginal contribution to tracking risk (tracking error)	Security's marginal contribution to total risk
Top down	Attribute tracking error to relative allocation and selection	Factor's marginal contribution to total risk and specific risk
Factor based	Factor's marginal contribution to tracking error and active specific risk	

Tracking risk (or tracking error) is the relevant risk measure to consider for relative attribution analysis, and the general objective is to determine the returns generated from active management and compare them to the amount of tracking risk assumed. For the bottom-up approach, each security in the portfolio has a marginal contribution to tracking risk, and that amount is multiplied by its active weight to determine the contribution to tracking risk. In contrast, the top-down approach takes a more macro approach and attributes active return to allocation; then it attributes tracking error to allocation and selection.

Absolute attribution analysis quantifies general risk arising from market, size, and style exposures and specific risk arising from stock picking. A common risk measure to use is standard deviation. For example, a bottom-up approach could be focused on selection decisions. Therefore, it would be necessary to obtain each security's marginal contribution to total risk—in other words, the change in portfolio standard deviation resulting in a small increase of the security holding in the portfolio. Taking the sum of the marginal contributions to total risk for all the securities and dividing by total portfolio risk will provide the overall risk contribution due to selection decisions.

Risk attribution provides insight into the amount of risk that was introduced into the fund. Risk attribution must be combined with return attribution to fully understand the portfolio manager's active investment decisions.

Return Attribution

LOS 35.h: Distinguish between investment results attributable to the asset owner versus those attributable to the investment manager.

CFA® Program Curriculum, Volume 6, page 196

Macro Attribution

Fund sponsors first determine the strategic asset allocation for the portfolio by assigning specific weights to the asset classes. Assuming the fund sponsor decides to hire external portfolio managers for tactical asset allocation purposes, then macro attribution allows for the determination of the effect of such decisions by the fund sponsors.

Suppose, for the purposes of the equity allocation of a balanced fund, the fund sponsor hires two external portfolio managers: one to manage growth and the other to manage value. Refer to the information in Figure 35.6.

Figure 35.6: Performance of Growth and Value Portfolio Managers

	Fund Weight	Fund Return	Benchmark Weight	Benchmark Return
Growth portfolio manager	0.22	0.82%	0.25	–1.08%
Small-cap growth equities	0.22	0.82%	0.25	–1.08%
Value portfolio manager	0.78	0.99%	0.75	0.32%
Small-cap value equities	0.20	2.39%	0.25	1.52%
Large-cap value equities	0.58	0.51%	0.50	–0.28%
Total	1.00	0.95%	1.00	–0.03%

An analysis of the hiring decision of the growth portfolio manager is as follows:

- **Allocation effect = (0.22 − 0.25) × [–1.08% − (–0.03%)] = 0.03%**
- Growth equities were underweighted by the fund sponsor by 3%.
- Growth equities underperformed the fund's total aggregate benchmark by 1.05%.
- Therefore, underweighting growth equities increased portfolio return.
- **Selection and interaction effects = [0.25 × (0.82% − (–1.08%))] + [(0.22 − 0.25) × (0.82% − (–1.08%))] = 0.42%**
- The growth manager outperformed the growth benchmark by 1.90%, so the fund sponsor's manager selection decision (selection effect) increased portfolio return.
- A manager who outperformed the benchmark was underweighted by the plan sponsor, which means the interaction effect increased portfolio return.

The same analysis can be done for the hiring decision of the value portfolio manager. The following is a summary of the results (minor differences will arise due to rounding of decimal places):

Return Attribution (Plan Sponsor Level)	Selection + Interaction	Allocation	Total
Growth portfolio manager	0.42%	0.03%	0.45%
Value portfolio manager	0.52%	0.01%	0.53%
Total	0.94%	0.04%	0.98%

Micro Attribution

After completing macro attribution analysis, it is necessary to move down one level to examine the portfolio manager's active management decisions.

For example, the calculations for the small-cap value equities portfolio manager are as follows:

allocation effect = (0.20 − 0.25) × (1.52% − (–0.03%)) = –0.08%

selection and interaction effects = [(0.25) × (2.39% − 1.52%)] + [(0.20 − 0.25) × (2.39% − 1.52%)] = 0.17%

The same calculations apply to large-cap growth equities and large-cap value equities, and the results are summarized as follows:

Return Attribution (Segment Level)	Fund Weight	Selection + Interaction	Allocation	Total
Growth portfolio manager	0.22			
Small-cap growth stocks	0.22	0.42%	0.03%	0.45%
Value portfolio manager	0.78			
Small-cap value stocks	0.20	0.17%	–0.08%	0.09%
Large-cap value stocks	0.58	0.46%	–0.02%	0.44%
Total	1.00	1.05%	–0.07%	0.98%

Overall, good security selection decisions in all three investments added 1.05% return to the overall portfolio. Allocation decisions reduced overall portfolio return by 0.07%; a marginally positive allocation effect in small-cap growth was offset by two marginally negative allocation effects in small-cap value and large-cap value.

The same process of micro attribution using the Brinson approach can be applied to additional levels, such as individual securities or individual countries in the case of a portfolio with an international focus.

MODULE QUIZ 35.2

To best evaluate your performance, enter your quiz answers online.

1. The following is an extract from a micro attribution analysis of one of the investment managers of the Hiatus fund:

Economic Sectors	Portfolio Weight (%)	Sector Benchmark Weight (%)	Portfolio Return (%)	Sector Benchmark Return (%)
Energy	8.38	7.72	3.55	3.32
Financial	15.48	13.42	1.66	1.10
Technology	17.89	22.01	3.21	3.18

*The overall benchmark return was 2.32%.

Using the previous table, **calculate** and **evaluate**:

(i) The allocation effect for the energy sector.

(ii) The selection effect for the financial sector.

(iii) The interaction effect for the technology sector.

Use the following information for Questions 2 through 4.

Patty McDaniel and Peggy Peterson are consultants to Sigma Advisors. Sigma manages funds for wealthy individuals and small institutions. McDaniel and Peterson have been asked by Sigma to develop a plan to evaluate investment manager performance.

As part of McDaniel's and Peterson's task, Sigma asks them to perform micro performance attribution on one of its managers, Frank Matson. Matson invests primarily in large-cap value stocks. Matson's performance relative to the appropriate benchmark is shown in the following table.

	Portfolio Sector Weight	Benchmark Sector Weight	Portfolio Sector Return	Benchmark Sector Return
Agricultural	4.00%	6.00%	–2.00%	–1.00%
Capital goods	8.00%	9.00%	–4.00%	–5.00%
Consumer durables	32.00%	35.00%	2.00%	3.00%
Energy	6.00%	6.00%	8.00%	2.00%
Financial	20.00%	18.00%	6.40%	4.00%
Technology	16.00%	16.00%	2.60%	–2.00%
Utilities	12.00%	10.00%	4.00%	–2.00%
Cash	2.00%	0.00%	0.20%	
Total	100.00%	100.00%		
Portfolio plus cash return			2.90%	0.86%

2. From the data in the table, does Matson demonstrate an ability to wisely allocate funds to the capital goods and/or financial sectors?
   A. Yes, but only in the capital goods sector.
   B. Yes, but only in the financial sector.
   C. Yes, in both capital goods and financial sectors.

3. Does Matson demonstrate an ability to select stocks in the consumer durables and/or technology sectors?
   A. Yes, in both technology and consumer durables sectors.
   B. Yes, but only in the technology sector.
   C. No, he does not demonstrate the ability to select stocks in either sector.

4. Does Matson demonstrate an ability to generate a positive return from interaction effect in the agricultural and/or utilities sectors?
   A. Yes, but only in the agricultural sector.
   B. Yes, in both agricultural and utilities sectors.
   C. Yes, but only in the utilities sector.

MODULE 35.3: BENCHMARKING INVESTMENTS AND MANAGERS

Liability-Based Benchmarks

LOS 35.i: Discuss uses of liability-based benchmarks.

CFA® Program Curriculum, Volume 6, page 202

A more frequent benchmark in institutional investing is the **liability-based benchmark**, which is likely to be used by fund sponsors and portfolio managers when a firm has a specific liability to pay in the future (e.g., a defined benefit plan). A liability-based benchmark focuses on the cash flows necessary to satisfy the liability and frequently limits the investment choices available to the portfolio manager (e.g., equity and fixed income only). Frequently used assets within a liability-based benchmark include nominal bonds, inflation-adjusted bonds, and high-quality stocks.

As an example of a liability, consider a defined benefit plan that requires future cash flows to fund future liabilities. Some of the plan features will likely impact the structure of the liability and therefore impact which assets the portfolio manager should select to meet those cash flows.

Such features include:

- How many years until the average number of workers will retire in the plan.
- How many workers have already retired and are drawing cash from the plan.
- The impact of inflation on the liabilities.
- The correlation between the company's operating profit (EBIT) and the plan assets.
- If the plan is frozen or has a terminal life.
- Any actuarial assumptions, including life expectancy and required discount rate for the plan.

Asset-Based Benchmarks

LOS 35.j: Describe types of asset-based benchmarks.

CFA® Program Curriculum, Volume 6, page 205

The *seven primary types of benchmarks* are as follows:

1. **Absolute.** An **absolute benchmark** is a return objective that aims to exceed a minimum target return. An example would be the minimum acceptable return (MAR) that is used in computing the Sortino ratio.
    - Advantage:
        - Simple and straightforward benchmark.
    - Disadvantage:
        - Absolute return objective is not an investable benchmark.
2. **Broad market indexes.** There are several well-known broad market indexes that are used as benchmarks (e.g., S&P 500 for U.S. common stocks).
    - Advantages:
        - Well recognized, easy to understand by clients, and widely available.
        - Unambiguous, generally investable, measurable, and may be specified in advance.
        - Appropriate to use if it reflects the current investment process of the manager.
    - Disadvantage:
        - Manager's style may deviate from the style reflected in the index (e.g., it is not appropriate to use the S&P 500 for a small-capitalization U.S. growth stock manager).
3. **Style indexes.** Investment-style indexes represent specific portions of an asset category. Four well-known U.S. common stock style indexes are (1) large-capitalization growth, (2) large-capitalization value, (3) small-capitalization growth, and (4) small-capitalization value.
    - Advantages:
        - They are widely available, widely understood by clients, and widely accepted.

- If the index reflects the manager's style and it is investable, it is an appropriate benchmark.
  - Disadvantages:
    - Some style indexes can contain weightings in certain securities and sectors that may be larger than considered prudent.
    - Differing definitions of investment style can produce quite different benchmark returns, making them inappropriate benchmarks.
4. **Factor-model-based. Factor models** involve relating a specified set of factor exposures to the returns on an account. A well-known one-factor model (CAPM) is the market model where the return on a portfolio is expressed as a linear function of the return on a market index. A generalized factor model equation would be:

   $R_P = a_p + b_1 F_1 + b_2 F_2 + ... + b_K F_K + \varepsilon$

   where:

   R_P = periodic return on an account

   a_p = "zero factor" term, representing the expected value of R_P if all factor values were zero

   F_i = factors that have a systematic effect on the portfolio's performance; i = 1 to K

   b_i = sensitivity of the returns on the account to the returns generated from factor i

   ε = error term; portfolio return not explained by the factor model

   Some examples of factors are the market index, industry, growth characteristics, a company's size, and financial strength. The benchmark portfolio (normal portfolio) is the portfolio with exposures to the systematic risk factors that are typical for the investment manager.

   The manager's past portfolios are used as a guide.
   - Advantages:
     - It is useful in performance evaluation.
     - It provides managers and sponsors with insight into the manager's style by capturing factor exposures that affect an account's performance.
   - Disadvantages:
     - Focusing on factor exposures is not intuitive to all managers or sponsors.
     - The data and modeling are not always available and may be expensive to obtain.
     - It may be ambiguous because different factor models can produce different outputs, leading to misspecification.
5. **Returns-based. Returns-based benchmarks** are constructed using (1) the managed account returns over specified periods and (2) corresponding returns on several style indexes for the same periods. Those return series are submitted to an allocation algorithm that solves for the combination of investment-style indexes and most closely tracks the account's returns.
   - Advantages:
     - Generally easy to use and intuitive.
     - Meets the criteria of a valid benchmark.

- Useful where the only information available is account returns.
  - Disadvantages:
    - The style indexes may not reflect what the manager owns or what the manager or client would be willing to own.
    - Enough monthly returns would be needed to establish a statistically reliable pattern of style exposures.
    - Will not work when applied to managers who change style.

6. **Manager universes.** The **median manager** or fund from a broad universe of managers or funds (that follows a similar investment process) is used as the benchmark. The median manager is the fund that falls at the middle when funds are ranked from highest to lowest by performance.
   - Advantage:
     - It is measurable.
   - Disadvantages:
     - Manager universes are subject to "survivor bias," as underperforming managers often go out of business and their performance results are then removed from the universe history.
     - Fund sponsors who choose to employ manager universes must rely on the compiler's representations that the universe has been accurately compiled.
     - They cannot be identified or specified in advance, so it is not investable; thus, it's not an acceptable benchmark.

7. **Custom security-based. Custom security-based benchmarks** are designed to reflect the manager's security allocations and investment process.
   - Advantage:
     - Meets all the required benchmark properties and all the benchmark validity criteria.
     - Allows continual monitoring of investment processes.
     - Allows fund sponsors to effectively allocate risk across investment management teams.
   - Disadvantages:
     - It can be expensive to construct and maintain.
     - A lack of transparency by the manager (e.g., hedge funds) can make it impossible to construct such a benchmark.

PROFESSOR'S NOTE

Although not directly required by the LOS, it's important to understand the properties that constitute a valid benchmark. A valid benchmark should possess the following seven characteristics, which should align the benchmark's style and risk with that of the manager and provide the manager with an appropriate management objective:

1. **Specified in advance.** The benchmark is known to both the investment manager and the fund sponsor. It is specified at the start of an evaluation period.
2. **Appropriate.** The benchmark is consistent with the manager's investment approach and style.
3. **Measurable.** Its value and return can be determined on a reasonably frequent basis.

4. **Unambiguous.** There are clearly defined identities and weights of securities constituting the benchmark.

5. **Reflective of the manager's current investment opinions.** The manager has current knowledge and expertise of the securities within the benchmark.

6. **Accountable.** The manager(s) should accept the applicability of the benchmark and agree to accept differences in performance between the portfolio and benchmark as caused only by their active management.

7. **Investable.** It is possible to replicate the benchmark and forgo active management.

Benchmark Quality Evaluation

LOS 35.k: Discuss tests of benchmark quality.

CFA® Program Curriculum, Volume 6, page 210

A portfolio return can be broken up into three components: market, style, and active management.

$$P = M + S + A$$

where:

P = investment manager's portfolio return

M = return on the market index

S = B − M = excess return to style; difference between the manager's style index (benchmark) return and the market return—S can be positive or negative

A = P − B = active return; difference between the manager's overall portfolio return and the style benchmark return

This relationship recognizes first that the manager's style benchmark can earn more or less than the market. Had the manager taken a passive position in a broad market index, the return on that index, *M,* would be an appropriate benchmark, and S = 0. Because the manager might specialize in a particular style, however, we add (if B > M, S > 0) or subtract (if B < M, S < 0) the difference between the benchmark and market returns. Finally, the return to active management, *A,* is the difference between the manager's portfolio return and the benchmark return and is attributed to active management.

Benchmarking Alternative Investments

LOS 35.l: Describe problems that arise in benchmarking alternative investments.

CFA® Program Curriculum, Volume 6, page 212

Hedge Funds

Three general types of benchmarks could be considered for hedge funds: (1) broad market indexes, (2) risk-free rate, and (3) hedge fund peer universes. However, they present some problems.

Broad market indexes are not appropriate to use as a benchmark for hedge funds because hedge funds cover a wide range of investment strategies. In addition, hedge funds differ significantly from each other and can have wide asset allocation fluctuations in the long term, which makes the use of broad market indexes problematic. With hedge funds using leverage,

short positions, and derivatives—plus their overall lack of liquidity, transparency, ability to monitor, and low or no correlation of returns with the broad market index—broad market indexes should not be used as a benchmark for hedge funds.

The risk-free rate with an added spread could be used for some hedge fund strategies that focus on arbitrage. The idea here is that the risk-free nature of arbitrage strategies should be matched with the risk-free rate as the appropriate benchmark. Any additional spread would take into account the incremental returns due to active management net of costs. Unfortunately, the vast majority of hedge funds will carry some systematic risk, and the use of leverage will only exacerbate the risk. As a result, the spread would need to be increased accordingly. Finally, as with broad market indexes, the lack of correlation of hedge fund returns and the risk-free rate makes the risk-free rate an unsuitable benchmark.

Hedge fund peer universes are not suitable because a specific peer group's risk and return objectives are not likely to match those of a specific hedge fund. Additionally, peer universes are subject to backfill and survivorship bias. Finally, because of the frequent illiquidity of underlying assets in hedge funds, current pricing may not be exact and may be based on an appraisal or prior period price. As a result, there may be a smoothing effect, which reduces the reported standard deviation, thereby increasing the Sharpe ratio and the allocation to hedge funds.

Real Estate

Many real estate benchmarks exist but they are not all suitable for real estate investments:

- The benchmarks are derived from a sample of the real estate universe, which means they are not completely representative of the real estate asset class.
- The performance of the index probably bears a very high correlation to the largest investments.
- Benchmark returns are self-reported, so some subjectivity and/or bias may be present.
- Benchmarks that are value-based could be biased toward the most expensive properties or geographical areas.
- The use of appraisal data (e.g., infrequent pricing) leads to a smoothing effect and understated volatility or risk.
- There is a lack of comparability with benchmark returns given that some benchmarks use leverage while others do not.
- The indexes assume no transaction costs, full transparency, and normal liquidity, which is usually not the case; those factors would impact actual real estate returns.

Additionally, there is lack of consistency in the use of return measures. For example, the cash inflows and outflows for open-end funds are controlled by the investor, so time-weighted returns would be used. In contrast, the cash inflows and outflows for closed-end funds are controlled by the manager, so an internal rate of return (IRR) would be used.

Private Equity

Benchmarks exist to allow for performance comparisons specific private equity funds and that of a relevant peer group. The metric used is usually IRR, taking into account all investment cash flows since inception plus the ending investment value. Key problems with such benchmarks include managers using different methods of valuation, which makes

comparison more difficult. In addition, IRR may be biased by losses or gains occurring near the beginning of an investment. Finally, all the results are reported at one common point in time, even though the firms are likely in varying stages of development.

Commodities

Benchmarks for commodity investments are usually based on futures as opposed to actual assets. This may result in significant differences between the benchmark and the commodity investments portfolio, which reduces the comparability. Similar to other alternative investments, the different amounts of leverage employed by portfolios versus benchmarks—as well as the different weightings of exposures between portfolios and benchmarks—make the benchmarking process problematic for commodities.

Managed Derivatives

Managed derivatives use specific benchmarks because of the lack of market indexes. As a result, such benchmarks may be too specific or not specific enough for a given investment strategy and, therefore, are not suitable. There are also peer group–based benchmarks, but as discussed previously, they are subject to problems such as stale pricing and survivorship and backfill bias.

Distressed Securities

Given the illiquidity and severe lack of marketability of distressed securities, it is almost impossible to determine an appropriate benchmark. Should the financial state of a distressed company become better, it may become more liquid. However, it is likely to require a significant amount of time to occur (if it even does) and that creates valuation problems (e.g., stale pricing).

Market indexes do exist such as the Barclay Distressed Securities Index; however, they may take into account numerous strategies so the suitability of indexes for a specific strategy is questionable. As well, the indexes may perform valuations at erratic intervals so the issue of stale pricing may not be solved.

Appropriate Choice of Benchmark

LOS 35.m: Describe the impact of benchmark misspecification on attribution and appraisal analysis.

CFA® Program Curriculum, Volume 6, page 215

The phrase *garbage in, garbage out* is appropriate to use regarding the impact of benchmark misspecification on attribution and appraisal analysis. Useful performance evaluation (and any of its three components) requires an appropriate fund benchmark. When an incorrect benchmark is used in the performance evaluation process then performance measurement, which comprises attribution and appraisal analysis, will not be useful or provide valid information on understanding the investment process. Misspecified benchmarks will result in misfit active return.

To illustrate active return, suppose a manager invests in large and liquid French stocks. The sponsor assesses the manager's performance using the Euronext 100 Index. Although French stocks comprise the majority of the Euronext 100 Index, the Euronext 100 does include

stocks from the Netherlands, Belgium, Portugal, and Luxembourg. As a result, the CAC 40 (large and liquid French stocks) would be more appropriate to label as the manager's normal portfolio. Assume the manager's portfolio return is 10%, the Euronext 100 (investor benchmark) return is 9% and the CAC 40 (normal portfolio) return is 12%.

Based on the returns provided, the manager outperformed the investor benchmark (10% versus 9%) but underperformed its proper benchmark (10% versus 12%). In other words, the misfit active return is +1% and the *true* active return is –2%.

MODULE QUIZ 35.3

To best evaluate your performance, enter your quiz answers online.

1. Rhombus Asset Management (Rhombus) runs a U.S. small-cap equity portfolio. The portfolio generated an 8.9% return during 2005. Rhombus uses the Russell 2000[®] Index as the most appropriate benchmark. The Russell 2000[®] Index yielded 9.1% over the same evaluation period. The Wilshire 5000, a broad U.S. equity market index, yielded 8.5% over the same evaluation period.

   Calculate Rhombus's return due to style and due to active management. **Assess** Rhombus's performance compared to the benchmark and to the market.

2. Hexagon PLC is an investment management company based in London. It manages portfolios consisting of European equities only. It states that its benchmark is to beat the median manager. **Discuss** the validity of the median manager benchmark approach.

MODULE 35.4: PERFORMANCE APPRAISAL

LOS 35.n: Calculate and interpret the Sortino ratio, the appraisal ratio, upside/downside capture ratios, maximum drawdown, and drawdown duration.

Video covering this content is available online.

LOS 35.o: Describe limitations of appraisal measures and related metrics.

CFA[®] Program Curriculum, Volume 6, page 217

The final stage of the performance evaluation process is performance appraisal. Performance appraisal is designed to assess whether the investment results are more likely due to skill or luck.

Should we hire or fire the manager? Risk-adjusted performance measures are one set of tools to use in answering such questions. Active investment management skill is evident when the portfolio manager's investment process adds value on a risk-adjusted basis. In other words,

can the fund manager outperform their appropriate benchmark on a risk-adjusted basis consistently?

> 🎓 **PROFESSOR'S NOTE**
>
> Unfortunately, many investment managers have only a few years of performance to evaluate, which makes it extremely difficult to differentiate between luck and skill through the appraisal process. It is recommended to have many years of observations to determine at an appropriately high confidence level that the manager truly possesses superior investment skill.

The following seven appraisal measures will be discussed (the first five are risk-adjusted measures):

1. Sharpe ratio.
2. Treynor ratio.
3. Information ratio.
4. Appraisal ratio.
5. Sortino ratio.
6. Capture ratios (upside and downside).
7. Drawdown (maximum drawdown, drawdown duration).

1. **Sharpe ratio**

$$S_A = \frac{\bar{R}_A - \bar{r}_f}{\hat{\sigma}_A}$$

The Sharpe ratio is calculated as the incremental or excess return over the risk-free rate (numerator) divided by standard deviation (denominator). A key drawback with the ratio is that the denominator does not differentiate between volatility that is upside versus downside. Therefore, with the Sharpe ratio, there is a penalty for all volatility, even if it is "good" volatility.

2. **Treynor ratio**

$$T_A = \frac{\bar{R}_A - \bar{r}_f}{\hat{\beta}_A}$$

The Treynor ratio is similar to the Sharpe ratio, but the denominator for the former is measured by beta, so it only considers systematic risk rather than total risk like the latter. Therefore, with the Treynor ratio, the universe of appropriate benchmarks is limited to only those that assume efficient markets. The Treynor ratio is only useful in evaluating portfolios that have systematic risk and do not have unsystematic risk; in other words, such portfolios are well diversified.

3. **Information ratio**

$$IR = \frac{E(r_P) - E(r_B)}{\sigma(r_P - r_B)}$$

The information ratio (IR) is used to measure a portfolio's performance against the benchmark but accounts for differences in risk. The numerator is the difference between the mean returns of the portfolio and the benchmark, respectively. The denominator is known as the tracking risk, or the variability in the portfolio performance with that of its benchmark.

4. **Appraisal ratio**

$$AR = \frac{\alpha}{\sigma_\varepsilon}$$

The appraisal ratio (AR) is calculated as alpha divided by the standard deviation of the residual/unsystematic risk (otherwise known as the standard error of regression). Alpha is excess return, which is calculated as the return earned by the portfolio minus the return suggested by CAPM. In other words, the AR is the ratio of returns from active management over risks of active management. Both the numerator and denominator are expressed on an annualized basis (e.g., how many units of active return per unit of active risk).

5. **Sortino ratio**

   The Sortino ratio only considers the standard deviation of the downside risk. That is in contrast to the Sharpe ratio, which considers all risk (e.g., both upside and downside). Positive volatility associated with the upside can be considered "good" volatility.

   In practice, however, clients tend to be more concerned about volatility associated with negative returns. As a result, the Sortino ratio can provide a more meaningful view of a portfolio's risk-adjusted performance than the Sharpe ratio.

   $$SR_D = \frac{E(r_p) - r_T}{\sigma_D}$$

   $$\widehat{SR}_D = \frac{\bar{r}_p - \bar{r}_T}{\hat{\sigma}_D}$$

   In the previous equations, the r_T refers to the MAR, or target rate of return, and the σ_D refers to target semi-standard deviation, or target semideviation. In other words, the Sortino ratio penalizes managers only for "bad" volatility by considering only returns below the MAR.

   Therefore, assuming an average portfolio return of 7%, MAR of 3%, and semi-standard deviation of 5%, the Sortino ratio is calculated as (7% – 3%) / 5% = 0.80. Similar to the Sharpe ratio, the higher the Sortino ratio, the better the risk-adjusted performance.

