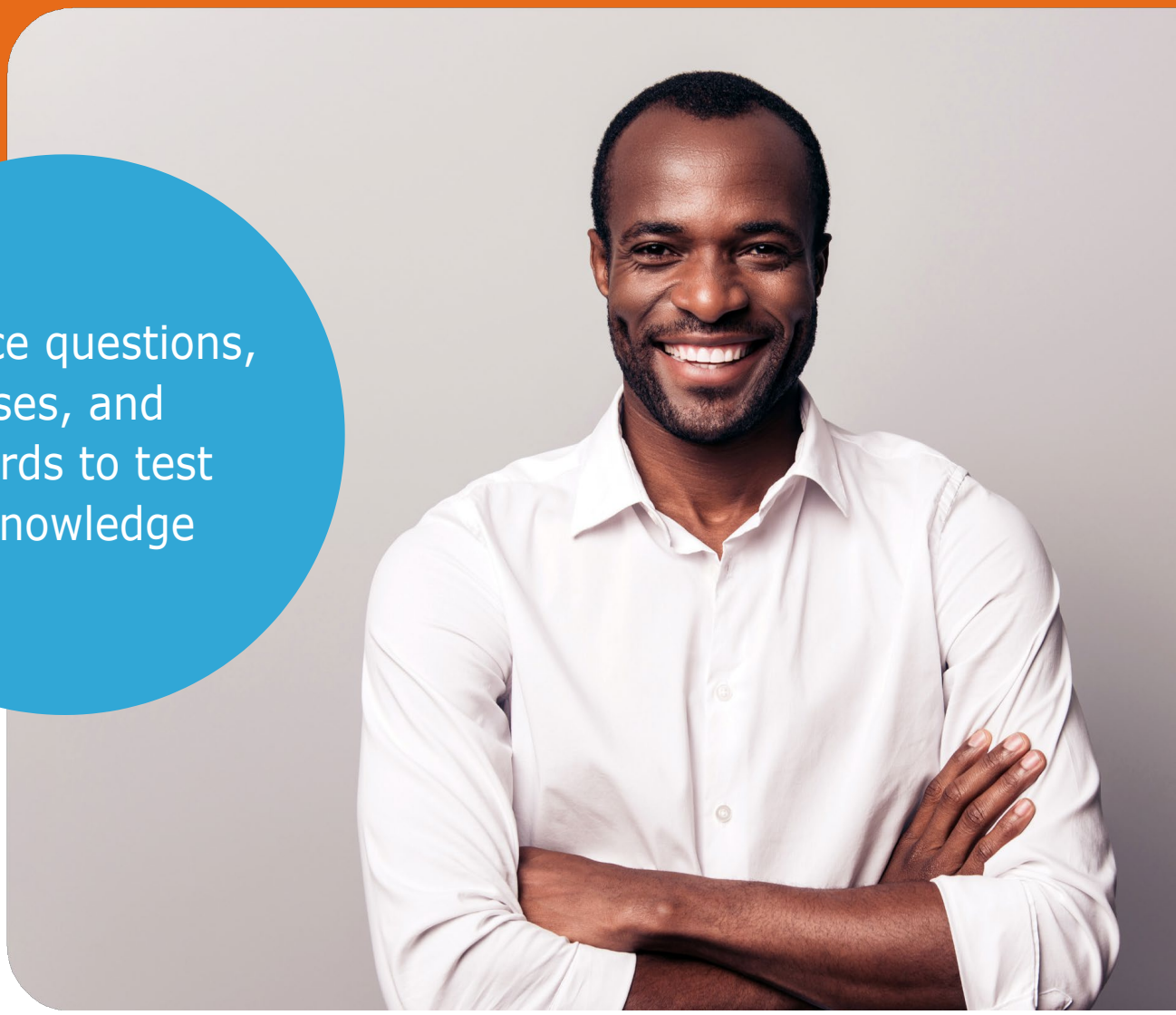
CAIA® Level II Workbook

Practice questions, exercises, and keywords to test your knowledge



SEPTEMBER 2021

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Preface

Congratulations on your successful completion of Level I and welcome to Level II of the Chartered Alternative Investment Analyst (CAIA) program. The CAIA Charter Program, organized by CAIA Association and co-founded by the Alternative Investment Management Association (AIMA) and the Center for International Securities and Derivatives Markets (CISDM), is the only globally recognized professional designation in the area of alternative investments, the fastest growing segment of the investment industry. The following is a set of materials designed to help you prepare for the CAIA Level II exam.

Workbook

The exercises are provided to help candidates enhance their understanding of the reading materials. The questions that will appear on the actual Level II exam will not be of the same format as these exercises. In addition, the exercises presented here have various levels of difficulty, and, therefore, candidates should not use them to assess their level of preparedness for the actual examination.

September 2021 Level II Study Guide

It is critical that each candidate carefully review the study guide. It contains information about topics to be studied as well as a list of equations that the candidate MAY see on the exam. The study guide can be found on the CAIA website, on the Curriculum page.

Errata Sheet

Correction notes appear in the study guide to address known errors existing in the assigned readings that are viewed as being substantive. Occasionally, additional errors in the readings and learning objectives are brought to our attention after publication. At those points, we will then post the errata directly to a **separate errata sheet on the Curriculum and Study Materials section of the CAIA website.**

It is the responsibility of the candidate to review these errata prior to taking the examination. Please report suspected errata to curriculum@caia.org.

The Level II Examination and Completion of the Program

All CAIA candidates who are not CFA Charterholders must pass the Level I examination before sitting for the Level II examination. Separate Study Guides are available for each level. As with the Level I examination, the CAIA Association administers the Level II examination twice annually. Upon successful completion of the Level II examination, and if the candidate has met all the Association's membership requirements, the CAIA Association will confer the CAIA Charter upon the candidate. Candidates should refer to the CAIA website, www.caia.org, for information about examination dates and membership requirements.

Review Questions and Answers

Part 1: Ethics Regulations and ESG

Note: There are no exercises for Chapter 1 and Chapter 2.

Chapter 3: Global Regulation

Exercises

1. Which U.S. regulatory body is responsible for overseeing the derivatives market?

2. Of the following U.S. federal statutes, which one provides registration and regulation of persons and entities who are engaged in providing advice to others?
    a. The Securities Act of 1933
    b. The Securities Exchange Act of 1934
    c. The Investment Advisers Act of 1940
    d. The Investment Company Act of 1940

3. For what purpose was the Dodd-Frank Act enacted?

4. In the United States, a firm manages a hedge fund with $50 million in assets under management and operates in a state that does not require the registration of investment advisers. Is national registration still required, and who is the firm's regulator?

5. What is the difference between an initial public offering (IPO) and an initial coin offering (ICO)?

6. Each European country has its own scheme for regulation and compliance. Therefore, an alternative investment manager must comply with the individual regulatory bodies in each country. Under what circumstance would there be an exception to this rule?

7. What are the major differences between Undertakings for Collective Investments in Transferable Securities (UCITS) and Alternative Investment Funds (AIFs) in Europe?

8. Name the two methods available to fund managers to engage in the marketing of AIFs by AIFMs.

9. What is entailed within asset stripping rules and how long do the rules apply after acquiring control of a non-listed company?

10. Describe the duties of the Securities and Futures Ordinance (SFO) and the Securities and Futures Commission (SFC) in Hong Kong.

11. Under which three situations would a fund manager not be required to obtain a capital markets services (CMS) license in Singapore?

12. Describe the role of the Financial Supervisory Service (FSS) in South Korea.

13. Describe the level of regulation for marketing of fund interests in Japan.

Solutions

1. The U.S. Commodity Futures Trading Commission (CFTC)

   (Section 3.2.1)

2. The Investment Advisers Act of 1940

   (Section 3.2.1)

3. The Dodd-Frank Act was enacted to promote the financial stability of the U.S. by improving accountability and transparency in the financial system, to end "too big to fail", to protect the American taxpayer by ending bailouts, to protect consumers from abusive financial services practices, and for other purposes.

   (Section 3.2.1)

4. Yes, registration is required, and the regulator is the Securities and Exchange Commission (SEC)

(Section 3.2.1)

5. An initial public offering (IPO) sells shares of a company for the first time, while an initial coin offering (ICO) sells ownership of an asset as tracked through a coin or a digital token.

(Section 3.2.6)

6. If a manager seeks to conduct business within the European Union, they are subject to a single regulatory scheme, as long as the manager is domiciled in one of its member states.

(Section 3.3)

7. These are the following differences:
    1. UCITS are generally for retail investors with small investment amounts while AIFs are for investors with higher investments
    2. UCITS are restricted to safe and liquid assets while AIFs have fewer investment restrictions
    3. UCITS limit leverage while AIFs can use reasonable levels of leverage

(Section 3.2.2)

8. The two methods are as follows:
    1. Using a marketing passport available under the AIFMD
    2. Marketing in a specific EU member country in accordance with that country's private placement regime

(Section 3.3.4)

9. Asset stripping rules prevent an AIF from making a controlling private equity investment, having the non-listed company take a loan, and then distributing the loan proceeds themselves. The rules are in effect for two years.

(Section 3.3.6)

10. The Securities and Futures Ordinance (SFO) is the primary legislation for the regulation of asset management activity in Hong Kong. The Securities and Futures Commission (SFC) is the regulator responsible for overseeing the SFO in Hong Kong.

    (Section 3.4.1)

11. Under the follow three situations:
    1. It carries on fund management in Singapore on behalf of not more than 30 qualified investors, (of which not more than 15 may be funds or limited partnerships)
    2. The total value of the assets managed does not exceed a specific amount set out in the regulations
    3. It is registered with the Monetary Authority of Singapore (MAS) as a registered fund management company (RFMC).

    (Section 3.4.2)

12. The Financial Supervisory Service (FSS) in South Korea is responsible for inspection of financial institutions as well as enforcement of relevant regulations as directed by the FSC.

    (Section 3.4.3)

13. The marketing of fund interests in Japan is heavily regulated.

    (Section 3.4.4)

Chapter 4: ESG and Alternative Investments

Exercises

1. What are some of the potential motivations for ESG adoption amongst institutional investors?

2. List some of the challenges faced by institutional investors regarding ESG.

3. Water conservation, biodiversity, endangered species, and chemical usage are all environmental issues associated with which asset class?

4. For natural resource investors, compliance with health and safety standards for workers, customers, and surrounding communities would most likely fit into which component of ESG: Environmental, Social, or Governance?

5. Explain some considerations an ESG investor might have when allocating to commodity derivatives.

6. Investors can access commodities through derivatives or through physical ownership. Why might ESG investors avoid buying physical commodities?

7. Why might environmental stewardship be such a large consideration for an ESG investor in real estate?

8. What are some of the key rationales behind ESG adoption amongst hedge fund managers?

9. Regarding hedge fund governance and transparency, describe the rationale behind the Open Protocol Hedge Fund Reporting and describe its framework.

10. Describe the arguments for and against hedge fund managers implementing short selling as part of their process.

11. How might an activist hedge fund manager fit into an ESG framework?

12. How does ESG adoption in private equity differ from other alternative investments?

Solutions

1. The goals and motivations are as follows:
    a. Increasing risk-adjusted returns
    b. Reducing reputational risk
    c. Address stakeholder concerns
    d. Doing the right thing or improving the planet

    (Section 4.1)

2. The following are challenges:
    a. ESG Adoption
    b. Lack of Standards
    c. Cost

    (Section 4.1.3)

3. Natural Resources

    (Section 4.2.1)

4. This issue would fall under Social considerations

    (Section 4.2.2)

5. The presence of non-commercial (or speculative) investors can lead to increased price volatility. This can be problematic for food-related products, especially for poor economies that rely heavily on agriculture.

    (Section 4.3.2)

6. Buying physical commodities with limited supply can have a large impact on the demand for that commodity and more directly impact the price/volatility.

    (Section 4.3.3)

7. Buildings and construction activity account for 36% of global final energy use and are responsible for 39% of global carbon emissions. Both also can

create significant amounts of waste.

(Section 4.4.2)

8. Some of the key drivers behind the shift in adoption by hedge funds include regulation, risk management, client demand, and new potential sources of alpha.

(Section 4.5)

9. The Open Protocol Hedge Fund Report was created to bridge investors' needs for risk and portfolio metrics and the need of hedge funds to maintain some level of privacy around detailed data. The Protocol provides a standard and consistent framework around data and inputs, calculations and methods, timely and regular report, and protocols and standards.

(Section 4.5.3)

10. Proponents of short-selling claim that it provides a vital function in the marketplace, as it dampens the potential for over-priced securities or prevents and punishes corporate fraud and mismanagement. Arguments against short-selling claim that short-sellers hope for price declines, which is harmful to market sentiment and could potentially increase market volatility.

(Section 4.5.4)

11. Activist hedge fund managers can urge or pressure management to take a more positive position when working with stakeholders such as employees, communities, customers, and suppliers.

(Section 4.5.6)

12. PE firms can require portfolio companies to make certain commitments that comply with shared ESG objectives. Additionally, PE firms can institute longer horizon ESG goals and objectives for portfolio companies.

(Section 4.6.2)

Chapter 5: ESG Analysis and Application

Exercises

1. Describe the goals of the Global Reporting Initiative (GRI) and the Global Reporting Initiative Standards.

2. At the board meeting of a publicly-traded company, a large shareholder stood up and made the argument that the board and management should focus solely on one thing – maximizing shareholder value by focusing on total return. What additional goal might an ESG investor advocate for that would conflict with this shareholder's view?

3. Is there academic consensus about the relationship between companies that exhibit positive ESG characteristics (high ESG scores) and equity market performance? What about high ESG scores and risk?

4. Compare the consistency of credit rating organizations relative to ESG ratings organizations.

5. What are the five ESG categories included on the SASB Materiality Map?

6. What is the purpose of the United Nations' 17 Sustainable Development Goals (SDG)?

7. Discuss the potential conflict between the principals of ESG and Fiduciary Responsibility in the United States.

8. Contrast European and Asian regulatory attitudes and implementation with those in the United States.

9. An ESG investor is building a portfolio and has decided to avoid any company that deals in firearms and tobacco. What kind of screening method is the ESG investor employing?

10. Compare and contrast engagement strategies and proxy voting in the context of ESG investing methods.

11. Describe mission related investments (MRI) and program related investments (PRI). Between MRI and PRI, which one qualifies for tax

advantages to charitable organizations in the United States?

12. When controlling for industry, vintage year, fund sequence, and geography, how have impact funds performed on an IRR basis relative to traditional venture capital funds?

13. Discuss the Coase theorem in the context of shareholders and victims of negative externalities.

14. In an investment committee meeting, a portfolio manager proposes that the firm consider ESG issues when conducting investment decisions. She makes two cases for special consideration of ESG issues: "investment managers have a duty to protect shareholders from ESG-related risks such as litigation or penalties" and "investment managers who have higher allocations to ESG-compatible investments contribute to a better world". What is third primary justification for special consideration of ESG issues?

Solutions

1. GRI seeks to help businesses and governments worldwide understand and communicate their impact on critical sustainability issues such as climate change, human rights, governance and social well-being.

   The GRI standards are meant to enable all organizations to report publicly on their economic, environmental, and social impacts – and show how they contribute towards sustainable development. The standards also serve as a reference for policy makers and regulators.

   (Section 5.1.2)

2. One of the goals of ESG advocates would be for equitable distribution of returns amongst stakeholders of a company, not just maximizing shareholder return.

   (Section 5.1.3)

3. No, there is no consensus in empirical research. While some academic papers have identified a positive relationship between high ESG scores and performance, others have found the opposite or that ESG scores can be explained by common equity factors (as identified by Rabener).

Giese and Lee (2019) found that ESG characteristics had a positive effect on risk (i.e., dampening risk), in particular mitigating tail risk.

(Section 5.1.3)

4. There has been criticism the heterogeneity of ESG-related ratings for the same firms across ratings agencies. For example, one study found that while the three biggest credit rating agencies (Moody's, S&P, and Fitch) have credit ratings correlations of 0.9, the ESG ratings of MSCI, Sustainalytics, and Reprisk have an ESG ratings correlation of 0.32.

(Section 5.2)

5. The five ESG categories are Environment, Social Capital, Human Capital, Business Model and Innovation, and Leadership and Governance.

(Section 5.3.3)

6. The United Nations published a list of 17 goals to "improve the plight of the human race," seeking to improve incomes, living conditions, and reduce poverty and inequality worldwide while stalling or reversing the impact of climate change.

(Section 5.4.2)

7. Under the Investment Advisers Act of 1940, fiduciary duties cannot conflict with the clients' best interest. Therefore, there is a potential conflict in that ESG matters may not always result in a direct financial benefit, such as improved risk-adjusted returns. Unless explicitly directed by the investor, fiduciaries in the US are directed to only invest with the goal of maximizing returns relative to the financial risk constraints of the client.

(Section 5.5.1)

8. In the United States, the U.S. Department of Labor stated that fiduciaries may consider ESG issues while investing, but only if those issues are directly relevant to the return, risk, and economic outlook of each investment. In other words, financial risk and return comes first, ESG issues second.

European regulation is increasingly supporting mandatory disclosure of ESG-related issues, but regulation beyond that is somewhat unclear.

In Asia, there are also few requirements. Hong Kong is slightly ahead of other Asian countries, in that the Securities and Futures Commission announced The Hong Kong Strategic Framework for Green Finance in 2018.

(Section 5.5.3)

9. The investor is engaging in a negative screening method.

(Section 5.6.1)

10. An engagement strategy is when an investor takes a long position in the stock of a company and seeks to influence the company's agenda on how to improve the ESG standing of the company. Proxy voting, however, is more passive than an engagement strategy. Proxy voting deals with issues specifically put for election by management and does not go beyond the agenda of management.

(Section 5.6.2)

11. Mission related investments (MRI) are investments viewed as offering a combination of ESG impact as well as financial return. MRIs are often further defined as offering competitive risk-adjusted returns along with ESG impact. Program related investments (PRI) are investments offering ESG impact and no financial return or offering a combination of ESG impact as well as a sub-competitive risk adjusted financial return. In the United States, PRIs quality for tax advantages to charitable organizations.

(Section 5.6.3.1)

12. Research has shown that the IRR on impact funds is lower than traditional venture capital funds.

(Section 5.6.3.3)

13. Coase asserts that whether the law sides with shareholders who claim a right to generate negative externalities or with the victims of negative

externalities will not interfere with the ability of the parties to negotiate the most efficient resolution to the dispute so that they can share in the net benefits (or least costs).

(Section 5.7.2)

14. The historic total returns from portfolios of listed securities based on ESG concerns and adjusted for risk based on single-market-factor methods appear to be equally attractive, and perhaps in some cases or jurisdictions more attractive, than portfolios that ignore or eschew ESG concerns.

(Section 5.8.2)

Part 2: Models

Chapter 6: Modeling Overview and Interest Rate Models

Exercises

1. Describe a theoretical, normative, time-series model of equity returns that might be used by a hedge fund to guide a high frequency trading strategy.

2. Suppose the parameters of the Vasicek model are $\mu = 5\%$ (i.e., the long-term mean level of the short-term interest rate), and the speed of adjustment parameter is given as $\kappa = 0.8$ and $\sigma = 1\%$. If the current short-term rate is 4%, what would be the expected short-term rate for the next period?

3. What are the two main disadvantages of the Ho and Lee model?

4. An analyst is calibrating a Black–Derman–Toy binomial tree model and obtains the following values for the current short rate $(r_0 = 0.06)$ and its two potential realizations after one period ($r_d = 0.05$ and $r_u = 0.08$). What is the total two-year return obtained from investing in the current two-period short rate?

5. An analyst is calibrating a Black–Derman–Toy binomial tree model and observes the following values: r_d, the next period short-rate in the down state, is 0.04, and the implied continuous volatility of the short-rate next period, σ, is 0.25. What is the value for the next period short-rate in the up state, r_u?

6. Between a P-Measure and a Q-measure, which is typically based on an assumption of risk neutrality?

Solutions

1. The descriptions are as follows:

    - Theoretical models tend to explain behavior accurately in more

simplified situations where the relationships among variables can be somewhat clearly understood through logic.

- Normative economic models tend to be most useful in helping explain underlying forces that might drive rational financial decisions under idealized circumstances and, to a lesser extent, under more realistic conditions.
- Time-series models analyze behavior of a single subject or a set of subjects through time.

For example, a model that hypothesized the impact of large orders in an equity market with risk-averse traders of limited capital in a world of informational asymmetries in which the large orders were driven by exogenous shocks to the institutions placing the orders would qualify.

(Section 6.1)

2. Inserting the given values into Equation 6.2 produces:

$$E[r_{t+1}] = 0.04 + 0.8(0.05 - 0.04) = 4.8\%$$

If the current short-term rate is 6%, next year's short-term rate is expected to be 5.2%. Of course, Equation 6.2 has four variables, any one of which could be calculated given the other three.

(Section 6.2)

3. The main disadvantages of the Ho and Lee model are that interest rates can be negative and that it assumes a very simple binomial process for bond prices.

(Section 6.3.4)

4. Use annual compounding. Inserting the given values into Equation 6.5 to find the averaged of the two-period short-rate returns:

$$\text{Averaged short-rate return} = 0.5[(1+r_0)(1+r_u) + (1+r_0)(1+r_d)] - 1$$
$$\text{Averaged short-rate return} = 0.5[(1.06)(1.05) + (1.06)(1.08)] - 1 = 12.89\%$$

Given any two of the three rates (r_0, r_d, and r_u) the missing rate can be found.

Note that the total two-year return of 12.89% corresponds to an annualized return of 6.25%: $[(1+0.1289)\wedge 0.5]-1$

(Section 6.4)

5. Inserting the given values into Equation 6.6 to find next period short-rate in the up state:

$$r_u = r_d e^{2\sigma}$$
$$r_u = .04 * e^{2\times 0.25} = 0.06595$$

Given any two of the three values the missing value can be found. Note that the continuous implied volatility requires the use of the exponential function.

(Section 6.4)

6. A Q-Measure in finance is typically based on an assumption of risk neutrality.

(Section 6.5)

Chapter 7: Credit Risk Models

Exercises

1. Suppose a loan that has $150 million of principal and $12 million of interest due at the end of the year. The probability of default (PD) for the borrower is estimated to be 1.5%. If there is a default, the lender expects to be able to recover $40 million four years after the default. Find the exposure at default (EAD), the present value (PV) of the sum to be recovered, the recovery rate (RR), the loss given default (LGD), and the expected loss using an interest rate of 10%.

2. Describe the relationship between the probability of default and the credit spread with respect to the following four important properties of the Merton model: 1. Sensitivity to maturity, 2. Sensitivity to asset volatility, 3. Sensitivity to leverage, and 4. Sensitivity to the riskless rate.

3. Suppose that the assets of XYZ Corporation are worth $150 million. Calculate XYZ's distance to default (DD) if its default trigger is estimated to be $80 million, and the volatility of its assets is 30% per year.

4. Suppose there were 300 firms with distance to default (DD) equal to 1.5 at the beginning of 2015 in a sample of European corporations. Of this total, seven defaulted by the end of the year. Estimate the expected default frequency (EDF) empirically. Interpret the result obtained.

5. Company 123 has an actual default intensity of 0.13. Find (1) the expected time to default for Company 123, (2) the probability of survival, and (3) the probability of default over the next three periods.

6. Suppose that the riskless rate is 1% and that the face value of a one-year zero coupon bond issued by a start-up firm is $30 million. What is the current price of the bond if it has a default intensity of 7%?

7. A one-year zero-coupon bond has a credit spread of 4% and a recovery rate estimated to be 70%. Find the risk-neutral default intensity.

8. List the five determinants of Altman's Z-Score.

Solutions

1. These values are given as follows (with some rounding):

EAD = $150 million principal + $12 million interest = $162 million
PV of sum to be recovered = $40 million/$1.10^4$ = $27.32 million
RR = PV of sum to be recovered/EAD = $27.32 million/$162 million = 0.168642
LGD = EAD(1 − RR) = $162 million (1.0 − 0.168642) = $134.68 million
Expected loss = LGD × PD = $134.68 million × 1.5% = $2.0202 million

Note that LGD can also be found as EAD – Present value of sum to be recovered:
$162 million - $27.32 million = $134.68 million

(Section 7.1.4)

2. The relationship between the probability of default and the credit spread with respect to the following four properties of the Merton model is as follows:

1. Sensitivity to maturity: The probability of default increases, at a decreasing rate, as the time to maturity increases. The credit spread increases with maturity initially but then begins to decline slightly as maturity increases.

2. Sensitivity to asset volatility: The probability of default increases, at a decreasing rate, as the volatility of the asset increases. The credit spread will also increase as the volatility of the asset increases.

3. Sensitivity to leverage: As leverage increases, both the probability of default and the credit spread increase.

4. Sensitivity to the riskless rate: As the riskless rate increases, the mean return on the firm's assets (which under Merton's model is implicitly assumed to be equal to the riskless rate plus a constant risk premium) increases, reducing the probability of default and the credit spread.

(Section 7.3.5)

3. The DD of XYZ is found using Equation 7.15 as (rounded):

DD = (150 – 80)/(150 × 0.3) = 1.56

XYZ Corporation is 1.56 standard deviations of asset volatility away from default.

(Section 7.4.2)

4. The estimate of the EDF is found using Equation 7.16:

$$\text{EDF} = \frac{\text{Number of Firms That Defaulted within One Year with DD} = \text{n}}{\text{Total Number of Firms in the Population with DD} = \text{n}}$$

EDF = 7/300 = 2.33% (rounded)

Based on historical observation, we might expect 2.33% of European firms with DD = 1.5 to default within one year.

(Section 7.4.3)

5. The expected time to default of any company is (1/λ), which in the case of Company 123 is 1/0.13 or (rounded) 7.69 periods. Both remaining problems are solved using Equation 7.17.

$$p(t) = \exp(-\lambda \times t) \qquad (7.17)$$

The probability of survival is $e^{-0.13\times 3}$, which equals 0.677 (rounded). The probability of default is simply 1.0 minus the probability of survival: 1.0 – 0.677, or 0.323 (rounded).

(Section 7.5.1)

6. We need to use equation 7.19:

$$D_0 = e^{-r\times T}(\text{Prob}_{\text{No Default}} \times K + \text{Prob}_{\text{Default}} \times 0) = e^{-r\times T}(e^{-\lambda\times T} \times K + (1 - e^{-\lambda\times T}) \times 0) = e^{-(r+\lambda)\times T} K$$

Substituting:

$$D_0 = e^{-(0.01+0.07)\times 1} \times 30 = \$27.69 \text{ million (rounded)}$$

(Section 7.5)

7. We need to use equation 7.21:

$\lambda \times (1 - RR) \approx$ Credit Spread

Using Equation 7.21, the implied risk-neutral default intensity is 0.1333:

$0.04 = \lambda \times (1 - 0.7)$

$\lambda = 13.33\%$

(Section 7.5.4)

8. The five determinants of Altman's Z-Score are:

1. Working Capital/Total Assets.
2. Retained Earnings/Total Assets.
3. Earnings before Interest and Taxes/Total Assets.
4. Market Value of Equity/Book Value of Total Liabilities.
5. Sales/Total Assets.

(Section 7.6.3)

Chapter 8: Multi-Factor Equity Pricing Models

Exercises

1. What advantage do multi-factor models have over single-factor models, such as the Capital Asset Pricing Model?

2. List the three major categories of factors that drive asset returns.

3. What are the three steps of an empirical factor model?

4. What factor is contained in the Fama-French-Carhart model that is not contained in the Fama-French model?

5. What are the three challenges associated with empirical multi-factor models?

6. Regarding factor investing, list the three important observations as described by Ang (2014).

7. What are two examples of bond factors? Describe both.

8. In theory, an investor could passively allocate to several factors that could produce attractive results, but how might they implement a more sophisticated approach to multi-factor investing?

9. Compare a factor with an arbitrage opportunity.

10. Describe the four practical implications of an adaptive view on markets.

11. Why are stochastic discount factors important for a portfolio that includes alternative investments?

Solutions

1. Multi-factor models tend to explain systematic returns much better than do single-factor models. By doing so, multi-factor models are generally believed to produce better estimates of idiosyncratic returns.

(Section 8.1.1)

2. Macroeconomic factors, fundamental/style/investment/dynamic factors, and statistical factors.

(Section 8.1.5)

3. First, the risk-free rate is subtracted from the returns of each security to form an excess return, which is used as the dependent variable; Second, the researcher selects a set of potential factors that serve as independent variables; Third, statistical analysis is used to identify those factors that are significantly correlated with returns.

4. Momentum

(Section 8.2.2)

5. False identification of factors, factor return correlation vs. causation, and justifying why the CAPM may not be sufficient.

(Section 8.3)

6. Ang (2014) observes that: factors matter, not assets; assets are bundles of factors; and different investors should focus on different factors.

(Section 8.4.1)

7. The credit risk premium and the term premium. The credit risk strategy takes long positions in bonds with low credit quality and short positions in bonds with high credit quality. The term strategy takes long positions in long-term bonds and short positions in short-term bonds.

(Section 8.4.2)

8. Not all factor premiums are the same, so a sophisticated strategy would take advantage of these differences by allocating higher weights to factors that are believed to be offering more attractive risk premiums.

(Section 8.4.3)

9. A source of return that is a legitimate factor should perform poorly during "bad" times and "good" during normal times. If a source of return performs well in both "bad" and "good" times, it's an arbitrage opportunity.

   (Section 8.4.3)

10. The four practical implications of an adaptive view on markets are:

    The tradeoff between risk and return is not stable over time and risk premiums can be predicted based on technical and fundamental variables

    Market efficiency is a relative concept instead of an absolute one, and a market displays varying degrees of efficiency depending on the point in time and the participant.

    It is necessary to use adaptable investment approaches to handle changes in the market environment

    With time, alpha becomes beta due to innovation and competition.

    (Section 8.5)

11. In a multi-factor portfolio that includes alternative investments, different pieces of the portfolio will require different types of multi-factor methods, such as recognizing that cash flows must be valued differently depending on good vs. bad times and differently based on time horizons, different liabilities, and illiquidity profiles.

    (Section 8.7.4)

Chapter 9: Asset Allocation Processes and the Mean-Variance Model

Exercises

1. Suppose that an investor's utility is the following function of wealth (W):

$$UU(WW) = \sqrt{WW}$$

An investor currently has $150 and is considering whether to speculate on an investment with a 70% chance of earning 20%, and a 30% chance of losing 30%. Find the current and expected utility of the investor. Should the investor take the speculation rather than hold the cash?

2. Continuing with the previous exercise (#1), suppose instead that the investor's utility is the following function of wealth (W):

$$UU(WW) = \mathrm{W} - 0.005\mathrm{W}^2$$

Should the investor take the speculation rather than hold the cash? (Suppose once again that the investor currently has $150 and is considering whether to speculate on an investment with a 70% chance of earning 20%, and a 30% chance of losing 30%).

3. Suppose that an investor's expected utility, $E[U(W)]$, from an investment can be expressed as:

$$EE[UU(WW)] = \mu\mu - \frac{\lambda}{2} \times \sigma\sigma^2$$

where W is wealth, μ is the expected rate of return on the investment, σ^2 is the variance of the rate of return, and λ is a constant that represents the asset owner's degree of risk aversion.

Use the expected utility of an investor with λ = 0.7 to determine which of the following investments is more attractive:

Investment X: μ = 0.05 and σ^2 = 0.03
Investment Y: μ = 0.07 and σ^2 = 0.10

4. In the previous exercise, suppose now that the investor is risk neutral. Would the answer change?

5. An investor's optimal portfolio has an expected return of 9%, which is 6% higher than the riskless rate. If the variance of the portfolio is 0.02, what is the investor's degree of risk aversion, λ?

6. Suppose that an investor is using mean-variance optimization with one risky asset and a riskless asset. Suppose that the riskless rate is 2%, and that the expected rate of return on the risky asset is 7% per year. The standard deviation of the index is estimated to be 10% per year. What is the optimal investment in the risky asset for an investor with a risk aversion degree of 8?

7. Consider the case of mean-variance optimization and suppose that the expected annual rate of return of an optimal portfolio is 12%, and the riskless rate is 3% per year. What is the hurdle rate for a new asset that has a beta of 1.2 with respect to the optimal portfolio? What if the new asset has a beta of –0.5?

8. While conducting mean variance optimization for a multi-asset portfolio, an analyst seeks to reduce the effects of estimation error by gathering historical return data, estimating the statistical parameters (means and variance-covariance matrix), and applying a Monte Carlo simulation to generate a large number of hypothetical returns. Which application of resampling is she using to reduce estimation error?

Solutions

1. The current utility of holding the cash is 12.25, which can be found as (rounded):

$$UU(WW) = \sqrt{150} = 12.25$$

The expected utility of taking the speculation is found as (rounded):

$$EE[UU(WW)] = (0.70 \times \sqrt{180} + 0.30 \times \sqrt{105}) = 12.47$$

Where: 180 = 150 x 1.20; and 105 = 150 x 0.7. Because the investor has an expected utility of taking the speculation of 12.47, the investor would prefer to take the speculation as opposed to holding the cash, which has a utility of only 12.25.

(Section 9.1.3)

2. With this utility function, the current utility of holding the cash is 37.50:

$$UU(WW) = WW - 0.005WW^2 = 150 - 0.005 \times 150^2 = 37.50$$

In this case, the investor has an expected utility of taking the speculation of 27.56, found as (rounded):

$$\begin{aligned} EE[UU(WW)] &= 0.70 \times (180 - 0.005 \times 180^2) + 0.30 \times (105 - 0.005 \times 105^2) \\ &= 27.56 \end{aligned}$$

In this case, the investor would prefer to hold the cash.

(Section 9.1.3)

3. The expected utility of the investments is found as:

Investment X: $EE[UU(WW)] = 0.05 - \frac{0.7}{2} \times 0.03 = 0.0395$

Investment Y: $EE[UU(WW)] = 0.07 - \frac{0.7}{2} \times 0.10 = 0.0350$

Investment X is more attractive because the investor's expected utility of holding X is higher.

(Section 9.1.5)

4. In the case of a risk neutral investor, λ=0. This means that: $EE[UU(WW)] = \mu\mu$. Therefore, Investment Y is more attractive than Investment X for a risk neutral investor, because:

$$EE[UU(WW_{YY})] = 0.07 > EE[UU(WW_{XX})] = 0.05$$

(Section 9.1.3)

5. Using Equation 9.5, the degree of risk aversion (λ) can be obtained as follows:

$$\lambda = \frac{E\text{\textlozenge}R_p\text{\textlozenge} - R_f}{\sigma^2}$$

$$\lambda = \frac{E\text{\textlozenge}R_p\text{\textlozenge} - R_f}{\sigma^2} = \frac{0.06}{0.02} = 3$$

(Section 9.1.8)

6. The solution is found using Equation 9.14:

$$ww = \frac{1}{\lambda} \times \frac{EE[RR - RR_0]}{\sigma\sigma^2}$$

$$ww = \frac{1}{8} \times \frac{0.07 - 0.02}{0.10^2} = 62.5\%$$

$$ww_0 = 1 - 62.5\% = 37.5\%$$

That is, the optimal investment in the risky asset for this investor is 62.5%. The remaining 37.5% will be invested in the riskless asset.

(Section 9.2.2)

7. According to Equation 9.16, the hurdle rate for a new asset that has a beta of 1.2 with respect to the optimal portfolio would be:

$$EE[RR_{NNNNNN}] - RR_{ff} > \text{\textbf{\textbf{\textbf

Chapter 10: Other Asset Allocation Approaches

Exercises

1. The core-satellite approach structures a portfolio in various sub-portfolios, which can then be assembled using one of the three construction techniques available (e.g., bottom-up, top-down, or mixed). List some of the advantages of the core-satellite approach.

2. Consider the following information regarding a portfolio consisting of three assets (mean expected returns, standard deviations, portfolio weights, and correlation coefficients between each asset and a portfolio that is invested as follows: 40% in Asset 1, 40% in Asset 2, and 20% in Asset 3):

	Mean	Standard Deviation	Weights	Correlation with Portfolio
Asset 1	5.21%	6.93%	40%	0.8623
Asset 2	4.00%	3.87%	40%	0.7511
Asset 3	4.86%	11.09%	20%	0.2938

   Calculate the contribution of each asset to the standard deviation of the portfolio.

3. Suppose that the correlation between changes in the credit spread and the return on a certain portfolio is 0.25. The standard deviation of changes in the credit spread is estimated to be 23%, and the factor loading of the portfolio on the credit spread is 0.587. If the total risk of the portfolio is 9.94%, what is the risk contribution of the credit spread to the total risk of the portfolio?

4. What is the difference between a risk parity portfolio and a minimum volatility portfolio?

5. Consider the following two hypothetical risk parity and minimum volatility portfolios:

Two Hypothetical Portfolios	Expected Return	Standard Deviation	Sharpe Ratio
Risk Parity Portfolio	6%	8%	0.63
Minimum Volatility Portfolio	10%	15%	0.60
Riskless Rate	1%		

   Suppose that an investor thinks that the expected return of the risk parity portfolio is too low and is considering enhancing the risk-adjusted return of this portfolio using 50% leverage. What would be the expected return and

volatility of the levered risk parity portfolio?

Solutions

1. The core-satellite approach aims to increase risk control, reduce costs, and add value. This may be an effective strategy, particularly for institutions desiring to diversify their portfolios without giving up the potential for higher returns generated by selected active management strategies. The flexibility it offers to customize a portfolio to meet specific investment objectives and preferences. This approach also offers the structure for targeting and controlling those areas in which an investor considers that she is better able to control risks, or is simply willing to take more risks. What constitutes core versus satellite depends on the investor's focus and expertise. Some see venture capital as satellite, while others view a balanced buyout and a venture capital funds portfolio as core. It facilitates dedicating more time to the satellite portfolio, which is expected to generate excess performance, and less time on the lower-risk core portfolio.