   The Sortino ratio is more appropriate for investments with non-normal (nonsymmetrical) return distributions. Positively skewed and negatively skewed investment strategies would both result in lower Sharpe ratios (e.g., higher standard deviation in the denominator), but only the negatively skewed investment strategy would result in a lower Sortino ratio (e.g., higher semi-standard deviation in the denominator). Therefore, for investments that have nonsymmetrical or skewed return distributions, such as hedge funds or options, the Sortino ratio appears to be a more appropriate performance metric. However, a comparability problem exists with the Sortino ratio because the determination of MAR is subjective and specific to each investor.

6. **Capture ratios**

   Capture ratios determine the manager's relative performance when markets are up or down. Consider an up market where the index or benchmark return is positive. The question is whether the manager's portfolio return is also positive and if it is above or below the benchmark return. For example, if the benchmark return is 4% and the portfolio return is 5%, the upside capture ratio is 125% (5% / 4% = 1.25) and there is outperformance during a period of positive returns. Assuming the same benchmark return but a portfolio return of only 3%, the upside capture ratio is 75% (3% / 4% = 0.75) and there is underperformance during a period of positive returns.

   Similarly, consider a down market where the index or benchmark return is negative. For example, if the benchmark return is –4% and the portfolio return is –5%, the downside capture ratio is 125% (–5% / –4% = 1.25) and there is underperformance

during a period of negative returns. Assuming the same benchmark return but a portfolio return of –3%, the downside capture ratio is 75% (–3% / –4% = 0.75) and there is outperformance during a period of negative returns.

One can now calculate the capture ratio (upside capture divided by downside capture). Using the previous examples with benchmark returns of +4% and –4% and portfolio returns of +5% and –5%, the capture ratio is 1.25 / 1.25 = 1. A capture ratio of 1 is indicative of a symmetrical return profile. Therefore, if the capture ratio > 1, then there is a positively asymmetrical (convex) return profile in that there is greater upside capture than downside capture. Correspondingly, if the capture ratio < 1, there is a negatively asymmetrical (concave) return profile in that there is greater downside capture than upside capture.

For example, during an up market, if the manager earns 7% and the benchmark earns 8%, the upside capture is 87.5%. If, during a down market, the manager earns –6% and the benchmark earns –10%, the downside capture is 60%. Therefore, the capture ratio is about 1.46 (87.5% / 60%), which indicates a positively asymmetrical (convex) return profile. Ideally, the manager would capture as much of the upside as possible and capture as little of the downside as possible to maximize the capture ratio.

7. **Drawdown**

   Drawdown duration is the total time required to fully recover a drawdown; it is from when the drawdown commences up to when the cumulative drawdown is zero. Drawdown duration can be subdivided into a drawdown phase and a recovery phase. Maximum drawdown occurs at the very end of the drawdown phase and at the very start of the recovery phase; it is the point at which the cumulative drawdown is at its highest (in absolute terms).

   To illustrate and calculate drawdown duration and maximum drawdown, consider the following data pertaining to the monthly returns of a stock for a 12-month period.

Month	Monthly Return	Drawdown	Cumulative Drawdown	Comments
01/2018	3.14%		0.00%	
02/2018	–2.55%	–2.55%	–2.55%	Drawdown phase begins
03/2018	–2.71%	–2.71%	–5.26%	
04/2018	–4.66%	–4.66%	–9.92%	
05/2018	–4.91%	–4.91%	–14.83%	
06/2018	–0.73%	–0.73%	–15.56%	Maximum drawdown
07/2018	2.18%		–13.38%	Recovery phase begins
08/2018	3.11%		–10.27%	
09/2018	2.45%		–7.82%	
10/2018	3.65%		–4.17%	
11/2018	4.03%		–0.14%	
12/2018	4.14%		0.00%	Drawdown recovered

Based on the data provided, the maximum drawdown was calculated as –15.56% and the drawdown duration was approximately 10 months (from beginning of drawdown in 02/2018 to full recovery of drawdown in 12/2018).

Manager Skill Evaluation

LOS 35.p: Evaluate the skill of an investment manager.

The skill of an investment manager can be evaluated through attribution analysis as well as appraisal analysis. An example of each type of analysis is provided next.

Example of Attribution Analysis

Manager X has a benchmark of the Euronext 100. The following summary information states that Manager X underperformed the benchmark by 67 bps. The question is whether the underperformance is due to lack of skill or bad luck.

	Manager X		Euronext 100		Attribution Effects		
Market	**Weight**	**Annualized Return**	**Weight**	**Annualized Return**	**Allocation**	**Selection + Interaction**	**Total**
France	60%	10.14%	63%	11.49%	–0.04%	–0.81%	–0.85%
Netherlands	15%	8.78%	19%	7.65%	0.09%	0.17%	0.26%
Belgium	15%	9.12%	11%	8.12%	–0.07%	0.15%	0.08%
Portugal	6%	4.35%	5%	4.99%	–0.05%	–0.04%	–0.09%
Luxembourg	4%	7.14%	2%	7.92%	–0.04%	–0.03%	–0.07%
Total	**100%**	**9.32%**	**100%**	**9.99%**	**–0.12%**	**–0.56%**	**–0.67%**

The manager underperformed the benchmark by 12 bps due to country weighting decisions. Although the manager made a good decision in underweighting the Netherlands by 4% because it underperformed the total benchmark by 2.34%, the manager made bad decisions in all of the other countries. For example, the manager underweighted France by 3% when it outperformed the total benchmark by 1.50% and overweighted Belgium by 4% when it underperformed the total benchmark by 1.87%. Overall, the manager was not successful with country weighting decisions.

The manager underperformed the benchmark by 56 bps due to stock picking decisions. Although the manager selected outperforming stocks in the Netherlands and Belgium that earned a total of 32 bps, there was significant underperformance in France that lost 81 bps. Overall, the manager was not successful with picking stocks. Additionally, the selection effect was significantly greater than the allocation effect.

In the next example, the level of risk taken to achieve the manager's performance will be considered by comparing performance to other managers.

Example of Appraisal Analysis

In this section, performance appraisal measures for the same period will be analyzed for Managers X, Y, and Z. All managers will be compared to the same benchmark; return and standard deviation percentages are all expressed on an annualized basis.

Appraisal Measure	Manager X	Manager Y	Manager Z	Benchmark
Return	9.32%	11.42%	8.12%	9.99%
Standard deviation	11.65%	13.76%	10.11%	11.98%
Sharpe ratio	0.63	0.68	0.61	0.67
Treynor ratio	0.07	0.08	0.06	0.08
Information ratio	(0.22)	0.41	(0.72)	–

| Sortino ratio (MAR = 4%) | 0.75 | 0.78 | 0.63 | 0.87 |

Manager X's volatility of returns (as measured by standard deviation) is only slightly below that of the benchmark. Manager X's volatility of returns is between that of Manager Z (Z is lower by about 1.5%) and Manager Y (Y is higher by about 2.1%). Those observations are confirmed by the Sharpe ratios for all three managers and the benchmark (using an assumed risk-free rate of 2%). Therefore, although Manager X took on less total risk and earned less return than the benchmark and Manager Y, Manager X's return was relatively lower than both of them on an excess return (annualized return less risk-free rate) per unit of risk basis. Manager X did perform better than Manager Z on a risk-adjusted basis.

The conclusions based on the Sharpe ratio are consistent with those for the Treynor ratio and IR; the latter two focus on systematic risk. Given that both Manager X and Manager Z underperformed the benchmark, it makes sense that their IRs are negative. Therefore, on the basis of systematic risk only, Manager X did not perform as well as Manager Y or the benchmark.

Manager X's Sortino ratio of 0.75 is higher than its Sharpe ratio of 0.63, which suggests that Manager X should be able to earn greater returns in relation to the 4% threshold for measuring downside risk.

Conclusion

Overall, Manager X was not able to demonstrate sufficient skill in investing as demonstrated by losses incurred due to poor country allocation and poor stock selection decisions, relative to the benchmark.

Additionally, on a risk-adjusted basis, Manager X did outperform Manager Z but fell short when compared to Manager Y and the benchmark.

Consideration may need to be given to replacing Manager X with a suitable manager who is able to outperform the benchmark in terms of country allocation and stock selection as well as outperform its peers on a risk-adjusted basis.

MODULE QUIZ 35.4

To best evaluate your performance, enter your quiz answers online.

1. One of your portfolio managers, Mort Van Sleet, has recently complained that by measuring risk-adjusted returns using the Sharpe ratio, he is placed at an unfair disadvantage. He has stated flatly that the standard deviation of his portfolio returns is artificially inflated. **Explain** how this can be true, and **offer** and **explain** a potential solution to the problem.

2. During an up market, assume a manager earns 4% and the benchmark earns 3%. Then, in a down market, the same manager earns –4% and the benchmark earns –8%. Which of the following amounts is *closest* to the manager's capture ratio?
    A. 0.25.
    B. 0.38.
    C. 2.67.

LOS 35.a

Performance evaluation answers three questions regarding a portfolio's performance:

1. What performance did the fund achieve during the period (performance measurement)?
2. How did the fund manager achieve their performance (performance attribution)?
3. Did the fund manager achieve their performance via skill or luck (performance appraisal)?

LOS 35.b

An effective performance attribution process includes:

- A reflection of 100% of the portfolio's return or risk exposure.
- The portfolio manager's current decision-making process.
- The active investment decisions taken by the portfolio manager.
- A full explanation of the portfolio's excess return and risk.

LOS 35.c

Return attribution evaluates the impact of the active portfolio management decisions on the fund's investment returns. Risk attribution is the parallel of return attribution but analyzes the impact of the portfolio manager's active investment decisions on portfolio risk.

Micro attribution analyzes the portfolio at the portfolio manager's level and seeks to verify that the portfolio manager did what they said they were going to do and to understand the drivers of the portfolio's return. Macro attribution analyzes investment decisions at the fund sponsor's level and quantifies the decisions made by the fund sponsors to deviate from their strategic asset allocation and the timing when they made those decisions.

LOS 35.d

Returns-based attribution uses regressions to analyze the portfolio returns over some period and isolates the asset class components through indexes that would have generated these returns. There is no attempt to determine the actual holdings of the portfolio.

Holdings-based attribution uses beginning-of-period portfolio assets; the accuracy of analysis improves as the time interval for the analysis becomes smaller (e.g., annual to monthly, to weekly). Since holdings-based attribution does not adjust for any portfolio changes that are made after the initial period, this analysis frequently does not match the actual portfolio returns.

Transactions-based attribution improves upon the holdings-based attribution by updating the attribution of the beginning-of-period holdings of the portfolio with any subsequent trades. Both the weights and the returns of the portfolio will reflect the actual transactions, including any transaction costs.

LOS 35.e

The Brinson model approach quantifies the portfolio returns into three attribution effects: the allocation effect, the security selection effect, and the interaction effect.

- The allocation effect refers to the portfolio manager's decision to overweight or underweight specific sector weightings in the portfolio versus the portfolio benchmark.

- The security selection refers to the value the portfolio manager either added or detracted from the portfolio by selecting individual securities within the sector and weighting the portfolio differently compared to the benchmark's weightings.

- The interaction effect refers to the residual amount that ensures the arithmetic return minus the relative benchmark is fully accounted for in attribution analysis.

The Carhart model calculates the excess return from active portfolio management investment decisions by determining the impact on the portfolio due to the following factors: (1) market index (RMRF), (2) market capitalization (SMB), (3) book value to price (HML), and (4) momentum (WML).

LOS 35.f

Exposure decomposition is a top-down approach that utilizes duration to quantify active portfolio manager decisions regarding interest rate decisions relative to its benchmark.

Yield decomposition (duration) can be either top-down or bottom-up and utilizes both duration and yield to maturity (YTM) in computing price return (as one component in calculating total return).

Yield decomposition (full repricing) involves repricing based on zero-coupon curves, or spot rates. The full-repricing method is the most accurate measure of price changes in securities.

LOS 35.g

There are two general methods of risk attribution: relative and absolute.

For relative attribution analysis, tracking risk (or tracking error) is the relevant risk measure to consider and the general objective is to determine the returns generated from active management and compare them to the amount of tracking risk assumed.

Absolute attribution analysis quantifies general risk arising from market, size, and style exposures and specific risk arising from stock picking. A common risk measure to use is standard deviation.

LOS 35.h

Macro attribution analysis looks at the impact of fund sponsor decisions. Micro attribution analysis looks at the impact of portfolio manager decisions. Both types of analysis utilize Brinson model computations to determine allocation, selection, and interaction effects.

LOS 35.i

A liability-based benchmark focuses on the cash flows necessary to satisfy the liability and frequently limits the investment choices available to the portfolio manager (e.g., equity and fixed income only). Frequently used assets within a liability-based benchmark include nominal bonds, inflation-adjusted bonds, and high-quality stocks.

LOS 35.j

There are seven types of benchmarks:

1. An absolute benchmark is a return objective that aims to exceed a minimum target return.

2. Broad market indexes, such as the S&P 500 for U.S. common stocks, can be used as benchmarks.

3. Investment-style indexes represent specific portions of an asset category and can be used as a benchmark. Four well-known U.S. common stock style indexes are (1) large-capitalization growth, (2) large-capitalization value, (3) small-capitalization growth, and (4) small-capitalization value.

4. Factor models involve relating a specified set of factor exposures to the returns on an account. Some examples of factors are the market index, industry, growth characteristics, a company's size, and financial strength. The benchmark portfolio (the normal portfolio) is the portfolio with exposures to the systematic risk factors that are typical for the investment manager. The manager's past portfolios are used as a guide.

5. Returns-based benchmarks are constructed using (1) the managed account returns over specified periods and (2) corresponding returns on several style indexes for the same periods. Those return series are submitted to an allocation algorithm that solves for the combination of investment-style indexes that most closely tracks the account's returns.

6. A manager universe looks at a wide group of managers that have a similar investment process. The median manager or fund from that universe is used as the benchmark. The median manager is the fund that falls at the middle when funds are ranked from highest to lowest by performance.

7. Custom security-based benchmarks are designed to reflect the manager's security allocations and investment process.

LOS 35.k

A portfolio return can be broken up into three components: market, style, and active management.

$$P = M + S + A$$

where:
P = investment manager's portfolio return
M = return on the market index
S = B − M = excess return to style; difference between the manager's style index (benchmark) return and the market return—S can be positive or negative
A = P − B = active return; difference between the manager's overall portfolio return and the style benchmark return

LOS 35.l

Three general types of benchmarks could be considered for hedge funds: (1) broad market indexes, (2) risk-free rate, and (3) hedge fund peer universes. However, broad market indexes are not appropriate to use as a benchmark for hedge funds because hedge funds cover a wide range of investment strategies and differ significantly from each other. The risk-free rate is not appropriate because the vast majority of hedge funds will carry some systematic risk and the use of leverage will only exacerbate the risk. Hedge fund peer universes are not suitable because a specific peer group's risk and return objectives is not likely to match that of a specific hedge fund.

With the many real estate benchmarks that could be used, they may not be suitable for all real estate investments for reasons including: small sample size, bias toward larger investments,

use of appraisal data, lack of consistency regarding use of leverage, and unrealistic assumptions of no transaction costs, full transparency, and normal liquidity.

Private equity benchmarks usually use internal rate of return (IRR) measures but managers may be using different methods of valuation. Also, IRR may be biased by losses or gains occurring near the beginning of an investment. Finally, all the results are reported at one common point in time even though the firms are likely in varying stages of development.

Benchmarks for commodity investments are usually based on futures as opposed to actual assets. That may result in significant differences between the benchmark and the commodity investments portfolio, which reduces the comparability.

Managed derivatives use specific benchmarks because of the lack of market indexes. As a result, such benchmarks may be too specific or not specific enough for a given investment strategy and therefore not suitable.

Given the illiquidity and severe lack of marketability of distressed securities, it is almost impossible to determine an appropriate benchmark.

LOS 35.m

When an incorrect benchmark is used in the performance evaluation process then performance measurement, which comprises attribution and appraisal analysis, will not be useful. Misspecified benchmarks will result in "misfit" active return.

LOS 35.n and 35.o

The Sharpe ratio is calculated as the incremental or excess return over the risk-free rate (numerator) divided by standard deviation (denominator). A key drawback with the ratio is that the denominator does not differentiate between volatility that is upside versus downside.

The Treynor ratio is similar to the Sharpe ratio but the denominator for the former is measured by beta so it only considers systematic risk rather than total risk like the latter.

The information ratio (IR) is used to measure a portfolio's performance against the benchmark but accounting for differences in risk. The numerator is the difference between the mean returns of the portfolio and the benchmark, respectively. The denominator is known as the tracking risk, or the variability in the portfolio performance with that of its benchmark.

The appraisal ratio (AR) is calculated as alpha divided by the standard deviation of the residual/unsystematic risk (or otherwise known as the standard error of regression). Alpha is excess return, calculated as the return earned by the portfolio minus the return suggested by CAPM.

The Sortino ratio only considers the standard deviation of the downside risk. It uses a minimum acceptable return (MAR, or target rate of return) and target semi-standard deviation (target semideviation). The Sortino ratio penalizes managers only for "bad" volatility by considering only returns below the MAR.

Capture ratios determine the manager's relative performance when markets are up or down. Consider an up market where the index or benchmark return is positive. The question is whether the manager's portfolio return is also positive and if it is above or below the benchmark return (upside capture). Similarly, consider a down market where the index or benchmark return is negative. The question is whether the manager's portfolio return is

negative and if it is above or below the benchmark return (downside capture). Using those amounts, the capture ratio is calculated as upside capture divided by downside capture.

Drawdown duration is the total time required to fully recover a drawdown; it is from when the drawdown commences up to when the cumulative drawdown is zero. Maximum drawdown occurs at the very end of the drawdown phase and at the very start of the recovery phase.

LOS 35.p

The skill of an investment manager can be evaluated through attribution analysis as well as appraisal analysis.

Module Quiz 35.1

1. **A**   Performance appraisal determines whether the performance was affected primarily by investment decisions, by the overall market, or by chance. Performance appraisal combines output from both performance measurement and performance attribution to render a professional judgment on the quality of the performance.

    Performance measurement serves as the initial foundation phase and calculates both the return and the risk of the fund over specified time periods. Performance attribution determines the key drivers that generated the account's performance. (LOS 35.a)

2. **C**   Transactions-based attribution improves upon the holdings-based attribution by updating the attribution of the portfolio's beginning-of-period holdings with any subsequent trades. Transactions-based attribution is the most reliable of the measures.

    Returns-based attribution uses regressions to analyze the portfolio returns over some period and isolates the asset class components through indexes that would have generated these returns. There is no attempt to determine the actual holdings of the portfolio. It is the least reliable of the three methods but the easiest to implement.

    Holdings-based attribution uses beginning-of-period portfolio assets; the accuracy of analysis improves as the time interval for the analysis becomes smaller. Holdings-based attribution frequently offers a higher level of quality of attribution analysis than the returns-based attribution. (LOS 35.d)

Module Quiz 35.2

1. (i)   energy sector allocation effect = [(0.0838 − 0.0772) × (3.32% − 2.32%)] = 0.0066%

    This shows that the decision to overweight a sector that performed better than the overall benchmark resulted in a positive contribution to portfolio performance.

    (ii)   financial sector security selection effect = 0.1342 × (1.66% − 1.10%) = +0.0752%

    The positive contribution shows that the Hiatus portfolio held financial stocks that performed better than the financial stocks contained in the sector benchmark.

    (iii)   technology sector interaction effect = [(0.1789 − 0.2201) × (3.21% − 3.18%)] = −0.0012%

    Underweighting the portfolio in the technology sector when the fund performed better than the sector benchmark has led to a negative contribution. (LOS 35.h)

2. **C**   To answer this question, we must first examine the return for the overall benchmark versus the return for the benchmark in both sectors. The overall return for the benchmark is given at 0.86%. The capital goods sector return in the benchmark was −5.00%. For the financial sector, it was 4.00%. Thus, relative to the overall benchmark return of 0.86%, the capital goods sector was an underperforming sector and the financial sector outperformed. Now determine whether Matson overweighted or underweighted each sector. He underweighted the weak capital goods sector (8.00% allocation for the manager versus 9.00% for the benchmark), and he overweighted the

strong financial sector (20.00% allocation for the manager versus 18.00% for the benchmark). Because Matson underweighted a weak sector and he overweighted a strong sector, he made correct decisions for both.

No calculations are needed to reach these conclusions. However, the allocation effect can be calculated by multiplying the difference between the portfolio and benchmark allocation by the difference in sector benchmark return and overall benchmark return for each sector. For the capital goods sector, it is (8.0% − 9.0%) × (–5.00% − 0.86%) = 0.0586%. For the financial sector, it is (20.0% − 18.0%) × (4.00% − 0.86%) = 0.0628%. (LOS 35.h)

3. **B**   To answer this question, examine the return for the manager against the return for the benchmark in each sector. Matson's return in the consumer durables sector was 2% versus 3% for the benchmark, so he did not outperform the benchmark for security selection in this sector. However, the return for the manager in the technology sector was 2.6% versus –2% for the benchmark, so he did outperform the benchmark for security selection in this sector.

No calculations are needed to reach the conclusions just listed. However, the selection effect can be calculated by multiplying the difference between the portfolio and benchmark return in each sector by the benchmark's weight. For the consumer durables sector, it is (2.0% − 3.0%) × 35% = –0.35%. For the technology sector, it is (2.6% + 2.0%) × 16% = 0.736%. (LOS 35.h)

4. **B**   To answer this question, multiply the difference in weightings for the manager and the benchmark by the difference in returns for the manager and the benchmark in each sector. In the agricultural sector, this is (4% − 6%) × (–2% + 1%) = 0.02%. In the utilities sector, this is (12% − 10%) × (4% + 2%) = 0.12%. (LOS 35.h)

Module Quiz 35.3

1. style return = B − M = 9.1% − 8.5% = +0.6%

   active management return = P − B = 8.9% − 9.1% = –0.2%

   The positive style return tells us small-cap stocks outperformed the market as a whole.

   However, the negative active management return tells us Rhombus has underperformed its benchmark for the evaluation period in question. Consistently underperforming the benchmark would bring Rhombus's investment management skills under question. (LOS 35.k)

2. The median manager is not a valid benchmark because that manager cannot be specified in advance and is not investable. It is not a passive alternative to active management. The only benchmark characteristic it meets is it can be measured after the fact. (LOS 35.j)

Module Quiz 35.4

1. In calculating the traditional standard deviation, all returns for the measurement period are used (e.g., all the positive and negative alphas). This is like looking at the entire normal distribution, with the benchmark return as the center of the distribution. Negative alphas would fall to the left of the benchmark return, and positive alphas would fall to the right.

The manager is arguing that only negative alphas are relevant for measuring risk. This would be analogous to using only the left half of that normal distribution. Using the Sortino ratio compensates for this by only using returns below a designated level.

Excess return for the Sortino ratio (the numerator) is calculated as the portfolio return less the minimum acceptable portfolio return (MAR). The denominator of the ratio is the standard deviation of returns calculated using only returns below the MAR. The motivation behind the downside measure of volatility utilized in the Sortino ratio is the sense that very good performance (high returns) can unfairly inflate the volatility measure (the standard deviation used as the risk measure). (LOS 35.o)

2. **C** If, during an up market, the manager earns 4% and the benchmark earns 3%, the upside capture is 133.3%. If, during a down market, the manager earns –4% and the benchmark earns –8%, the downside capture is 50%. Therefore, the capture ratio is about 2.67 (133.3% / 50%). (LOS 35.n)

READING 36: INVESTMENT MANAGER SELECTION

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EXAM FOCUS

The investment manager selection process involves both quantitative and qualitative considerations, although the focus in the reading is primarily qualitative. Some topics in the reading (e.g., returns-based and holdings-based style analysis, and pooled investment vehicles) are covered in other areas of the curriculum or were covered in previous levels (e.g., Type I and II errors), which should allow for more efficient coverage of the material. Key areas of focus for the exam include Type I and II errors, capture ratios and drawdowns, and computing performance-based fees.

MODULE 36.1: MANAGER SELECTION PROCESS

▶

Video covering this content is available online.

LOS 36.a: Describe the components of a manager selection process, including due diligence.

CFA® Program Curriculum, Volume 6, page 246

Due diligence is the analysis and investigation in support of an investment decision, action, or recommendation. Due diligence on investment managers must emphasize the sources and reasons behind the actual returns generated in the past. Then there must be an evaluation on the probability of repeatedly earning sufficient or better returns in the future using the same investment process. Overall, due diligence must consist of manager universe, quantitative analysis, and qualitative analysis.

Manager Universe

The manager universe consists of only those managers who are *suitable* for the portfolio in terms of the objectives and constraints of the IPS, invest in the relevant *style* (e.g., value, growth, mixed) desired by the client, and will manage the portfolio with the appropriate balance between *active versus passive* approaches.

This is a process of elimination that must carefully balance having too many or too few managers in the candidate pool from which to make a selection. The purpose of the manager search is crucial. For example, the desire for a specific new strategy or risk exposure will involve trying to find the best manager for that strategy or exposure. Or the inclusion of a new manager to diversify an existing portfolio would require a manager who could complement the existing holdings. The terms "best" and "complement," for example, have an aspect of subjectivity that must be looked at in the context of the IPS.

The search usually begins by establishing the role for the potential manager within the portfolio and that is defined by the benchmark. The benchmark can be determined using one or more of: third-party categorization, returns-based style analysis, holdings-based style analysis, and manager experience. With third-party categorization of managers provided by database or software providers, the problem is that the provider's definition may not be the same as that definition for the purposes of the role within the portfolio. Manager experience can be ascertained by analyses of holdings within the manager's portfolios as well as past returns. Returns-based and holdings-based style analyses will be examined in greater detail later.