   (Section 10.1)

2. Using Equation 10.2 (results were rounded):

$$\frac{\partial \sigma_{PP}}{\partial w_i} \times w_i = \frac{\sigma_{iP}}{\sigma_{PP}} \times w_i = \rho_{iP} \times \sigma_i \times w_i$$

   Contribution of Asset 1 = 0.8623 × 0.0693 × 40% = 2.39%

   Contribution of Asset 2 = 0.7511 × 0.0387 × 40% = 1.16%

   Contribution of Asset 3 = 0.2938 × 0.1109 × 20% = 0.65%

   (Section 10.4.1)

3. First, recall that the factor loading of the portfolio on credit spreads is the coefficient of credit spread in Equation 10.3:

$$R_{P,P,P} = a_P + b_{1P} F_{1P} + b_{2P} F_{2P} + \varepsilon_P$$

   The risk contribution of credit spread to the total risk of the portfolio is calculated as follows:

   Contribution of credit spread (rounded) = 0.25 × 0.23 × 0.587 = 3.38%

Therefore, 3.38% of the total risk of 9.94% (i.e., around a third) of the portfolio can be explained by the volatility in the credit spread.

(Section 10.4.2)

4. The risk-parity approach proposes that the portfolio allocation to each asset class should be set so that each asset class has the same marginal contribution to the total risk of the portfolio. By doing so, the risk parity portfolio recommends an equalization of the risk contributions of each asset class in the portfolio.

   In turn, the minimum volatility portfolio is constructed using mean-variance optimization, with the goal of assigning positive weights to create a portfolio with minimum standard deviation (when used as a measure of total risk), regardless of mean returns.

   (Section 10.5.3)

5. The expected return of the levered risk parity portfolio is:

   8.5% (i.e., 1.5 × 6% - 0.5 × 1%),

   and the volatility of the levered risk parity portfolio is:

   12% (i.e., 1.5 × 8).

   (Section 10.5.3)

Part 3: Institutional Asset Owners and Investment Policies

Chapter 11: Types of Asset Owners and the Investment Policy Statement

Exercises

1. Briefly explain the major internal and external investment policy constraints.

2. What are the three components of the expected return on all asset classes?

3. What are the six benefits to a thoughtfully developed investment policy statement (IPS)?

4. Regarding the decision-making parties in the investment policy statement, what is the role of the board relative to role of the investment committee?

5. Describe some common differences between the investment objectives of an endowment relative to a short-term foundation.

6. How are the time horizons of defined benefit plans similar to those of endowments or sovereign wealth funds? What are some of the additional considerations that play into the time horizon of a defined benefit plan?

7. Describe two potential ways the asset allocation guidelines for defined benefit plans can be customized.

8. Why might quantitatively focused standards be problematic regarding manager selection and retention?

Solutions

1. Internal investment policy constraints are those that are imposed by the asset owner. The three main internal constraints are:
    1. Liquidity- the asset owner may have specific liquidity requirements that must be clearly acknowledged
    2. Time horizon- the investment horizon of the asset owner can affect its liquidity needs. Also, investors with a short-term investment horizon should take less risk, as there is not enough time to recover from a potential large drawdown
    3. Sector and country limits- an asset owner may wish to impose constraints on allocations to specific countries or sectors.

External investment policy constraints are driven by factors that are not directly under the control of the asset owner. The two main external constraints are:

a. Tax status- most institutional investors are tax exempt, and for that reason allocations to tax-exempt investment vehicles are not as attractive to institutional investors as they are for taxable investors
b. Regulations- some institutional investors are subject to rules and regulations regarding their investment strategies.

(Section 11.7)

2. The expected return on all asset classes can be expressed as the sum of three components (Equation 11.1):

   Asset class return = Short-term real riskless rate + Expected inflation + Risk premium

(Section 11.5)

3. The six benefits are:
   1. Articulates the investor's long-term investment objectives and outline policies and procedures to help meet those objectives.
   2. Provides guidance around the risk tolerance and investment beliefs of the investor and governing bodies.
   3. Monitors the investment program and measures outcomes against objectives.
   4. Helps new staff, board, and investment/finance committee members get up to speed on the investments.
   5. Allows the investor to maintain focus on important strategic issues and take a holistic view of how the investment program ties back to goals and activities.
   6. Serves as a road map for the fiduciaries and provides guidance through all phases of a market cycle.

(Section 11.8.1)

4. The board is the highest governing body and is responsible for approving the investment policy statement and target asset allocation strategy. The investment committee makes investment recommendations and final decisions.

(Section 11.8.3)

5. Endowments have long-term objectives, but a foundation created for a very targeted and/or shorter-term purpose would state an investment objective focused less on maintaining purchasing power and more on preserving capital to support specific goals.

(Section 11.8.4)

6. In general, endowments, sovereign wealth funds, and defined benefit plans all have long time horizons. However, defined benefit plans are heavily influenced by spending needs, funded status, the duration of their liabilities, and whether the plan is open, closed, or frozen.

(Section 11.8.5)

7. First, the defined benefit's asset allocation can be de-risked as the funded status rises, or a hedge ratio policy could be put into place. A hedge ratio policy reduces the interest rate risk as the funded status improves.

(Section 11.8.8)

8. Quantitatively focused standards and watch lists are generally discouraged as a means of monitoring managers as this could put the asset owner in a position of being forced to prematurely terminate a manager. Instead, manager selection should be driven by a variety of considerations, both quantitative and qualitative.

(Section 11.8.9)

Chapter 12: Foundations and the Endowment Model

1. List the six advantages that may explain the excellent returns earned by large endowments in recent years.

Problems 2 to 4

XYZ is a hypothetical Foundation that ended 2013 with assets that amounted to $124 million. In 2014, the foundation received gifts for a total of $6 million, and spent $7 million. For simplicity, assume that gifts and expenditures occurred at the end of the year. The U.S. inflation rate was 0.76% in 2014 (based on the CPI, from December to December). The foundation's assets grew to $131 million at the end of 2014.

2. What was the nominal rate of return on the foundation's assets?

3. What was the real rate of return on the foundation's assets?

4. Suppose that in 2015 the foundation received gifts for $3 million and had a spending rate of 5% of the prior year's closing level of the foundation's assets. For simplicity, assume that gifts and expenditures occurred at the end of the year. The foundation's assets close at $118 million at the end of 2015. The U.S. inflation rate in 2015 was 0.73% (based on the CPI, from December to December). What was the real rate of return on the foundation's assets in 2015?

Problems 5 to 9

123 is a relatively large U.S. endowment that is considering allocating funds to alternative investments. To this end, 123 hired a consultant who has just made a preliminary presentation in which she discusses whether each of the following five factors can explain the returns earned by large endowments in recent years: the degree of aggressiveness of asset allocation, the effectiveness or ineffectiveness of investment manager research, whether there exists a first mover advantage, the potential impact of having access to a network of talented alumni, and the effects of a specific type of risk.

5. At the beginning of the presentation, the consultant comments that "…*In the case of traditional investments, security selection and market timing of pension plans explained a very large percentage of the variance in pension fund returns. The remaining portion of fund returns can be explained by strategic asset allocation*." Is this comment by the consultant correct? Explain.

6. Later, the consultant asserts that "…*The value added by active managers in alternative investments can be quite substantial*." Is this assertion by the consultant empirically sound? Explain.

7. An analyst working at 123 is concerned about the returns that 123 might obtain if they decide to invest in top managers in alternative assets and asks the consultant about the empirical evidence on this issue, considering that 123 is new to the world of alternative investments. The consultant replies that "…*Empirical evidence shows that newer investors pursuing access to top managers (in alternative investments), especially in venture capital, are expected to underperform when the top managers allow commitments only from those investors who participated in their earlier funds*." Is the consultant's reply correct?

8. The consultant explains that "…*Empirical evidence suggests that hedge fund managers who attended undergraduate colleges with higher average SAT scores recorded higher performance*." Is this statement correct? Explain.

9. Towards the end of the presentation, the consultant asserts that "…*As the longest-term investors charged with protecting the real value of endowment principal for future generations of students, universities are seeking to earn a premium by investing in privately-held vehicles with the idea that their perpetual nature allows them to easily handle this specific type of risk.*" What type of risk is the consultant most likely to be referring to?

10. Consider the following two put options contracts: the first is 15% out-of-the-money and the second is 25% out-of-the-money. How could a bear put spread be created?

<u>Problems 11 to 14</u>

ABC is a U.S. endowment that has previously invested only a marginal portion of its portfolio in alternative investments. ABC is considering allocating more funds to alternative investments, including hedge funds, but is afraid of the negative effects that the illiquidity of some of these alternative assets may have on the riskiness of its portfolio. To this end, ABC hires a consultant to determine, among other issues, the effects of lockup periods on returns, the costs of liquidity risk during periods of market stress, how to manage liquidity risks, the potential effects of gates on investors, as well as the effects that the smoothing of data reported by a number of alternative assets may have on allocations to these investments. The consultant has just submitted a report to ABC addressing these questions.

11. The consultant comments that "…*Everything else being the same, evidence suggests that funds with long lockup periods normally provide a higher rate of return to investors*." Is this comment by the consultant correct? Explain.

12. The consultant states that "…*When a small fraction of a fund's investors redeem their shares during periods of market turmoil, the cost of liquidity risk remains essentially the same for all investors, even in the case in which the underlying assets of the fund are less liquid than the liquidity provisions it offers to its investors*." Is this statement by the consultant empirically sound? Explain.

13. Towards the end of the report, the consultant cautions that, during times of market turmoil "…*Endowments that invest in leveraged hedge funds must be prepared for the potentially large drawdowns in these strategies, as well as the potential for the erection of gates*." Is this advice by the consultant correct?

14. At the end of the report, the consultant expresses that "… *To the extent that certain alternative investments have smoothed returns or net asset values that are reported with a time lag, liquid alternatives and traditional assets will decline in allocation rapidly during times of crisis*." What is the underlying principle of this analysis?

15. Endowment ABC was founded in December 31st, 2011. At that time, assets totaled €100 million. Between 2012 and 2015 the endowment received annual gifts and made annual expenditures in the amounts depicted in the following table (amounts in millions):

Endowment ABC	2012	2013	2014	2015
Beginning assets	€ 100	€ 112	€ 115	€ 122
Income from gifts	€ 6	€ 5	€ 7	€ 6
Expenditures	-€ 8	-€ 9	-€ 10	-€ 9
Ending assets	€ 112	€ 115	€ 122	€ 108

To simplify, assume that gifts and expenditures occurred at the beginning of each year. What were the annual rates of return earn by the endowment in each year?

Solutions

1. The six advantages that may explain the exceptional returns earned by large endowments in recent years are:

   1. Aggressive asset allocation

2. Effective research by the investment manager
3. First-mover advantage
4. Access to a network of talented alumni
5. Acceptance of liquidity risk
6. Sophisticated investment staff and board oversight

(Section 12.4)

2. From Section 12.2 we know that:

   Change in foundation value = Income from gifts − Spending + Net investment returns

   Therefore, we have (amounts in U.S. $ millions):

   ($131-$124) = $6 - $7 + Net Investment Returns ($ Nominal)

   ⇨ Net Investment Returns ($ Nominal) = $8 million

   ⇨ Net Investment Returns (% Nominal) = $8 million / $124 = 6.45% (rounded)

   (Section 12.2)

3. Real Net Investment Returns are:

   $$(1+RR_{rrNNrrrr}) = \frac{(1+RR_{NNNNNNiiNNNNN})}{(1+lIIIffrrrrPPiiIIII\ rrrrPPNN)}, \quad RR_{rrNNrrrr} = \frac{(1+0.0645)}{(1+0.0076)} - 1 = 5.65\% \text{ (rounded)}$$

   (Section 12.2)

4. A spending rate of 5% implies that $6.55 million (i.e., 5% of $131 million) was spent in 2015.

   As explained in exercise 2:

   Change in foundation value = Income from gifts − Spending + Net investment returns

   Therefore, we have that (amounts in U.S.$ millions):

   ($118-$131) = $3 - $6.55 + Net Investment Returns ($ Nominal)

   ⇨ Net Investment Returns ($ Nominal) = -$9.45 million

- ⇨ Net Investment Returns (% Nominal) = -$9.45 million / $131 = -7.21% (rounded)
- ⇨ Net Investment Returns (% Real) = $(1 + RR_{rrNNrrrr}) = \frac{(1+RR_{NNNNNNiiNNNNN})}{(1+lIIIffrrrrPPiiIIII\ rrrrPPNN)} = RR_{rrNNrrrr} = \frac{(1-0.0721)}{(1+0.0073)} - 1 = -7.88\%$ (rounded)

The foundation experienced heavy asset losses in 2015, mainly because of the negative investment returns received, but also because expenditures were above income from gifts.

(Section 12.2)

5. This comment by the consultant is incorrect. In the case of traditional investments, studies indicate that the strategic asset allocation of pension plans accounted for between 91.5% and 93.6% of the variance in fund returns. The remaining portion of fund returns, between 6.4% and 8.5%%, is explained by security selection and market timing.

(Section 12.4.2)

6. This assessment is consistent with empirical evidence. Managers working in inefficient markets have a greater opportunity to profit from information, skill, and access to deal flow. Inefficient markets are inherent to many alternative asset classes.

(Section 12.4.3)

7. The consultant's reply is correct.

(Section 12.4.4)

8. This statement is correct. Research shows that hedge fund managers who attended universities with higher average SAT scores earned higher returns with lower risk than the median fund managers.

(Section 12.4.5)

9. Liquidity risk.

(Section 12.4.6)

10. The investor could create a bear put spread by selling the put option that is 25% out-of-the-money (i.e., the contract that is farther out-of-the-money), and buying the put option that is 15% out-of-the-money.

(Section 12.7)

11. The consultant's comment is correct. A long lockup period helps managers to decrease the cost of liquidity risk. For instance, during the recent financial crisis, funds with long lockup periods had the advantage of not being under pressure to sell their assets at fire sale prices.

(Section 12.5.3)

12. This statement is not empirically sound. According to evidence presented in the book, when the underlying assets of a fund are less liquid than the liquidity provisions it offers to its investors, then the cost of liquidity risk increases for all investors, even if only a small fraction of the fund's investors decide to redeem their shares during periods of market turmoil.

(Section 12.5.3)

13. This advice by the consultant is correct and consistent with events that occurred during the recent financial crisis.

(Section 12.5.3)

14. In the case of relatively illiquid investments (e.g., certain alternative investments such as private equity and hedge funds), the net asset value adjusts slowly to changes in public market valuation. As a result, in periods of crisis, prices of liquid assets decline rapidly and investors may react by only rebalancing within the liquid assets, while slowly changing allocations to relatively illiquid alternative investments (by modifying the size of future commitments).

(Section 12.6)

15. The annual rates of return earned by the endowment in each year are calculated at the end of the following table (some rounding):

Beginning assets	€ 100	€ 112	€ 115	€ 122
Income from gifts	€ 6	€ 5	€ 7	€ 6
Expenditures	-€ 8	-€ 9	-€ 10	-€ 9
Amount invested	€ 98	€ 108	€ 112	€ 119
Ending assets	€ 112	€ 115	€ 122	€ 108
Rate of return per year	14.29%	6.48%	8.93%	-9.24%

First, we need to compute the amount of assets invested each year, which is equal to beginning assets plus annual gifts minus annual expenditures. Gifts and expenditures were assumed to occur at the beginning of the year. For example, in 2012 the amount of assets invested was €100 + €6 – €8 = €98. Given that the ending assets for that year totaled €112, the rate of return earned by the manager of the endowment in 2012 was 14.29% [i.e., (€112-€98)/€98 ×100]. The same procedure was used to calculate the rates of return for the other three years.

(Section 12.2)

Chapter 13: Pension Fund Portfolio Management

Exercises

Problems 1 to 4

Julia Sullivan, John Ng, and Paola Ruggeri retired in 2016 after each having worked for 40 years. Each one of them started with an income of $20,000 in 1976 and received average annual salary increases of 3.5% until they had retired.

Julia worked 40 years at the same firm, which provided a benefit of 1.5% of the average of the final five years of salary multiplied by the number of years of service. John worked for two employers, each for 20 years. Each employer provided a benefit of 1.5% of the average of the final five years of salary multiplied by the number of years of service. Finally, Paola worked for 40 years at the same firm, but was under a defined contribution plan where she invested 5% of her salary and earned employer contributions in a similar amount. The plan provided average investment returns of 7% per year during the 40-year period.

1. Calculate the annual benefit to be received by Julia.

2. Calculate the annual benefit to be received by John.

3. Compare and comment on the annual benefits to be received by Julia and John.

4. Calculate the total amount accumulated by Paola.

5. As discussed in the book, The Citigroup Pension Liability Index tracks corporate bond yields that can be used to discount future values of the projected benefit obligation (PBO). At December 31st, 2009, the discount rate was 5.98%, while the duration of PBO benefits was estimated at 16.2 years. By June 30th, 2016, the discount rate had fallen to 3.61%. Calculate the percentage increase in the PBO, assuming that duration and future benefits assumptions remain unchanged.

6. Consider a retiree earning a pension of $3,000 per month and having an 80% cost of living adjustment (COLA). Calculate the retiree's pension after six years if inflation rates averaged 3.5% per year during the first three years, and 2.5% during the last three years.

7. Suppose that the market value of the retirement fund of an individual is £1,200,000. The annual net of fees nominal rate of return on the fund is estimated to be 6%, the inflation rate is projected to by 2% per year, and the retiree wants to withdraw £100,000 in the first year, and an amount each year thereafter that will grow at the rate of inflation. What is the expected economic life of the fund?

8. A pension plan offers a choice of a fixed €150,000 initial annual benefit or a €50,000 initial annual benefit that will grow by 2% per year. Using a market interest rate of 4%, calculate the present value of both choices based on a life expectancy of 15 years (based on annual compounding).

9. Suppose the case of an employer that offers a retirement benefit of 2% of salary for each year the employee worked before retirement. If the final salary to which the benefits apply is $75,000, and the employee has worked for 35 years, calculate the retirement income-replacement ratio.

10. Suppose the case of a retiree earning a pension of $2,500 per month. Calculate the retiree's pension in seven years if inflation rates are 5% per year and the cost of living adjustment (COLA) is 80%.

<u>Problems 11 to 15</u>

Lisa Larsson and Karl Lehman worked for 40 years at XYZ. Mike Mancini worked for 20 years at ABC and for the following twenty years at XYZ. Both XYZ and ABC provide their employees with a benefit of 1.5% of the average of the final four years of salary multiplied by the number of years of service.

Lisa started with an income of $18,000 in 1972 and retired in 2011 with an income of $65,000. Her final four years of salary were $65,000 (2011), $63,050 (2010), $61,789 (2009), and $59,940 (2008).

Mike also started with an income of $18,000 in 1972 and also retired in 2011 with the same income as Lisa ($65,000). Mike worked for ABC from 1972 to 1991, with an average annual salary in the final four years of $32,041. His final four years of salary at XYZ, his second employer (1992-2011), were the same as those of Lisa.

Finally, and paralleling the case of Lisa, Karl Lehman also worked at XYZ for forty years, also started with a salary of $18,000 in 1972 and also retired when he was earning a salary of $65,000 in 2011, enjoying the same average annual salary increases as Lisa. However, Karl had a Defined Contribution (DC) plan in which 5% of his salary was invested and earned employer

contributions in a similar amount (i.e., annual contributions were for 10% of his salary). Investment returns in the DC plan averaged 7% per year.