At the manager universe stage, there should not be any performance assessment; that will occur later during quantitative analysis. Instead, there must be an emphasis on the manager's risk profile and whether or not it is a good fit for the portfolio's requirements. The universe of managers is constantly changing as strategies change and as managers come and go.

Quantitative Analysis

The manager's performance should be evaluated objectively in terms of the distribution of past returns. Through performance *attribution and appraisal,* one can distinguish between managerial skills versus luck (e.g., external market factors). The *capture ratio* would examine performance in both good and weak market conditions. Finally, one must check for any significant *drawdowns* (i.e., peak-to-trough decline in percentage terms for a specific time period).

Qualitative Analysis

Two important issues arise in qualitative analysis: (1) What is the likelihood that the same level of returns will continue in the future? (2) Does the manager's investment process account for all the relevant risks? Those two issues will be elaborated somewhat here.

Continuity of returns can be assessed by looking at the four Ps—philosophy, process, people, and portfolio. In short, the *philosophy* focuses on a specific area of market inefficiency to earn excess returns. Then the *process* and *people* will determine whether the strategy is feasible and if it is possible to execute the strategy with the given knowledge and skills of the employees. Finally, the *portfolio* must be built in a way that is congruent with the philosophy and process.

Risk assessment considers the *firm* and whether it is robust and performing well, and its likelihood of remaining a going concern. Examining the *process and procedures* of the firm involves aspects such as the quality of the back office, the ability to safeguard assets, and the ability to prepare useful reports on a timely basis. Going into such detail with operational due diligence is meant to determine any risks not evident in the firm's past returns and to determine the firm's sustainability. The proposed *investment vehicle* must be assessed for suitability within the portfolio and the *terms* of the manager contract must be reasonable and relevant in context of the investment strategy and vehicle. Finally, continual *monitoring* of the manager is needed to ensure the manager continues to be the appropriate one for the portfolio.

LOS 36.b: Contrast Type I and Type II errors in manager hiring and continuation decisions.

Type I and II Errors

In making decisions on whether to hire a new manager or to keep or fire an existing manager, hypothesis testing can be used. The null hypothesis (H_0) is that there is no value added, therefore, to demonstrate that it is value added on a statistically significant basis, the calculated test statistic would have to be large enough so that the null hypothesis would be rejected.

As a result, there could be a Type I error whereby the null hypothesis is rejected, when in fact, there was no value added. In other words, the hired or kept manager did not demonstrate sufficient skill. Alternatively, there could be a Type II error whereby the null hypothesis is not rejected, when in fact, there was value added. In other words, the manager who was not hired or the manager who was fired did demonstrate sufficient skill. Figure 36.1 summarizes Type I and II errors.

Figure 36.1: Type I and Type II Errors

		Realization	
		Below expectations (no skill)	At or above expectations (skill)
Decision	Hire/Retain	Type I	Correct
	Not Hire/Fire	Correct	Type II

Type I errors receive much more attention than Type II errors. One reason may relate to the notion of regret aversion by the decision maker, which is linked to an error of commission (a Type I error). Errors of commission are active decisions that result in explicit (or visible) costs. In contrast, Type II errors are errors of omission, so they result in implicit or opportunity (less visible) costs. Another reason is that Type I errors are easier to determine; for example, a manager's relative performance can be measured against a benchmark. Such performance also impacts the decision maker's compensation so additional care would be taken to reduce the risk of a Type I error. In contrast, Type II errors are difficult to determine; for example, how can one objectively determine how a manager (who was not hired) would have performed? Finally, Type I errors are much more visible to clients who can easily determine that their investments have underperformed the benchmark over a specific time period, for example. In contrast, clients are less likely to follow or monitor managers who are not hired or who are fired to determine if such managers would have added value over the same time period.

Preventing Type II Errors

An excessive number of Type II errors would be indicative of a problem with the hiring and firing of managers. The obvious solution to minimizing Type II errors would be to track the subsequent performance of managers who were not hired as well as those who were fired. For example, what are the characteristics of the managers who are selected versus those who are not selected and are those characteristics of the selected managers consistent with the portfolio investment objectives? As well, what are the characteristics of the managers who are retained versus fired, and again, are the characteristics of the retained managers consistent with the portfolio investment objectives? Ultimately, it is important not to hire or fire managers because of short-term performance or because of behavioral biases.

Costs of Type I and II Errors

Type I errors result in costs associated with retaining managers who are weak, while Type II errors result in costs associated with not retaining managers who are strong. Therefore, assuming two separate groups of managers (e.g., strong and weak), the greater the differences in sample size and mean, the greater the costs of Type I and II errors. The wider the dispersion of returns between strong and weak managers, the easier it is to distinguish between their relative skills. Therefore, it makes it less likely to have a Type I or II error which results in a lower expected cost of a Type I or II error.

In an efficient market, the dispersion of return distributions between the two groups is probably smaller due to greater difficulty in achieving alpha through active management, which would lessen the costs of hiring or retaining weak managers (Type I error).

If markets are mean-reverting, then Type I errors may occur when firing a poor performer, only to have performance improve subsequently or hiring a strong performer only to have performance deteriorate subsequently (Note: That is not a Type II error because the assumption is that the poor and strong performers have been accurately determined initially but it is the mean-reversion of the markets that leads to the Type I error). Type II errors occur in mean-reverting markets when strong managers are retained for too long (e.g., they subsequently underperform when the market goes down) or managers who have weaker short-term performance (but have sufficiently strong long-term performance) are not hired and they subsequently outperform when the market goes up.

MODULE QUIZ 36.1

To best evaluate your performance, enter your quiz answers online.

1. Quantitative analysis of the manager selection process includes:
   A. defining the universe.
   B. evaluating a performance appraisal.
   C. performing investment due diligence.

2. The difference in expected cost between Type I and Type II errors is:
   A. higher the lower the perceived difference between the distribution of skilled and unskilled managers.
   B. lower the greater the perceived difference between the distribution of skilled and unskilled managers.
   C. higher the greater the perceived difference between the distribution of skilled and unskilled managers.

3. A return distribution of skilled managers that is not distinct from the return distribution of unskilled managers, *most likely* implies a:
   A. highly inefficient market.
   B. low opportunity cost of not hiring a skilled manager.
   C. high opportunity cost of not hiring a skilled manager.

MODULE 36.2: APPROACHES TO MANAGER ANALYSIS

Video covering this content is available online.

LOS 36.c: Describe uses of returns-based and holdings-based style analysis in investment manager selection.

CFA® Program Curriculum, Volume 6, page 252

Style Analysis

Style analysis examines the manager's risk exposures (e.g., industry, concentration, capitalization) in relation to an appropriate benchmark and the changes in those exposures over time. The risk exposures allow for the classification of managers (e.g., value, growth) by style for selection purposes and to perform returns-based style analysis (RBSA) and holdings-based style analysis (HBSA). Once RBSA and HBSA have been performed, congruence between the output and the investment process is crucial to ensure the process can be replicated consistently in the future. Monitoring the RBSA and HBSA output over time can help to detect style drift, whereby the manager's actions are deviating from the manager's stated style.

Style analysis is relevant when comparisons can be made over time and between different managers, when it is done on a timely basis, when the risks analyzed are the key sources of the manager's risk and return, and when the reported amounts are consistent with the manager's actual risk exposures. Style analysis works best for publicly traded investments with frequent pricing data. For less liquid investments, style analysis can still be used to generate questions in the due diligence process. In sum useful style analysis must be *meaningful*, *accurate*, *consistent*, and *timely*.

RBSA

RBSA estimates the portfolio's sensitivities to security market indexes for a set of key risk factors. One complication of RBSA is that the risk factors are estimated rather than using predetermined style categories. However, the approach is top-down in nature and little additional data is needed to perform the analysis so the computational approach is relatively easy. RBSA can determine the key risk factors and return drivers for basic and complex strategies. Also, RBSA uses objective data and allows for comparability between managers and through time. Finally, RBSA can be performed on a timely basis (e.g., right after the data is released).

RBSA lacks precision since it essentially assumes that there is a static portfolio for the period. As a result, it makes it difficult to ascertain the impact of multiperiod investment decisions for a given period, and could alter the breakdown of the sources of value added. The portfolio may also contain illiquid securities, so stale prices could understate risk exposure. When performance is computed based on appraisals of ongoing projects and the internal rate of return of cash distributions (e.g., venture capital and private equity), the short-term volatility may be understated. A manager's true return standard deviation is best gauged over a longer time period. Finally, reporting timeliness will decrease in the presence of illiquid or nontraded securities due to the longer time required for pricing.

HBSA

HBSA looks at the actual securities included in the portfolio at one time. That allows one to estimate the current risk exposures using a more security-specific (bottom-up) approach. Many of the advantages are the same as for RBSA (e.g., determine key risk factors and return drivers, comparability between managers and through time, performed on a timely basis). Overall, HBSA is most appropriate for equity-based strategies.

A key drawback of HBSA is the increased computational requirement as complexity increases and transparency decreases. HBSA uses a point in time analysis format that may not

be useful in projecting into the future or if the portfolio has high turnover. Similar to RBSA, the presence of illiquid and nontraded securities results in stale pricing and that could understate risk exposure as well as decrease reporting timeliness.

LOS 36.d: Describe uses of the upside capture ratio, downside capture ratio, maximum drawdown, drawdown duration, and up/down capture in evaluating managers.

CFA® Program Curriculum, Volume 6, page 255

Capture Ratios

Capture ratios determine how suitable a manager is with respect to the investor's risk tolerance and time horizon. The **upside capture ratio** (UC) looks at capture when the benchmark has a positive return. Based on the benchmark return, UC that is higher (lower) than 100% is indicative of outperformance (underperformance). Conversely, the **downside capture ratio** (DC) looks at capture when the benchmark has a negative return. Based on the benchmark return, DC that is lower (higher) than 100% is indicative of out- (under-) performance.

The **capture ratio** (CR) = UC ratio / DC ratio. The CR is a measure of return asymmetry, > 1 = positive asymmetry (convex shape), and < 1 = negative asymmetry (concave shape).

In examining positive asymmetry (convex shape), the question is whether the investment strategy is naturally convex or if the convexity occurs because of manager skill. With the former, consider an example of a hedging strategy that involves buying a series of out-of-the-money puts prior to severe market downturns. The result is positive asymmetry with many small losses (low DC ratio) due to the puts expiring worthless with far fewer large gains in this scenario (high UC ratio). With the latter, consider an example of a long-only equity strategy requiring active management to minimize losses and maximize gains. That requires manager skill, but may not result in consistent positive asymmetry.

When betas are increasing (decreasing), momentum-driven strategies should have higher (lower) UC than value-driven strategies. A low-beta (high-beta) strategy will have lower (higher) UC and DC. Therefore, CRs can be used to confirm the investment strategy.

Drawdown

Drawdown is the total peak-to-trough loss for a specified time period; maximum drawdown is the largest peak-to-trough loss during that time period. Large drawdowns are not appropriate for investors approaching the end of their investment horizon. **Drawdown duration** is the total time from when the drawdown begins to when the total drawdown recovers to zero (the latter achieved with offsetting gains).

In comparing a long-only strategy (100% invested in S&P TR Index) versus a low-beta strategy (50% in S&P TR Index, 50% in 90-day T-bills), it is quite possible for the low-beta strategy to outperform the long-only strategy on a risk-adjusted returns basis. In other words, a low-beta strategy may have lower absolute returns but the lower risk in the form of lower drawdowns may result in better risk-adjusted returns.

Drawdowns are useful for identifying poor or poorly executed investment strategies, weak internal controls, and operational problems. Significant or extended drawdowns could cause a manager to utilize self-preservationist tactics that could harm the investors.

There is a fine line between risk management versus self-preservation. For example, it may be prudent to immediately sell assets with unrealized losses in a market downturn, because those losses may become worse later due to a fundamental change in the asset. It might be risky to sell assets in a market downturn should there be a subsequent reversal. The question is whether the manager acted properly in accordance with the IPS, acted for self-preservation reasons, or had a sudden overreaction.

In applying the concept of drawdown to the IPS, those investors with shorter time horizons and lower risk tolerance with less time to recover from losses should invest with managers with smaller and less extended drawdowns.

MODULE QUIZ 36.2

To best evaluate your performance, enter your quiz answers online.

1. Which of the following statements is *least likely* an advantage of HBSA over RBSA?
   A. HBSA is a more precise tool.
   B. HBSA is generally easier for equity strategies.
   C. The data required for HBSA is generally easier to obtain.

2. A manager whose relative performance is better during market upturns *most likely* has a capture ratio that is:
   A. equal to one.
   B. less than one.
   C. greater than one.

MODULE 36.3: EVALUATING MANAGERS

LOS 36.e: Evaluate a manager's investment philosophy and investment decision-making process.

CFA® Program Curriculum, Volume 6, page 259

Investment Philosophy

The entire investment process should be driven by a succinct and precise investment philosophy. Some managers believe that markets are very efficient and that active management will underperform after considering all related costs. Therefore, those managers will execute passive strategies and attempt to earn risk premiums instead. **Risk premiums** are risk-free returns that are earned by bearing undiversifiable risks. To earn risk premiums, passive strategies will target one or more specific systematic risk factors including equity risk, credit risk, liquidity risk, and volatility risk.

In contrast, active strategies take the position that markets are inefficient and can allow for those inefficiencies to be exploited when market prices of securities deviate from their intrinsic values.

There are two broad types of inefficiencies to be considered: behavioral and structural. *Behavioral inefficiencies* are mispricings caused by other investors and their behavioral biases (e.g., trend-following). The mispricings are very short-term in nature and therefore, must be quickly exploited (sometimes within seconds) prior to the market correction. *Structural inefficiencies* occur because of laws and regulations, which can make them long-term in nature. Active strategies often believe in the value of diversification for risk

management purposes and believe in the notion of market prices converging to intrinsic value. With the latter, the idea is to exploit the incongruence prior to convergence.

Whatever the investment philosophy, it is necessary for the manager to be able to convey the underlying assumptions in a clear manner. Going deeper, do the assumptions make sense and are they congruent with the investment process? For example, the belief of inefficient markets would not be congruent with a passive approach. Furthermore, has the philosophy remained constant over time, thereby making it repeatable? If not, have the changes in philosophy been logical in view of market changes or have they merely been reactionary based on short-term performance? The former would support the repeatability of the process while the latter would not. Finally, is the inefficiency being exploited more of an informational advantage or more of a *structural inefficiency*? The former is more short-term in nature and likely less repeatable, while the latter is more long-term in nature and likely more repeatable.

Assuming there is a valid inefficiency to exploit, there is the related issue of capacity. Capacity refers to the amount, repeatability, and sustainability of the inefficiency. For example, the inefficiency must provide enough excess returns to cover transaction costs and fees. If leverage is required, then borrowing costs must be considered. Also, is the inefficiency repeatable or just a one-time opportunity? Finally, what minimum asset level is required in order to earn a sufficient return from the inefficiency? Therefore, sustainability depends on market depth and liquidity and the amount of capital that can be set aside to exploit the inefficiency.

Investment Decision-Making Process

Idea Generation

An investment signal may be a piece of information that can be used to establishing an investment position to exploit an inefficiency. To effectively exploit inefficiencies, investment strategies must utilize unique information to have an informational advantage over other market participants. Additionally, that information must be obtained and used on a very timely basis as it is frequently the case that the window of opportunity to exploit is very short. Finally, the investment manager must have superior cognitive or interpretive skills with regards to utilizing the information.

Idea Implementation

Here the investment idea is transformed into an investment position (i.e., signal capture). Two key concerns include the repeatability of process and its congruence with the investment philosophy plus the determination and approval of the investment position.

Portfolio Construction

A fundamental question is what kinds of securities are used to construct the portfolio. For example, if derivatives are used, then is the manager sufficiently knowledgeable and experienced with derivatives to adapt to changing markets?

The portfolio allocations may be done quantitatively or qualitatively. Either way, the allocations must make sense in view of the investment philosophy. For example, a passively managed portfolio should not have excessive turnover. The allocations should also account

for the manager's views, therefore, performance maximization would occur by overweighting the expected outperformers and underweighting the expected underperformers. A related issue is the allocation of long and short positions—they may be paired or determined separately. If they are paired, then proper position sizing will eliminate market risk. At the same time, it will allow for the exploitation of inefficiencies prior to the convergence of market prices with intrinsic values.

Assets under management (AUM) will likely increase over time, therefore, the underlying positions may need to be adjusted (e.g., liquidity constraints) to allow for greater AUM.

Stop losses are orders to sell a security once it reaches a certain price and can be an important risk management tool. Hard or soft stop losses may be used. The former involve automatic dispositions when a specific loss threshold is met and the latter involve subjective evaluations when a specified loss threshold is met. As well, hedges are used to manage risk so information about how they are implemented, the financial instruments used to hedge, and the determination of hedge ratios, is necessary.

With liquidity, it should be determined whether the manager is a net supplier or demander of liquidity. Either way, care must be taken to ensure that the portfolio can react appropriately to changing market conditions or investor liquidity requirements. A portfolio that has too many illiquid securities may be faced with high exit costs in addition to the usual high transaction costs. There is also the risk of having to sell securities at depressed prices if funds are suddenly required by the investor. Therefore, in assessing liquidity, there should be an analysis of how much of the portfolio can be liquidated in five days or less (more liquid and therefore, greater flexibility) and well as how much needs more than 10 days to liquidate (less liquid and therefore, subject to higher transaction costs). A calculation of average daily volume (weighted by portfolio position size) is also necessary. Finally, there should be the determination of any security where the firm owns more than 5% of its total market capitalization as that would suggest some liquidity problems if the entire position needed to be disposed of suddenly.

Portfolio Monitoring

The monitoring process looks at external factors such as the general economy and financial markets and their impact on how the manager may exploit relevant inefficiencies. It also looks at internal factors such as historical returns, risk level, and allocations. There is a check for any significant deviations from the investment process (e.g., style drift) and to ensure that investment decisions are congruent with the most up-to-date client objectives.

LOS 36.f: Evaluate the costs and benefits of pooled investment vehicles and separate accounts.

CFA® Program Curriculum, Volume 6, page 268

Separately managed accounts (SMAs) and pooled investment vehicles are used to execute investment strategies. Pooled vehicles bring together the funds from all investors into one portfolio (e.g., mutual funds, ETFs, hedge funds) and there is no customization for any specific investor. SMAs hold the funds of one investor in a separate account so a key analysis is the cost-benefit trade-off of holding investments in a SMA. As well, one must ensure the manager has the capability and resources to manage the SMA.

Compared to pooled investments, SMAs have higher transaction costs but provide control, customization, tax efficiency, separate reporting, and greater transparency. The *control* is in the form of direct and legal ownership of the underlying securities by the investor. Therefore, there is extra protection given to the investor in case of a liquidity event or bankruptcy of the manager. As well, unlike pooled investments, the investor is not impacted by the redemption demands of other investors. In terms of *customization*, SMAs allow for the tailoring of client-specific objectives and constraints. *Tax efficiency* could be higher in SMAs because there is only payment of realized capital gains required; for pooled investments, payment of accrued taxes on unrealized gains may be required. Investing strategies for SMAs can be tailored to minimize taxes paid by the individual investor. In terms of transparency, SMAs can provide an instantaneous snapshot or dashboard view of the investment holdings at any given point. Pooled investments may be able to do so but probably with a delay.

Customized SMAs require an extra layer of due diligence to evaluate security selection, portfolio construction, and operational issues. Cost-wise, SMAs have fixed costs that must be borne entirely by the one investor and cannot be spread amongst multiple investors in the case of pooled investments. For pooled investments, the incremental costs of adding additional investors are relatively low (e.g., custody, reporting) whereas SMAs require a separate account for each investor. Trading costs are relatively higher for SMAs because trades cannot be aggregated (e.g., buy and sell trades amongst multiple investors) to reduce trading volumes. A customized SMA will differ from the benchmark so it creates tracking risk due to investor constraints instead of manager actions. Customized SMAs are subject to micromanagement risk on the part of the investor and that makes it difficult to determine the true value added by the manager (if any). Investors may be subject to trend chasing, avoidance of unfamiliar investments, and not understanding the benefits of hedging (which often involve sacrificing some returns).

MODULE QUIZ 36.3

To best evaluate your performance, enter your quiz answers online.

1. Passive strategies earn risk premiums based on bearing:
   A. systematic risk only.
   B. unsystematic risk only.
   C. both systematic and unsystematic risk.

2. Which step in the investment decision-making process focuses on the attributes of information in exploiting inefficiencies?
   A. Signal capture.
   B. Signal creation.
   C. Portfolio construction.

3. One reason for an investor to choose a separately managed account over a pooled investment vehicle would *most likely* include the investor:
   A. is tax exempt.
   B. desires lower costs and fees.
   C. desires real-time details on investment positions.

MODULE 36.4: MANAGER CONTRACTS AND FEES

LOS 36.g: Compare types of investment manager contracts, including their major provisions and advantages and disadvantages.

Although investment contracts cover a wide variety of terms, the focus here will be on liquidity and management fees, in context of what is most suitable for the investor's needs.

Liquidity

Closed-end funds and ETFs have the highest liquidity because they are traded intra-day. Open-end funds offer almost as much liquidity in that they are traded based on end-of-day NAV only.

Investments held in limited partnership structures (e.g., hedge funds, private equity, and venture capital) usually involve investment capital that is tied up for more time. For example, hedge fund liquidity involves redemption frequency, lockup periods, notification periods, and gates. Redemption frequency refers to how often the investor may withdraw funds, and the notification period refers to the amount of advance notice required by the investor for a redemption. The lockup period refers to the period immediately following the initial investment, where funds may not be withdrawn. A hard lock does not permit redemptions, while a soft lock permits redemptions for a fee. Gates provide for a limit in the redemption amount for any given redemption.

Private equity and venture capital funds have the lowest liquidity because of capital calls; investors only receive returns after about five years into the 10-year average life of the funds. The manager may extend the life of the fund for up to two one-year periods, which further lowers liquidity.

Key advantages of limited partnership terms include ability to have a long investment horizon, thereby not allowing investors to overreact to short-term aberrations. As well, allowing for the earning of illiquidity premiums by investing in illiquid assets and not being forced to sell assets at depressed prices due to redemption requests.

Key disadvantages of limited partnership terms include the impaired ability to change portfolio allocations in response to changes in the market. As well, the impaired ability to meet sudden liquidity demands.

With SMAs, the liquidity is determined by the liquidity of the underlying assets, as the securities can be sold at any time

Management Fees

Managers charge fees to cover their fixed and variable costs as well as to earn a profit. The average asset-weighted expense ratio paid by mutual investors has declined substantially over the years as investors have increasingly allocated to no-load mutual funds and index funds which have lower fees.

Mutual fund fees are often based on AUM. In some cases, minimum balances are required. Fees can be structured as a fixed dollar amount or on the basis of a percentage of assets. The fee structure (e.g., AUM, performance-based) is important to ensure that managers work to the advantage of the investors. It could be argued, however, that even in the absence of incentives, managers will still work to the advantage of the investors to retain them and potentially gain new investors. However, the fee structure may result in a misalignment of the principal and the agent's interests. For example, the investor does not always see the full extent of all the work the manager is doing; or the investor and manager may have different

opinions on how to interpret time horizons or investment losses. Additionally, overall investment performance has a strong element of luck, so in theory, the manager should not be rewarded for it.

An advantage of the investor paying fees based on AUM is that it rewards based on the manager's skill and ability to grow the asset base. Many managers have declining percentage fees for larger accounts, so the AUM fee percentage is reduced with increased asset size, which reduces investors' fees. Unfortunately, luck may play a significant role in the short-term growth of assets. Another disadvantage is that once the assets are attained by the managers, there is more incentive to retain the assets and earn the AUM fees (e.g., engage in safe strategies, such as indexing) rather than take risks for the benefit of the investor.

LOS 36.h: Describe the three basic forms of performance-based fees.

CFA® Program Curriculum, Volume 6, page 271

Basic Forms

Performance-based fees are a form of risk sharing between the investor and the manager in order to align their interests. They are computed on the basis of total or relative return. The fees (using a sharing percentage) could be based on total performance or performance in excess of a base.

There are three basic forms of performance-based fees:

- Symmetrical structure with full upside and downside exposures.
  - Fee = base + performance sharing
  - The greatest alignment between investor and manager incentives but increased risk to manager due to the full downside exposure
- Bonus with full upside and limited downside exposures.
  - Fee = Greater of: (1) base, (2) base + sharing of positive performance
- Bonus with limited upside and downside exposures.
  - Fee = Greater of: (1) base, (2) base + sharing of positive performance (within limit)

Performance-based fee structures transform symmetrical gross active return distributions into asymmetrical net active return distributions. The result is lower relative variance on the upside versus the downside. Therefore, by using a symmetrical risk measure such as standard deviation, there could be an underestimation of downside risk.

Performance-based fees benefit investors since they will pay relatively lower performance-based fees (rather than relatively higher standard fixed fees) in the case of low active returns. Such fees benefit managers, as they may incentivize them to increase their efforts to benefit the investor's portfolio and to increase their own compensation. However, all three structures have in common the fact that base fees are paid even when the manager underperforms.