11. Calculate the average annual salary increase received by Lisa and Mike.

12. Calculate the annual benefit received by Lisa.

13. Calculate the annual benefit received by Mike and compare it to the annual benefit received by Lisa.

14. Calculate the amount that Karl would have accumulated on his DC plan at retirement.

15. Determine the amount accumulated by Karl in his DC plan that corresponds to contributions by Karl and XYZ, and the amount that corresponds to investment earnings.

Solutions

Notes for Solutions 1 to 4: If each employee receives his/her salary at the end of 1st year, the future values will be as follows. Please note that since the first salary is earned at the end of 1st year, the salary earned at the end of year 40 will be $76507 = 20000 \times (1+0.035)^{39}$. That is, the salary will have 39 growth periods.

1. Julia worked her entire career with one employer. Her final five-year salaries should have been (rounded):

$$2016: 76507 = 20000 \times (1+0.035)^{39}$$
$$2015: 73920 = 20000 \times (1+0.035)^{38}$$
$$2014: 71421 = 20000 \times (1+0.035)^{37}$$
$$2013: 69005 = 20000 \times (1+0.035)^{36}$$
$$2012: 66672 = 20000 \times (1+0.035)^{35}$$

This results in a final five-year salary average of $71,505 (rounded). Therefore, Julia's annual benefit would be $42,903 (1.5% × 40 years × the final five –year salary average of $71,505).

(Section 13.3.1)

2. John worked at the first employer from 1976 to 1996, with an average annual salary in the final five years of:

$$1996: 38450 = 20000 \times (1 + 0.035)^{19}$$
$$1995: 37150 = 20000 \times (1 + 0.035)^{18}$$
$$1994: 35894 = 20000 \times (1 + 0.035)^{17}$$
$$1993: 34680 = 20000 \times (1 + 0.035)^{16}$$
$$1992: 33507 = 20000 \times (1 + 0.035)^{15}$$

This results in a final five-year salary average of $35,936. The annual benefits of $10,781 (1.5% × 20 years × $35,936) are determined in 1996, but not paid until retirement in 2016. The second employer pays annual benefits in the amount of $21,452 (1.5% × 20 years × $71,505). The final five-year salary average of $71,505 was calculated in the previous exercise. Therefore, John earns an annual pension of $32,232 ($10,781 plus $21,452).

(Section 13.3.1)

3. The benefits are quite different between Julia and John. This is because defined benefit plans reward workers who spend their entire career with a single employer and punish workers who experience job mobility. Compared to the annual benefit of $42,903 received by Julia after working the entire career for a single employer, John earns an annual pension of only $32,232 ($10,781 plus $21,452), which is $10,671 per year less than if he had worked for a single firm.

(Section 13.3.1)

4. Paola would have accumulated $629,439.89 at retirement. This is calculated as the future value of a growing annuity, in which the first payment is equal to $2,000 [i.e, her initial annual salary of $20,000 multiplied by the defined contribution of 10%, 5% from her and 5% from her employer]. The growing annuity has a return (*r*) of 7% (which represents the average investment returns earned by the plan during the 40 year period, *t* = 40), and grows (*g*) at a 3.5% rate per year, which are the average annual salary increases.

$$PPP_{GGrrIINNiiIIGG\ AAIIIIInniiPPnn} = \frac{IIIIIIIIIIaaII\ PPaaPPPPPPIIII}{rr - gg} \times \left(1 - \left(\frac{1 + gg}{1 + rr}\right)^{PP}\right) \qquad (13.5)$$

$$PPPP_{GGrrIINNüIIGG\ AAIIIInnüPPnn} = \frac{\$2{,}000}{0.07 - 0.035} \times \left(1 - \left(\frac{1.035}{1.07}\right)^{40}\right) = \$42{,}034.24$$

$$FFPP_{GGrrIINNüIIGG\ rrIIIInnüPPnn} = PPPP_{GGrrIINNüIIGG\ AAIIIInnüPPnn} \times (1 + rr)^{PP}$$

$$FFPP_{GGrrIINNüIIGG\ rrIIIInnüPPnn} = \$42{,}034.24 \times (1.07)^{40} = \$629{,}439.89$$

Note that we could have also used the formula for the future value of a growing annuity (as we will do in exercise 14):

$$FFPPFFFF = CC\left(\frac{(1 + rr)^{PP} - (1 + gg)^{PP}}{rr - gg}\right) = \$2{,}000\left(\frac{(1.07)^{40} - (1.035)^{40}}{0.07 - 0.035}\right) = \$629{,}439.89$$

(Section 13.5.3)

5. The pension plan's PBO, which is the present value of the amount of benefits assumed to be paid to all future retirees of the firm, can be compared to a short position in corporate bonds, which will change in value as described in equation 13.2 (approximate amounts):

   %Change in Liabilities = −Modified Duration × Change in Yield (13.2)

   Over the six and a half year period between December 2009 and June 2016, the 2.37% decline in corporate bond yields (i.e., from 5.98% to 3.61%) has led to an increase of 38.89% in the PBO, assuming that duration and future benefits assumptions remain unchanged.

   38.39% = −16.2 × (−2.37)

   (Section 13.3.3)

6. The retiree's pension will have risen by 2.8% per year (i.e., 80% x 3.5%) during the first three years, and by 2% per year (i.e., 80% x 2.5%) during the last three years. Therefore, the retiree's pension will have risen to $3,458.61 [i.e., $3,000 x $(1.028)^3$ x $(1.02)^3$] per month after six years.

   (Section 13.3.6)

7. First, the annual net of fees *real* rate of return on the fund is estimated to be 4% (i.e., 6% - 2%).

   Using Equation 13.3, the expected economic life of the fund is:

$$EEEE = \frac{1}{\ln(1+RR)} \times \ln\left(\frac{PPaaPPPPPPIIII - RR \times FFAAAAPPIIAA}{PPaaPPPPPPIIII}\right) \qquad (13.3)$$

$$EEEE = \frac{1}{\ln(1+0.04)} \times \ln\left(\frac{£100{,}000 - 0.04 \times £1{,}200{,}000}{£100{,}000}\right) = 16.67\ YYPPaarrAA$$

The fund is expected to last 16.67 years (rounded).

(Section 13.6.3)

8. Both choices can be valued using Equation 13.5 by using a zero growth rate for the fixed payment choice and 2% for the growth choice (as well as the different initial payments).

   The fixed annuity has a higher present value.

$$PV_{Growing\ Annuity} = \frac{Initial\ Payment}{r-g} \times \left[1 - \left(\frac{1+g}{1+r}\right)^{t}\right]$$

$$PV_{Fixed\ Annuity} = \frac{€150{,}000}{0.04} \times \left[1 - \left(\frac{1}{1+0.04}\right)^{15}\right] = €1{,}667{,}758$$

$$PV_{Growing\ Annuity} = \frac{€50{,}000}{0.04-0.02} \times \left[1 - \left(\frac{1+0.02}{1+0.04}\right)^{15}\right] = €631{,}717$$

(Section 13.6.5)

9. In this problem, the retiree will be paid retirement benefits in the amount of $52,500 per year (i.e., 2% × 35 years × $75,000) for the rest of his life. This provides the worker with a retirement income-replacement ratio of 70% (i.e., $52,500/$75,000). This is the pension benefit as a portion of the final salary.

   (Section 13.1)

10. The retiree will have a cost of living adjustment of 4% (i.e., 80% × 5%) per year. Therefore, the retiree's pension in seven years will be: $2,500 × $(1.04)^7$ = $3,289.83 per month.

   (Section 13.3.6)

11. In both cases, the average annual salary increase was 3.26% (i.e., in a financial calculator: *n* = 40, *PV* = -18,000, *PMT* = 0, *FV*= 65,000, and solve for *i* or *r*).

    (Section 13.3.1)

12. For Lisa, the average annual salary for the final four years was $62,444.75 [i.e., ($65,000 + $63,050 + $61,789 + $59,940)/4].

    The annual benefit received by Lisa would be $37,466.85 (i.e., 1.5% × 40 years × $62,444.75).

    (Section 13.3.1)

13. The annual benefit received by Mike at ABC would be of $9,612.30 (i.e., 1.5% × 20 years × $32,041). This annual benefit is determined in 1991, but not paid until retirement in 2011. The second employer, XYZ, pays annual benefits in the amount of $18,733.43 (i.e., 1.5% × 20 years × $62,444.75). The final four-year average salary of $62,444.75 was calculated in the previous exercise.

    Compared to the annual benefit of $37,466.85 received by Lisa after working her entire career for XYZ, Mike only earns an annual pension of $28,345.73 (i.e., $9,612.30 + $18,733.43), which is $9,121.12 per year less than Lisa (who worked her entire career for a single firm, XYZ).

    (Section 13.3.1)

14. We already calculated in Problem 11 that the average annual salary increase enjoyed by Lisa was 3.26%. This is the same percentage salary increase received by Karl.

    Karl would have accumulated $547,041.46 at retirement. This value is found using the formula for the future value of a growing annuity (*FVGA*), which is:

$$FFPPFFFF = CC \left(\frac{(1+rr)^{PP} - (1+gg)^{PP}}{rr - gg} \right)$$

    Where:

    C is Karl's first annual contribution (i.e., 1971), which is equal to $18,000 × 10% = $1,800

r is the average annual returns in the DC plan, which in this case is 7%
g is the average annual salary increase, which in the case of Karl is 3.26%
t is the total number of years that Karl and XYZ contributed to the DC plan, which in this case is 40 years.

Therefore,

$$FFPPFFFF = \$1{,}800 \left(\frac{(1+0.07)^{40} - (1+0.0326)^{40}}{0.07 - 0.0326} \right) = \$547{,}041.46$$

(Section 13.5.4)

15. The contributions by Karl and XYZ totaled $144,008.39 (i.e., in a financial calculator: *n* = 40, *r* = 3.26, *PV* = 0, *PMT* = $1,800, and solve for *FV*). Half of this ($72,004.19) was contributed by Karl and the other half by XYZ. The amount that corresponds to investment earning is $403,033.07 (i.e., $547,041.46 - $144,008.39).

(Section 13.5.4)

Chapter 14: Sovereign Wealth Funds

Exercises

1. Country XYZ experienced a $20 billion drop in its reserve account and recorded a $30 billion deficit in its current account. What was the capital account surplus or deficit of country XYZ?

2. Briefly explain under which scenarios a country's currency is likely to depreciate as it pertains to:

    1. Inflation rate compared to its trading partners
    2. Real interest rates compared to its trading partners
    3. Policies that attract or discourage capital inflows
    4. Income growth versus trading partners

<u>Problems 3 to 6</u>

ABC is a small country that derives 70% of its income from oil exports.

3. Explain the three concerns that this country should have regarding tax revenues.

4. Explain the four common motivations which may lead to the establishment of a sovereign wealth fund (SWF) by country ABC.

5. Suppose that oil companies working in country ABC have recently discovered vast amounts of new oil reserves. The government of country ABC is worried that this discovery will cause country ABC to suffer from a case of the "Dutch disease." Explain the meaning of the concept "Dutch disease" applied to the case of country ABC.

6. Country ABC is considering engaging in sterilization policies to counter the effects of the recent discovery of oil reserves. Explain the two types of sterilization policies that country ABC may implement.

Solutions

1. Inserting the known values into Equation 14.1 and solving for the capital account surplus generates a value of $10 billion, which indicates a capital account surplus of $10 billion.

$$\Delta \text{ Reserve Account} = \Delta \text{ Current Account} + \Delta \text{ Capital Account} \qquad (14.1)$$

(Section 14.1.1)

2. Like any other asset, currency prices are typically set by supply and demand. A country's currency is likely to depreciate when the country has:

   1. A higher inflation rate compared to its trading partners
   2. Lower real interest rates compared to its trading partners
   3. Policies that discourage capital inflows
   4. Higher income growth versus trading partners that increases the demand for imports

(Section 14.1.2)

3. First, the volatility of oil prices can create a volatile income stream for country ABC. This is a concern for the country because government spending is likely more stable than oil prices. Second, it is unclear how long these oil revenues will continue, as the oil reserves of the country will not last forever (i.e., there is a concern regarding depletion). Third, the government of country ABC would like to have a diversified economy, ideally earning tax revenues from other industries, rather than depending almost exclusively on oil revenues.

(Section 14.1.4)

4. The following are four common motivations which may lead to the establishment of a sovereign wealth fund (SWF) by country ABC:

   1. Protect the economy and fiscal budget of country ABC from a possible decline or volatility in income from oil;
   2. Assist the central bank to offset redundant liquidity;
   3. Build up the level of savings for future generations, especially considering that country ABC is mainly an oil exporting country, and thus the situation that caused the surplus is at a reasonable risk for depletion or reversal; and/or
   4. Invest the money saved in infrastructure or projects that promote economic growth today to strengthen a sector of the economy or grow a specific industry, and thus help diversify away from oil revenues.

(Section 14.3.1)

5. Dutch disease occurs when large currency inflows from oil exports harm the long-run strength of country ABC's other sources of economic growth (e.g.,

manufacturing sector). In particular, the discovery of vast amounts of new oil reserves will have two major impacts. First, it will increase local wages and cause a shift in workers from other sectors of the economy to the oil sector. Second, the value of the local currency will increase due to large inflows of cash, even if they have not yet occurred but are expected to take place. These two results reduce the competitiveness of country's ABC manufacturing sector, leading to its de-industrialization.

(Section 14.3.3)

6. There are two types of sterilization policies that country ABC may implement.

   First, the central bank of country ABC may sell local currency and buy foreign currency to satisfy the higher demand for local currency by foreign importers of its products. This would lead to inflation as the money supply would be increasing. To sterilize the local economy from the impact of the intervention in the foreign currency markets, the central bank will need to sell bonds denominated in local currency to keep the money supply unchanged and inflation under control.

   Second, the central bank of country ABC may accumulate a significant amount of foreign reserves if the oil revenues are earned by companies that are completely or partially controlled by the government. If the government were to spend the revenues in the local economy, this could cause major disruptions in the local economy, especially in the case of a small country such as ABC, which most likely has a small economy compared to the size of the inflows. In this case, the government may choose to invest much of the oil revenues outside of the country, for example, investing much of its sovereign assets in dollar or euro denominated securities of other countries in order to not disrupt the local economy and to prevent the appreciation of the local currency.

   (Section 14.3.3)

Chapter 15: Family Offices and the Family Office Model

Exercises

1. Are family offices in the U.S. allowed to operate under a "safe harbor" with the Securities and Exchange Commission (SEC)?

2. Aiko Yamaguchi is an entrepreneur who owns a substantial stake in a Japanese-based construction company. Explain the concepts of a completion portfolio and a concentrated portfolio applied to her case.

3. To a family office, what is the difference in taxation between cash dividends and capital distributions from a private equity fund?

4. Suppose that the portfolio of a family office generates $200,000 of profit from short-term trading and is in an ordinary income tax bracket of 40%. Assume that the long-term capital gains tax rate is half the ordinary tax rate. Compare the after-tax profits if the gains were and were not from Section 1256 contracts.

5. Compare the liquidity profile of an ultra-high-net-worth individual (UHNWI) to that of a well-known university endowment.

6. Can a family office eliminate the potential conflicts of interest to which a wealthy family is subject to when it allocates capital to different financial advisers and managers? Explain.

Solutions

1. In the U.S., family offices were allowed to operate under a "safe harbor" with the SEC in the past. This safe harbor allowed family offices to accept up to 15 outside clients. However, with the 2010 passage of the Dodd-Frank Act by the U.S. government, this safe harbor was abolished from the U.S. securities laws. Therefore, if a family office accepts $1 from a non-family member, it may be required to register with the SEC.

   (Section 15.2.3)

2. A completion portfolio is a group of assets that is managed with the objective of diversifying and managing the aggregated risks of the concentrated portfolio (i.e., construction company stock in the case of Aiko), and the completion portfolio. The assets purchased by Aiko for the

completion portfolio should have a low correlation to the assets she holds in the construction company stock.

For example, she could invest in sovereign debt or foreign stocks from sectors other than the construction sector. This should gradually lead to a more diversified portfolio, even when counting the construction company stock she holds.

(Section 15.3.2)

3. Income taxes are a significant constraint for family offices. To a family office, there is a significant difference between cash dividends and capital distributions from a private equity fund. This is because, in most jurisdictions, cash dividends are considered ordinary income, and thus taxed at a higher tax rate than distributions from a private equity fund.

(Section 15.5)

4. In non–Section 1256 securities, the lower tax rate on long-term capital gains is levied only on investment gains in which assets are held for longer than one year. The after-tax profits for non–Section 1256 contracts are:

   $200,000 × (1 − Tax Rate) = $200,000 × (1 − 40%) = $120,000

   Trading in securities in the U.S. that qualify for Section 1256 contracts can be used as a major advantage for high-net-worth investors because 60% of the gains are taxed favorably at the long-term capital gain tax rate.

   For Section 1256 contracts, the after-tax profit can be derived by first computing the tax rate using Equation 15.1:

   $T_{1256\ \text{Contracts}} = (0.40 \times T_{\text{Ordinary}}) + (0.60 \times T_{\text{LTCG}})$

   $T_{1256\ \text{Contracts}} = (0.40 \times 0.40) + (0.60 \times 0.40/2) = 0.28$

   The after-tax gain using the blended rate (28%) raises the after-tax profits from $120,000 to $144,000 [i.e., $200,000 × (1 − 28%) = $144,000]

(Section 15.5.2)

5. The liquidity profile of a UHNWI can be more aggressive than a well-known university endowment. This allows UHNWIs to gain the liquidity premium inherent to illiquid assets. University endowments are constrained by the sum

of the university budget that they must backfill. On the other hand, UHNWIs are in an advantageous situation because they don't have a university budget to which they must commit resources each year. Therefore, family offices can assign more of their wealth to long-dated assets (compared to a university endowment).

(Section 15.9)

6. When a wealthy family allocates capital to different financial advisers and managers, it usually encourages competition among outside money managers and creates incentives that can be detrimental to the family. A family office removes these possible conflicts by producing structures where the interests of the total family, external money managers, and the family office are aligned toward common objectives. For example, by combining the money of the family members, the family office can negotiate fee breaks and other beneficial conditions that a single family member may not be able to achieve. Finally, by taking more asset management in-house family offices mitigate external conflicts of interest and have a greater power to negotiate fees.

(Section 15.9)

Part 4: Risk and Risk Management

Chapter 16: Cases in Tail Risk

1. Were the losses to investors of Amaranth Fund to be expected given the high risks of the fund's investment strategy?

2. What was the primary premise of Long Term Capital Management's trading strategies?

3. How could Carlyle Capital Corporation suffer large losses from a strategy dominated by long positions in AAA-rated securities?

4. How is behavioral finance related to fund failures?

5. What is believed to be the cause of the Flash Crash in 2010?

6. What pattern of trading orders is believed to have caused Knight Capital Group's demise?

7. What primary issue could a prospective investor have researched in order to avoid losses from investing in Bayou Fund?

8. Why should an investor who exits a fraudulent scheme before it collapses be concerned about the losses of the investors who did not exit prior to the collapse?

9. Why were the closing market prices of Lancer's positions argued to be unreliable?

10. List four major lessons from the chapter's cases in tail events.

Solutions

1. No, Amaranth was a multistrategy fund with a stated strategy that would not lead investors to expect such losses. For example, external investors

would not expect that 50% of its capital was dedicated to one specific market/trade. Amaranth had very large, highly levered and concentrated positions but apparently had no formal stop-loss or concentration limits. This suggests that Amaranth's internal team likely severely underestimated the probability of long-term and large unidirectional price movements against its positions.

(Section 16.1.1)

2. The primary premise of Long Term Capital Management's trading strategies was the expectation that the spread in prices or rates between two similar securities would converge over time. LTCM would buy the cheaper security and short the more expensive security (while applying tremendous leverage) and wait for the spread between the two similar securities to narrow before closing the trades.

   (Section 16.1.2)

3. Carlyle Capital Corporation used significant leverage in order to initiate its long positions in AAA-rated securities. When the creditworthiness of AAA-rated mortgage securities came under question, the value of the AAA-rated mortgage securities decreased and Carlyle Capital Corporation received margin calls from its creditors that it could not fulfil. It is alleged that the AAA-ratings were undeserved.

   (Section 16.1.3)

4. Behavioral finance attempts to explain the potential influence of cognitive, emotional, and social factors in opposition to evidence and reason. For example, these factors can lead fund managers to take enormous risks to try to offset losses in the face of evidence that a strategy is not working. These biases can also lead investors with overconfidence to select managers that are more likely to commit fraud because the managers are playing to the emotions of the investors.

   (Section 16.1.5)

5. Initially the SEC reported that a "backdrop of unusually high volatility and thinning liquidity" just as "a large fundamental trader (a mutual fund complex) initiated a program to sell a total of 75,000 E-Mini S&P contracts (valued at approximately $4.1 billion) as a hedge to an existing equity position." Subsequently, it has been alleged that the flash crash was caused by spoofing – the placing of intentionally deceptive offers designed to move markets by a trader (or group of traders) holding massive positions that hope to benefit from the market moves.

   (Section 16.2.2)

6. According to an analysis by Nanex, a Knight algorithm appeared to have been repeatedly buying at the offer and selling at the bid, causing Knight to lose a small amount of money (the spread) on each trade – losing huge sums due to the trades being repeated over and over again.

   (Section 16.2.3)

7. A prospective investor could have researched the background of the principals of the fund, which would have uncovered evidence of dishonesty. In addition, the prospective investor could have researched the auditing firm and found that Richmond-Fairfield had only one employee, a Bayou employee, and only one client, Bayou.

   (Section 16.3.1)

8. Courts can order investors who are enriched by a fraud to return the profits as restitution to those who suffered losses, even if the investors were unaware of the investment's fraudulent nature.

   (Section 16.3)

9. It is alleged that Lauer manipulated the market price of thinly traded shares by placing trades at key points in time to print ("paint") high prices in the stock's trading record and thereby justifying placing high values on the fund's holdings. Not only were the public shares not regularly trading at these prices but also the restricted shares held by Lancer were likely to be

worth even less than the registered shares.

(Section 16.3.3)

10. The lessons are as follows:

    1. A consistent theme across many of the cases is the danger of using large amounts of leverage.
    2. Over-confidence of traders can lead to high risk and high losses.
    3. Highly quantitative financial systems using high-tech capabilities may contain risks that are difficult to predict, and
    4. The large fees and assets of the hedge fund world attract both geniuses and charlatans.

(Section 16.4)

Chapter 17: Benchmarking and Performance Attribution

Exercises

1. What is the common name for a comparison group of funds with similar risk and return objectives and characteristics?
2. What is the traditional difference indicated by the use of "a" to denote an intercept rather than a?
3. An analyst is using a multi-factor return model to estimate the overperformance or underperformance of a fund. What would be the anticipated effect of omitting systematic risk factors to which the fund was negatively exposed in an "up" market?
4. Explain the relationship between the effect of omitted systematic risk factors and the overall direction of the market in a performance attribution.
5. List three reasons why the CAPM is an especially poor model with which to benchmark alternative investments.
6. Describe the difference between a value-based commodity index and a quantity-based index.
7. Which of the three generations of commodity indices incorporates active commodity selection?
8. Briefly describe the three approaches to benchmarking managed futures performance presented in the book.
9. A five-year PE fund required a capital call of $200 at the end of Year 0 and $500 and the end of Year 1. The PE fund paid a single, final distribution at the end of Year 5 of $1,500. In the meantime, the market index generated annual returns 7%, 10%, 15%, 0% and 20% in Years 1 – 5. Calculate and interpret the IRR of the PE Fund and the IRR using the PME method. What is the difference?

10. Assume a core real estate index is expected to generate 6% over the next 10-years and the 10-year Treasury is currently yielding 1%. What is the risk premium of the core real estate index?

Solutions

1. Peer group (or comparison group)

   (Section 17.1.4)

2. "a" is used to represent variables estimated in and outputted from a statistical procedure, in this case the y-intercept. a is used to represent the true and unobservable variables, in this case $a = Rp - [Rf + (Rm - Rf)\beta]$.

   (Section 17.2.4)

3. In an "up market" (i.e., a market in which major indices outperformed the riskless rate), the omission of systematic risk factors will cause an analysis to overestimate the risk-adjusted performance of assets positively exposed to the omitted factors and underestimate the performance of assets negatively exposed to the omitted risk factors.

   (Section 17.3.2)

4. In an "up market" (i.e., a market in which major indices outperformed the riskless rate), the omission of systematic risk factors will cause an analysis to overestimate the risk-adjusted performance of assets positively exposed to the omitted factors and underestimate the performance of assets negatively exposed to the omitted risk factors. In a down market the anticipated effect would be the opposite. Most long-term studies are more likely to be up markets since risky assets on average outperform the riskless asset.

   (Section 17.3.2)

5. Multiperiod issues, nonnormality, illiquidity of returns and other barriers to diversification

   (Section 17.4)

6. A value-based index has fixed-component weights expressed as percentages of the value of the index, while a quantity-based index holds a fixed quantity of contracts for each commodity.

   (Section 17.5.1)

7. Third-generation commodity indices.

   (Section 17.5.5)

8. The first approach consists of using an index of long-only futures contracts. Because CTAs are as likely to be long as to be short, this approach is not particularly helpful.

   The second approach is to use peer groups, where managed futures are usually benchmarked to indices representing active or passive futures trading. Active benchmarks of futures trading reflect the actual performance of a universe of CTAs. Unfortunately, there are a number of issues that arise when using hedge fund/CTA databases.

   Finally, CTAs may be compared to passive benchmarks of futures trading. These passive indices correspond to the performance of an individual trading system (as opposed to the performance of CTAs themselves).

   (Section 17.6)

9. The answer can be found by creating a similar table below:

	Year 0	**Year 1**	**Year 2**	**Year 3**	**Year 4**	**Year 5**
IRR Cash Flows	$ (200)	$ (500)	$ -	$ -	$ -	$ 1,500
PE IRR	**19.37%**					
Market Index Returns		7%	10%	15%	0%	20%
Cash Flow Value 1	$ 200	$ 214	$ 235	$ 271	$ 271	$ 325
Cash Flow Value 2		$ 500	$ 550	$ 633	$ 633	$ 759
Total Value	$ 200	$ 714	$ 785	$ 903	$ 903	$ 1,084
PME Cash Flows	$ (200)	$ (500)	$ -	$ -	$ -	$ 1,084
PME IRR	**10.71%**					
PE IRR - PME IRR	**8.66%**					

(Section 17.7.2)

10. The risk premium is 5%.

(Section 17.9.2)

Chapter 18: Liquidity and Funding Risks

1. Suppose a CTA investor's account has a funding level of $100,000 and a notional level of $300,000. If the CTA returned 25% that year (on the trading level), what was the funding level return?

2. Describe the relationship between a fund's margin-to-equity ratio and the fund's volatility.

3. What is the difference between Capital at risk (CaR) and Value at Risk (VaR) for managed futures?

4. Let's assume a CTA's monthly mean return is 0.75% with a monthly volatility of 3%. What is the monthly VaR at the 95% confidence level?

5. A CTA manager has a stated monthly target return of 5%. Over the next 12 months, they generate monthly returns of 10%, 3%, 6%, 2%, -1%, 3%, 15%, -5%, 6%, 7%, 2%, 0%. What is this CTA manager's Omega ratio?

6. Discuss the impact of price smoothing on fund returns, volatility, betas, and correlations with the market.

7. Suppose that the value of the parameter alpha for the following equation (Equation 18.10 from the book) is 0.40.

   $$P_{t,reported} = aP_{t,true} + a(1-a)P_{t-1,true} + a(1-a)^2P_{t-2,true} + \ldots \qquad (18.10)$$

   How much of the current reported price depends on the current true price, how much depends on the true price of the previous observation date, and how much depends on the true price of the observation date from two periods before?

For Exercises 8 – 13

The following Exhibit contains quarterly return data for two real estate series between the third quarter of 2007 and the second quarter of 2012. The first series (column 3) corresponds to the returns of a hypothetical U.S. real estate index (XYZ RE Index) that is unlevered and that is based on appraised prices of private real estate properties. The second series (column 4) corresponds to the returns of

the all-equity FTSE NAREIT, which is based on closing market prices of publicly traded equity real estate investment trusts (REITs) in the U.S. The fifth and sixth columns contain the lagged returns of the XYZ RE Index and the all-equity FTSE NAREIT, respectively.

Year	Quarter	XYZ RE Index Returns	NAREIT All Equity Returns	XYZ Real Estate Index Lagged Values	NAREIT All Equity Lagged Values
2007	3	2.87%	2.59%		
2007	4	4.01%	-12.67%	2.87%	2.59%
2008	1	2.12%	1.40%	4.01%	-12.67%
2008	2	0.21%	-4.93%	2.12%	1.40%
2008	3	0.02%	5.55%	0.21%	-4.93%
2008	4	-7.28%	-38.80%	0.02%	5.55%
2009	1	-8.87%	-31.87%	-7.28%	-38.80%
2009	2	-6.61%	28.85%	-8.87%	-31.87%
2009	3	-4.21%	33.28%	-6.61%	28.85%
2009	4	-3.04%	9.39%	-4.21%	33.28%
2010	1	-0.36%	10.02%	-3.04%	9.39%
2010	2	2.98%	-4.06%	-0.36%	10.02%
2010	3	3.71%	12.83%	2.98%	-4.06%
2010	4	5.01%	7.43%	3.71%	12.83%
2011	1	4.97%	7.50%	5.01%	7.43%
2011	2	4.66%	2.90%	4.97%	7.50%
2011	3	4.17%	-15.07%	4.66%	2.90%
2011	4	3.45%	15.26%	4.17%	-15.07%
2012	1	3.43%	10.49%	3.45%	15.26%
2012	2	3.59%	3.97%	3.43%	10.49%
	Mean	0.74%	2.20%		
	Std.Dev.	4.40%	17.27%		
	Autocorrelation XYZ RE		86.45%		
	Autocorrelation NAREIT		23.04%		

8. Comment on the mean and standard deviations of XYZ RE Index and FTSE NAREIT returns. Furthermore, offer potential explanations for the finding that the standard deviation of returns for the XYZ RE Index is substantially lower to that of FTSE NAREIT.

9. Offer potential explanations for the finding that the autocorrelation of the all-equity FTSE NAREIT returns is substantially lower than that of XYZ RE Index returns.

10. Calculate the first unsmoothed return (i.e., fourth quarter of 2007) for XYZ RE Index.

11. Calculate the unsmoothed return in the fourth quarter of 2008 for XYZ RE Index. Comment on the result obtained.

12. In terms of asset allocation, what is the consequence of using the XYZ RE Index (original smoothed data) versus the unsmoothed version of this index?

13. In terms of correlations between real estate and other asset classes, what is the effect of using the XYZ RE Index returns (original smoothed data) versus the unsmoothed version of this index returns?

14. The smoothed returns of a return series with an autocorrelation of 0.45 have a true beta of 1.15 after adjusting for smoothing. What is the estimated reported beta (i.e., the beta of the smoothed returns)?

Solutions

1. Using equation 18.1, the trading level can be found as

$$\text{Trading Level} = \text{Funding Level} + \text{Notional Level}$$

Meaning the trading level is $400,000 ($100,000 + $300,000).

A trading return of 25% would generate a dollar gain of $100,000, meaning an investment gain of 100% on the funding level ($100,000 gain / $100,000 funding level).

(Section 18.1)

2. There is a close correlation between a fund's margin-to-equity ratio and the fund's overall volatility. As the margin-to-equity ratio increases, the volatility of the fund increases.

(Section 18.1.2)

3. Capital at Risk represents the total loss that would be incurred should each position hit its stop-loss price level on that day. Value at Risk measures the potential loss in an investment portfolio given a particular holding period, with no changes to the portfolio during the holding period.

(Section 18.2 and Section 18.1.4)

4. Using equation 18.7,

$$\mathrm{VaR}_{\alpha} = (\alpha \times \sigma_t) + \mu$$

We can calculate the monthly VaR at the 95% confidence level as follows:

$$\mathrm{VaR} = (-1.6448 \times 3.0\%) + 0.75\% = -4.18\%$$

(Section 18.2.4)

5. Using equation 18.8,

$$\Omega = \frac{\textit{Upper Partial Moment}}{\textit{Lower Partial Moment}} = \frac{\frac{1}{N}\sum_{i=1}^{N} \max(R_i - T, 0)}{\frac{1}{N}\sum_{i=1}^{N} \max(T - R_i, 0)}$$

We can calculate the Omega ratio of this manager. In order to calculate the ratio, we must find the difference between each of the monthly returns the manager generated and the manager's monthly return objective. Therefore, we must subtract 5% from each of the following monthly returns: 10%, 3%, 6%, 2%, -1%, 3%, 15%, -5%, 6%, 7%, 2%, 0%. All positive numbers end up as upper partial movements, while any negative numbers end up as lower partial movements.

This results in the following upper partial moments: 5%, 1%, 10%, 1%, 2%
And results in the following lower partial moments: 2%, 3%, 6%, 2%, 10%, 3%, 5%

The Upper Partial Moments sums to 19% and the Lower Partial Moments sums to 31%. Therefore, the Omega ratio is 19% / 31% = 0.61
(Section 18.3.2)

6. Price smoothing has little impact on fund returns but understates standard deviations, betas, and correlations with the market.
(Section 18.4.4)

7. 40% (i.e., alpha = 0.40) of the current reported price depends on the current true price, 24% (i.e., 0.40 × 0.60) depends on the true price of the previous observation date, and 14.4% (i.e., 0.40 × 0.60 × 0.60) depends on the true price of the observation date from two periods before.

   (1/0.50) = 2 ➔True price changes should be estimated based on a price change that is 2 times larger than the most recent reported price change.

   (Section 18.5)

8. The mean quarterly return of the all-equity FTSE NAREIT is slightly higher than the corresponding mean quarterly returns of the XYZ RE Index (2.20% vs. 0.74%). The difference in standard deviations is striking (17.27% for the all-equity FTSE NAREIT versus only 4.40% for the XYZ RE Index).

   The difference in the standard deviations of returns can be partially explained by the fact that, as mentioned in the exercise, the XYZ RE Index has no leverage, whereas the all-equity FTSE NAREIT reflects the returns of the levered real estate positions that are generally included in REITs. The other explanation arises from the fact that the XYZ RE Index is based on appraisals, and thus is subject to price smoothing.

   (Section 18.7)

9. The autocorrelation of the all-equity FTSE NAREIT returns is low, and its positive (although) small value may even have a spurious component arising from the extraordinary events that affected the real estate market in the years following 2007. This low value suggests that the market for REITs is informationally efficient. This REIT index can be considered a proxy of a true return series. On the other hand, the high value for the autocorrelation of XYZ RE Index returns is consistent with XYZ RE Index being based on appraisals, and thus subject to price smoothing.

   (Section 18.7)

10. Using Equation 18.11:
    $R_{t,true} = (R_{t,reported} - \rho R_{t-1,reported}) / (1 - \rho)$

    $R_{t,true} = [4.01\% - 0.8645 \times 2.87\%] / (1 - 0.8645) = 11.28\%$

    (Section 18.7.3)

11. Using Equation 18.11:

$R_{t,true} = (R_{t,reported} - \rho R_{t-1,reported}) / (1 - \rho)$

$R_{t,true} = [-7.28\% - 0.8645 \times 0.02\%] / (1 - 0.8645) = -53.85\%$

The -7.28% (smoothed) XYZ RE Index return in the fourth quarter of 2008 produces a striking -53.85% return in the unsmoothed return, which is closer to the true return during that quarter (proxy by the all-equity FTSE NAREIT), which fell by -38.80% during that quarter.

(Section 18.7.3)

12. The XYZ RE Index (original smoothed data) wrongly and dangerously suggests a very low standard deviation of returns for real estate and thus, asset allocations based on these falsely low volatilities would substantially overweight real estate in a mean-variance optimization framework.

(Section 18.7)

13. The use of XYZ RE Index returns (original smoothed data) understates the correlation of the (smoothed) returns to the returns of other asset classes. In a mean-variance framework, the combination of low volatility (already discussed in the previous exercise) with the low correlation of smoothed returns would assign weights to real estate that can be substantially higher than those corresponding to unsmoothed data.

(Section 18.7)

14. Inserting the true beta and autocorrelation coefficient into Equation 18.14 generates the following equation:

$$\beta\beta_{PPrrnnNN} = \frac{\beta\beta_{rrrrrrNNrrrrrrrr}}{1-\rho\rho}$$

$$1.15 = \frac{\beta\beta_{PrrNNppIIrrPPNNrr}}{1 - 0.45}$$

$$\beta_{reported} = 1.15 \times 0.55 = 0.6325$$

The smoothed series exhibits a much lower beta than the true return series. **(Section 18.7.5)**

Chapter 19: Hedging, Rebalancing, and Monitoring

Exercises

Use the following information for Problems 1-3

An analyst has taken a long position in 1,000 call options and is trying figure out a way to create a delta-risk-neutral strategy around her position. The current stock price is $50/share. The analyst creates a one-period option tree, with an upper node of $52 and a lower node of $48. The option is currently priced at $3.25, but the price rises to $4.50 in the upper node and falls to $2.00 in the lower node. Assume a 50% probability that the stock price will move up or down and the risk-free rate is 0%. The 12-month volatility of the stock price is 20%.

1. What is the call option's delta?

2. In order to properly delta hedge the option's position, should the analyst take a long or short position in the underlying shares of the company stock?

3. How many shares should the analyst buy (long) or sell (short)?

4. What are the three key observations behind the financial economics of delta-hedging between an option and its underlying asset?

5. An analyst has created two delta-neutral portfolio by being long put options and long the underlying asset. While both portfolios are delta-hedged, both have positive gamma and vega. The underlying volatility of the first portfolio is 15% while the volatility of the second is 30%. Based on those volatility statistics, which portfolio should stand to benefit more?

6. A portfolio manager is tasked with periodically re-hedging a delta-neutral portfolio. If the portfolio manager decides to infrequently re-hedge, what is his view on the underlying asset's autocorrelation?