Some investments have no limits on performance fees. In some cases, performance fees could be tempered to include high-water or clawback provisions (e.g., hedge funds) that will offset prior period negative returns from current period positive returns, for example. For private equity partnerships, the investors are structured as limited partners and the manager as the general partner. A beneficial term for the investors is one that stipulates the repayment of
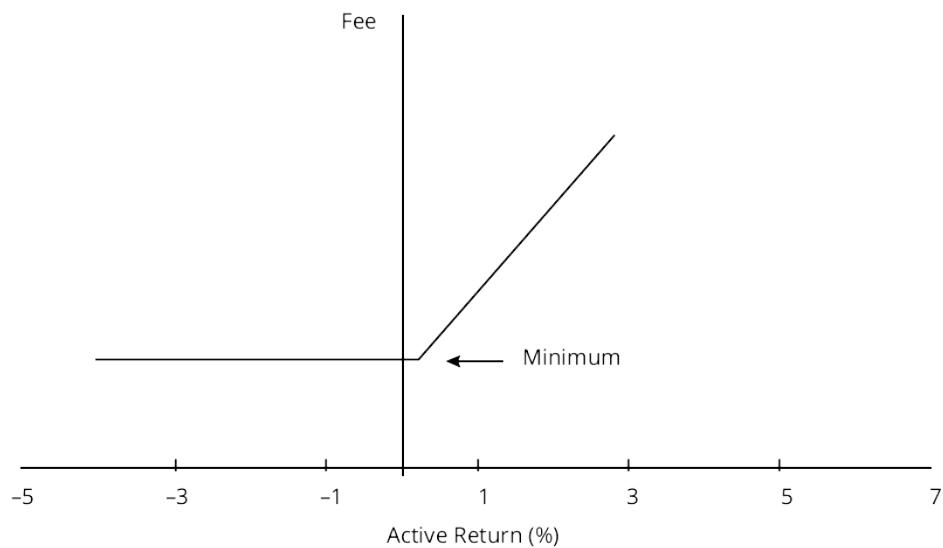
principal and share of profits to the limited partners prior to any payment of performance fees to the general partner.

In negotiating fee agreements, only the most successful managers or the ones with limited capacity can command the highest base fees and/or the highest sharing percentages.

Call Option
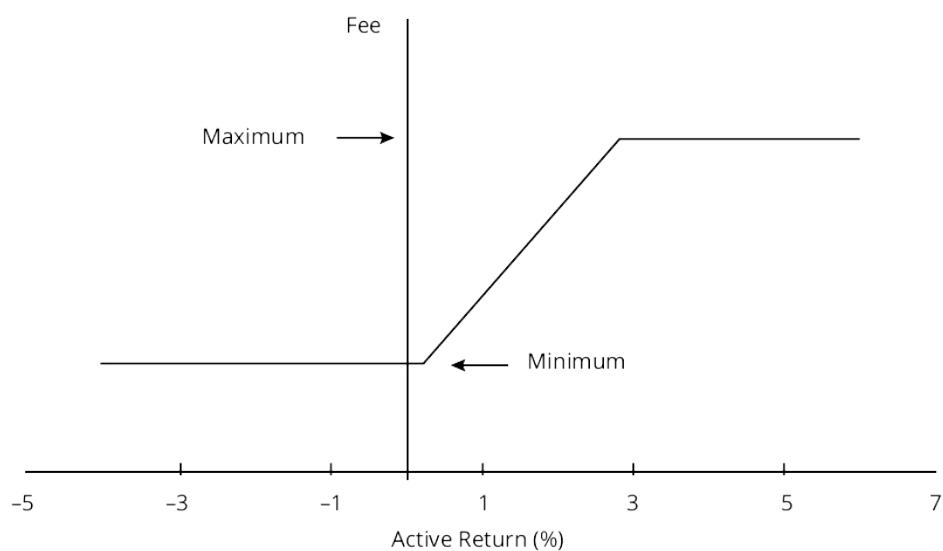
The previous bonus fee structures are analogous to a manager having a long position in a call option on the portfolio active return. The exercise price would be the base fee. See Figure 36.2 for a graphical representation. The payoff to the manager is theoretically unlimited.

Figure 36.2: Payoff Line of Sample Performance-Based Fee Schedule 1

In Figure 36.3, there is the addition of a short position in a less valuable call option with an exercise price equal to the maximum fee (assuming such a provision is applicable).

Figure 36.3: Payoff Line of Sample Performance-Based Fee Schedule 2

Based on the this discussion, a net long position in a call option on portfolio active return, would cause a manager to take more risk since option pricing theory states that higher volatility increases option value. Therefore, it is recommended that managers be both penalized for taking too much risk and rewarded for earning higher risk-adjusted returns.

Other issues

LOS 36.i: Analyze and interpret a sample performance-based fee schedule.

CFA® Program Curriculum, Volume 6, page 273

A sample performance-based fee schedule is illustrated in Figure 36.4.

Figure 36.4: Sample Performance-Based Fee Schedule

Panel A. Sample Fee Structure

Standard fee	0.50%
Base fee	0.25%
Sharing*	20%
Breakeven active return	1.50%
Maximum annual fee	0.75%

Panel B. Numerical Examples for Annual Periods

	Active Return		
	≤ 0.25%	1.50%	≥ 2.75%
Billed fee	0.25%	0.50%	0.75%
Net active return	≤ 0.00%	1.00%	≥ 2.00%

* On active return, beyond base fee.

Based on the details in Panel A and the summary calculations in Panel B of Figure 36.4, the fee is a bonus with limited upside (maximum billed fee) and downside (minimum billed fee) exposures. There is symmetry within the active return range of 0.25% and 2.75% and centered around a breakeven active return of 1.50%. In calculating the breakeven return, we have the following:

(1.50% – 0.25%) × 20% = 0.25% performance fee

Adding the performance fee to the base fee of 0.25% results in a total billed fee of 0.50%, which is the same as the standard fee of 0.50%.

At an active return of 0.25% or less, the performance fee is zero (the nonnegativity constraint frequently encountered in practice prevents the performance fee from being negative).

In that case, the billed fee is simply the base fee of 0.25%. At an active return of 2.75% or more, the performance fee is maximized at 0.50%, and so the billed fee is a maximum of 0.75%.

MODULE QUIZ 36.4

To best evaluate your performance, enter your quiz answers online.

1. Which investment fund generally has the *least* amount of liquidity?
   A. Hedge fund.

      B. Closed-end fund.
      C. Private equity fund.

2. Which of the following fee structures *most likely* has no impact on the volatility of a portfolio's net returns?
      A. Incentive fees only.
      B. Management fees only.
      C. Neither incentive fees nor management fees.

3. Fund X earns a –3% gross return for the year. The computed management fee is equal to a base fee of 2% plus a 20% sharing of both positive and negative performance. The sharing is based on return net of the base fee. What is Fund X's total management fee for the year?
      A. 1.0%.
      B. 1.4%.
      C. 2.0%.

4. Fund Y earns a gross return of 12% for the year, while the relevant benchmark earns 3%. The computed management fee is equal to the higher of either a base fee of 0.4%, or base plus a 20% sharing of positive performance, up to a maximum annual fee of 2.9%. The sharing is based on active return. What is Fund Y's total management fee for the year?
      A. 2.2%.
      B. 2.8%.
      C. 2.9%.

KEY CONCEPTS

LOS 36.a

In the context of investment manager selection, due diligence consists of manager universe, quantitative analysis, and qualitative analysis.

The manager universe consists of only those managers who are *suitable* for the portfolio in terms of the objectives and constraints of the IPS, invest in the relevant *style* (e.g., value, growth, mixed) desired by the client, and will manage the portfolio with the appropriate balance between *active versus passive* approaches.

Quantitative analysis focuses on performance attribution and appraisal as well as the analyses of CR and significant drawdowns.

Two important issues arise in qualitative analysis:

- What is the likelihood that the same level of returns will continue in the future?
- Does the manager's investment process account for all the relevant risks?

LOS 36.b

Type I errors occur when the null hypothesis is rejected, when in fact, there was no value added. In other words, the hired or kept manager did not demonstrate sufficient skill. Type II errors occur when the null hypothesis is not rejected, when in fact, there was value added. In other words, the manager who was not hired or the manager who was fired did demonstrate sufficient skill.

Type I errors receive much more attention than Type II errors since the former are errors of commission (more visible) while the latter are errors of omission (less visible). Also, Type I errors are easier to determine than Type II errors.

LOS 36.c

Style analysis examines the manager's risk exposures in relation to an appropriate benchmark and the changes in those exposures over time. The risk exposures allow for the classification of managers by style for selection purposes and to perform RBSA and HBSA.

RBSA is a top-down approach that estimates the portfolio's sensitivities to security market indexes for a set of key risk factors. HBSA is a bottom-up approach that looks at the actual securities included in the portfolio at one time. Many of the advantages of RBSA are the same as for HBSA (e.g., determine key risk factors and return drivers, comparability between managers and through time, performed on a timely basis).

LOS 36.d

The capture ratio (CR) = UC ratio / DC ratio. The CR is a measure of return asymmetry; > 1 = positive asymmetry (convex shape) and < 1 = negative asymmetry (concave shape).

Drawdown is the total peak-to-trough loss for a specified time period; maximum drawdown is the largest peak-to-trough loss during that time period. Drawdown duration is the total time from when the drawdown begins to when the total drawdown recovers to zero (the latter achieved with offsetting gains).

LOS 36.e

The entire investment process should be driven by a succinct and precise investment philosophy. Some managers believe markets are very efficient and will execute passive strategies. Other managers believe markets are inefficient and can allow for those inefficiencies to be exploited when market prices of securities deviate from their intrinsic values; they will execute active strategies. Active managers will look at behavioral inefficiencies (shorter-term; caused by other investors and their behavioral biases) and structural inefficiencies (longer-term; caused by laws and regulations).

The investment decision-making process consists of four steps:

1. Idea generation
2. Idea implementation
3. Portfolio construction
4. Portfolio monitoring

Within portfolio construction, the key issues to consider include allocation, risk management, and liquidity.

LOS 36.f

SMAs and pooled investment vehicles are used to execute investment strategies. Pooled vehicles bring together the funds from all investors into one portfolio and there is no customization for any specific investor. SMAs hold the funds of one investor in a separate account the cost-benefit trade-off of holding investments in a SMA must be evaluated.

Compared to pooled investments, SMAs have higher transaction costs but provide control, customization, tax efficiency, separate reporting, and greater transparency. Customized SMAs require an extra layer of due diligence to evaluate security selection, portfolio construction, and operational issues.

LOS 36.g

Closed-end funds and ETFs have the highest liquidity because they are traded intra-day. Open-end funds offer almost as much liquidity in that they are traded based on end-of-day NAV only.

Investments held in limited partnership structures (e.g., hedge funds, private equity, venture capital) usually involve investment capital that is tied up for more time.

Private equity and venture capital funds have the lowest liquidity because of capital calls; investors only receive returns after about five years into the 10-year average life of the funds. There may be the possibility to extend by the manager for up to two one-year periods, which further lowers liquidity.

With SMAs, the liquidity is determined by the liquidity of the underlying assets.

LOS 36.h and 36.i

There are three basic forms of performance-based fees:

- Symmetrical structure with full upside and downside exposures
  - Fee = base + performance sharing
  - The greatest alignment between investor and manager incentives but increased risk to manager due to the full downside exposure
- Bonus with full upside and limited downside exposures

- Fee = Greater of: 1) base, 2) base + sharing of positive performance
  - Bonus with limited upside and downside exposures
    - Fee = Greater of: 1) base, 2) base + sharing of positive performance (within limit)

Module Quiz 36.1

1. **B** Quantitative analysis includes attribution and appraisal (as well as an analysis of the capture ratio and drawdown). Defining the universe is a separate step in the manager selection process, and investment due diligence is a component of qualitative analysis. (LOS 36.a)

2. **C** The greater the difference in the distribution between skilled and unskilled managers, the greater the opportunity cost of retaining and cost of hiring an unskilled manager. (LOS 36.b)

3. **B** When two distributions are not distinct, the unskilled managers are not expected to significantly underperform the skilled managers, implying a low opportunity cost of not hiring skilled managers. Inefficient markets are likely to exhibit larger differences of returns between skilled and unskilled managers. (LOS 36.b)

Module Quiz 36.2

1. **C** The data required for HBSA is likely to be more difficult to find than the data required for RBSA.

   HBSA is more precise than RBSA; RBSA is a relatively imprecise tool that does not require a thorough computational effort but that may sacrifice accuracy. HBSA is typically easier for equity strategies. (LOS 36.c)

2. **C** A capture ratio (upside capture divided by downside capture) greater than one indicates the upside capture is greater than downside capture and reflects greater participation in rising markets than in falling markets. (LOS 36.d)

Module Quiz 36.3

1. **A** Passive strategies assume markets are efficient enough that active management does not add value that exceeds its transaction costs and fees. Therefore, the risk premiums being sought are only for bearing risk that is not easily diversified away, which is systematic risk.

   Unsystematic risk is relevant for active strategies only. (LOS 36.e)

2. **B** Signal creation (idea generation) focuses on how investment ideas are generated and information is viewed in context of the efficient market hypothesis to determine whether it can be used to exploit inefficiencies. (LOS 36.e)

3. **C** SMAs can provide an instantaneous snapshot or "dashboard view" of the investment holdings at any given point. Pooled investments may be able to do so, but probably with a delay.

   The tax benefits of a SMA would only accrue to investors who are taxable and would not benefit those who are tax exempt. SMAs generally have higher costs and fees than pooled investment vehicles. (LOS 36.f)

Module Quiz 36.4

1. **C**   Private equity funds have the lowest liquidity because of capital calls. Closed-end funds have the highest liquidity because they are traded intra-day. (LOS 36.g)

2. **B**   Management fees are charged as a fixed percentage based on assets, which results in a lower net return but no impact on the standard deviation of the returns.

   Because incentive fees are charged as a percentage of returns (reducing net gains or reducing net losses), incentive fees lower the standard deviation of returns. (LOS 36.h)

3. **A**   2% + [20% × (–3% – 2%)] = 1%.

   (LOS 36.i)

4. **A**   Higher of: (1) 0.4%, or (2) 0.4% + [20% × (12% – 3%)] = 2.2%

   (LOS 36.i)

READING 37: CASE STUDY IN PORTFOLIO MANAGEMENT: INSTITUTIONAL

Study Session 16

EXAM FOCUS

This case study covers the following issues: capturing the illiquidity premium, managing liquidity, asset allocation, using derivatives or cash for tactical asset allocation, and portfolio rebalancing. There is also some coverage of potential ethical violations in the process of manager selection. Some of the material covered in this reading assumes prior knowledge of alternative investments and other basic portfolio management concepts.

MODULE 37.1: MANAGING LIQUIDITY RISK

LOS 37.a: Discuss tools for managing portfolio liquidity risk.

Video covering this content is available online.

CFA® Program Curriculum, Volume 6, page 292

Liquidity risk refers to a portfolio having to dispose of illiquid securities at a deep discount during troubled markets. Four key methods to manage liquidity risk include (1) liquidity profiling and time-to-cash tables, (2) rebalancing and commitments, (3) stress testing, and (4) derivatives.

Liquidity Profiling and Time-to-Cash Tables

For an endowment, the potential cash inflows and outflows must be determined. Taking the example of a university endowment with sizable holdings of illiquid assets, cash outflows would have to account for distributions to the university as well as capital call requests for certain types of investments such as hedge funds or private equity. Cash inflows would typically include donations and investment income earned from the portfolio.

The next step is to establish a timeline that involves constructing a liquidity classification schedule (time-to-cash table). That schedule would have three distinct components: (1) amount of time needed to convert assets to cash, (2) liquidity classification level, and (3) liquidity budget. An example is provided in Figure 37.1.

Figure 37.1: Time-to-Cash Table

Time to Cash	Liquidity Classification	Liquidity Budget (% of portfolio)
< 1 week	Highly liquid	At least 5%
< 1 quarter	Liquid	At least 25%
< 1 year	Semi-liquid	At least 40%

> 1 year	Illiquid	Up to 40%

The liquidity classification is closely linked to the amount of time it takes to liquidate an investment without having a major impact on markets. The latter would be demonstrated by a minimal differential in the expected market price immediately before and after a sell transaction. In addition, an investment that takes over one year to exit would likely be considered illiquid.

The time to cash may include a full range of periods beyond those illustrated in Figure 37.1, depending on whether they correspond to the investor's cash outflows. The liquidity budget will then provide minimum or maximum percentage allocations for the different time periods. For example, the three more liquid groups state minimum allocations, while the illiquid group states a maximum. Those requirements apply in all market situations, including times when liquidity is constrained; hence, the results of any stress tests are useful in determining the requirements.

To develop the liquidity budget, there must be preliminary work performed in observing the liquidity traits of the investments over a reasonable time period. Within a specific asset class, the various investments could have very diverse liquidity characteristics [e.g., exchange-traded funds (ETFs) may be more liquid than commingled funds]. Additionally, the same type of investment (e.g., commingled fund) may offer different levels of liquidity; one may offer semiannual liquidity because it is focused on small-cap foreign stocks, while the other may offer monthly liquidity because it is focused on large-cap foreign stocks. That is why it is important to analyze the investments in greater detail. An excerpt of a liquidity profile is provided in Figure 37.2.

Figure 37.2: Liquidity Profile

Asset Class	Asset Class Allocation (% of portfolio)	Investment Allocation (% of overall portfolio)	Investment Vehicle	Liquidity Classification			
				Highly Liquid	Liquid	Semi-Liquid	Illiquid
Fixed income	12%	4%	Separate account	100%	0%	0%	0%
		6%	Commingled fund	100%	0%	0%	0%
		2%	Futures	100%	0%	0%	0%
Domestic equity	20%	9%	Commingled fund	0%	50%	50%	0%
		9%	Separate account	0%	100%	0%	0%
		2%	ETF	100%	0%	0%	0%

Rebalancing and Commitments

Rebalancing

In addition to managing liquidity, it is necessary to maintain the overall risk profile within a desired (quantitative) range because over time and during times of market stress, asset values will change—sometimes very dramatically—thus greatly altering the desired balances in each asset class. With rebalancing costs for illiquid investments being very high, it is therefore crucial to maintain enough liquid assets to execute any necessary rebalancing transactions.

Systematic rebalancing policies are designed to maintain the long-term (strategic) asset allocation as much as possible. Examples include calendar and percent-range rebalancing with predetermined acceptable ranges for various asset classes. In attempting to reduce transaction costs, a wider range would be required for more volatile investments. In contrast, a narrow range would incur frequent transaction costs each time the allocation percentage for a given asset class falls outside of its (narrow) range.

Automatic adjustment mechanisms assist in keeping the portfolio risk profile relatively constant if there is a change from the target. For example, assume the portfolio has exposure to market risk relating to private companies and public companies, and that we can use public companies as a proxy for private companies. If the private equity has a beta of 1, and if the private equity allocation falls by 2% relative to the target, then there would be an automatic adjustment to increase the public equity allocation by 2%. That is intended to maintain the level of systematic risk, but of course, it means the level of unsystematic risk (which we can also think of as illiquidity risk) has decreased. The same methodology can be extended to other illiquid asset classes, where the public market can be a reasonable proxy for the private market.

Commitments

Investing in private market funds makes it more difficult for the portfolio to keep a stable or specific allocation level in the long term because within a given fund, the timing and frequency of when the committed capital is drawn and the return of capital distributions are beyond the control of the investor. By investing in multiple funds, however, the timing and frequency becomes more stable.

A multiyear funding strategy tries to determine the right level of annual commitments (investments) from the portfolio to arrive at a long-term optimal exposure to the asset class. That annual amount is derived from extensive quantitative analysis that considers, amongst other things, the estimated rate in which committed capital is drawn, the rate in which distributions are made, and the rate of change of asset size. In the end, there should be a determination of the asset class exposure as a percentage of the total portfolio for several hypothetical commitment levels. Additionally, the use of scenario analysis can take the analysis further to account for various market conditions (e.g., regular vs. stressed). Over time, the level of annual commitments will need to be adjusted as needed.

Stress Testing

Stress testing explicitly considers how the liquidity needs of a portfolio will change during a period of market stress. The idea is to conduct analysis to assume "worst case" or very extreme market conditions and the impact on both assets and liabilities at the same time. For example, for assets, one could make extreme assumptions on volatility (high), returns (low), correlation of returns between assets (high), and liquidity (low). For liabilities, one could assume that the distributions suddenly increase significantly during a period of market stress.

The stress tests can be based on any combination of the following: history, statistical models, and scenario analysis.

Derivatives

Derivatives require far less cash than investing in underlying assets, which makes derivatives an ideal method for rebalancing. In addition, a futures overlay allows for rebalancing of many (but not all) asset classes without altering any of the asset allocations determined by the external active managers.

With leverage, taking a long futures position requires only minimal cash requirements for margin, for example. Therefore, any cash not required for margin can be used to invest in other assets with differing levels of liquidity, or to meet other liquidity requirements. Options can be purchased at premiums that are often only a fraction of the cost of the underlying asset, thereby serving as a form of leverage. Or, options can be sold to earn premium income that helps to generate liquidity.

LOS 37.b: Discuss capture of the illiquidity premium as an investment objective.

CFA® Program Curriculum, Volume 6, page 297

It is often the case that relatively illiquid investments such as private equity and real estate will earn an additional return (over the market return) for taking on the risk of holding up capital for an unknown amount of time. This is known as the illiquidity (or liquidity) premium earned. Studies have shown that the illiquidity premium increases with the amount of time (think of an upward-sloping yield curve, for example).

A different way to model the illiquidity premium is to think of it as the value of a put option where the strike price is the marketable price (a theoretically estimated price, as if it were freely traded) of the illiquid asset when it was purchased. That leads to the computation of the price of the illiquid asset as follows:

illiquid asset price = marketable asset price – put price

Using the marketable and the illiquid prices, we can derive the expected returns for both, and the difference in expected returns would be the illiquidity premium in percentage terms as follows:

illiquidity premium (%) = expected return on illiquid asset (%) – expected return on marketable asset (%)

There are a substantial number of studies to support the positive correlation between illiquidity and expected returns for publicly traded stocks.

In practice, the illiquidity premium is challenging to accurately determine given all the other factors that interact in determining equity returns. In addition, broad market indexes are used to estimate illiquidity premiums, even though the typical investor is not likely to have such a breadth of investment exposure. As a result, the typical investor faces exposure to more unsystematic risk, which means that liquidity budgeting is essential in the balancing act of simultaneously earning excess returns through the illiquidity premium and managing risk.

MODULE QUIZ 37.1

To best evaluate your performance, enter your quiz answers online.

1. A portfolio analyst makes the following two statements:

    Statement 1: The illiquidity premium is relatively easy to determine accurately.

    Statement 2: Calendar and percent-range rebalancing are examples of automatic adjustment mechanisms.

    How many of the analyst's statements are correct?

A. Zero.
B. One.
C. Two.

2. **Describe** how futures and options can be used for leverage and liquidity purposes.

MODULE 37.2: ADDRESSING LIQUIDITY NEEDS

LOS 37.c: Analyze asset allocation and portfolio construction in relation to liquidity needs and risk and return requirements and recommend actions to address identified needs.

CFA® Program Curriculum, Volume 6, page 298

Quadrivium University (QU) Endowment[1]

The Quadrivium University (QU) endowment was set up many years ago with the purpose of offering financial assistance to undergraduate students. The current value of the endowment is $8 billion, and about 75% of that amount has unrestricted use, with the other 25% being subject to donor-specified use restrictions.

QU's annual operating budget is $583 million, and more than two-thirds of that amount covers the remuneration of faculty and administrative staff. The remainder is to cover debt payments, maintenance costs, and provide funds related to research and financial aid. The endowment makes annual distributions to fund about 60% of QU's operating budget, and the dollar amounts have been increasing for each of the past five years. Greater stability in the distributions has been requested by the board of the university, so in that regard, the spending rule was changed after the financial crisis over 10 years ago. Formerly, a simple spending rule existed based on 5% of the market value of the endowment at the beginning of the year. Now, the spending rule incorporates geometric smoothing and is expressed as follows:

(66% × spending for the previous fiscal year) + 34% × (5% × endowment value at the end of the previous fiscal year)

To compute the QU endowment's spending for the current year, the previous year's spending was $358.1 million and the endowment's market value at the end of the previous fiscal year was $7,002.3 million.

(66% × $358.1 million) + 34% × (5% × $7,002.3 million) = $355.4 million

The QU endowment's investment objective is to earn a sufficient return over the long term to cover the annual spending and to maintain the real value of the endowment. At an annual 5% spending rate, 2%–3% annual inflation applicable to universities, and annual donations of 1%, the endowment has an annual nominal return requirement of 8%–9%. The risk objective is between a 12% and 14% annual standard deviation of portfolio returns.

Quadrivium University Investment Company (QUINCO)

A board of trustees ("the Trustees") oversees the activities of QU. The Quadrivium University Investment Company (QUINCO) is the university investment office and is responsible for managing the QU endowment. Aaron Winter is the president of QUINCO, and he reports to the university president and to the QUINCO board of directors ("the Board"). The Board consists of 11 individuals appointed by the Trustees, and the Board deals with approving investment policy and guidelines. QUINCO staff are charged with implementing the investment policy.

QUINCO's 13 investment professionals are officially employed by QU. QUINCO's investment model involves implementation of investment strategy by external managers instead of having in-house investment management. Instead, internal staff deal with asset allocation, risk management, manager selection, and continuation decisions regarding the external managers.

Assets are invested in (1) fixed income, (2) public equity, (3) private equity, (4) real assets (e.g., private real estate, natural resources), and (5) diversifying strategies (e.g., hedge funds). The last three categories comprise alternative investments. Each of the five categories is managed by a senior portfolio manager and an analyst. The other three investment professionals are a portfolio strategist and analyst, who are responsible for asset allocation and risk management, and the president, who serves as the chief investment officer (CIO). The portfolio strategist has ongoing duties involving rebalancing, overlays, and tactical asset allocation (TAA) tilts. Any decisions made by external investment managers and TAA deviations require the approval of the internal investment committee. Winter leads that committee, which includes all senior portfolio managers and the portfolio strategist. Finally, the Board must provide final approval for the hiring of any external managers.

QUINCO Investment Strategy

QUINCO's investment strategy is concerned primarily with the long term. Its connections with QU alumni networks in the industry has allowed the endowment to benefit from the knowledge of the best-in-class managers.

Initially, its investment universe was confined to traditional publicly traded stocks and bonds. With growth of the endowment, the long-term strategy began to include alternative investments (e.g., private equity, real estate, commodities, hedge funds), which may allow for greater diversification and higher risk-adjusted returns. Alternative investments have helped to boost the endowment's returns over the past 20 years, although QU's allocation to alternative investments is still below average compared to other comparable endowments. Over a long time span, the alternative investments portion of the portfolio has become more established and diversified with respect to managers and strategies, for example.