7. Discuss the importance of rebalancing, even if stocks follow a random walk.

8. What do empirical studies suggest regarding the correlation of commodity sectors with each other (e.g., the correlation between energy sector and metals sector commodities)?

Solutions

1. The call option's delta can be found by dividing the change in the option price by the change in the stock price between the two nodes. The change in the option price is $2.50 ($4.50-$2.00) and the change in the share price is $4 ($52-$48). Therefore, the option's delta is 0.625.

   (Section 19.3.2)

2. Since the analyst has taken a long position in the call options, the analyst should short the underlying shares of stock.

   (Section 19.3.2)

3. The analyst should take a short position in 625 shares of the underlying stock.

   (Section 19.3.2)

4. (1) Delta-hedging is not a directional speculation on the stock price, (2) if a stock is efficiently priced, all trading strategies on that stock have an NPV of zero, and (3) delta-hedging is part of a speculation on volatility

   (Section 19.4)

5. Portfolios with positive gamma and vega exposure in a portfolio will benefit from high volatility, so the second portfolio should stand to benefit more.

   (Section 19.5)

6. The portfolio manager is making a bet on positive autocorrelation. Without rebalancing, a delta-neutral, long gamma portfolio will benefit greatly from volatility that is directional or trending but will have little or no benefit from volatility that is mean reverting.

   (Section 19.5)

7. If stocks follow a random walk, then rebalancing does not change the expected value of a portfolio, it only alters the risk.

   (Section 19.6.2)

8. Empirical evidence suggests that commodity sectors have a low correlation with each other. Therefore, commodities can offer uncorrelated or low correlation investment opportunities across various commodity markets.

Energy sector commodities do not have high positive correlations with other sectors, because higher energy prices can weigh on economic growth and therefore slow down demand for other commodities.

(Section 19.7)

Chapter 20: Risk Measurement, Risk Management, and Risk Systems

Exercises

1. List the five components of risk management in the context of: who, what, when, where, and how.

2. What are the three methods for approximating short-term valuations for illiquid securities?

3. In the context of data collection frequency and data reporting, what are some examples of data collected on a monthly basis and how are those data points reported?

4. What are some of the qualitative elements of risk management typically associated with alternative investments?

5. How might the dimensions of risk differ in terms of strategy when evaluating a systematic managed futures strategy relative to a long/short equity strategy?

6. How can key person risk be mitigated?

7. List the seven categories of quantitative information that allocators may find helpful to calculate, compile, and review on a regular basis.

8. List the five categories of qualitative information that allocators may find helpful to calculate, compile, and review on a regular basis.

9. Describe some of the proprietary and other confidential information that could be lost if a firm does not maintain strong cybersecurity methods.

10. Describe the three models of risk management structure. Why might it make sense for the CIO to serve as the risk manager in an organization?

Solutions

1. Risk Reporting (Who), Dimensions of Risk (What), Frequency of Data Collection (When), Investment/Position Level (Where), and Aggregation and Systems Development (How),

(Section 20.1.2)

2. The three methods are as follows: capital statement valuations, discounted cash flow model-based calculations, and customized index-based calculations.

(Section 20.1.3)

3. Some examples of data collected on a monthly basis might be position and manager changes and non-investment qualitative risks such as business, legal, regulatory, and compliance. These translate to reporting outcomes such as position and manager turnover, top positions, exposures, cash, cash flow, illiquid/miscellaneous positions and qualitative risks reports.

(Section 20.1.4)

4. For alternative investments, qualitative risks are typically reviewed in the areas of business operations, legal, regulatory, and compliance.

(Section 20.1.6)

5. A long/short equity strategy might be subject to strategy risk in the form of macro analysis, sector, idiosyncratic security selection risk, and dispersion risk. A systematic managed futures strategy, however, might be subject to risks such as model risk, trade execution, lack of volatility/trend or trend reversals, and leverage.

(Section 20.1.7)

6. Key Person risk can be mitigated by 1) constructing an investment process that is less reliant on one individual, 2) purchasing key person insurance policies, 3) using extraordinary redemption rights triggered by the departure of a key person, or 4) maintaining a "bench" of alternative investment opportunities and adequately diversifying the existing portfolio.

(Section 20.1.7)

7. Historical performance, historical risk measurement review, asset allocations and capital balances, gross contribution, various activity

reports, fixed income reports, and CTA and managed futures expoures.

(Section 20.2.1)

8. Descriptive information, key information, other information, watch or focus list summary, and activities log.

(Section 20.2.3)

9. Proprietary investment methods (algorithms, models, analytics, and research), confidential information on individuals and organizations, investments, sales and distribution, and business management.

(Section 20.8.1)

10. The three models of risk management are as follows: 1) CEO/President as Risk Manager, 2) COO/CFO as Risk Manager, and 3) Chief Investment Officer as Risk Manager. It might make sense for the CIO to be Risk Manager because the CIO has a complete understanding of the risks associated with the investments.

(Section 20.9.1)

Part 5: Methods for Alternative Investing

Chapter 21: Valuation and Hedging Using Binomial Trees

Exercises

1. Assume the following: interest rates are 0%, investors are assumed to be risk-neutral so that all risk premiums are set to 0%, and there is zero recovery assuming default. If a bond is priced at at 75% of par, what is the implied probability of default?

2. Describe the differences between a P-measure and a Q-measure.

3. List the four key concepts of risk-neutral modelling.

4. Assume an asset has a single-period binomial tree with three potential asset value expectations and probabilities:

Up Return:	$1.25	Probability:	40%
Middle Return:	$1.03	Probability:	5%
Down Return:	$0.87	Probability:	55%

   What is the expected average value of the asset?

5. Given that σ=0.18 for Δt=2, compute the values of u and d based on a Cox, Ross, and Rubenstein (CRR) tree model.

6. Using u and d from problem #5, what is the risk neutral probability of the up movement assuming the risk-free rate is 5%?

<u>Problems 7 to 9</u>

Assume a stock is priced at $50 per share. An analyst is attempting to determine the value of a call option on the stock. The call option's strike price is $53. Assume u = 1.10 and the risk-free rate is 3%.

7. What are the values of S_u and S_d?

8. Does the tree correctly value the stock?

9. What is the value of the call option?

10. Five years ago, a company issued a 5-year convertible bond with a 5% coupon. Assume the company's convertible bond provides the option for the bondholder to convert their shares into three shares of stock. If the stock price is currently $300, would it make sense for the convertible bond shareholder to convert their shares to equity shares?

11. Under what two circumstances would an issuer of a callable bond exercise that underlying option?

12. Assuming the value of the call option is positive, describe the relationship between a callable bond price and a non-callable bond price.

Solutions

1. Under these conditions, a bond priced at 75% of par infers a probability of default of 25%.

   (Section 21.1.1)

2. A Q-measure is a probability-like value or other related variable within a model derived for modeling purposes under the assumption that risk-neutrality holds when it is likely that the world is not risk-neutral. A P-measure, however, is a statistical probability that represents the likelihood of an outcome in the real world.

   (Section 21.1.3)

3. 1) There is often an infinite number of sets of values that are consistent with a particular value for a financial derivative. 2) Expected risk premiums in a risk-averse world are generally unobservable. 3) The derivative's value obtained from Q-measures is identical to the no-arbitrage values that must exist in a risk-averse world using P-measures. 4) Since Q-measures are tractable, they are used in risk-neutral modeling under those conditions in which actual derivative prices must match risk-neutral model prices.

   (Section 21.1.4)

4. The expected average value is $1.03. To determine the expected average value of the asset, multiply the expected asset values by their respective probabilities and sum them up.

   1.25 x 40% + 1.03 x 5% + $0.87 x 55%

   (Section 21.2.1)

5. To find the value of u, we use equation 21.2

$$uu = PP^{\sigma\sigma\sqrt{\triangle PP}}$$

$$uu = PP^{0.18\sqrt{2}} = 1.2899$$

   To find *d*, we simply take the inverse of *u*: d = 1 / u = 1 / 1.2899 = 0.7753

   (Section 21.3.1)

6. Using equation 21.3, we find can find the risk-neutral probability of the up movement,

   p = (r – d) / (u – d). *r* is equal to 1 + risk-free rate, or 1.05.

   Therefore, p = (1.05 – 0.7753) / (1.2899 – 0.7753) = 0.5339 or 53.39%

   (Section 21.3.1)

7. First, if *u = 1.10*, we know that d = 1/u = 1/1.10 = 0.91 Therefore Su = 1.10 x 50 = $55 and Sd = $45.50.

   (Section 21.3.2)

8. Even with the information in Exercise 7, we still need the risk-neutral probability of an up movement to use backward induction and determine if the tree correctly values the stock. We also know the risk-free rate is 3%, meaning r = 1.03.

   To find the risk-neutral probability of an up movement, we must use equation 21.3: p = (r – d) / (u – d) = (1.03 – 0.91) / (1.10 – 0.91) = 0.6316 = 63.16%.

Therefore, the tree values the stock can be calculated as the following = [(0.6316*50*1.1)+(0.3684*50*0.91)]/1.03 = $50.00

Yes, the tree values the stock correctly.

(Section 21.3.2)

9. To find the value of the option, we follow a similar process to Exercise 8, only this time by examining the value of the option at each node. Since this is a call option, the value can is equal to max (S – X, 0). The strike price is $53.

   In exercise 7, we calculated the values of Su and Sd, so we can use these values to determine the values of the options at those respective nodes.

   Option Value at Su node: max ($55 - $53, 0) = $2
   Option Value at Sd node: max ($45.50 - $53, 0) = $0

   Next, we calculate the call option value using the same approach as exercise 8.

   c = [(0.6316*$2) + (0.3684*$0)] = $1.26

   Now that we have found the weighted value of the node, we must discount it to the present, Therefore 1.26/1.03 = 1.22

   (Section 21.3.2)

10. If the conversion ratio is 3.0, then the conversion value is currently $900. The currently value of the bond at maturity is expected to be $1,050 ($1,000 par + $50 coupon). Therefore, it does not make sense for the shareholder to convert their shares.

    (Section 21.3.4)

11. An issuer would typically call a bond after a pre-specified date when the bond trades at a premium to a pre-determined price level outlined in the terms of the bond.

    (Section 21.4)

12. If the value of the call option is positive, then the non-callable bond price will be greater than the callable bond price.

    (Section 21.4.3)

Chapter 22: Directional Strategies and Methods

1. Suppose a CTA is using the signal-to-noise ratio (SNR) to measure the level of divergence for the following price series corresponding to six days: $73, $71, $68, $69, $66, $63. Calculate the signal-to-noise ratio and indicate whether the signal is strong.

2. Suppose the S&P 100 Index, German Government bonds, gold, crude oil, and Treasury notes have 100-day signal-to-noise ratios (SNRs) of 0.2, 0.1, 0.4, 0.2, and 0.3, respectively. Calculate the market divergence index (MDI).

3. *Hudson Investment Fund* follows a contrarian approach and employs traditional valuation metrics (e.g., book-to-market, price-earnings ratios (P/E), and ratio of P/E to earnings growth rate) to search for undervalued companies. Which approach (e.g., value, growth, momentum, etc.) is most likely to categorize the investment style of *Hudson Investment Fund*?

Solutions

1. The signal-to-noise ratio is the ratio of the overall trend to a series of price changes during the same period. In this case, n = 6, as there are six days in the signal observation period. Using Equation 22.1, the SNR is:

$$SSSSRR_{PP}(II) = \frac{|PP_{PP} - PP_{PP-II}|}{\sum_{ii=}^{II-1} |PP_{PP-ii} - PP_{PP-ii+1}|}$$

|63 – 73| divided by |71 – 73| + |68 – 71| + |69 – 68| + |66 – 69| + |63 – 66|, which is equal to 10/12 = 0.833. This indicates a very strong trend.

(Section 22.2.4)

2. First, we notice that gold has the largest SNR of the five series presented, which means that the trend signal is the highest for gold over the past 100 days. German Government bonds have the smallest SNR, which means that its trend signal is the lowest. Using Equation 22.2, the MDI for all included markets would be the average SNR:

$$MMMMII_{PP}(II) = \frac{1}{MM} \sum_{ii=1}^{MM} SSSSRR_{PP}^{ii}(II) = \frac{0.2+0.1+0.4+0.2+0.3}{5} = 0.24$$

This MDI value can be compared to SNRs from previous periods to verify whether markets are trending.

(Section 22.2.6)

3. The investment style of Hudson Investment Fund is most likely categorized as a value approach.

(Section 22.5)

Chapter 23: Multivariate Empirical Methods and Performance Persistence

Exercises

1. Describe principal component analysis (PCA).

2. Explain the purpose of PCA and how its use can help with the research process.

3. An analyst performs a PCA with the criteria that a factor will not be added to the list of principal components unless it explains an additional 10% of the variation of the dataset. If the first five factor eigenvalues are as follows: 25, 10, 9, 8, 3 and the total eigenvalue for the entire set is 60, at which factor would the analyst no longer add a new factor.

4. What are the three key differences between PCA and factor analysis?

5. Why is multicollinearity an issue in a multiple regression model but not a single regression model?

6. In the context of a dummy variable approach to dynamic risk exposures, what is a "down market beta"?

7. Why would an analyst use a rolling window analysis of the systematic risk exposures of an investment strategy rather than a single analysis based on the entire dataset?

8. What are two major shortcoming of an empirical study that examines performance persistence of funds by comparing the correlation of returns in an earlier period with returns in a subsequent period when returns are based on appraised values?

Solutions

1. Principal Component Analysis (PCA) is a linear statistical method that identifies the set of orthogonal factors from a dataset that maximize the percentage of explained variation.

   (Section 23.1.1)

2. The process of PCA reduces the dimensionality of a matrix of multiple asset classes. Rather than relying on potentially hundreds or thousands of inputs,

PCA seeks to find a few factors that explain most of the data's variation.

(Section 23.1.2)

3. With a total eigenvalue of 60, the cumulative and additional variance explained is as follows:

	Factor 1	**Factor 2**	**Factor 3**	**Factor 4**	**Factor 5**	**Total**
Eigenvalue	25	10	9	8	3	60
Cumulative Explained	42%	58%	73%	87%	92%	
Additional Explained		17%	15%	13%	5%	

Therefore, the analyst would stop after Factor 4, since Factor 5 only adds 5% to the additional variance explained.

(Section 23.1.3)

4. (1) Factor analysis makes specific statistical and modeling assumptions about the return process while PCA does not require a definite model because it simply maximizes explained variance. (2) Factor analysis generates different factor scores when different numbers of factors allowed in the model, while PCA's loadings do not change as the number of components considered is increased. (3) PCA can identify a factor driven almost entirely by one security (e.g., one stock or bond with a very volatile and unusual risk profile) while FA seeks factors that drive at least two securities.

(Section 23.1.5)

5. There is only one independent variable in a single regression model, but two or more independent variables are needed to have multicollinearity. A multiple regression model is a regression model with more than one independent variable. Multicollinearity is when two or more independent variables in a regression model have high correlation to each other.

(Section 23.2.2)

6. The down market beta, bi,d is the responsiveness of the fund's return to the market return when the market return is less than the riskless rate (i.e., when the market's excess return is negative or "down").

   (Section 23.4.2)

7. The analyst is concerned about style drift (specifically, systematic risk exposures that change through time). By using a short-term analysis that moves through time the analyst can get estimates of the change in risk exposures through time.

   (Section 23.5.4)

8. (1) The results could be driven by serial correlation in returns that does not reflect true performance correlations, and (2) the returns are not risk-adjusted

   (Section 23.7)

Chapter 24: Relative Value Methods

Exercises

Problems 1 to 3

Assume the following scenario. In April, a spreader observes contango in the crude oil forward curve. July and December light sweet crude oil futures on the NYMEX are trading at $55.45 and $62.27, respectively. The size of the NYMEX light sweet crude oil contract is 1,000 barrels. The spreader anticipates a flattening of the curve and narrowing of the spread between the two maturities.

1. What positions (long or short) should she take in July and December light sweet crude oil futures?

2. Suppose that the spreader takes a position of long 5 July contracts and short 5 December contracts, and that in June an oversupply of crude in the world markets causes the price of the July contract to decline to $45.33, while the December contract declines to $49.03. Calculate the total gain (loss) of the spread.

3. Suppose that the spreader takes 5 long July positions and 5 short December positions, and that in May political turmoil in oil-producing countries causes the price of the July contract to increase to $63.08 and the December contract to increase to $69.63. Calculate the total gain (loss) of the spread.

4. This problem has been partially adapted from NYMEX's publication Crack Spread Handbook (2001). Suppose that an independent refiner is worried about the possibility of increasing oil costs (input) and falling refined product (heating oil and gasoline) prices (output). The refiner will use a crack spread to hedge this risk.

   On June 17, the refiner enters an obligation in the cash market to buy 60,000 barrels of crude oil on July 15 at prevailing market prices. The refiner has also entered an obligation to sell 840,000 gallons (20,000 barrels) of heating oil and 1,680,000 gallons (40,000 barrels) of gasoline on August 28 at prevailing market prices. August crude oil futures contracts are trading at $87.54/bbl., September heating oil contracts are trading at $110.05/bbl. and September gasoline futures contracts are trading at $108.31/bbl. Each one of these contracts is for the equivalent to 1,000 barrels. In the cash market, crude oil is trading at $88.10/bbl., gasoline at $2.6181 per gallon, and heating oil at $108.94/bbl. 42 gallons of gasoline are equivalent to one barrel of gasoline.

Which positions in crude oil futures, heating oil futures and gasoline futures contracts should the refiner take on June 17 through a 3:2:1 crack spread?

Note: Remember that a 3:2:1 crack spread means that 3 barrels of oil are used to produce 2 barrels of gasoline and 1 barrel of heating oil.

5. Wheat typically trades in contracts for delivery of 5,000 bushels. Assume that May wheat contracts currently sell for $6.30 per bushel, which is $0.12 more than the futures price of wheat contracts for delivery in July, due to anticipated harvesting. A commodity trader anticipates that abnormal weather will increase the difference in price between these two contracts to $0.26. Describe the calendar spread position that the trader should take. If the trader is correct, what will be the profit of the calendar spread if she buys/sells 50 contracts?

Solutions

1. The spreader should go long July and short December light sweet crude oil futures.

   (Section 24.4)

2. The loss on the long July contract is: -$55.45 + $45.33 = -$10.12

   The gain on the short December contract is: $62.27 - $49.03 = $13.24

   Total gain on the spread = -$10.12 + $13.24 = $3.12

   The total gain of the spread is:

   Position P&L = P&L barrel × Contract size × Position size

   = $3.12 × 1,000 × 5 = $15,600

   (Section 24.4)

3. The gain on the July contract is: -$55.45 + $63.08 = $7.63

   The loss on the December contract is: $62.27 - $69.63 = -$7.36

   Total gain on the spread = $7.63 + ($7.36) = $0.27

The total gain of the spread is:

Position P&L = P&L barrel × Contract size × Position size

= $0.27 × 1,000 × 5 = $1,350

(Section 24.4)

4. On June 17, the refiner should initiate a long position in crude oil and a short position in heating oil and gasoline to fix a substantial portion of his refining margin through a 3:2:1 crack spread. He does this by going long 60 August crude oil futures contracts at $87.54/bbl., while selling 20 September heating oil contracts at $110.05/bbl. and 40 September gasoline futures contracts at $108.31/bbl.

   (Section 24.4)

5. The calendar spread position that the trader should take is long May contracts and short July contracts, because she expects May contracts to increase in price relative to July contracts (from $0.12 to $0.26 per bushel).

   It is not necessary to know absolute prices in calculating the profit or loss of a spread trade. In this example, the spread between the two dates is assumed to increase from $0.12 per bushel to $0.26 per bushel. Using Equation 24.4, the profit is found to be $35,000:

   Position P&L = $P\&L_{bushel}$ × Contract × Position Size

   Position P&L = ($0.26-$0.12)/bushel × 5,000 bushels × 50 contracts = $35,000

   (Section 24.4)

Chapter 25: Valuation for Private Assets: The Case of Real Estate

Exercises

Problems 1 to 2

A building has a $15,000,000 depreciable base that will be evenly depreciated over 15 years (using straight-line depreciation). The marginal tax rate is 35% and the discount rate is 7%.

1. Calculate the present value of the 15-year tax shield.

2. Assuming that the building is sold after 15 years for a value above its original cost, what would be the net gain to the taxpayer from being able to deduct depreciation? Note: Assume that both the tax rate and the discount rate remain at 35% and 7%, respectively.

Problems 3 to 8

An investment grows at 8% per year (pre-tax) during 10 years. Gains are taxed at 30% per year.

3. Calculate the future value of this investment if taxes are paid yearly.

4. Calculate the future value of the investment if taxes can be deferred.

5. Calculate how much more profit is allowed by the tax deferral.

6. Calculate the after-tax rate with deferral.

7. How much does the after-tax deferral of gains help increase after-tax gains?

8. What is the pre-tax equivalent to the after-tax gains with tax deferral?

9. Suppose the case of a real estate investment held by a taxpayer who is in a 30% tax bracket on all income. The investor is considering a property that offers €2 million per year in depreciation over the next ten years. However, the depreciation will be recaptured for tax purposes when the property is sold at the end of ten years. Assuming an interest rate of 6.50%, what is the present value of the combined tax effects of depreciating the property and recapturing the depreciation? Assume, for computational simplicity, that the tenth and final year of depreciation is both deducted and recaptured in the tenth year.

10. Suppose that an investor is comparing the after-tax rates of return on an investment offering a pre-tax return of 4.70% per year in USD. Inside one investment wrapper, the return is fully taxed each year. Another wrapper defers taxation until the funds are withdrawn. The investor has a 12-year investment horizon and is in a 25% tax bracket on all income. Compute the after-tax returns of the investment using both wrappers.

11. How does depreciation impact the after-tax IRR relative to the pre-tax IRR reduced by the current tax rate?

Problems 11 to 13

The Fullertown City Employees' Pension Fund is considering allocating funds to real estate investments. As a first step, the fund's investment committee has asked researchers John Troconis, Virginia Peterman, and Jay Ahn, to write a report on alternative investment vehicles available to institutional investors for gaining access to real estate investments. The three researchers are examining the characteristics of real estate indices as a first step to understand the idiosyncrasies of reported real estate returns and return standard deviations.

Mr. Troconis finds that properties that are transacted during a particular period and that are used to calculate these indices may not be representative of the underlying real estate market. Ms. Peterman finds that a technique used when designing real estate indices uses observed transactions of some properties to estimate the prices of all properties, including those that did not transact, by directly modeling the heterogeneity of real estate properties. Finally, Mr. Ahn finds that a technique used when constructing real estate indices has been criticized because only a few data points can be found to create an index when following this methodology.

12. Which bias does Mr. Troconis discover?

13. To which technique is Ms. Peterman referring?

14. What is the technique that Mr. Ahn finds to be problematic?

Solutions

1. This building will allow deduction of an annual depreciation of $1,000,000 per year [i.e., $15,000,000 x (1/15)]. At a marginal tax rate of 35%, using formula 25.1 the annual depreciation tax shield is $350,000 per year:

Depreciation tax shield$_t$ = Depreciation$_t$ × Tax$_t$ (25.1)

The present value of the tax shield is:

PV Depreciation Tax Shield = $\sum_{PP=}^{TT} \frac{DDNNpprrNNDDiirrPPii1111_{rr} \times}{TTrrTT_{\bullet\bullet}(1+RRff)^{TT}}$ (25.2)

At a discount rate of 7%, using formula 25.2 computes the present value of the 15-year tax shield as $3,187,770 (i.e., *n* = 15, *i* = 7%, *PMT* = $350,000, *FV* = 0, compute *PV*).

(Section 25.1)

2. In this case, the taxpayer will owe taxes on the recaptured depreciation of $15,000,000. Given a tax rate of 35% and a discount rate of 7%, this tax liability of $5,250,000 (i.e., $15,000,000 × 0.35) in 15 years has a present value of $5,250,000/$(1.07)^{15}$, or $1,902,842. Thus, the net gain to the taxpayer from being able to deduct depreciation is $3,187,770 – $1,902,842 = $1,284,928.

(Section 25.1)

3. In this case, the investment would grow at:

After-tax rate without tax deferral = r × (1 – Tax Rate) (25.3)

After-tax rate without tax deferral = r × (1 – Tax Rate) = 8% × (1 – 0.30) = 5.6%

A dollar invested for 10 years earning 5.6% per year would grow to $1 × $(1.056)^{10}$ = $1.7244 (or $1 + $0.7244) in 10 years.

(Section 25.1)

4. $1 growing for 10 years at 8%, with gains taxed at 30% at the end of 10 years, would grow as follows:

After-tax rate with tax deferral = [[1 × [$(1 + r)^T$ – 1] × (1 – Tax Rate)] + 1]

After-tax future value of $1 = [[$1 × (1.08^{10} – 1) × (1 – 0.30)] + 1] = $1 + $0.8113 = $1.8113.

(Section 25.2)

5. In this example, the tax deferral allows accumulation of 12% more profit compared to the previous problem [($0.8113 – $0.7244) / $0.7244].

   (Sections 25.1 and 25.2)

6. The general formula for the after-tax rate using an annual taxation of gains that is equivalent to earning *r* % for T years with tax deferral is:

   After-tax rate with tax deferral = $[1 + [(1 + r)^T – 1] \times (1 – \text{Tax Rate})]^{1/T} - 1$ (25.4)

   After-tax rate with tax deferral = $[1 + [(1 + 0.08)^{10} – 1] \times (1 – 0.30)]^{1/10} – 1$ = 6.12%

   (Section 25.2)

7. Tax deferral of gains has the effect of increasing the after-tax gains from 5.6% to 6.12%.

   (Sections 25.1 and 25.2)

8. The pre-tax rate equivalent to 6.12% after-tax is found by dividing by (1 – Tax):

   6.12% / (1 – 0.30) = 8.74%. Thus, tax deferral of gains relative to annual taxation of gains is equivalent to being able to earn 8.74% pre-tax rather than 8%.

   (Section 25.1)

9. The benefit is a ten-year €600,000 annuity found by multiplying the annual depreciation amount by the tax rate (i.e., €2 million x 0.30). The cost is the need to pay taxes at the end of ten years on $20 million (i.e., €2 million x 10 years), of recaptured depreciation (i.e., €6 million). The benefits and costs can be computed in a single step with an annual payment of €600,000, a future value of –€6 million, *N* = 10, and interest rate = 6.50, for a net benefit (present value) of €1,116,941.92. This amount may be viewed as the value of an interest-free loan generated by the tax shield.

   (Section 25.1)

10. The wrapper with annual taxation is computed using Equation 25.4 as 4.70% × (1 – 0.25) = 3.53% (rounded). The wrapper with deferred taxation is

computed using the following equation (we already used the equation in Exercise 4):

After-tax rate with tax deferral = $[[1 \times [(1 + r)^T - 1] \times (1 - \text{Tax Rate})^{1/T}] + 1]$

After tax future value of \$1: $[[\$1 \times (1.0470^{12} - 1) \times (1 - 0.25)] + 1] = \$1 + \$0.5514 = \$1.5514$

(Section 25.2)

11. When accounting depreciation either is not allowed for tax purposes or is allowed at a rate that is slower than the true economic depreciation, the after-tax IRR will be less than the pre-tax IRR reduced by the tax rate. When depreciation for tax accounting purposes matches true economic depreciation in timing, the after-tax return generally equals the pre-tax return reduced by the stated income tax rate. When depreciation for tax accounting purposes is accelerated in time relative to true economic depreciation, the after-tax return generally exceeds the pre-tax return reduced by the stated income tax rate.

(Section 25.3.2 - 25.3.4)

12. Sample selection bias.

(Section 25.6)

13. Hedonic-price indices.

(Section 25.5)

14. Repeat-sales method.

(Section 25.6)

Part 6: Accessing Alternative Investments

Chapter 26: Hedge Fund Replication

Exercises

1. What are the potential benefits of replication products?

2. How does the fund bubble hypothesis explain a general rise in the beta of hedge fund indices and the corresponding decline in their alphas?

3. How does the capacity constraint hypothesis explain the general rise in the beta of hedge fund indices and the corresponding decline in their alphas during the past two decades?

4. How does the increased allocation to active funds hypothesis explain the general rise in the beta of hedge fund indices and the corresponding decline in their alphas during the past two decades?

5. Critique the following statement: "*Hedge replication products cannot provide alpha because they are not managed by skilled managers*."

6. Is it possible to identify top-tier hedge fund managers a priori, and do hedge fund managers display significant performance persistence?

7. What is the underlying assumption behind the factor-based approach?

8. *Acquirer Inc*. initiates a takeover bid for *Target Inc*. on June 15, 2019. In this stock-for-stock transaction, *Acquirer* initially offers 2 shares for every 1 share of *Target*'s shares. The day the deal is announced, shares of *Target* close at $45.16 and shares of *Acquirer* close at $24.00, representing a $48.00 bid. At the last minute, *Acquirer* increases the bid to 2.3 shares, representing a $55.20 bid, before completing the acquisition on November 11, 2019. The acquisition process has taken a total of 149 days to complete from the day of initiation of the first bid. On the day the deal is completed, the price of *Acquirer* is $27.50. Calculate the profit employed by a merger arbitrage strategy. Assume the short rebate is 0.50% annualized, neither company pays a dividend, and the merger arbitrage manager initiates the trade by buying 1,000 shares of Target Inc and shorting 2,000 shares in *Acquirer* Inc.

<u>Problems 9 to 10</u>

Assume that a convertible bond with a $1,000 face value is trading at 104% of par. The bond pays semiannual coupons at an annual rate of 6%. The bond converts to 24 shares of stock and currently has a delta of 0.591. The current stock price is $22.38.

9. Calculate the number of shares that need to be sold short to make the convertible bond delta neutral.

10. Suppose the stock price moves up by 1%. Continuing with the previous exercise, show that the gain in the value of the convertible bond is exactly offset by the loss in value of the stock.

Solutions

1. The most important benefit from investing in replication products is the enhancement of absolute and risk-adjusted portfolio returns (and hence they are also named *return enhancers*). This benefit can arise from earning alpha (typically measured relative to the performance of all underlying traditional or alternative beta exposures), or by investing in alternative beta exposures that are underweighted or not held in traditional portfolios. Liquidity risk is another source of return not available in traditional investments. Finally, a time-varying traditional source of beta (e.g., a dynamic beta that results from actively managing a portfolio) could be considered an alternative source of beta.

   (Section 26.2)

2. The fund bubble hypothesis assumes that skilled hedge fund managers can earn substantially superior returns than successful fund managers in the traditional space. This hypothesis asserts that the number of less qualified managers in the hedge fund industry increases with the supply of capital to hedge funds. The correspondingly inferior returns provided by these new hedge funds dilute the aggregate industry performance.

   (Section 26.3)

3. The capacity constraint hypothesis asserts that alpha is essentially a zero-sum game and that, therefore, only a few managers can be expected to consistently deliver alpha. The per capita amount of alpha available in the marketplace has declined substantially with AUM growing almost exponentially since the early 1990s. According to this hypothesis, alpha will be expected to continue to decline unless new sources of alpha are discovered.

(Section 26.3)

4. The increased allocation to active funds hypothesis argues that as investments in hedge funds becomes more popular; the aggregate performance of the industry will be adversely affected by the decisions of investors who have allocations to these funds as well as to traditional assets. In other words, the systematic risks or betas of hedge funds will increase as more capital flows into the industry. For instance, during periods of financial market turmoil, investors may be forced to liquidate both their traditional and their alternative investments, increasing the correlation between these two asset classes.

(Section 26.3)

5. First of all, and by definition, a replication product will capture the alpha offered by the benchmark (this should be true at least in an extreme case where a replication product can perfectly replicate the return properties of the benchmark). Further, replication products bear lower fees than actively managed portfolios and therefore enhance the possibility of providing alpha to investors who invest in these products. In the end, whether replication products can provide alpha is an empirical question.

(Section 26.3)

6. Empirical evidence (both from the academia and from the industry) provides mixed results on these issues. For instance, some of the studies suggest that top-tier hedge funds do exhibit return persistence. However, the outperformance of these top-tier hedge funds tends to disappear as time passes and as capital flows to these top-performing funds. Other researchers have not found performance persistence among hedge fund managers, and if they find any, it tends to erode after only a few months.

(Section 26.4)

7. The underlying assumption behind the factor-based approach is that a set of asset-based factors can explain a significant portion of a fund's returns.

(Section 26.5)

8. The following table describes the profit by the fund manager from merger arbitrage involving the acquisition of *Target Inc.* by *Acquirer Inc:*

Profit-and-Loss Statement for the Example Merger Arbitrage Trade

Description		Amount
Gain on Target's long position	1,000 x [($27.50 x 2.3) - 45.16)]	$ 18,090.00
Loss on Acquirer's short position	-1,000 x 2 x (27.50 - 24.00)	$ (7,000.00)
Short Rebate at 0.50% rate	1,000 x 2 x 24.00 x 0.50% x 149/365	$ 134.94
Total profit (loss) from strategy		$ 11,224.94
Initial Investment	1,000 x 45.16	$ 45,160.00
Return on investment over 149 days	11,224.94 / 45,160.00	40.06%
Annualized Return	(1 + 40.06%) ^ (365/149) - 1	128.25%

(Section 26.7)

9. The number of shares that need to be sold short to make the convertible bond delta neutral is (rounded) 27.46 ($1,040 × 0.591/$22.38). Therefore, the dollar value of stock held short to create a delta-neutral position is $614.55 (27.46 × $22.38).
(Section 26.7)

10. A 1% stock price increase will cause the value of the convertible bond to increase by more than 0.591% (the delta of the convertible bond), because the positive gamma of the option means that the bond's delta will increase as the stock price increases.

The following table shows the value of the portfolio before and after a 1% increase in the stock price. After a 1% increase in the stock price, the value of the short position in stock (which has a gamma of zero) becomes –$620.70 (–$614.55 × 1.01). At the same time, the value of the convertible bond becomes greater than $1,046.15 (1,040 × 1.00591) because the delta of the convertible increased as the stock price increased.

Hedging of Convertible Bonds (amounts in $):

	Before	*After*	*Change*
Long convertible bond	1,040.00	1,046.15	6.15
Short stock	−614.55	−620.70	-6.15
Portfolio value	425.45	425.45	

Note that this is what is supposed to happen when the convertible bond is perfectly delta-hedged. However, as the stock price fluctuates, the hedge ratio needs to be constantly adjusted to keep the portfolio delta neutral.
(Section 26.7)

Chapter 27: Diversified Access to Hedge Funds

1. List the three major advantages of investing directly with hedge funds.

2. When it comes to strategy and fund selection, why have institutions historically relied on funds of hedge funds, and how has this changed over time?

3. An investor is attempting to quickly gain hedge fund exposure in their portfolios. The investor does not have the ability to directly invest in hedge funds at this time but would still like to gain exposure. What are some of the benefits of investing in liquid alternatives over direct hedge funds?

4. Calculate equally weighted and equally risk-weighted allocations to the following strategies.

Strategies (2001-2008)	Annualized Return	Standard Deviation
CISDM Equity Market-Neutral	5.6%	2.0%
CISDM Fixed Income Arbitrage	3.6%	4.8%
CISDM Convertible Arbitrage	3.3%	6.2%
CISDM Distressed Securities	7.6%	6.0%
CISDM Merger Arbitrage	4.8%	3.4%
CISDM Emerging Markets	7.9%	10.5%
CISDM Equity Long/Short	4.4%	6.0%
CISDM Global Macro	6.4%	3.3%

Source: Edited from Schneeweis, Crowder, and Kazemi (2010)

5. According to empirical evidence, how do funds of hedge fund (FoFs) compare to single hedge funds in terms of drawdowns, standard deviation of returns, and average returns?

6. Mary Helstrom is a young, high net worth individual. Until now, Mary has invested her financial wealth in U.S. large cap stocks. However, recent financial turmoil has prompted Mary to revise her investment strategy. She is considering investing a portion of her financial wealth in funds of hedge funds (FoFs). Using the information presented in the following table, calculate the expected return and standard deviation of returns of a portfolio that is 80% invested in U.S. stocks and 20% invested in FoFs. Interpret the results obtained.

1991-2008	Annualized Return	Standard Deviation	Correlation with FOF
U.S. Stocks (S&P 500)	7.90%	14.40%	0.58
CISDM Funds of Funds Diversified Index	7.90%	5.10%	1

Source: Edited from INGARM, "The Benefits of Hedge Funds," August 2009.

7. What is funding bias?

8. Describe the tradeoff investable hedge fund index providers face.

9. How did the Dodd-Frank Act in the United States close the regulatory gap between hedge funds and mutual funds?

10. While liquidity could be considered a benefit of alternative mutual funds, it is perhaps its biggest risk as well. Why?

Solutions

1. (1) the cost savings from avoiding an extra layer of fees charged by a fund of hedge funds, (2) access to cost-effective, experienced consultants to assist implementing the approach, and (3) the ability to have improved control and transparency in the asset allocation and due diligence process.

   (Section 27.2.1)

2. Funds of hedge funds historically had preferred access to hedge funds, experienced insight regarding which strategies are likely to outperform going forward, and have reduced the risk of negative headlines should one of the underlying hedge fund investments "blow up." However, the dissemination of hedge fund knowledge and expertise has reduced the value proposition of funds of hedge funds.

   (Section 27.2.2)

3. Liquid alternatives typically provide exposure to hedge funds without some of the major drawbacks of direct investing. Typically they have lower fees, better liquidity, and improved transparency.

   (Section 27.2.3)

4. The following table shows the allocations. The equally weighted method is easy to apply; each strategy is allocated the same weight of 12.5% (i.e.,

100%/8). In the case of the equally risk-weighted method, to obtain the allocations to each strategy, first one needs to use Equation 27.1:

$$\text{Equal risk weight } i = \frac{1/\text{Annualized Standard Deviation } i}{\sum_{i=1}^{n} 1/\text{Annualized Standard Deviation } i}$$

Where: The numerator is the inverse of each strategy's whole-period annualized standard deviations and the denominator is the sum of the inversed standard deviations.