Spanning an over 20-year period from 1996 to 2017, the QU endowment asset allocation has changed as follows:

- Cash allocation has remained constant at 1%.
- Traditional stocks (domestic) and bonds initially accounted for almost 70% of assets but have been reduced to about 30%.
- International equity (developed markets) initially accounted for almost 25% of assets but have been reduced to 10%.
- Emerging market equity initially accounted for 0% and has increased to 10%–15%.

- Private equity initially accounted for less than 5% and has increased to 15%–20%.
- Real assets (e.g., real estate, commodities) initially accounted for less than 5% and have increased to 10%–15%.
- Diversifying strategies (e.g., hedge funds) initially accounted for 0% and have increased to 10%–15%.

During the most recent strategic asset allocation (SAA) review by the QUINCO Board two years ago, they resolved to increase the allocation to alternative investments and decrease the allocation to developed market equities (domestic and international).

Winter has worked at QUINCO for five years and became the president and CIO one year ago. He will be performing his first asset allocation review. Winter has a portfolio strategy team to assist him with the review. The team includes Julia Thompson, the team lead, as well as her asset allocation analysis plus the senior portfolio managers for fixed income and public equities. After consulting with the Board, Winter advises the team to deal with the following matters pertaining to the review:

- An optimal liquidity profile and liquidity management plan for the endowment.
- The SAA in context of the investment outlook; there is an expectation of lower future returns in most traditional asset classes.
- The use of TAA as a complement to SAA to improve risk-adjusted returns.
- The QU endowment's underperformance compared to its peers.

Strategic Asset Allocation (SAA)

The strategy team have finished the work requested and will be making a presentation to the Board. As part of their economic analysis, they used unsmoothing methods for private equity (a relatively illiquid asset class) due to the smoother reported returns resulting from the lack of frequency of pricing data, for example. The unsmoothing methods resulted in an upward adjustment to the reported volatility of private equity. Figure 37.3 summarizes the results of the team's analysis.

Figure 37.3: Risk/Return Analysis[2]

Asset Class	Expected Real Return (annual geometric mean, next 10 years)	Expected Nominal Return (annual geometric mean, next 10 years)	Standard Deviation of Returns (annual)	Sharpe Ratio
Cash	0.9%	3.4%	1.7%	
Fixed income	1.8%	4.3%	6.3%	0.14
Domestic equity	5.0%	7.6%	18.1%	0.23
International developed equity	4.8%	7.4%	19.7%	0.20
Emerging market equity	6.0%	8.7%	26.6%	0.19
Private equity	8.5%	11.2%	24.0%	0.32
Real assets	4.5%	7.1%	13.3%	0.27
Diversifying strategies	4.0%	6.6%	10.0%	0.31

Note: Inflation assumed to be 2.5% p.a.

With some research, it was determined that the primary reasons for the QU endowment's underperformance relative to its peers was the lower amount of risk taken and the lower allocation to illiquid investments, especially private equity. Therefore, the current and proposed allocations are as follows:

	Current	Proposed
Cash	1%	1%
Fixed income	14%	9%
Domestic equity	17%	15%
International developed equity	10%	9%
Emerging market equity	12%	12%
Private equity	18%	23%
Real assets	13%	16%
Diversifying strategies	15%	15%

Some metrics are provided in Figure 37.4 that suggest increasing the allocation to private equity and real assets would raise the Sharpe ratio. Thompson realizes that there are higher investment management and performance fees for private equity and real assets compared to public equity and fixed income, so the returns in Figure 37.4 are on a net-of-fees basis. There is also some reporting of Monte Carlo simulation results to bring attention to the potential erosion in purchasing power. The Board is willing to accept an annualized standard deviation of returns between 12% and 14%.

Figure 37.4: Current and Proposed Risk/Return Data[3]

Portfolio Characteristic	Current SAA	Proposed SAA
Expected nominal return (annual average, geometric, next 10 years)	7.5%	7.8%
Expected real return (annual average, geometric, next 10 years)	5.0%	5.3%
Standard deviation of returns (annual)	12.5%	13.2%
Sharpe ratio	0.33	0.34
Probability of 25% erosion in purchasing power over 20 years with 5% spending rate	35%	30%

Note: The probability of erosion in purchasing power was derived based on a Monte Carlo simulation with a 20-year investment horizon, assuming expected return and volatility characteristics will be the same as for the next 10 years.

Thompson argues that the higher Sharpe ratio is sufficient reason to amend the SAA. She knows that the standard deviation of returns increases by 0.7% if the proposed asset allocation is accepted. Her reasons for taking on more stand-alone risk include the following:

- Lower future returns expected for all asset classes will necessitate taking on more risk to maintain the same level of returns.
- QU's endowment takes on less risk than its peers.
- The estimated Sharpe ratio for fixed-income investments (less risky) means that there should not be as much allocation to less risky assets.
- Monte Carlo simulations have indicated that in the long term, the proposed asset allocation has a better chance of earning the desired real return and preserving purchasing power.

Liquidity Management

Managing liquidity is paramount for the endowment given QU's need for cash flows from the endowment. As part of their management duties, Thompson's team performs cash flow modeling over several time horizons and under normal and stressed market conditions. Thompson is worried that liquidity may deteriorate significantly during stressed market conditions. Three reasons why deterioration may occur include the following:

- For private equity, capital calls are greater than capital distributions, resulting in a greater concentration of private equity (a more illiquid investment) in the portfolio.

- Certain investments made by portfolio managers may restrict investors from withdrawing their funds during stressed market conditions, which decreases the portfolio's overall liquidity.

- Private equity investments are not valued as frequently as public equity, for example. The resulting lagged valuations mean there is a relative increase as a percentage of the portfolio and a relative decrease in liquid assets as a percentage of the portfolio during stressed market conditions (e.g., the liquid assets fall in value "faster" because they are valued more frequently). Overall portfolio liquidity on a dollar basis is unchanged, but the percentage of assets available for meeting liquidity needs is reduced when it is most needed during a stressed period.

Accordingly, Thompson's team has prepared a summary of liquidity profiles as follows:

- Existing portfolio liquidity profile:
  - Normal conditions: highly liquid (19%), liquid (26%), semi-liquid (22%), illiquid (33%)
  - Stress conditions: highly liquid (15%), liquid (26%), semi-liquid (20%), illiquid (39%)
- Proposed portfolio liquidity profile:
  - Normal conditions: highly liquid (14%), liquid (24%), semi-liquid (23%), illiquid (39%)
  - Stress conditions: highly liquid (11%), liquid (25%), semi-liquid (21%), illiquid (43%)

MODULE QUIZ 37.2

To best evaluate your performance, enter your quiz answers online.

1. A. **Discuss** three reasons why the QU endowment should increase its allocation to illiquid investments.

   B. **Discuss** one concern with increasing the allocation to illiquid assets and **describe** how that concern can be mitigated.

2. A. Using the information in [Figure 37.4](#), **discuss** two reasons that support Thompson's proposed asset allocation.

   B. **Discuss** two tradeoffs involved with implementing the proposed asset allocation.

   C. **State** two items that Thompson should confirm before implementing the proposed asset allocation.

3. **Discuss** how a current spending policy could impact liquidity needs when market conditions deteriorate.

4. **Discuss** three tools for QUINCO to use for liquidity management—specifically, (1) cash flow forecasting and commitment pacing models, (2) liquidity budgets, and (3) stress tests.

5. **Describe** the impact on QU's liquidity resulting from the proposed asset allocation.
   Describe any follow-up actions Thompson needs to take with respect to the proposed asset allocation.

MODULE 37.3: MODIFYING ASSET ALLOCATION

LOS 37.d: Analyze actions in asset manager selection with respect to the Code of Ethics and Standards of Professional Conduct.

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Asset Manager Selection

Several months later, the process of hiring more external managers to implement the proposed asset allocation changes has begun. A request for proposal (RFP) for a private equity manager was issued, and one of the responses came from Genex Venture Capital (GVC) with a proposal to invest in its venture capital fund called "GVC Fund II." GVC is owned and operated by Virginia Hall, CFA, who is on the QU endowment board and has been a long-time and highly supportive donor to the university. Therefore, both the university treasurer and president are strongly in support of GVC's proposal and have indicated so to Winter. Winter, on the other hand, believes that Hall asked the two individuals in advance to support her proposal. Through the process of elimination, the two finalists are GVC and another venture capital fund that is a direct competitor of GVC, called Beacher Venture Investments (Beacher).

GVC and Beacher are requested to present to QUINCO's investment committee. Jason Allen, a former colleague of Winter, is GVC's managing director, and he gives the GVC presentation. However, Winter knows that the presentation contains confidential information that is not publicly available, which was possibly obtained from the university treasurer. In addition, GVC's historical returns are presented with amounts materially greater than those reported elsewhere by third parties. Beacher is the more established pick of the two firms, despite some problems with the performance of its previous fund. But some concerns were raised about GVC's short existence to date. Ultimately, Bud Davis, one of QUINCO's top portfolio managers in private equity, is asked to make a recommendation on which firm to go with.

Davis states that GVC is finding it difficult to raise the targeted $300 million for Fund II since Fund I only raised $100 million. Investors are worried about the threefold expansion and the uncertainty whether GVC can achieve its goal. However, Davis tempers that point with strong, positive comments about GVC's manager and GVC's investment approach. In addition, Davis confirms that GVC's investment management fee will be lowered. Based on Davis's comments, the investment committee agrees with Davis's recommendation to go with GVC.

Afterward, Winter speaks with Allen to convey the news. During the conversation, Allen states that Davis's spouse, Andrea, is Hall's daughter. When Winter confronted Davis with that knowledge, Davis simply stated that it was well known and assumed that everyone on the investment committee already knew of the relationship.

LOS 37.e: Analyze the costs and benefits of derivatives versus cash market techniques for establishing or modifying asset class or risk exposures.

LOS 37.f: Demonstrate the use of derivatives overlays in tactical asset allocation and rebalancing.

The Board has approved a much larger active risk budget for QUINCO's proposed TAA plan. The annual tracking error limit was specifically increased from 100 bps to 250 bps to try to increase overall portfolio returns. Winter and his staff are completely responsible for implementing the new TAA plan, and they have the authority to use 150 bps of the 250 bps budget to do so. Additionally, because the use of derivatives in the implementation would result in increased leverage, the Board approved a maximum leverage position of 5% of the portfolio value.

Winter thinks that the TAA plan will allow for overweight and underweight positions in acceptable asset classes and allow for investing in assets beyond the policy portfolio benchmark universe that are still consistent with the investment policy. In implementing the plan, Winter began with fair value and mean reversion by creating fair value models for the portfolio assets. Relevant economic and financial data known to have predictive power were gathered and used to estimate future risk and return for periods ranging from one to three years. The output from the models (i.e., theoretically correct fair value) is then compared to actual prices to assess whether any variances are significant enough to be exploited, after considering the costs involved in doing so. Subsequent and thorough backtesting revealed that the models worked well.

Specifically, large-cap U.S. equities were priced far below their fair value and mean reversion would occur in about a year. Thompson uses that information and proposes to overweight U.S. equities by 1% using either a total return swap, equity futures, or ETFs. The objective is to minimize use of cash and transaction costs.

Her team comes up with the following summary, shown in Figure 37.5.

Figure 37.5: Comparing Investment Costs[4]

Cost Component	ETF	Futures	Total Return Swap
Commission (round trip)	4.00	2.00	5.00
Management fee (annual)	9.50	0.00	0.00
Bid/offer spread (round trip)	2.50	2.00	6.00
Price impact (round trip)	15.00	10.00	0.00
Mispricing (tracking error, annual)	4.00	8.00	0.00
Cost to roll the futures contract	0.00	20.00	0.00
Funding cost	0.00	0.00	40.00
Total cost	**35.00**	**42.00**	**51.00**

Notes: The exhibit shows the team's cost comparison for the three implementation options—ETFs, futures, and total return swaps—for an $80 million notional exposure to the S&P 500 Index (assuming a fully funded mandate) over a one-year investment horizon. All numbers are in basis points (bps) unless otherwise indicated.

Thompson feels that ETFs require too much up-front cash (100% of the value) or that the 50% permitted margin would provide only limited leverage opportunities ($80 million investment with $40 million provided in cash and $40 million borrowed). She realizes that using futures and total return swaps to obtain $80 million exposure would require far less cash than the $40 million required if using ETFs.

On the other hand, ETFs and futures are more liquid—they are widely traded and have low transaction costs. Both instruments allow for early termination, should market conditions

warrant it, and Thompson has made it known that the flexibility is important to her. Total return swaps are traded over the counter (OTC) in that the terms are negotiated and features are customized between the counterparties. However, with futures, Thompson does not like the daily margin monitoring tasks. Additionally, she has concerns over interest rate and counterparty credit risk.

The overlay will be performed on the assumption of a leverage level of 4, meaning 25% of the investment is provided in cash and 75% borrowed. Financing costs are based on a 2% 3-month LIBOR rate for futures and swaps, with an additional 0.5% financing cost for ETFs.

Asset Allocation Rebalancing

It is now three months after the overweight position in U.S. equities, and the position has done well. Fixed income has not performed well due to a large rise in interest rates. As a result, there has been noticeable drift in the QU endowment asset allocation. Rebalancing of the portfolio is performed quarterly for cost control reasons; however, the portfolio drift from the SAA is checked on a monthly basis. At the end of each quarter, if a relatively liquid asset class moves outside the rebalancing corridor, then it is systematically rebalanced back to either the target allocation or to the edge of the corridor. For more illiquid asset classes, high transaction costs mean that rebalancing is done more implicitly by altering the commitments and reinvestments when allocations drift to the either end of the corridor.

Pertinent asset allocation information on the QU endowment is presented in Figure 37.6.

Figure 37.6: Asset Allocation Information[5]

	Target Allocation (SAA)	Corridor	Min/Max Target	Current Allocation
Cash	1%	±1%	0%–2%	0.8%
Fixed income	9%	±3	6%–12%	6.5%
Domestic equity	15%	±2.5	12.5%–17.5%	17.3%
International developed equity	9%	±2%	7%–11%	11.5%
Emerging market equity	12%	±2%	10%–14%	13.9%
Private equity	23%	±5%	18%–28%	19.2%
Real assets	16%	±3%	13%–19%	13.8%
Diversifying strategies	15%	±3%	12%–18%	17.1%
Total	**100.0%**			**100.0%**

Based on her analysis of Figure 37.6, Thompson notices the following:

- International developed equity at a current allocation of 11.5% has exceeded the top end of the corridor (11%) by 0.5%.
- Fixed income at a current allocation of 6.5% is off significantly from the target of 9% but still within the acceptable range of 6%–12%.
- Private equity at a current allocation of 19.2% is near the low end of the corridor (18%).
- Real assets at a current allocation of 13.8% is near the low end of the corridor (13%).

As an immediate action, Thompson wishes to reduce the international developed equity allocation and increase the fixed income allocation by 0.5%. That will take the former back to

the top edge of its corridor. The question is whether to perform the transaction through the cash market or the derivatives market. She is aware that implementation will take more time in the cash market but is necessary for larger or more important adjustments.

Upon further research, Thompson finds out that the 0.5% rebalancing transaction over a three-month investment horizon will incur 30 bps of transaction costs in the cash market (bid/offer spread of 5 bps, price impact of 5 bps, and cash drag of 20 bps). The cash drag includes the impact of timing delays and disruptions to active manager portfolios. The same rebalancing transaction will incur 24 bps of transaction costs in the futures market (bid/offer spread of 3 bps, price impact of 4 bps, and mispricing of 17 bps).

With additional consultations within the team, Thompson then opts to rebalance international developed equity back to the 9% allocation, so that involves a 2.5% decrease to equity as well as a 2.5% increase to fixed income. Now, the investment horizon is one year and will incur 60 bps of transaction costs in the cash market (bid/offer spread of 5 bps, price impact of 5 bps, and cash drag of 50 bps). For the futures market, there will be 82 bps of transaction costs (bid/offer spread of 4 bps, price impact of 4 bps, cash drag of 68 bps, and cost of rolling futures contracts of 6 bps).

MODULE QUIZ 37.3

To best evaluate your performance, enter your quiz answers online.

1. **Discuss** ethical issues and potential violations of the Code and Standards by Winter, Hall, the QU president and QU treasurer, Allen, and Davis. (Note: The citation of specific standard numbers and names is not necessary.)

2. On the assumption of no leverage employed, **identify** the most appropriate method for Thompson to use to implement the overweight to U.S. equities. **Justify** your response with three reasons, including cost, logistical, and risk considerations.

3. Assuming a leverage level of 4, **determine** whether Thompson would change her mind in terms of investment vehicle for implementation purposes. **Identify** one issue unrelated to cost. (Note: Ignore any additional return that could be earned by investing the 75% of cash that is not required for the investment.)

4. **Discuss** the issues of cash drag in rebalancing in the cash market and tracking error in

rebalancing in the derivatives market.

5. **Discuss** how implementation speed and rebalancing size would impact the method of implementation.

6. Assuming the 2.5% reallocation is performed, **evaluate** the implementation options and **select** the most appropriate one for Thompson to use.

KEY CONCEPTS

LOS 37.a

Four key methods to manage liquidity risk include (1) liquidity profiling and time-to-cash tables, (2) rebalancing and commitments, (3) stress testing, and (4) derivatives.

A liquidity classification schedule (time-to-cash table) has three distinct components: (1) amount of time needed to convert assets to cash, (2) liquidity classification level, and (3) liquidity budget.

To maintain the overall risk profile within a desired (quantitative) range, both systematic rebalancing policies and automatic adjustment mechanisms are used.

A multiyear funding strategy tries to determine the right level of annual commitments (investments) from the portfolio to arrive at a long-term optimal exposure to the asset class. Over time, the level of annual commitments will need to be adjusted as needed.

Stress testing explicitly considers how the liquidity needs of a portfolio will change during a period of market stress. The idea is to conduct analysis to assume "worst case" or very extreme market conditions and the impact on both assets and liabilities at the same time.

Derivatives require far less cash than investing in underlying assets, which makes derivatives an ideal method of rebalancing (e.g., by their nature, derivatives have significant leverage possibilities).

LOS 37.b

The illiquidity (or liquidity) premium refers to the additional return (over the market return) for taking on the risk of holding up capital for an unknown amount of time. Studies have shown that the illiquidity premium increases with the amount of time.

illiquidity premium (%) = expected return on illiquid asset (%) – expected return on marketable asset (%)

In practice, the illiquidity premium is challenging to accurately determine given all the other factors that interact in determining equity returns.

LOS 37.c

With some research, it was determined that the primary reasons for the QU endowment's underperformance relative to its peers was the lower amount of risk taken and the lower allocation to illiquid investments, especially private equity. Therefore, the current and proposed allocations are as follows:

	Current	Proposed
Cash	1%	1%
Fixed income	14%	9%
Domestic equity	17%	15%
International developed equity	10%	9%
Emerging market equity	12%	12%
Private equity	18%	23%
Real assets	13%	16%
Diversifying strategies	15%	15%

Managing liquidity is paramount for the endowment given QU's need for cash flows from the endowment. There should be cash flow modeling over several time horizons and under normal and stressed market conditions. Liquidity may deteriorate significantly during a stressed market condition.

- For private equity, capital calls are greater than capital distributions, resulting in a greater concentration of private equity in the portfolio.
- Certain investments made by portfolio may restrict investors from withdrawing their funds during stressed market conditions, which decreases the portfolio's overall liquidity.
- Private equity investments are not valued as frequently as public equity. The resulting lagged valuations mean there is a relative increase as a percentage of the portfolio and a relative decrease in liquid assets as a percentage of the portfolio during stressed market conditions.

LOS 37.d

Potential violations of the Code and Standards with respect to the process of asset manager selection include:

- Standard I(B): Independence and Objectivity.
- Standard I(C): Misrepresentation.
- Standard III(D): Performance Presentation.
- Standard III(E): Preservation of Confidentiality.
- Standard IV(A): Loyalty.
- Standard V(A): Diligence and Reasonable Basis.
- Standard VI(A): Disclosure of Conflicts.

LOS 37.e

Because changes in the market will often result in asset allocation drifts, the endowment portfolio will need to be periodically rebalanced. Derivatives are both cash efficient and quite liquid, so their role is threefold: (1) rebalancing, (2) changes in TAA, and (3) meeting short-term liquidity requirements.

Rebalancing with derivatives is most likely to be implemented more quickly, and with no impact on the active managers. That is on the assumption of reasonably high levels of liquidity in the equity futures market, for example.

If the rebalancing transaction is larger, then the transaction is likely to be more permanent or long term in nature. That makes rebalancing with cash more desirable despite the associated cash drag.

LOS 37.f

Derivatives overlays would allow the endowment to periodically rebalance exposures to asset classes without impacting the existing allocations to external active managers. That makes overlays more desirable for making smaller, short-term adjustments that could easily be reversed later.

ANSWER KEY FOR MODULE QUIZZES

Module Quiz 37.1

1. **A** Statement 1 is incorrect. In practice, the illiquidity premium is challenging to accurately determine given all the other factors that interact in determining equity returns. In addition, broad market indexes are used to estimate illiquidity premiums, even though the typical investor is not likely to have such a breadth of investment exposure.

   Statement 2 is incorrect. Calendar and percent-range rebalancing are examples of systematic rebalancing policies.

   (LOS 37.a, LOS 37.b)

2. Taking a long futures position requires only minimal cash requirements for margin, which is a form of a leveraged investment. Therefore, any cash not required for margin can be used to invest in other assets with differing levels of liquidity, or to meet other liquidity requirements.

   Options can be purchased at premiums that are often only a fraction of the cost of the underlying asset, thereby serving as a form of leverage. Or, options can be sold to earn premium income that helps to generate liquidity.

   (LOS 37.a)

Module Quiz 37.2

1.

   A. The QU endowment has a long-term investment focus, which increases its ability to invest in illiquid investments. Therefore, the addition of such assets to the QU endowment's investment opportunities may allow the efficient frontier to be shifted upward so that it achieves a higher return for a stated level of risk.

   The QU endowment has consistently earned positive returns with its illiquid (alternative) investments over the past 20 years. After such a long time period, the illiquid investments portion of the portfolio is clearly established and diversified. With a team of industry experts at their disposal, including best-in-class managers, the endowment should expect to continue earning strong returns in the future, which justifies increasing the allocation to illiquid investments.

   Compared to its peers, the QU endowment is underinvested in illiquid investments. Therefore, an increased allocation is justified to overcome its past underperformance compared to its peers.

   B. The increased allocation to illiquid assets (especially private equity and real assets) introduces more unsystematic risk. Therefore, placing smaller amounts in a larger number of investments will reduce much of that unsystematic risk.

   (LOS 37.c)

2.

   A. The proposed asset allocation has a better risk-return relationship than the existing SAA, as illustrated in <u>Figure 37.4</u> by the increase in Sharpe ratio from 0.33 to 0.34.

The proposed asset allocation has a higher chance of earning the target return in the long term. Using the Monte Carlo simulation results, there is a 70% probability of having at least 75% of the purchasing power for the next 20 years; the result in Figure 37.4 explicitly states 30% probability of a 25% erosion. Under the existing SAA, there is only a 65% probability of having at least 75% of the purchasing power.

B. One tradeoff of the proposed asset allocation is the increase in portfolio volatility—annual standard deviation rises 0.7% to 13.2%. However, given the expectation of lower returns for all asset classes, greater risk must be taken to earn the same level of returns.

Another tradeoff is the transaction costs, since private equity and real assets are most likely to have higher investment management and performance fees than traditional public stock and bond investments. However, the return amounts in Figure 37.4 are on a net-of-fees basis, so they account for the increased fees.

C. She should confirm that the metrics in Figure 37.4 such as the standard deviation of returns (increased from 12.5% to 13.2%) and the 30% probability of a 25% erosion in purchasing power are acceptable within the endowment's risk appetite.

She should confirm that after increasing the illiquid assets allocation, the new asset allocation continues to meet all the portfolio liquidity requirements.

(LOS 37.c)

3. Spending policies have a built-in countercyclical impact, so spending rates end up being less than 5% during stronger market conditions and more than 5% during weaker market conditions. As a result, the endowment's liquidity needs are amplified during stressed market conditions. (LOS 37.c)

4. Cash flow forecasting and commitment pacing models can be used to estimate the increased allocation to private equity and real assets. For example, cash outflows need to be estimated for future commitments in private equity; capital calls are legal obligations. Also, during market downturns, such cash outflows may become more onerous as inflows from prior investments could be curtailed or completely stopped due to a lack of cash as investments may not be liquidated due to low valuations.

Liquidity budgets can be created after accounting for the endowment's cash inflows and outflows.

Stress tests can be performed using both historical information and hypothetical assumptions within the framework of sensitivity analysis to determine how much variance in liquidity may occur and still be within the liquidity budget constraints.

(LOS 37.c)

5. There will be a noticeable increase in more illiquid investments and a noticeable decrease in highly liquid investments. For example, in normal conditions, highly liquid assets will decrease by 5% (from 19% to 14%) and illiquid assets will increase by 6% (from 33% to 39%). In stressed conditions, highly liquid assets will decrease by 4% (from 15% to 11%) and illiquid assets will increase by 4% (from 39% to 43%). QU's overall liquidity profile will become more illiquid due to the increased investment in private equity and real assets, both of which are the most illiquid asset classes.

Thompson must be certain that the endowment will be able to meet all its liquidity needs (e.g., distributions and rebalancing) for the proposed allocation and do so in

stressed market conditions. Monitoring at key times when there is increased risk of not being able to meet its liquidity needs, as well as regular stress tests, would be suitable follow-up items to perform.

(LOS 37.c)

Module Quiz 37.3

1. Aaron Winter, QUINCO CIO

   - Standard VI(A): Disclosure of Conflicts. Winter should have disclosed to the Board that the owner of GVC is already very closely associated with the university.
   - Standard I(B): Independence and Objectivity. Winter is under pressure from some members of the university to award the position to GVC, which would impact his independence and objectivity. Winter should have disclosed that GVC's managing director is a former colleague as that it could potentially impair Winter's independence and objectivity.
   - Standard III(E): Preservation of Confidentiality. Winter suspected that GVC used confidential information in its presentation, and he should have disclosed his concerns to the university.
   - Standard I(C): Misrepresentation and Standard III(D): Performance Presentation. Winter is suspicious as to the precision of the historical results provided.
   - Standard V(A): Diligence and Reasonable Basis. Winter did not confirm or dispel his suspicions by doing any subsequent research or probing with GVC.

   Virginia Hall, QU trustee, owner of GVC

   - Standard VI(A): Disclosure of Conflicts. If Hall is trying to influence the hiring decision in favor of her company, then there is a conflict of interest. Hall's position as a QU trustee and her ownership of GVC is also a conflict as GVC is one of the finalists to be considered for hiring as an external portfolio manager for the QU endowment.
   - Standard IV(A): Loyalty. By potentially putting her own business interests ahead of the best interests of the university (she is a QU trustee), Hall would be in violation of her duty of loyalty.
   - Standard III(E): Preservation of Confidentiality. Hall may have obtained confidential information and used it in GVC's presentation to improve GVC's chances of being hired.

   QU president and QU treasurer (both are members of the QU Board)

   - Standard IV(A): Loyalty. Both the president and treasurer must act in the university's best interests by hiring only the best portfolio manager. They are violating Standard IV(A) by pressuring Winter to hire GVC given Hall's close association with the university.
   - Standard III(E): Preservation of Confidentiality. They may also be in violation of Standard III(E) if they were the culprits who provided the confidential information in the GVC presentation.
   - Standard VI(A): Disclosure of Conflicts and Standard I(B): Independence and Objectivity. For example, they should have disclosed their bias toward Hall given her past generosity to the university. Furthermore, they should have

abstained from any voting decisions on the external manager given their lack of independence and objectivity.

Jason Allen, GVC's managing director

- Standard I(C): Misrepresentation and Standard III(D): Performance Presentation. Allen may have used incorrect information, unknowingly or knowingly, in his presentation.

Bud Davis, QUINCO senior portfolio manager

- Standard VI(A): Disclosure of Conflicts and Standard I(B): Independence and Objectivity. Davis needs to make an objective evaluation of GVC in context of a hiring decision. The fact that his spouse is the daughter of GVC's owner presents a serious impairment to his independence and objectivity, and he should have disclosed the relationship.

(LOS 37.d)

2. With respect to costs, the ETF is the lowest at 35 bps, with 70% of it due to price impact (buying and selling the position) and the management fee. Futures are more costly at 42 bps, with rolling costs (due to upward-sloping yield curve) constituting about half of the costs. Price impact and tracking error constitute most of the remaining costs. The total return swap is the highest at 51 bps. On cost considerations alone, the ETF should be chosen.

Logistically, futures require quarterly rollover and daily monitoring of margin, so in that regard, futures are less appealing for Thompson. ETFs are managed by the ETF manager. There are no real logistical issues for total return swaps. On logistical considerations, either the ETF or the total return swap should be chosen.

From a tracking error (risk) perspective, ETFs face tracking error for reasons such as cash drag and mandatory diversification. Futures face tracking error for reasons such as liquidity and interest rate differentials. Total return swaps have no tracking error since the receipt is the S&P 500 Index return. On tracking error considerations, the total return swap should be chosen.

Furthermore, Thompson worries about interest rate risk, which would be prevalent with futures and the total return swap. She also worries about counterparty credit risk, which would occur with futures. On risk considerations, the ETF should be chosen.

Overall, the best choice is the ETF because it has the lowest cost, no logistical issues, and no exposure to interest rate and counterparty credit risks.

(LOS 37.e)

3. ETF financing cost = $80 million × 75% × 2.5% = $1.5 million = 1.875%

   futures financing cost = $80 million × 75% × 2% = $1.2 million = 1.5%

   swaps financing cost = $80 million × 75% × 2% = $1.2 million = 1.5%

Taking into account the costs from [Figure 37.5](#):

   ETF total cost = 0.35% + 1.875% = 2.225%

   futures total cost = 0.42% + 1.5% = 1.92%

   swaps total cost = 0.51% + 1.5% = 2.01%

On the basis of costs with the assumption of a leverage level of 4, Thompson may change her mind and elect to implement using futures because it is the lowest-cost

option by 9 bps.

However, Thompson must consider the incremental work to be performed with monitoring the futures (e.g., margin) and rolling over the contracts every quarter.

(LOS 37.f)

4. In the cash market, cash drag (in the form of timing delays and disruptions to active manager portfolios) comprises two-thirds of the total costs. A sufficient amount of investments from international developed equity managers would need to be liquidated, and the cash would be taken from those managers and transferred to existing or new fixed income managers. Doing so results in transaction costs as well as cash drag, since there will be some delay in getting the funds to the fixed income managers and having the funds invested.

In the derivatives market, tracking error comprises more than 70% of the total costs. The transaction would involve a short position in equity futures to reduce exposure and a long position in fixed-income futures to increase exposure. The use of multiple futures contracts will increase tracking error; it is 17 bps for two contracts compared to 8 bps for one contract, as noted earlier in Figure 37.5.

(LOS 37.e)

5. Rebalancing with derivatives is most likely to be implemented more quickly, and with no impact on the active managers. That is on the assumption of reasonably high levels of liquidity in the equity futures market, for example.

If the rebalancing transaction is larger, then the transaction is likely to be more permanent in nature rather than merely a short-term adjustment that could easily be reversed later.

(LOS 37.f)

6. From a cost perspective, transacting in the cash markets is preferable given the savings of 22 bps compared to transacting in the derivatives markets.

Should a faster implementation time be required, transacting in the derivatives market is preferable.

Given the larger size of the rebalancing (2.5% now vs. 0.5%, discussed earlier), there is an implied longer time horizon that supports transacting in the cash markets.

Overall, with a 2.5% reallocation, the most appropriate option would be to transact in the cash markets.

(LOS 37.e)

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1. Reprinted from Level III CFA Volume 6, page 298.

2. Reprinted from Level III CFA Volume 6, page 303, Exhibit 7.

3. Reprinted from Level III CFA Volume 6, page 305, Exhibit 10.

4. Reprinted from Level III CFA Volume 6, page 315, Exhibit 13.

5. Reprinted from Level III CFA Volume 6, page 318, Exhibit 15.

The following is a review of the Cases in Portfolio Management and Risk Management principles designed to address the learning outcome statements set forth by CFA Institute. Cross-Reference to CFA Institute Assigned Reading #38.

READING 38: CASE STUDY IN RISK MANAGEMENT: PRIVATE WEALTH

EXAM FOCUS

Risk management is a vital piece of putting together a personal financial plan. By understanding a client's full situation, and taking a holistic view of their circumstances, we have the best opportunity to offer advice tailored to their goals and needs.

This reading will focus on identifying a family's risk exposures throughout different stages of their lives. We will be following the same family members through four stages of their careers: early career, career development, peak accumulation, and early retirement. Each stage comes with new variables and new challenges. We must find ways to help mitigate or remove any risks the family might face.

Keep in mind, each stage provides a snapshot in time, with multiple variables. Focus on the information that is being presented for that stage; resist the temptation to use external variables to justify a risk management recommendation.

PROFESSOR'S NOTE

For the purposes of this reading, we will focus on the Learning Outcome Statements. The original reading provides further detail regarding local regulations, current economic conditions, and tax laws. While this provides a more holistic view, it is very likely that a case on the exam will forgo multiple pages of background information and will instead provide a narrower list of things you need to consider.

MODULE 38.1: EARLY CAREER STAGE[1]

Video covering this content is available online.

Jessica and Paul Schmitt, both aged 28, were recently married. They are in the early phase of their careers. Both Jessica and Paul graduated with master's degrees three years ago in computer science and mathematics, respectively.

Paul took a teaching position at a local school upon graduation. He earns a gross annual salary of €45,600, which translates to a take-home pay of €33,670, after social security and tax deductions.

After graduating university, Jessica joined an IT startup. Jessica's gross annual salary is €24,000, which after taxes and social security contributions becomes €20,490. Though Jessica's current salary is low, the potential exists for a significant increase. She also expects to receive a bonus if the startup becomes successful; this bonus is likely to represent a significant share of her compensation. Were she to move to a different employer, Jessica

could earn a much better salary; however, she believes strongly that the startup will succeed and prefers this potential upside that her current position offers.

The couple combined have savings of €15,000. Aside from their participation in their government's pension scheme (to which they have contributed since beginning work three years ago), the Schmitts have no other financial assets. Their only other asset of note is their car (which they use only occasionally). The Schmitts have an automobile insurance policy in place, protecting them from liability for other parties' repair costs or injury compensation.

The Schmitts are debt-free because their parents covered their expenses when they were students, and tuition costs were relatively low at the university they attended. The Schmitts' monthly expenses are €2,900, which includes rent of €1,000.

The following table is a summary of the Schmitts' finances:

Figure 38.1: Summary of the Schmitts' Circumstances in the Early Career Stage (€)[2]

	Jessica	Paul	Combined
Annual Gross Income	24,000	45,600	69,600
Annual Net Income	20,490	33,670	54,160
Source of income	IT Startup	Teacher	
Annual living expenses			34,800
Financial assets			15,000
Debt			0
Car			7,000

After further discussion, you identify the following objectives for the couple:

- Ensure long-term financial security
- Ensure a comfortable retirement
- Start a family soon
- Purchase a condominium

The Schmitts have toured a home that costs €270,000 located in a popular neighborhood that has seen considerable property value appreciation recently. A 25-year mortgage would be 3.6% per year, fixed for five years, and floating thereafter.

LOS 38.a: Identify and analyze a family's risk exposures during the early career stage.

CFA® Program Curriculum, Volume 6, page 326

Identify the Risks

At this point, we have identified the Schmitts' financial objectives as well as their financial assets and liabilities. Because the couple are early on in their career, the majority of their economic balance sheet consists of their **human capital**. Notice that Paul and Jessica's human capital differs in the following ways:

- **Paul's human capital** is very bond-like as long as he continues his career as a teacher. This is because (1) he has high job security, which limits earnings risk, (2) Paul's job may not be portable to other countries due to licensing requirements, and (3) his

income is expected to increase as he gains seniority but otherwise has very limited upside potential.

- **Jessica's human capital** is very equity-like in her current industry role. This is because (1) there are significant unknowns related to her future employment cash flows, though she can also earn considerable rewards if she excels at her job and the firm performs well, (2) unemployment is a much greater worry for Jessica because, unlike Paul, Jessica's job does not have significant job security, (3) her discretionary bonus payments are uncertain, and (4) Jessica's human capital is portable across countries.

As a result, Jessica and Paul's marriage creates a diversified mix of human capital.

Next, we must turn to actually identifying and analyzing the couple's risk exposures. Despite being young and in good health, they still face the following risks:

Earnings Risk

The couple face earnings risk from either unemployment or disability. Because both are young and have little in the way of financial capital, their largest asset on their economic balance sheet is their human capital.

The two big drivers of earnings risk at this career state are the risk of unemployment and risk of a health event or disability.

Unemployment: Jessica, more than Paul, faces a significant risk of unemployment because the firm where she works is a startup, while Paul's career has more job security. The probability of Jessica losing her job is difficult to estimate, but we can be confident it is higher than the likelihood of Paul becoming unemployed. Because they have been paying into the social security system for a few years, they would be entitled to an unemployment benefit, which would partially replace each of their salaries.

Disability: Despite the fact that Jessica and Paul are young and fit, the risk of a health event or disability is still present. Again, the couple would be entitled to disability payments from the state social security system, but the monthly income from that source would not be enough to cover their current salary.

Premature Death Risk

The case suggests the likelihood of a premature death is low, as both Paul and Jessica are in good health. In the unlikely event of premature death, there would be a few implications for the surviving spouse at this stage of life:

- One-time costs such as the funeral expenses would need to be paid. Additionally, the surviving spouse would need to establish a fund to deal with emergencies alone.
- The surviving spouse's lifestyle would be affected because of the need to assume sole responsibility for household costs, such as rent.

Car Accident and/or Repair Costs

The Schmitts own an older car. They have an insurance policy in place that should protect them in case they need to pay compensation or repair costs to other motorists. However, they are not covered for repair or replacement of their own car.

Home Purchase

At this stage of their lives, the Schmitts do not have a lot of cash flow to support short-term expenditures. While they would be able to finance a house purchase through a mortgage, making a substantial down payment would leave them with little liquid assets. This could become an issue if some of the previously mentioned risks were to arise (e.g., their old car needs to be replaced, one or both of them suddenly lose their job, etc.).

Other Liabilities

Most of the couple's assets are covered by insurance at this point. There are not any other apparent major liability risks.

LOS 38.b: Recommend and justify methods to manage a family's risk exposures during the early career stage.

CFA® Program Curriculum, Volume 6, page 332

Earnings Risk

We previously identified two drivers of earnings risk: sudden unemployment and a health/disability event. Methods of mitigating these risks are different.

Unemployment: Earnings risk resulting from unemployment can be problematic to insure against. In some countries, supplemental income provided by government assistance is available to aid the unemployed, but one of the best ways to protect against sudden job loss is to accumulate a savings "buffer" of several months of normal expenditures. Six months is generally an appropriate recommendation.

Disability: **Disability insurance** can address earnings risk from serious illness or disability. We should recommend that each of them purchase a policy that would supplement their net income from disability benefits provided by the state. Because the Schmitts' salaries are expected to increase over time, we should recommend they choose a policy that allows them to purchase additional coverage going forward.

To determine the amount of disability insurance needed, we calculate the present value (PV) of net earnings that would need to be replaced. For the Schmitts, the calculation is shown in Figure 38.2.

Figure 38.2: Disability Insurance Calculation (€)[3]

	Jessica	Paul
Net income to be replaced	20,490	33,670
Annual disability coverage by the social security system	18,000	18,000
Shortfall	2,490	15,670
Benefit period (until retirement)	37 years	37 years
Assumed annual benefit adjustment	2%	2%
Discount rate	3%	3%
PV of future earnings replacement required (annuity due)	77,700	489,000

Premature Death Risk

To protect against premature death risk, the couple should take on **life insurance**. If one of the Schmitts were to die prematurely, life insurance would help support the other's loss of future income. As a reminder, there are two methods for calculating the amount of coverage necessary.

- **Human life value:** estimates the amount of future earnings that must be replaced
- **Needs analysis:** estimates the amount needed to cover living expenses for the surviving spouse

At this stage of the couple's lives, we determine the amount of coverage using the needs analysis method because of uncertainty about the level of future earnings life insurance would need to replace.

Figure 38.3: Life Insurance Calculation (€)[4]

	Paul	Jessica
Total cash needs (funeral, emergency fund, debts)	30,000	30,000
Capital needs (PV of surviving spouse's 25,000 annual living expenses – PV of survivor's income until retirement)	411,000	–77,000
Total financial needs	**441,000**	**–47,000**
Less capital available (savings)	15,000	15,000
Less PV of vested retirement accounts (attributable to surviving)	27,000	21,000
Additional life insurance needs	**414,000**	**–83,000**

Note that Paul's life insurance coverage needs are much higher than Jessica's. We should recommend purchasing a life insurance policy covering Paul's life. We should also mention to the couple that this will need to be reevaluated once the couple decides to start a family.

Car Accident and/or Repair Costs

The Schmitts' existing car insurance plan covers costs associated with other parties in the case of an accident, but it does not cover the Schmitts. The couple has mentioned they rarely use the car, so we should advise them to self-insure by means of a sufficient savings buffer, rather than spending money on additional coverage.

Liability Risk

Because the couple has minimal liability risk, there is nothing to recommend at this stage.

House Purchase

Because the couple has little financial capital, we should advise them against purchasing the home at this time. While there are many long-term benefits of home ownership, they can decrease their risk exposures by delaying the house purchase.

Instead of the house purchase, we should recommend that the Schmitts develop a plan to increase their savings and other financial assets. Should they purchase a home in the near future, they would be left virtually without other financial assets.

The Schmitts should create a substantial savings buffer, at least six months of expenses in total. Furthermore, once the savings buffer is in place, the couple should draw up an investment plan.

MODULE QUIZ 38.1

To best evaluate your performance, enter your quiz answers online.

1. For a family that is in the early career stage, the largest asset on their economic balance sheet is *most likely* to be:
    A. a mortgage.
    B. human capital.
    C. their savings account.

2. One reason that supports investors in their early career stage investing in their portfolio aggressively is that:
    A. human capital is equity-like.
    B. they have time to recoup losses.
    C. they still need to build up a sufficient safety net.

3. Which of the following is the *most appropriate* argument against purchasing new home while in the early career stage of life?
    A. Local real estate prices have been on the decline for two consecutive years and don't appear to be turning around any time soon.
    B. Families in the early career stage have little experience with real estate and should wait until they observe a full market cycle.
    C. The family has little financial capital available to cover short-term expenses, and purchasing a new property could present unexpected expenses.

MODULE 38.2: CAREER DEVELOPMENT STAGE

Video covering this content is available online.

We continue the Schmitts' case 17 years later. They have developed significantly in their careers and remain healthy. Both of their incomes are greater now, Jessica's significantly so. With their increased incomes, they have repaid the entire loan from Jessica's parents and most of their mortgage, while accumulating a liquidity buffer of just under €80,000.

Based on their understanding of the IT industry, the Schmitts have assembled a portfolio of shares in 10 local IT companies. They now own residential property in the area where these companies are located and are considering investing in additional residential property there.

Jessica and her employer each contribute €3,000 annually to a defined-contribution pension plan. Paul's employment benefits as a teacher include life insurance coverage equal to three times his salary, as well as disability benefits that would equal €2,520 per month.

The couple has two children: Roxane, age 12, and Peter, age 7. Peter requires extra support at school to accommodate mental development issues. The family's annual living expenses have increased to €65,000. After Roxane was born, the Schmitts increased their life insurance coverage, but they have not adjusted it since.

The two following tables provide a summary of the Schmitts' financial circumstances and annual budget.

Figure 38.4: Summary of the Schmitts' Circumstances in the Career Development Stage (€)[5]

	Jessica	**Paul**	**Combined**
Annual gross income	80,000	66,000	146,000
Annual net income	53,650	46,510	100,160
Source of income	Department head, IT	Teacher	
Annual living expenses			65,000
Pension provisions	Government pension as mandated by law *and* Employer's DC plan with a total annual contribution of 3,000 from Jessica + employer	Government pension as mandated by law; no separate private pension	15,000
Employer-provided insurance		Life insurance coverage of 3 × 66,000 = 198,000	
Private life insurance	200,000 life policy taken out after birth of first child	Life policy of 440,000	
Disability insurance	Government insurance coverage of 25,200 per year Private coverage of a lump sum of 112,200 (the original 80,000 policy taken out at 28, plus 2% annual benefit adjustment)	Government insurance covering 30,245 per year Private coverage producing a lump sum of 686,100 (the original 490,000 policy taken out at age 28, plus 2% annual benefit adjustment)	

Figure 38.5: Summary of the Schmitts' Annual Budget in the Career Development Stage (€)[6]

Combined annual gross salary	146,000
Less taxes and social security contributions	45,800
Net pay	**100,200**
Less living costs (including mortgage payments)	65,000
Less miscellaneous costs (house repair, maintenance, etc.)	3,500
Cash available for insurance and savings	**31,700**
Insurance premiums	3,500
Funds available to save or invest	**28,200**
Currently used primarily to:	
Fund investment portfolio	22,000
Add to savings accounts	3,200
Contribute to Jessica's employer's pension plan	3,000

LOS 38.c: Identify and analyze a family's risk exposures during the career development stage.

CFA® Program Curriculum, Volume 6, page 337

Earnings Risk

As in the early stage of the couple's careers, the same two earnings risks apply.

- *Unemployment:* Jessica continues to be at greater risk of unemployment than Paul does. Furthermore, because Jessica's salary is now substantially higher than it was before, the amount of income at stake is much greater.
- *Disability:* Should one of them become disabled, the rest of the family would suffer from lost earnings. The nondisabled spouse could be limited in their opportunity set, impacting income and costs.

Premature Death Risk

Having children increases the adverse financial consequences for the family of early death of one of the parents. Not only would the cost of raising the children no longer be met, the surviving spouse could suffer a reduction in income after becoming a single parent.

Investment Portfolio

The couple has built up their main investment vehicle, but the account is concentrated in a volatile sector. Additionally, because Jessica works in IT, the portfolio's performance is likely to be highly correlated with her human capital. If the IT sector underperforms, their investment portfolio and Jessica's career prospects are likely to suffer simultaneously.

The residential property in which the Schmitts are considering a speculative investment is located in the area where Jessica's offices and many other IT companies are located. It is comparable to their existing property.

Retirement Goals

The Schmitts' retirement funds could turn out to be inadequate for the lifestyle they desire if the couple's contributions to the retirement plans are inadequate or if the funds do not perform well. In addition to their state pension income in retirement, Jessica is participating in her employer's defined contribution company pension, which will help increase the probability of reaching their retirement goals.

By your calculations, if Paul and Jessica remain employed until their retirement age of 65, they will have a total gross retirement income of €76,000 (inclusive of pension and DC pension income), which is roughly half of their current income.

It is likely the couple's living expenses will be less than their current living expenses, but at this point there is a risk that their retirement income will be insufficient.

Other Risks

Other risks could include property risks or other liabilities.

LOS 38.d: Recommend and justify methods to manage a family's risk exposures during the career development stage.

CFA® Program Curriculum, Volume 6, page 343

Earnings Risk

Disability Insurance

Both Paul and Jessica already have disability insurance policies. However, the current level of coverage no longer matches the present value of future earnings, as demonstrated in the following table:

Figure 38.6: Disability Insurance Coverage Calculation in the Career Development Stage (€)[7]

	Jessica	Paul
Net income to be replaced	53,650	46,510
Annual disability coverage by the social security system	25,200	30,245
Shortfall	28,400	16,265
Benefit period (until retirement)	20 years	20 years
Assumed annual benefit adjustment	2%	2%
Discount rate	3%	3%
PV of future earnings replacement required (annuity due)	519,000	297,000

Over the course of 20 years, assuming an annual benefit adjustment of 2% and a discount rate of 3%, the present value of Jessica's required futures earnings replacement is €519,000. For Paul, the same calculation results in a value of €297,000.

Currently, Jessica's level of disability coverage is €112,200 and Paul's is €686,100. We should recommend that Paul and Jessica adjust the level of coverage to reflect their current present values of future earnings replacement. Jessica's coverage should be increased to €520,000, and Paul's reduced to €300,000.

> **PROFESSOR'S NOTE**
>
> You might be tempted to simply look at the total coverage between both parties. Remember, the purpose of this coverage is to help supplement income for the other party involved.

Life Insurance

To protect against the risk of Jessica or Paul's untimely death, each purchased life insurance at age 28. However, both of their salaries have increased and they now have children, so it is likely the amount of coverage needs to be changed. To determine the new coverage amount, we can use the *human life value* and *needs analysis* methods.

Human Life Value

Figure 38.7: Disability Insurance Coverage Calculation in the Career Development Stage (€)

	Jessica	Paul
Recommended additional life insurance using the human life value method	1,444,000	575,000
Recommended additional life insurance using the needs analysis method	764,000	366,000

Both Paul and Jessica will require additional life insurance coverage, although the specific amount will depend on the calculation method used. One way to select between the results is to go with the option that best matches the client's position. Another is to treat the different results as a range. In this case, you recommend increasing Paul and Jessica's policies to €900,000 and €1 million, respectively.

Investment Portfolio

Concentrated Stock Positions

The couple should hold an investment portfolio that has low correlation to their human capital. They should also find a way to diversify the portfolio, rather than holding concentrated positions in only 10 companies.

In order for the couple to achieve better diversification, we should recommend that, at a minimum, no new contributions be made in shares of IT companies. Rather, contributions should be directed into pooled investment vehicles—specifically funds that are well diversified by region, sector, and security selections.

Real Estate

Reasons that the couple should avoid investing in speculative real estate include the following:

- The local property's value is highly correlated to the strength of the local IT sector, which is highly correlated to the value of Jessica's human capital.
- Funding for the purchase would need to come from their investment portfolio and a loan because the couple has limited resources available.
- If they opt for funding the purchase with their investment portfolio, they would further decrease their diversification.
- An investment property would be a large, illiquid, and concentrated holding.
- They would incur ongoing costs to own and manage rental property.

Retirement Savings Plans

We can identify a substantial shortfall in the Schmitts' projected income in retirement relative to their retirement goals. To mitigate the risk of having inadequate funds to support their lifestyle in retirement, the Schmitts should consider dedicating a greater amount to their retirement needs.

According to their budget, the couple's after-tax monthly €8,350 income is greater than their monthly expenditures by approximately €2,700. Even after insurance premium payments, this should leave the couple with €2,350 per month (€28,200 per year) to invest. The Schmitts have built up a substantial liquidity buffer (€80,000) and should consider redirecting further contributions towards Jessica's pension or the investment portfolio to fund future retirement income.

Outcome

Suppose that the Schmitts accept your recommendations: they set aside the idea of buying a property near the IT district and they stop adding to their savings buffer, instead increasing their contributions to the pension plan from Jessica's employer. Furthermore, the Schmitts

will continue their contributions to their investment portfolio but will begin moving away from investing in individual securities, instead putting funds into diversified equity funds.

MODULE 38.3: PEAK ACCUMULATION STAGE

Video covering this content is available online.

It is 10 years later, and Jessica and Paul are now in their peak accumulation phase at age 55 years old. Over the past decade, they have progressed in their careers and have seen their incomes continue to increase.

Jessica's employer is now making significantly-increased contributions to the company pension plan. Jessica too has also been aggressively contributing to the firm's pension plan and to her new private pension, partly to benefit from tax breaks.

The segment of the technology sector that Jessica's company competes in is facing challenges arising from the ever-changing market environment. Paul's job remains steady. He too has been contributing consistently to a private pension plan.

The Schmitts' investment portfolio has grown substantially thanks to regular contributions and investment returns. Currently, the portfolio is invested in a number of diversified funds, and comprises 70% stocks (primarily global equity, plus some Eurolandian stocks) and 30% fixed income (divided approximately evenly between domestic government bonds and high-quality corporate bonds).

The value of the home has seen a decline in real terms, as a result of general softness in Eurolandia's real estate market, plus as a result of the local area losing its previous appeal.

Though the Schmitts have paid down their mortgage, they are still supporting Roxane, who only recently completed her undergraduate degree and is now pursuing graduate studies. The couple is also providing for the special needs of Peter, who is now aged 17. Peter has made progress but will probably need assistance for his entire life. The Schmitts estimate that they spend €13,000 per year to support Peter.

The Schmitts recognize that retirement planning has become an important issue now that they plan to retire in 10 years (at age 65). They maintain a healthy lifestyle. Together, they compile a summary of their current financial circumstances, shown in the following table.

Figure 38.8: Summary of the Schmitts' Circumstances in the Peak Accumulation Stage (€)[8]

	Jessica	Paul	Combined
Annual gross income	120,000	80,000	200,000
Annual net income	77,888	53,888	131,776
Source of income	Department head, IT	Teacher	
Annual living expenses			75,000
Property			340,000
Bank accounts			80,900
Investment portfolio			611,400
Pension provisions	Government pension as mandated by law, *and* Employer's DC plan with a total annual contribution of 3,000 from Jessica + employer *and* Private pension savings of 15,000	Government pension as mandated by law *and* Private pension savings of 47,500	15,000
Private life insurance	1 million private policy	900,000 private policy plus 3× salary insurance coverage of 240,000 provided by the employer	
Disability insurance	Government insurance coverage of 30,805 per year Private coverage that would provide a lump sum of 633,900 (the original 520,000 policy taken out at 45, plus 2% annual benefit adjustment)	Government insurance coverage of 36,966 per year Private coverage that would provide a lump sum of 365,700 (the original 300,000 policy taken out at age 45, reflecting 2% annual benefit adjustment)	

Financial Objectives

The couple develops the following financial objectives:

- Deliver financial security over the next decade while continuing in full-time employment.
- Have an agreeable retirement.
- Be able, both before and after they retire, to provide Peter with lifelong support and assistance.
- Leave a substantial inheritance for Roxane.

Once again, we analyze these objectives and assess where the couple may be exposed to risks.

LOS 38.e: Identify and analyze a family's risk exposures during the peak accumulation stage.

CFA® Program Curriculum, Volume 6, page 348

Earnings Risks

- *Unemployment:* Profitability is volatile in Jessica's industry. Should she lose her job at her current age, it might be difficult for her to find equivalent employment (at her current well-above-average salary and level of seniority.)
- *Disability:* Despite the couple maintaining a healthy lifestyle, the risk of losing future earnings due to disability remains. We should examine their current earnings situation to identify how much would be covered by social security.

Figure 38.9: Disability Insurance Coverage Calculation in the Peak Accumulation Stage (€)

	Jessica	Paul
Net income to be replaced	77,900	53,900
Annual disability coverage by the social security system	30,720	36,870
Shortfall	47,180	17,030
Benefit period (until retirement)	10 years	10 years
Assumed annual benefit adjustment	2%	2%
Discount rate	3%	3%
PV of future earnings replacement required (annuity due)	452,000	163,000

Once again, there is a shortfall between the Schmitts' net income and what is covered by the social security system. However, the couple has more than adequate supplementary insurance coverage to handle this shortfall, with the adjustments they made to their coverage 10 years ago. Jessica and Paul have disability coverage of €633,900 and €365,700, respectively.

> **PROFESSOR'S NOTE**
>
> Keep in mind, the period over which the Schmitts would rely on such benefit payments has decreased to 10 years instead of 20. This means that a lower present value of the disability protection will now be adequate.

Premature Death Risk

One of the couple's objectives is providing financial security for the family over the next 10 years, and an early death could easily derail this objective. Both Jessica and Paul have life insurance, so we will consider the current coverage to see if adjustments need to be made.

Figure 38.10: Disability Insurance Coverage Calculation in the Peak Accumulation Stage (€)

	Jessica	Paul
Recommended additional life insurance using the human life value method	–17,000	–403,000
Recommended additional life insurance using the needs analysis method	–782,500	–1,000,500

Regardless of the method used, it is apparent that the couple's current life insurance coverage is more than enough to cover the surviving spouse's financial needs.

Retirement Lifestyle Goals

The couple has continued to contribute to the mandatory government pension. Upon their retirement in 10 years' time at age 65, the Schmitts expect to immediately purchase a fixed annuity (with an assumed 5.0% annuity yield). Further assumptions are in Figure 38.11.

Figure 38.11: Schmitts' Retirement Assets and Main Risks (excluding their investment portfolio) (€)[9]

Assets	Type and Current Value	Expected Growth Rate	Expected Value at Age 65	Expected Annual Gross Pension Benefit	Risks
Paul's mandatory government pension plan	DB pension plan	-	-	48,950 (55% of estimated final salary)	Government may reduce retirement benefits due to fiscal pressures
Jessica's mandatory government pension plan	DB pension plan	-	-	28,191	As above
Jessica's company pension	DC plan, current value 113,500 in a balanced fund	14,000 annual contributions, increasing at 2% 4% annual investment returns	350,000	17,515	Investment risk and interest rate risk that could result in lower annuity income yield
Paul's private pension plan	DC plan currently valued at 47,500 in a balanced fund	6,000 annual contributions, increasing at 2%, 3% investment returns	135,900	6,795	As above
Jessica's private pension savings plan	DC plan opened recently Valued at 15,000 Uses aggressive, actively managed investment strategy with high risk	10,000 annual contributions, increasing at 2% 8% investment returns	201,600	10,080	As above
			Total income	**111,531**	

Excluding the investment portfolio, the couple's estimated total pension income will amount to approximately €111,500 before taxes, or approximately €84,000 after taxes. The couple believes they will need to live on approximately €75,000 (in real terms) in retirement. While

this is encouraging news, risks to these assumptions are a loss of employment, solvency of the state pension systems, or poor returns in the DC plans in the years before the couple retires.

Investment Portfolio

The investment portfolio has two objectives: supporting Peter and leaving an inheritance for Roxane. According to the couple, the required probability of success for supporting Peter is 100%, while the required probability of success for leaving an inheritance to Roxane is 60%.

Goal #1: Support Peter. Based on average life expectancy, Peter is expected to survive his parents by 40 years (to age 90). The couple estimates it costs them €13,000 to care for Peter each year, and it would be €30,000 per year to care for Peter if outside help is used.

You find the present value of these costs to be €500,000, after considering the Schmitts' plan to assist their son up until their retirement. Fortunately, this amount is less than the current portfolio of €611,000.

Goal #2: Inheritance for Roxane. The Schmitts want to leave money to Roxane. The probability of success they require for this goal is lower than that of supporting Peter, with a much longer time horizon because this inheritance will be left upon the couple's death. When asked about a dollar amount, the couple said they want to leave "as much as possible."

Asset Allocation

The couple's asset allocation within the investment portfolio should first address the objective of supporting Peter, while leaving the remaining balance as an inheritance for Roxane. The Schmitts' multiple objectives span multiple time periods.

LOS 38.f: Recommend and justify methods to manage a family's risk exposures during the peak accumulation stage.

CFA® Program Curriculum, Volume 6, page 359

Earnings Risk

- *Unemployment:* While it is almost impossible to formally insure against job loss, the Schmitts have continued to build up their savings and are effectively self-insuring against loss of employment.
- *Disability:* Earlier, we calculated the present value of earnings not covered by social security to be €452,000 for Jessica and €163,000 for Paul. Currently, the couple have more than sufficient coverage through their disability insurance (€633,900 and €365,700, respectively). We should recommend actually decreasing this coverage for both of them to lower the premiums being paid every month.

Premature Death

As in the case of disability insurance, the couple also has higher life insurance than what is necessary. We would recommend decreasing this coverage to lower the premiums paid.

Retirement Savings

The Schmitts are in a position to retire comfortably. The current projected income (assuming they continue to contribute the maximum amount) from their pension assets in retirement is in excess of their projected spending needs. The couple should continue to contribute the legal maximum to their pension plans.

Investment Portfolio Asset Allocation

Because the couple's first retirement goal, to live comfortably, is already covered through their retirement plans, we can focus on the other two objectives: supporting Peter and leaving an inheritance to Roxane.

The current balance of the investment portfolio is €611,000. We know the couple has been contributing €33,000 to this portfolio on an annual basis, and we should recommend that the Schmitts continue making these contributions. The higher the contributions, in addition to capital gains and dividends, the higher the probability of meeting the couple's objectives.

Because the couple has multiple objectives that span multiple time periods, we should follow a goals-based investing approach. Using this approach, we recommend creating two sub-portfolios that correspond to supporting Peter and leaving an inheritance to Roxane.

- *Peter's sub-portfolio:* Assets devoted to the goal of Peter's care, currently €500,000 allocated 70% equity/30% fixed-income, should be reallocated gradually toward an increasing proportion of inflation-protected government bonds. Allocating to inflation-protected bonds will help make sure the portfolio maintains its real value over time. Because the portfolio will not be touched for almost 20 years, realized gains should be managed in a way that maximizes the benefit of any capital gain tax exemptions.

- *Roxane's sub-portfolio:* Most of the portfolio is allocated to Peter's long-term care objectives, leaving only €111,000 in investable assets available for Roxane's sub-portfolio. This objective has an even longer time horizon (30+ years), so this sub-portfolio should initially be 100% allocated to diversified global equity funds to benefit from the high expected returns from equities.

Bear in mind the importance of reviewing whether the allocation stays in line with these goals as the Schmitts continue to save and accumulate assets. The portfolio allocations should be monitored regularly.

MODULE QUIZ 38.3

To best evaluate your performance, enter your quiz answers online.

Brandon and his wife, Eileen, are 55 years old and are in the peak accumulation stage of their careers. They meet with John Davis, CFA, a family friend, to begin to prepare for retirement, which they expect will occur in 10 years. Eileen, who is Chief Marketing Officer at a small marketing firm, makes an annual salary of $100,000 per year and expects her compensation to increase at 4% annually, somewhat above the current inflation rate of 2%, for the next 10 years. Brandon, having just left his job as a computer programmer, recently took a part-time consulting position with a small technology firm and is making $60,000 per year. He expects his compensation to rise with the current rate of inflation. Currently, the government provides disability assistance of 30% of gross income. Assume that the current tax rate is 20% and the risk-free rate is 3%.

1. Assuming that both Brandon and Eileen will qualify for government disability assistance, **calculate** the amount of additional disability insurance they should each take out individually. For this calculation, assume their current salaries are at time 0.

2. Five years later, Eileen receives a large raise of $50,000 per year. She believes her future compensation will continue to rise at 4% until retirement. Despite a large increase in salary, **discuss** why it may not be necessary to take out additional disability insurance. Note: There are no calculations necessary to answer this question.

3. Brandon and Eileen will have to fund their retirement income solely from their retirement accounts and investment portfolio. They also have three children, ages 30, 20, and 15, all three of whom, upon Brandon and Eileen's death, their parents would like to receive a substantial inheritance. The total value of their investment assets is currently valued at $2.5 million. Which of the following is *least appropriate* justification for Davis to use a goals-based investment strategy when making recommendations to Brandon and Eileen?
   A. Brandon and Eileen's goals have multiple time horizons associated with them.
   B. Brandon and Eileen have multiple goals they are trying to accomplish upon retirement.
   C. A strategy based on Brandon and Eileen's goals will maximize the portfolio's return for given measure of risk.

MODULE 38.4: EARLY RETIREMENT STAGE

We close the Schmitts' case study with the couple about to turn 65 and retire. They are generally in excellent health, though they infrequently make use of the government's medical system.

They currently spend less than they did in previous stages of life, and their investments now amount to approximately €1.5 million. Even with the gradual transition from equity funds to fixed-income funds, equities still account for 50% of the total portfolio, as a result of vigorous returns from this asset class. The rest is divided evenly between inflation-protected government bonds and high-quality corporate bonds.

Jessica's earnings have diminished because she decided to withdraw from her management role and enter IT consulting. The Schmitts' expenditures have also decreased because Roxane is now living independently.

In a meeting, the couple describes some of their goals as they enter this new stage of their career:

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- **Retire soon** with a comfortable income level for their lifetimes and avoid a scenario in which they live longer than their money. The Schmitts consider themselves to be in good physical shape and expect to live beyond the typical life expectancy. They also want to ensure that they preserve the purchasing power of their income in retirement.

- **Provide financial support for Peter.** The Schmitts estimate that in 10 years the cost of their son's care will be €35,000 per year before inflation.

- **Leave an inheritance to Roxane** in a still-undefined amount.

- **Help Roxane buy her first property** by providing her with up to €150,000.

The couple's financial circumstances and pension assets are summarized in Figures 38.12 and 38.13.

Figure 38.12: Summary of the Schmitts' Circumstances in the Early Retirement Stage (€)[10]

	Jessica	Paul	Combined
Annual Gross Income	90,000	89,000	179,000
Source of income	Senior IT Consultant	Teacher	
Annual living expenses			70,000
Property			420,000
Investment portfolio			1,511,000

Figure 38.13: Summary of the Schmitts' Retirement Assets in the Early Retirement Stage (€)[11]

Paul's mandatory government pension plan	Annual pension of 48,950 (55% of final salary of 89,000)
Jessica's mandatory government pension plan	Annual pension of 28,190
Jessica's company pension	DC plan; Fund value of 350,000 corresponding to an annual pension of 17,500
Paul's private pension savings plan	135,000 corresponding to annual pension of 6,750
Jessica's private pension savings plan	175,000 corresponding to annual pension of 8,750

Note: The annual pension amounts assume that the fund value at retirement is used to purchase a fixed payment annuity at a 5% yield.

Prior to assessing the couple's risk exposures, we establish the following:

- With the Schmitts' retirement imminent, there is no longer a need for disability or life insurance coverage.

- The government pension income that they will soon begin to receive is now known with certainty.

A strategy should be established for the pension schemes the Schmitts have. Their financial advisor explains that the options for the couple are as follows:

1. Create a stream of income for the remainder of their lives by purchasing annuities. The current nominal rate is 4.5% after costs.

2. Withdraw lump sums. Up to one-third of the employer pension can be withdrawn, while the private pension offers more flexibility. Current law states that 25% of a lump sum distribution is tax-free.

3. Keep the monies invested in the retirement plans schemes.

LOS 38.g: Identify and analyze a family's risk exposures during the early retirement stage.

CFA® Program Curriculum, Volume 6, page 361

At this point, the couple's risks look slightly different than they have in previous stages. They do not need to keep their life or disability insurance because they are no longer employed and earnings risk is no longer an issue. Additionally, saving for retirement through their public or private pensions no longer incurs risk because the amount of pension income in retirement is known.

Instead, there are two big risks at the early retirement stage.

Retirement Income Risk

One of the risks the Schmitts face is outliving their assets in retirement. Because the couple will receive pension income from the mandatory government pension plan, we know that part of their retirement income is already covered. However, both Jessica and Paul have private and employer pension plans, which do not provide known income in retirement.

Investment Portfolio Goals

- Provide economic support for Peter (this is a top priority).
- Give an inheritance to their children, chiefly Roxane.
- Offer Roxane a deposit on her house purchase in coming years.
- Maintain the ability to draw on their investments to cover unexpected expenses—for example, if their retirement income does not increase as much as the cost of living. Or if an unexpected expense arises, for example, related to their health care needs.

LOS 38.h: Recommend and justify a plan to manage risks to an individual's retirement lifestyle goals.

CFA® Program Curriculum, Volume 6, page 362

Retirement Income Objectives

The Schmitts have an objective of making sure their after-tax retirement income covers their €70,000 of living expenses. Their combined government pension plan income will yield €77,150 before taxes, so the couple will have to supplement the rest of this income with their employer and private pensions.

Current law says the couple can withdraw up to 25% of their company pension plans tax-free. If we withdraw 25% from Jessica's largest account and Paul's only pension account, and use the remaining balance to purchase an inflation-protected annuity at 4.5% after all fees, the couple would receive a total of €93,600 in pre-tax income, or €72,000 after tax. This is greater than the €70,000 in annual living expenses.

Figure 38.14: Summary of the Schmitts' Retirement Income Proposal in Early Retirement Stage (€)[12]

Jessica's state pension	28,200
Paul's state pension	48,950
Total pretax income from state pension	**77,150**
Annuity (4.5% after all fees) purchased using 75% of Jessica's company pension plan	11,800
Annuity (4.5% after all fees) purchased using 75% of Paul's private pension plan	4,600
Total pretax income from pensions and annuities	**93,600**
Less tax	21,600
After-tax income	**72,000**

The remaining one-quarter of the two pension plans could be taken as a tax-free lump sum (creating a total of €121,250). Jessica's remaining, untouched, private pension plan, would not be needed as a source of retirement income. You suggest withdrawing that 25% of that plan as a tax-free lump sum of €43,750, leaving the remainder invested in the plan.

The end result of this is the couple's living expenses are covered by pension income and inflation-protected annuities, while the couple is able to withdraw €165,000 tax-free (€121,250 + €43,750).

Investment Portfolio Asset Allocation

Suppose that the Schmitts ask you to advise them about their investment portfolio, which currently stands at €1,511,000. The couple will additionally receive a pension lump sum of €165,000 tax-free, which will leave €131,250 in Jessica's private pension plan, and bring the total value of resources available to about €1.8 million.

We must address the couple's top priority objective: supporting Peter. At the moment, the couple is taking care of their son from their current living expenses. However, they estimate the annual cost of supporting Peter will be €35,000 in nominal terms in 10 years, at which point they believe they will no longer be able to provide for him. This amount is expected to remain relatively constant in real terms. Using some assumptions around life expectancy, we estimate that the present value of these costs amounts to €800,000.

Next, we inquire about the couple's investment preferences, to which they respond with the following:

- They do not want to experience more than a 20% drop in the overall value of their investment portfolio.
- The Schmitts like to feel "in control" and wish to invest in instruments they can liquidate easily.
- Despite Eurolandia's stability, they worry about inflation.
- They do not want to make investments in real estate funds.

Because the Schmitts' income needs are being met by their pension income and annuities, their ability to take risk in their investment accounts is much higher than that of other couples that may need to use such accounts to supplement their pension income. However, based on Jessica's comments about not wanting to see their portfolio value decrease more than 20% in any year, their willingness to take risk is lower.

Because there are multiple objectives, it is appropriate to use a goals-based asset allocation approach. Using a combination of a goals-based investing techniques and capital market assumptions for the major asset classes (including Eurolandian equities), we come up with the following proposal:

Figure 38.15: Investment Portfolio and Goals as the Schmitts Enter Retirement[13]

Existing Asset Allocation	Current Allocation (€)	Goals	Time Horizon	Recommended Asset Allocation
Liquid funds (cash proceeds from pension lump sum)	165,000	Help Roxane with property purchase deposit	<1 year	Keep funds in cash
Inflation-protected government bond funds	380,000	Care for Peter	10 years	Inflation-protected bonds 45% (739,000)
Corporate bond funds	370,000	Inheritance for Roxane (amount undefined) and funding for unexpected expenses	Up to 25 years	Corporate bond funds 10% (164,000)
Passively managed equity funds	750,000			Global equities 35% (575,000), including actively managed equity funds in Jessica's private pension plan; Eurolandian equities 10% (164,000)
Jessica's private pension plan (actively managed equities)	131,250			
Total	Approximately 1.8 million			

We justify this recommendation using the following comments:

- To help Roxane with a down payment on a new home, we recommend keeping the funds received from the pension lump sum in cash.

- We calculated the present value of Peter's care costs to be €800,000. In the investment portfolio, we should allocate this amount to inflation-protected government bonds to maintain purchasing power.

- The majority of the remaining balance should be allocated to global equities to allow the investment portfolio to benefit from long-term stock returns.

Notice the portfolio is already invested in various asset classes, so a transition will require the couple to realize capital taxes. Therefore, we should recommend these moves are made in a matter that takes advantage of capital gains tax exemptions, if applicable.

MODULE QUIZ 38.4

To best evaluate your performance, enter your quiz answers online.

Lynn and Michael are 65 years old and have reached the early retirement stage of their careers. They currently have no debt outstanding and, over the course of their lives, have built up a combined investment portfolio value of $5 million. They meet with their advisor, Jamie Rodriguez, CFA, to discuss the following objectives in retirement:

- Live a comfortable retirement with their annual expenses covered. Starting next year, they estimate their annual living expenses will be $100,000 before tax.
- Set aside $1 million (in today's dollars) to leave to their three children, Kyle, Jacob, and Grant, in 30 years.
- Go on vacation twice a year, the total cost of which should amount to roughly $20,000 per year.

Throughout the conversation, Jamie inquires about the couple's risk tolerance. Lynn explains that she made a few bad investments earlier in her career and doesn't think she could stomach a drawdown of more than 20% in any given year. Michael shares that he wants more upside potential in their portfolio and wants to invest a significant portion of it in the stock market.

1. **Describe** and **justify** Lynn's ability and willingness to take risk.

2. Based on the couple's objectives, **describe** and **justify** which asset allocation technique Jamie should follow, and what kind of asset allocation recommendation (conservative, moderate, or aggressive) he should make across the different objectives.

   a. Asset allocation technique

   b. Asset allocation

      i. Live a comfortable retirement

      ii. Leave $1 million (in today's dollars) to their three children

      iii. Go on vacation twice a year

LOS 38.a

Risk exposures during the early career stage:

A family in the early career stage will have little financial assets, and economic assets will be primarily human capital.

Earnings risk: There is a risk of earnings loss from unemployment and/or disability.

Premature death risk: Spouses and children need protection against an untimely death of a spouse and the subsequent loss of income.

LOS 38.b

Managing risk exposures during the early career stage:

Earnings risk: A family should accumulate a savings reserve to protect against unemployment, as well as take out disability insurance.

Premature death risk: A family should purchase life insurance. The amount can be determined using the *human life value* and/or *needs analysis* methods.

LOS 38.c

Risk exposures during the career development stage:

Earnings risk: There is a risk of earnings loss from unemployment and disability. Risk increases with rising income, as well as if there is an increase in the number of dependents.

Premature death risk: Early passing can set surviving family members back in lifestyle, plus there may be an additional decrease in income if the surviving spouse becomes the primary caregiver for children.

Investment portfolio: Even if the family has built up investment savings, the portfolio may not be properly diversified or may be too correlated to human capital.

Retirement goals: Retirement income objectives must be met.

LOS 38.d

Managing risk exposures during the career development stage:

Earnings risk: To protect against unemployment, three to six months of expenses should be accumulated. To protect against disability, disability insurance should be purchased (and updated to reflect revised salary projections).

Premature death risk: Families should purchase and/or update their life insurance policy to reflect expenses and salary projections

Investment portfolio: This should be properly allocated and diversified against human capital.

Retirement goals: Proper savings goals should be developed. Asset allocation in retirement and savings accounts should match the objectives of these goals.

LOS 38.e

Risk exposures during the peak accumulation stage:

Earnings risk: There is a risk of earnings loss from unemployment and disability. Risk increases with rising income, as well as if there is an increased number of dependents.

Premature death risk: Premature death can set surviving family members back in lifestyle. Employment income may be impacted if the spouse takes on additional childcare duties.

Investment portfolio: Investment portfolios may not be appropriately allocated for current life stage and/or for the objectives to be met in retirement.

Retirement goals: Income objectives in retirement should be identified.

LOS 38.f

Managing risk exposures during the peak accumulation stage:

Earnings risk: As a hedge against unemployment, three to six months of expenses should be built up. To protect against disability, disability insurance should be purchased and/or updated to reflect updated salary projections. It may be appropriate to decrease insurance coverage at this stage to reflect the shortened time horizon.

Premature death risk: Life insurance should be updated. It is likely that the appropriate amount of insurance will decrease because the time horizon has been shortened.

Investment portfolio: This should be reallocated and rebalanced to reflect shortened time to retirement. It may be appropriate to reallocate to a balanced fund.

Retirement goals: Savings goals and asset allocation recommendations should reflect income objectives in retirement.

LOS 38.g

Risk exposures during the early retirement stage:

Retirement income: The retiree is no longer contributing to a retirement account, so income is known. The family must be able to match expenses with a reasonable income objective.

Investment portfolio: The investment portfolio may not match family goals for this life stage.

LOS 38.h

Managing risks to an individual's retirement lifestyle goals:

Retirement income: The family should consider purchasing annuities and/or taking lump sum distributions from pension plans (if applicable) to maximize potential income and tax benefit.

Investment portfolio: The investment portfolio should be allocated to match objectives and the time horizons of those objectives.

ANSWER KEY FOR MODULE QUIZZES

Module Quiz 38.1

1. **B**   In their early career stage, people have many working years ahead of them, and thus tend to be richly endowed with human capital—especially if they are trained in fields that are in high demand. (LOS 38.a)

2. **B**   People that are young and rich in human capital can afford to take more investment risk because they have ample time to recoup investment losses, plus they will have opportunities to invest labor income ahead of them during their working career. The other two reasons are reasons for someone in their early career stage to not invest in their portfolio aggressively. (LOS 38.b)

3. **C**   In the early career stage of life, a home purchase will increase a person's vulnerability to unexpected short-term outlays: their ability to pay unexpected bills will be limited if they use their limited savings as a down payment or to cover transaction costs. (LOS 38.b)

Module Quiz 38.2

1. **B**   It is difficult to directly insure against earnings risk arising from loss of employment. Financial advisors typically recommend that their clients build up a savings "buffer" amounting to approximately six months' worth of normal expenditures. This allows employees to self-insure themselves to be able to cope with job loss. (LOS 38.c)

2. **B**   Individuals should hold an investment portfolio with as low as possible correlation to their human capital. They should also steer clear of concentrated holdings in favor of diversification. Financial advisors generally recommend low-cost pooled investment vehicles, specifically funds that are diversified across a broad range of regions, sectors, and securities. (LOS 38.d)

3. **B**   If the client has children, his level of insurance coverage will need to be reviewed and potentially increased significantly. Under the *human life value* method, the amount of coverage that a life insurance policy should provide is estimated as the amount of future earnings that must be replaced, which is based on current and future salary. (LOS 38.d)

Module Quiz 38.3

1. **Disability Insurance Coverage for Brandon and Eileen**

	Eileen	Brandon
Net income to be replaced	80,000	48,000
Annual disability coverage from government assistance	30,000	18,000
Shortfall	50,000	30,000
Benefit period (until retirement)	10 years	10 years
Assumed annual benefit adjustment	4%	2%

Discount rate	3%	3%
PV of future earnings replacement required	527,492	284,438

(LOS 38.e)

2. Even though Eileen received such a large salary increase, the time horizon until retirement has shortened. Therefore, the present value of future earnings not covered by the government assistance program may now actually be less than the current disability coverage. (LOS 38.e)

3. **C** The idea behind goals-based investing is to disaggregate an investor's portfolio into multiple sub-portfolios, each designed to fund a goal that has its own probability of success and time horizon. (LOS 38.f)

Module Quiz 38.4

1. a. Willingness

   Lynn's willingness to take risk is low. She mentions making a few bad investments earlier in her career, which has made her cautious. Additionally, Lynn said she doesn't think she could stomach a 20% drawdown in any given year.

   b. Ability

   Lynn's ability to take risk is high. She and Michael currently have a portfolio of $5 million, and their income needs are $120,000 next year. Even though they wish to set aside $1 million, that's still 3% ($120,000 / $4,000,000) of income needs per year.

   (LOS 38.g)

2. a. Asset allocation technique

   Jamie should follow a goals-based asset allocation technique. Lynn and Michael have multiple objectives that span multiple time periods. Jamie should recommend dividing their portfolio into sub-portfolios.

   b. Asset allocation

   i. Live a comfortable retirement

   This sub-portfolio will represent the largest allocation. Because the income needs are small relative to the total portfolio, the asset allocation can be aggressive. However, given Lynn's low willingness to take risk, this sub-portfolio should be more conservative so as to keep her invested.

   ii. Leave $1 million (in today's dollars) to their three children

   Because this objective culminates 30 years in the future, this sub-portfolio should be invested aggressively (in asset classes like stocks) to grow as much as possible.

   iii. Go on vacation twice per year

   Because this annual income goal is covered by the first objective, the answer should be the same as i.

   (LOS 38.h)

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1. Portions of the case are reprinted from Level III CFA Volume 6, starting on page 326.

2. Reprinted from Level III CFA Volume 6, page 327, Exhibit 2.

3. Reprinted from Level III CFA Volume 6, page 332, Exhibit 5.

4. Reprinted from Level III CFA Volume 6, pages 333, 334, Exhibit 6.

5. Reprinted from Level III CFA Volume 6, pages 338, 339, Exhibit 8.

6. Reprinted from Level III CFA Volume 6, pages 338–339, Exhibit 8.

7. Reprinted from Level III CFA Volume 6, page 343, Exhibit 11.

8. Reprinted from Level III CFA Volume 6, pages 348, 349, Exhibit 13.

9. Reprinted from Level III CFA Volume 6, page 355, Exhibit 19.

10. Reprinted from Level III CFA Volume 6, page 361, Exhibit 22.

11. Reprinted from Level III CFA Volume 6, page 361, Exhibit 23.

12. Reprinted from Level III CFA Volume 6, page 364, Exhibit 24.

13. Reprinted from Level III CFA Volume 6, page 366, Exhibit 26.

Use the following information for Questions 1 through 4.

Rob Baker, an investment manager at Welker Auto Parts (Welker), is responsible for managing his company's defined benefit pension plan. The plan has been underfunded for several months, and Baker is meeting today with Gary Thompson, the company's CFO, to discuss possible ways to erase this liability funding shortfall.

During the meeting, Baker and Thompson make four comments:

> Comment 1: Baker proposes that the plan should increase the value of its pension assets by investing in riskier securities. Currently, the plan invests a majority of its funds in investment-grade corporate bonds and large-cap equities. Baker is confident that investments in small-cap equities will help bring the fund back to fully funded status.

> Comment 2: Thompson is not confident that shifting to riskier securities will guarantee an increase in pension asset values and points to the company's high debt ratio as an indication of a need to take a more risk-averse stance.

> Comment 3: Baker notifies Thompson of the high correlation of pension asset returns with the firm's operations and states that the high correlation increases the ability to take risk by increasing predictability and diversification.

> Comment 4: Thompson disagrees, suggesting that a firm's high ratio of active to retired lives diminishes the ability to take on more risk.

Baker and Thompson then turn to a list of additional discussion items:

> Item 1: Add an option to the plan that will allow participants to retire five years earlier than currently permitted at a 15% reduction in the value of the benefit payout.

> Item 2: Freeze the plan. All new employees will participate in a new defined contribution plan in which they can select from a list of investment alternatives that will range from more conservative to more aggressive than the defined benefit plan.

Each item is independent and is to be considered in isolation, as if it is adopted and no other changes are made.

1. Regarding Baker's comment 1 and Thompson's comment 2, which of the following *best* describes the appropriateness of their views?

Baker	Thompson
A. Inappropriate	Appropriate
B. Appropriate	Inappropriate
C. Inappropriate	Inappropriate

2. Regarding Baker's comment 3 and Thompson's comment 4, which of the following *most likely* describes their accuracy?

Baker	Thompson
A. Incorrect	Correct
B. Correct	Incorrect

| | C. Incorrect | Incorrect |

3. If item 1 is adopted, what is the *most likely* immediate effect on the plan's liquidity needs and surplus?

	Liquidity needs	Surplus
A.	Increase	Increase
B.	Increase	Decrease
C.	Decrease	No change

4. Assuming item 2 is adopted and most plan participants choose more aggressive assets than those in the pension plan portfolio, the risk for the sponsor (Welker) will *most likely*:
   A. increase.
   B. decrease.
   C. be unchanged.

Use the following information for Questions 5 through 8.

Nancy Wienke, CFA, is a senior portfolio manager at Nixon Investments, Inc. (Nixon). One of Nixon's largest clients is a pension fund, and Wienke is responsible for all of the pension fund's investment decisions and execution of trades. It is Wienke's belief that the firm's portfolio managers should be able to measure trading costs as well as have a complete understanding of available trading techniques. Tamika Brooks, a junior portfolio manager, assists Wienke with her decisions.

Wienke asks Brooks to evaluate a trade made last week for the pension fund, using the implementation shortfall measure. The trade was a buy order for the stock of Allen Materials (Allen). Allen is a mid-cap stock, which Wienke thinks is a timely buy given a recent announcement about the firm's prospects.

The details of the trade are as follows. On Wednesday, Allen's stock price closed at $60.00 per share. On Thursday morning before the market opened, Wienke decided to buy Allen and transferred a limit order for $59.75 per share for 1,000 shares to the trader. The trader released the order to the market 45 minutes after receiving it, when the price was $60.02. The order expired unfilled, and the Allen stock closed at $60.04 on Thursday. On Friday, the order was revised to a limit of $60.07. The order was partially filled that day: 700 shares were bought at $60.07. The commission was $19. The stock closed at $60.08 on Friday and the remaining order was canceled.

Wienke and Brooks next discuss Tabler, Ltd. (Tabler) stock. Wienke tells Brooks that she would like to use an algorithm to buy shares close to the market price at the time the order is submitted for execution. She is also risk averse regarding the Tabler trade and would like to buy the shares quickly to reduce the execution risk associated with trading more passively over longer time horizons.

Finally, Wienke has been given the task of selecting a new broker to execute all of Nixon's domestic fixed-income securities trades. Domestic fixed-income securities are considered a very liquid asset class.

5. The trading cost component of the implementation shortfall measure Brooks should calculate for the Allen trade is *closest* to:
   A. $21.
   B. $35.
   C. $49.

6. The opportunity cost component of the implementation shortfall measure Brooks should calculate for the Allen trade is *closest* to:
   A. $12.
   B. $21.
   C. $24.

7. What type of algorithm should be used to purchase the Tabler shares, given Wienke's stated requests?
   A. Scheduled.
   B. Arrival price.
   C. Opportunistic.

8. In selecting a new broker for Nixon's domestic fixed-income asset class, which of the following factors is *least* relevant for Wienke in making the decision?
   A. Financial stability.
   B. Settlement capabilities.
   C. Willingness to commit capital.

Use the following information for Questions 9 through 12.

Jonathan Li, CFA, and Christopher Adams, CFA, are both institutional portfolio managers who are focusing on managing liquidity risk for endowments.

Li states: "The time-to-cash is the estimated time it would take in the normal course of business to convert assets in a particular category into cash." For one of his portfolios, Li prepares a time-to-cash table and a liquidity budget, which include liquidity classifications for various asset classes, including asset class X. The liquidity classifications are based on the time expected to liquidate an investment without liquidation having a significant impact on market conditions and the resulting sale price for the investment.

Adams makes the following two statements with regard to systematic rebalancing policies and stress testing, respectively.

> Statement 1: Less volatile investment categories should usually have wider rebalancing ranges.

> Statement 2: Comprehensive stress testing exercises would presume extremely adverse market conditions for assets only to understand how they are impacted during stress conditions.

Adams is investigating the role of tactical asset allocation (TAA) in the investment strategy for one of his portfolios.

Over time, the asset allocation of one of Li's actively managed portfolios has drifted from its policy targets. After some discussion with his portfolio team, Li needs to perform a rebalancing transaction by reallocating 0.75% between fixed-income and equity asset classes. Prior to performing the transaction, he considers the costs of doing so in the cash market and the futures market.

9. Assuming the time-to-cash for asset class X is eight months, the *most appropriate* liquidity classification for this asset class would be:
   A. liquid.
   B. illiquid.
   C. semi-liquid.

10. Which of Adams's statements is correct?

A. Statement 1 only.
B. Statement 2 only.
C. Neither statement 1 nor statement 2.

11. The use of a specific TAA to improve the portfolio's risk-adjusted returns is *most appropriate* for the endowment's investment strategy in:
    A. the long term only.
    B. the short term only.
    C. the short term and the long term.

12. In analyzing the costs of the rebalancing transaction, the impact of timing delays and disruptions to active manager portfolios will affect which of the following trading cost components?
    A. Cash drag.
    B. Mispricing.
    C. Price impact.

Use the following information for Questions 13 through 16.

Ian and Jacqueline Munro, aged 30 and 31 respectively, are married and in good health. They have no children and do not plan to have any for at least the next three or four years. They have no debts and have been employed in stable positions for four years in their chosen fields: Ian as a civil engineer and Jacqueline as a marketing director. Their annual after-tax salaries are similar and substantial and are expected to remain that way for the foreseeable future.

Over the past four years, they have paid off all their student loans and accumulated enough savings for a $125,000 down payment on a townhome. Currently they rent an apartment for $2,100 per month, inclusive of all costs and subject to 2% annual increases (starting six months from now) for the next five years. Given their tendency to be environmentally friendly, they rely solely on public transportation and ride-sharing applications. Outside of work, they enjoy recreational activities such as downhill skiing and hiking.

Their real estate agent showed them several properties recently and they are now considering the purchase of a $500,000 townhome in six months. The townhome is located in the city and has strong potential for future appreciation in value. It has a basement suite that can be rented out, but the Munros state that they will fully utilize the townhome and not rent out the basement. The Munros have been preapproved for a $375,000 mortgage at a fixed annual rate of interest of 3.1% for a 5-year term and 25-year amortization. Payments are to be made on a semimonthly basis. Annual property taxes and maintenance costs are expected to remain stable at $3,300.

The Munros recently spoke to their insurance agent to determine if they each require life insurance and, if so, how much coverage. The insurance agent mentioned that the amount of coverage could be calculated using two methods: the human life value method and the needs analysis method. In terms of property insurance, a homeowners policy that provides them with sufficient coverage (should they purchase the townhome) would cost them $120 per month.

13. Considering their current circumstances, which risk is *most* relevant for the Munros to consider?
    A. Liability risk.
    B. Earnings risk.

      C. Premature death risk.

14. Assuming they go ahead with the townhome purchase, what is the *most appropriate* asset classification for their townhome?
    A. Mixed asset.
    B. Personal asset.
    C. Investment asset.

15. Assuming the Munros would like to purchase the minimum amount of insurance required to provide the surviving spouse with sufficient funds, which method of calculating life insurance coverage would be *most appropriate* for the Munros?
    A. Needs analysis method.
    B. Human life value method.
    C. Both methods are equally appropriate.

16. From a pure cost perspective, what is the *most appropriate* course of action for the Munros?
    A. Purchase the townhome.
    B. Continue to rent the apartment.
    C. Renting or purchasing would be equally appropriate.

1. **A**   Baker's views are inappropriate. He wants to take greater risk by investing in small-cap equities, but the plan's underfunded status has decreased the ability to take risk, and therefore taking greater risk is inappropriate. Thompson's views are appropriate. A high debt ratio would indicate a decreased capability of making contributions and meeting plan liabilities. (Study Session 14, Module 33.2, LOS 33.e)

2. **C**   Baker's statement is incorrect. A high correlation of pension asset returns with a firm's operations reduces the ability to take risk. For example, the ability of the firm to make contributions will be low at the same time that the plan is underfunded. Thompson's statement is also incorrect. A high ratio of active to retired lives usually indicates an increased ability to take risk because it lowers liquidity needs and increases the time horizon. (Study Session 14, Module 33.2, LOS 33.e)

3. **A**   The early retirement option will increase liquidity needs. While the payments made to a given individual will be discounted by 15%, that individual can start taking money sooner, and disbursements from the plan will increase immediately. Liquidity refers to disbursement needs now, not the final amount of total payments made over time. If the early payout were done at full value of the payout, the cash disbursed [reducing the present value of assets (PVA)] would equal the reduction in present value of liabilities (PVL). However, with the 15% discount applied to the distribution's value, PVA will decline less than PVL and surplus will improve. (Study Session 14, Module 33.2, LOS 33.e)

4. **B**   The risk of the plan for the plan sponsor will decrease regardless of the investment choices made by each participant. In a defined contribution plan, each participant bears the investment risk, not the sponsor. With a defined benefit plan, the sponsor essentially has an open-ended obligation to fund the plan. With the change to a defined contribution plan for new employees, this open-ended future obligation has been somewhat limited. Note there is no immediate change in PVA, PVL, and surplus; but even so, there is now some new limitation on the future obligations of the sponsor and thus of risk to the sponsor. (Study Session 14, Module 33.2, LOS 33.e)

5. **B**   The trading cost reflects the execution price paid on the shares executed. It is calculated as 700 × ($60.07 – $60.02) = $35.

   Note: the delay cost, which reflects the adverse price movement with not submitting the order to the market on a timely basis, is 700 × ($60.02 – $60.00) = $14. The sum of the trading cost and the delay cost is the execution cost, which is $49. (Study Session 15, Module 34.4, LOS 34.g)

6. **C**   The opportunity cost is based on the number of unexecuted shares and reflects the cost of not being able to execute all shares at the decision price. It is calculated as 300 × ($60.08 – $60.00) = $24. (Study Session 15, Module 34.4, LOS 34.g)

7. **B**   Wienke's risk aversion, need to trade quickly, and desire to trade at close to the market price suggest an arrival price algorithm. Arrival price algorithms are designed

to trade near current market prices when the order is received. They carry out a front-loaded strategy, trading more aggressively when trading begins to execute more shares near the arrival price. (Study Session 15, Module 34.2, LOS 34.d)

8. **C** A broker's willingness to commit capital (i.e., to act as a dealer) is especially important for less liquid securities. Because domestic fixed-income securities are a highly liquid asset class, the willingness to commit capital is a far less relevant factor to consider compared to financial stability and settlement capabilities. (Study Session 15, Module 34.5, LOS 34.i)

9. **C** If the time-to-cash is between one quarter and one year, its liquidity classification would most likely be semi-liquid. For one week to one quarter, it would be liquid, and for over one year, it would be illiquid. (Study Session 16, Module 37.1, LOS 37.a)

10. **C** The size or width of the ranges should consider the underlying volatility of each asset class to minimize transaction costs, which results in less volatile investment categories usually having narrower rebalancing ranges. Stated alternatively, more volatile asset classes should usually have wider rebalancing ranges. Therefore, statement 1 is not correct.

    Comprehensive stress test exercises would stress both assets and liabilities at the same time to understand how they are impacted during stress conditions. For assets, the stress test can encompass assumed distributions for prices, correlations across assets, and liquidity characteristics. It can also consider liability shocks (e.g., increased expected endowment distributions during stress periods). Therefore, statement 2 is not correct. (Study Session 16, Module 37.1, LOS 37.a)

11. **B** The use of a specific TAA is appropriate only in the short term; over the long term, various specific TAAs would likely be employed. The strategic asset allocation is appropriate in the long term. (Study Session 16, Module 37.2, LOS 37.c)

12. **A** When transacting in the cash market only, timing delays and disruptions to active manager portfolios specifically affect cash drag. (Study Session 16, Module 37.3, LOS 37.e)

13. **B** The most relevant risk for the Munros is earnings risk, especially earnings risk resulting from health or disability. Although they are young and healthy, because they engage in higher-risk activities, such as downhill skiing, there is an increased risk of disability (and the inability to work) resulting from potential injuries sustained in such activities.

    Because they are both young and healthy, premature death risk is less of a risk. Additionally, because they earn similar and substantial incomes, it is more likely that the surviving spouse would be able to adapt to a change in lifestyle if the household costs became the surviving spouse's sole responsibility. The household costs are also minimized because they have no children yet.

    Because the Munros currently live in rented premises and do not own a car (they rely solely on public transportation), they face minimal or no liability risks. (Study Session 16, Module 38.1, LOS 38.a)

14. **A** The house is considered a mixed asset, with elements of a personal asset (consumer item required for day-to-day living) and an investment asset (potential to appreciate in value). The fact that they do not plan to rent out any portion of their home

does not make it exclusively a personal asset. (Study Session 16, Module 38.1, LOS 38.a)

15. **A** The needs analysis method is based on estimating the amount needed to cover the surviving spouse's living expenses in the absence of income from the deceased spouse. Because Ian and Jacqueline's annual after-tax salaries are similar and substantial (and are expected to remain that way for the foreseeable future), the needs analysis method would suffice for them and provide a lower amount of insurance coverage.

    In contrast, the human life value method estimates the amount of future earnings that must be replaced. It would likely calculate an amount of insurance coverage that greatly exceeds what is necessary. (Study Session 16, Module 38.1, LOS 38.b)

16. **A** Renting the apartment currently costs $2,100 per month, but with the known 2% annual increases, the monthly rent will increase to $2,142 in year 1, $2,185 in year 2, $2,229 in year 3, $2,273 in year 4, and $2,318 in year 5.

    Purchasing the townhome will require mortgage payments, insurance costs, property taxes, and maintenance costs.

    Semimonthly mortgage payments are calculated as follows:
    - N = 2 × 12 × 25 = 600; I/Y = (3.1 / 12) / 2 = 0.129167; PV = $375,000
    - PMT = $898.55
    - Monthly mortgage payments = $898.55 × 2 = $1,797.10

    Monthly insurance costs would be $1,500 / 12 = $120. Monthly property taxes and maintenance costs would be $3,300 / 12 = $275. Total monthly costs of the townhome would be $2,192.10. That amount is likely to remain fixed for the next five years.

    In the first and second year, the monthly costs of the townhome ($2,192.10) exceed that of renting ($2,142 and $2,185). However, the rent costs will be higher than the townhome costs starting in the third year. Therefore, the most appropriate course of action from a pure cost perspective would be to purchase the townhome. (Study Session 16, Module 38.1, LOS 38.b)

FORMULAS

The change in the market value of equity for banks and insurers:

%ΔE = %ΔA(M) − %ΔL(M − 1)

where:
%ΔE = percentage change in the value of equity
%ΔA = percentage change in the value of assets
%ΔL = percentage change in the value of liabilities
M = leverage multiplier, A / E

The duration of the equity of a bank or insurer:

$$D_E = D_A(M) - D_L(M - 1) \left(\frac{\Delta i}{\Delta y} \right)$$

where:
D_E = modified duration of the institution's equity capital

D_A = modified duration of the institution's assets

D_L = modified duration of the institution's liabilities

M = leverage multiplier, A / E

$\frac{\Delta i}{\Delta y}$ = estimated change in yield of liabilities, *i*, relative to a unit change in yield of assets, *y*

The expected volatility (i.e.,standard deviation) of the percentage change in the market value of equity capital for a bank or insurer:

$$\sigma_E^2 = M^2\sigma_A^2 + (M - 1)^2\sigma_L^2 - 2(M)(M - 1)\sigma_A\sigma_L\rho_{AL}$$

where:
σ_E = standard deviation of percentage change in the market value of equity

σ_A = standard deviation of percentage change in the value of assets

σ_L = standard deviation of percentage change in the value of liabilities

M = leverage multiplier, A / E

ρ_{AL} = correlation of percentage value changes in assets and liabilities

Implementation shortfall (IS)—at the highest level, the absolute value is:

IS = paper return – actual return

IS can be decomposed into the following parts:

- Execution cost:
    - Delay cost = shares executed × (arrival price – decision price)
    - Trading cost = shares executed × (average purchase price – arrival price)
- Opportunity cost = portion of order not filled × (closing price – decision price)
- Fixed fees = shares executed × commission per share

total IS value ($) = delay cost + trading cost + opportunity cost + fixed fees

All of the components of and total IS can be expressed in terms of basis points (bps) of the original cost of the paper portfolio. A basis point is 1/100th of 1%. A decimal number is multiplied by 10,000 to convert it to basis points.

Trade costs represent costs relative to the benchmark; a positive value represents underperformance:

absolute cost ($) = side × (execution price − benchmark price) × shares executed

$$\text{trade cost (bps)} = \text{side} \times \frac{(\text{execution price–benchmark price})}{\text{benchmark price}} \times 10{,}000$$

where:
side = +1 for a buy order, –1 for a sell order

Market-adjusted cost is used to remove the impact of market movements on trade cost, which ensures a trader is not penalized or rewarded for general market movements over the trade horizon.

$$\text{index cost (bps)} = \text{side} \times \frac{(\text{index VWAP–index arrival price})}{\text{index arrival price}} \times 10{,}000$$

market-adjusted cost (bps) = arrival cost (bps) − β × index cost (bps)

where:
arrival cost = the arrival cost of the trade based on an arrival price benchmark
β = beta of the security versus the index used to calculate index cost

Added value is a different method of trade cost analysis comparing the arrival cost of the trade with the estimated pretrade cost calculated using a model that incorporates key trade cost variables such as order size and liquidity of the market. If a fund executes at a cost *lower* than the pretrade cost estimate, then the trader has added value.

added value (bps) = arrival cost (bps) – estimated pretrade cost (bps)

A negative cost is a benefit—this trader has added value through their trading decisions.

Allocation effect—the contribution to the *i*th sector is equal to the portfolio's sector weight minus the benchmark's sector weight, times the benchmark sector return: $A_i = (w_i − W_i)B_i$

Security selection—the contribution to selection in the *i*th sector is equal to the benchmark sector weight times the portfolio's sector return minus the benchmark's sector return: $S_i = W_i(R_i − B_i)$

Interaction effect—the contribution to the *i*th sector is equal to the portfolio sector weight minus the benchmark sector weight, times the portfolio sector return minus the benchmark sector return: $I_i = (w_i − W_i)(R_i − B_i)$

Carhart model:

$$R_p − R_f = a_p + b_{p1}RMRF + b_{p2}SMB + b_{p3}HML + b_{p4}WML + E_p$$

where:
RMRF = portfolio's sensitivity to a market index

SMB = market capitalization factor
HML = book-to-price factor
WML = momentum factor

For fixed income:

% total return = % income return + % price return

where:
% price return ≈ –duration − change in YTM

Factor-model-based benchmark:

$R_P = a_p + b_1F_1 + b_2F_2 + ... + b_KF_K + \varepsilon$

where:
R_P = periodic return on an account
a_p = "zero factor" term, representing the expected value of R_P if all factor values were zero
F_i = factors that have a systematic effect on the portfolio's performance; i = 1 to K
b_i = sensitivity of the returns on the account to the returns generated from factor *i*
ε = error term; portfolio return not explained by the factor model

Benchmark quality of a portfolio:

$P = M + S + A$

where:
P = investment manager's portfolio return
M = return on the market index
S = B − M = excess return to style; difference between the manager's style index (benchmark) return and the market return—S can be positive or negative
A = P − B = active return; difference between the manager's overall portfolio return and the style benchmark return

Sharpe ratio:
$$S_A = \frac{\bar{R}_A - \bar{r}_f}{\hat{\sigma}_A}$$

Treynor ratio:
$$T_A = \frac{\bar{R}_A - \bar{r}_f}{\hat{\beta}_A}$$

Information ratio:
$$IR = \frac{E(r_p) - E(r_B)}{\sigma(r_p - r_B)}$$

Appraisal ratio:
$$AR = \frac{\alpha}{\sigma_\varepsilon}$$

Sortino ratio:
$$SR_D = \frac{E(r_p) - r_T}{\sigma_D}$$

$$\widehat{\text{SR}}_{\text{D}} = \frac{\bar{r}_{\text{p}} - \bar{r}_{\text{T}}}{\hat{\sigma}_{\text{D}}}$$

Capture ratios are calculated as portfolio return divided by benchmark return. The capture ratio is calculated as upside capture divided by downside capture.