Strategies (2001-2008)	Equally Weighted	Equally risk-weighted
CISDM Equity Market-Neutral	12.50%	26.38%
CISDM Fixed Income Arbitrage	12.50%	10.99%
CISDM Convertible Arbitrage	12.50%	8.51%
CISDM Distressed Securities	12.50%	8.79%
CISDM Merger Arbitrage	12.50%	15.52%
CISDM Emerging Markets	12.50%	5.02%
CISDM Equity Long/Short	12.50%	8.79%
CISDM Global Macro	12.50%	15.99%

When analyzing the allocations generated by the equally-risk weighted method, it is not surprising that Equity Market-Neutral, the strategy with the lowest risk (with a low 2% annual standard deviation), is assigned the highest allocation (26.38%) of all the strategies. On the other hand, Emerging Markets had the highest standard deviation (10.5%) and is therefore assigned the lowest allocation (5.02%).

(Sections 27.4.2 & 27.4.3)

5. Empirical evidence presented in the book indicates that FoFs have fairly low drawdowns and standard deviations, and lower drawdowns and standard deviations than the average individual hedge fund. However, during the same period (1990-November 2011) average returns on FoFs were only a little more than half of those of individual hedge funds. These results can be explained by the double layer of fees charged by FoFs and by the upward bias in the reported performance of individual hedge funds caused by survivorship bias.

(Section 27.5)

6. The expected return of the portfolio $E(R_p)$ is equal to the weight of each asset in the portfolio multiplied by its expected return:

   $E(R_p) = 0.80 \times 7.9\% + 0.20 \times 7.9\% = 7.9\%$

   The formula for the standard deviation of returns of the portfolio (σ_p) is:

   $\sigma_p = [(w_{SP500})^2 \times \sigma^2_{SP500} + (w_{FOF})^2 \times \sigma^2_{FOF} + (2 \times w_{SP500} \times w_{FOF} \times \sigma_{SP500} \times \sigma_{FOF} \times \rho_{SP500,\ FOF})]^{1/2}$
   $= [(0.80)^2 \times (0.144)^2 + (0.20)^2 \times (0.051)^2 + (2 \times 0.80 \times 0.20 \times 0.144 \times 0.051 \times 0.58)]^{1/2}$
   $= 12.14\%$

   Where: w are the weights of each asset in the portfolio and ρ is the correlation coefficient between the returns of the two assets.

   In this case, the expected return of the portfolio is exactly the same as the return on each of the assets, which is 7.9%. The benefit from adding funds of hedge funds to the portfolio of U.S. large cap stocks resides in the reduction in portfolio risk that is achieved (the standard deviation of the portfolio declines from 14.4% to 12.14% when funds of hedge funds are added to the U.S. stock portfolio). The decline would be larger if a higher percentage of FoFs is added to the portfolio of U.S. stocks.

   (Section 27.4)

7. Funding bias exists when the returns to hedge funds available in databases are biased upward (compared to the case in which the full hedge fund universe would not have existed if there were no funds of hedge funds). In other words, FoFs discourage bad hedge funds from being launched or, if created, from remaining in business too long. Thus, this phenomenon creates an upward bias in hedge fund returns observed in databases. The existence of funding bias offers an important monitoring and due diligence service for the whole industry. Funding bias should not be confused with reporting biases.

   (Section 27.5)

8. Index providers face a trade-off between including more funds to be more representative and using fewer funds to facilitate management.

   (Section 27.6)

9. After the Dodd-Frank Act, many hedge fund managers had to register as investment advisers. Since a U.S. mutual fund manager must also be registered as an investment adviser, a hedge fund manager can easily launch a U.S. mutual fund once registered.

   (Section 27.7.1)

10. Funds may find themselves facing unforeseen redemption requests, which could require them to sell assets that have low liquidity.

    (Section 27.7.3)

Chapter 28: Access to Real Estate and Commodities

1. In the U.K., what are property unit trusts (PUTs)?

2. What are the three main criticisms that non-traded REITs have received?

3. Why do unlisted real estate funds suffer from cash drag?

4. List the six advantages of real estate funds.

5. Define the return to commodity beta.

6. What is the primary benefit of obtaining commodity exposure through derivatives contracts rather than direct physical ownership?

7. What is the primary vehicle used by institutional investors to obtain indirect commodity exposure?

8. In the context of obtaining commodity exposure, what are three major drawbacks of over-the-counter commodity index swaps?

9. Explain why equity of firms that derive a significant part of their revenue from the sale of physical commodities might offer weak exposure to the underlying commodities.

10. Explain why high grade bonds of commodity producing firms offer weaker exposure to commodities than high yield bonds of commodity producing firms.

11. What is the principal advantage of master limited partnership (MLP) structures in obtaining commodity exposure?

12. State four ways in which commodity-based exchange traded notes (ETNs) are different from commodity-based exchange traded funds (ETFs).

13. Define roll return in the context of commodity futures investments.

Solutions

1. Property unit trusts (PUTs) are unlisted investment vehicles comprised of a portfolio of properties held in the name of a trust. PUTs are the most important

open-end investment product used by pension funds and insurance funds to obtain exposure to the U.K. real estate market. The prices of PUTs are calculated using appraisals.

(Section 28.1)

2. First, the illiquidity of non-traded REITs may give the false impression of low return volatility. Second, these types of REITs command high fees and frequently entail significant conflicts of interests. And third, leverage is often used to finance current dividend payments. This practice sometimes conceals their inability to generate future dividends.

   (Section 28.1)

3. Unlisted real estate funds suffer from cash drag because cash invested by investors in these types of funds will most likely not be drawn by the fund manager right away. Instead, cash will be drawn from investors as it is required by the fund to buy real estate assets. As a result, investors will not attain immediate full exposure to real estate assets when they provide cash to unlisted real estate funds.

   (Section 28.1)

4. The six advantages of listed real estate funds are:

   - They help diversify real estate specific risk (similar to the case of unlisted real estate funds).
   - These types of funds are liquid and divisible.
   - They provide instant exposure to a real estate portfolio.
   - They convey information to the investors.
   - Some listed real estate funds allow the targeting of subsectors or regions (similar to the case of unlisted real estate funds).
   - They provide tax benefits, such as exemption from corporate taxes (similar to the case of unlisted real estate funds).

   (Section 28.2)

5. The return to commodity beta is defined as the fundamental risk-based return from holding a passive long position in a commodity.

(Section 28.3)

6. The primary benefit of obtaining commodity exposure through derivatives contracts is the ability to benefit from price changes in the commodity without the need to store it.

(Section 28.3)

7. The primary vehicle used by institutional investors for obtaining exposure to commodity indices is commodity index swaps.

(Section 28.3)

8. The main drawbacks of commodity index swaps are:

    - Limited access: commodity index swaps are available only to large, highly credit-worthy investors
    - Limited exit: the secondary market for commodity index swaps is not liquid
    - Additional risks: swaps experience greater counterparty risk than commodity futures markets

(Section 28.3)

9. Many such firms hedge their principal commodity exposures, which can significantly affect the degree of commodity exposure the firm provides to investors. Furthermore, there is evidence that commodity producers engage in selective hedging, in which they actively alter their hedge ratios based on their views of future commodity prices. Furthermore, public commodity-based equities are subject to significant market risk and business risk.

(Section 28.3)

10. High grade bonds of commodity producing firms have low sensitivity to the underlying commodity markets. High yield bonds, where the default or political risk is high, are more correlated with the prices of commodities produced by the issuing firms.

(Section 28.3)

11. The principal advantage of master limited partnership (MLP) structures is in avoiding corporate taxation. Income from qualifying MLPs is distributed directly to investors.

(Section 28.3)

12. The four ways are:

    i. ETNs are zero coupon instruments
    ii. The return to the ETN is subject to the credit-worthiness of the issuer
    iii. The price of the ETN is based on a contractually designated relationship with the underlying index
    iv. ETNs may qualify for capital gains tax treatment if held for a sufficiently long period of time

(Section 28.3)

13. Roll return, or roll yield, is the portion of the return to a futures contract that is due to the change in basis.

(Section 28.6)

Chapter 29: Access Through Private Structures

Exercises

1. List the seven major potential advantages of listed assets.

2. List the seven major potential advantage of privately organized assets.

3. What are some of the ways in which private equity GPs can create wealth?

4. An endowment investor is in the process of finalizing a side letter as part of their limited partnership agreement with a private equity GP. In the agreement, the investor is requesting to be treated with all other benefits offered to any other LP in the private equity fund. Additionally, the LP has requested anonymity as an investor in the fund. What are the names of these two terms the LP has requested in the side letter?

5. An LP is describing co-investing to one of her colleagues. She states that a blind pool equity fund is the best way to directly invest in a single portfolio company, because it provides a level of anonymity from the management of the portfolio company. Is this a correct statement?

6. List three alternative co-investing structures.

7. Why might it benefit a GP to engage in a co-investing strategy?

8. Describe some of the differences in risk and return regarding co-investments and direct investments.

9. What impact does co-investing have on the J-curve?

10. List the disadvantages associated with co-investing.

11. Describe the tradeoffs between an LP having too much or too little liquidity on hand regarding cash commitments to GPs.

12. Consider an investor with a $30 million allocation to private equity that decides to commit to $45 million of new private equity investments over

the next few years. Calculate the Overcommitment Ratio.

13. How has the evolution of the secondary private equity market evolved in terms of the rationale for investor participation?

14. Why might investors wish to participate in the secondary market over the primary market?

15. Describe the evolution of secondary market pricing in terms of discount to NAV since 2009.

16. A secondary-market venture capital investor is analyzing a fund. She forecasts that the fund will produce cash flows of $2 million, $0.5 million, $1 million, $1 million, and $3 million over the next five years, respectively. The buyer's required IRR is 15% and the fund's current net asset value is $5.1 million. What is the fund's estimated discount?

Solutions

1. Greater liquidity, lower managerial fees, easier diversification, visible indications of market values, regulatory oversight, greater access to financing, and tax simplification.

   (Section 29.1.2)

2. Illiquidity premium, more incentivized managers, greater asset targeting by investors, appearance of stable values, greater investor oversight, greater managerial flexibility, tax benefits.

   (Section 29.1.3)

3. GPs can create wealth through (1) assembling a top management team, (2) selecting portfolio companies with high return potential, (3) working with or replacing the management teams of those portfolio companies, (4) tapping the GP's networks to bring in personnel and contacts to optimize the potential success of each portfolio company, and (5) assisting the successful portfolio companies to perform exits that maximize the creation of wealth.

(Section 29.1.5)

4. The LP is requesting a most favored nation status and including a use of name clause in the side letter, respectively.

(Section 29.3)

5. No, she incorrectly defined a blind pool equity fund, which aggregates capital obtained from its partners into a single fund. Typically, this investment mandate does not involved limited partners in deal sourcing.

(Section 29.4)

6. 1) the LP invests directly into one or more of the portfolio companies of the main fund, 2) one or more LPs use a GP-controlled fund created apart from the man fund, and 3) making investments in co-investment programs in which the specific investments are identified and decisions of whether to co-invest are made on an ongoing and deal-by-deal basis.

(Section 29.4)

7. Co-investing can allow a GP to make larger investments without dedicating too much of the main fund's capital to a single transaction. This also increases diversification benefits.

(Section 29.4)

8. Research has found that direct investments have significantly outperformed co-investments and industry-standard benchmarks. Co-investments may be associated with higher risk deals.

(Section 29.4.3)

9. Co-investments are viewed as leading to a reduction of the J-curve effect and improved capital deployment and returns.

(Section 29.4.4)

10. Unbalanced portfolios, increased fiduciary risk, conflicts of interest, disagreements among LPs, allocation of fees.

(Section 29.4.5)

11. If a large part of capital remains uninvested or parked in low-returning assets such as Treasury bills, there can be a large performance drag. However, too little liquidity could lead to an increased probability of not meeting a cash commitment.

(Section 29.5.2)

12. Using Equation 29.3, the Overcommitment Ratio = Total Commitments/Resources Available for Commitments. Therefore, the ratio is $45 million / $30 million = 150%.

(Section 29.5.6)

13. The secondary market was initially viewed as a market of last resort for LPs wishing to sell their PE fund interests. However, the market has matured and large institutions regularly exit from private equity as part of an overall portfolio management and reallocation strategy.

(Section 29.6.1)

14. Some LPs are interested in secondaries as means of getting exposure to PE assets quickly without having to commit capital over a period of 10-12 years. Others seek a reduction of risks by using secondaries to diversify their vintage year exposure. Secondaries also tend to generate strong IRR performance and can counteract the J-curve effect of primary funds.

(Section 29.6.1)

15. The discount to NAV has decreased since 2009 across all strategies.

(Section 29.6.2)

16. The present value of the cash flow stream at 15% is $4.83 million. Therefore, the discount is [($5.10 – $4.83)/$5.10] = 5.29%

(Section 29.6.7)

Chapter 30: The Risk and Performance of Private and Listed Assets

Exercises

1. Describe the illiquidity premium and explain how it might be observed in U.S Treasuries and U.S. Equities.

2. What are the two competing explanations for the divergence in performance between listed REITs and private properties?

3. How might market segmentation impact performance divergence between listed REITs and private properties?

Problems 4 to 5

	2020	2021	2022	2023	2024	2025	2026
Real Estate Fund ABC	-150	-400	-1,000	-200	750	2,500	6,000

4. A performance analyst is calculating various performance measures for Real Estate Fund ABC, including interim internal rate of return (IIRR). What is the interim internal rate of return (IIRR) for Real Estate Fund ABC, assuming the figure for 2026 is the NAV for the fund?

5. Assume the cash flow figure for 2022 was written erroneously as "-1000" when it should be "+1000". Why might this sign change cause issues for the performance analyst when trying to compare Real Estate Fund ABC to other funds?

6. What two adjustments does IRR ignore and why might ranking investment opportunities by IRR not be the best way to evaluate the attractiveness of an investment?

Problems 7 to 8

Consider a Real Estate Fund that called $750 from its investors and invested all of it in multiple portfolio companies in 2010. In 2013, the Fund receives $250

and distributed it to investors from the sale of several portfolio companies. Finally, in 2015 the Fund is terminated with $2,000 distribution to its investors.

7. What is the IRR of the cash flow schedule?

8. Assume the fund instead decided to use a SLOC to invest in the portfolio companies, with an interest rate of 2% simple annual interest and decided to call their commitment in 2013. What would the IRR be in this case?

Problems 9 to 11

Assume a private equity fund has the following cash flows for years 0 through 5, respectively: -100, -300, -1,000, +400, +500. Also assume the NAV in year 6 is +4,000.

9. What is the fund's TVPI?

10. What is the fund's RVPI?

11. What is the fund's DPI?

12. Assume a private real estate's future value of distributions is 50, it's NAV is 200, and it's future value of contributions is 30. What is the fund's PME Ratio?

13. List the three weighting measures for IRR and IIRR in regards to a multi-manager portfolio. Why might an investor want to consider all three?

14. Describe the three key empirical findings regarding private equity performance.

15. Under what circumstance should an investor opt to invest in liquid structures relative to private structures?

Solutions

1. The theory behind an illiquidity premium is that higher returns can be earned by an investor willing to take on the risk of illiquidity for an extended amount of time. It can be observed in U.S. Treasuries by observing higher prices of on-the-run government bonds vs. off-the-run government bonds of the same maturity. In U.S. equities, stock liquidity has improved over the recent four decades to the point that illiquidity is significantly priced only for the smallest common stocks.

(Section 30.1.3)

2. The first argument is that listed REITs accurately represents the true changes in the values of real estate properties adjusted for the effects of leverage. This argument asserts that property value fluctuations are delayed due to appraisal methods, which mute true fluctuations. The second argument is that listed REITs and their high volatility emanate from a contagion effect of public equity markets, which does not represent the underlying economic fundamentals of real estate. Therefore, the volatility of private properties better reflect the realities of the real estate market.

(Section 30.2.2)

3. Many institutions may have limited need for liquidity throughout their entire portfolios and may view their investments with longer-term horizons. Invetors with shorter-term horizoons and a higher need for liquidity may perceive listed REITs as providing the liquidity they desire with low transaction costs.

(Section 30.2.2)

4. Using equation 30.1, we can calculate the IIRR:

$$\sum_{t=0} \frac{D_t}{(1+IIRR_T)^t} - \sum_{t=0} \frac{C_t}{(1+IIRR_T)^t} + \frac{NAV_T}{(1+IIRR_T)^t} = 0$$

The IIRR for Real Estate Fund ABC is 53.36%.

(Section 30.3.1)

5. When cash flows exhibit multiple sign changes, there can be multiple IIRs. IIRR computations with multiple sign changes can lead to less trustworthy measurements.

(Section 30.3.1)

6. IRR does not adjust for scale and timing. Ranking opportunities by IRR may not be the best way to select investments because of these adjustments. For example, an investment could have a high IRR, but the dollar amount

is smaller than the other opportunities. Additionally, an investment could earn most of the positive cash flows earlier in the life of the fund, but not later, which could impact the IRR calculation.

(Section 30.3.2)

7. The resulting cashflows from the perspective of the investors are:

2010	2011	2012	2013	2014	2015
-750	0	0	+250	0	+2,000

Therefore, the IRR of this fund is 26.17%.

(Section 30.3.5)

8. Under the SLOC scenario, the cash flows to the investor look like this:

2010	2011	2012	2013	2014	2015
0	0	0	+250	0	+2,000
			-45 (Interest)		
			-750 (commitment)		

Therefore, the IRR is 91.56%

(Section 30.3.5)

9. Using equation 30.2, we can solve for the TVPI:

$$TVPI_T = \frac{\sum_{t=0}^{T} D_t + NAV_T}{\sum_{t=0} C_t}$$

$$TVPI_T = \frac{400 + 500 + 4,000}{100 + 300 + 1,000} = 3.50$$

(Section 30.4.1)

10. Using equation 30.4, we can solve for the RVPI:

$$RVPI_T = \frac{NAV_T}{\sum_{t=0} C_t}$$

$$RVPI_T = \frac{4,000}{100 + 300 + 1,000} = 2.86$$

(Section 30.4.1)

11. Using equation 30.3, we can solve for the DPI

$$DPI_T = \frac{\sum_{t=0}^{T} D_t}{\sum_{t=0} C_t}$$

$$DPI_T = \frac{500 + 400}{100 + 300 + 1,000} = 0.64$$

(Section 30.4.1)

12. Using equation 30.7, we can solve for the PME ratio:

$$\text{PME Ratio} = \frac{FV(D) + NAV}{FV(C)}$$

$$\text{PME Ratio} = \frac{50 + 200}{30} = 8.33$$

(Section 30.4.1)

13. Equally-weighted IRR, Commitment-weighted IRR, and Pooled IRR. An investor should consider all three because there is no perfect measurement, and the analysis of IRRs and IIRRs should include a variety of metrics and examination of their relationships to the individual funds.

(Section 30.5.5)

14. Studies tend to indicate three key findings regarding PE fund performance: 1) Venture capital fund performance tends to exceed that of buyout funds, 2) Private equity outperformance and performance persistence have generally been lower in more recent years (since 2000) and 3) Risk-adjustment of returns and netting of fees tended to lower private equity performance to unattractive levels.

    (Section 30.6)

15. Generally, investors should invest in listed structures when managers with unremarkable skill or limited investment opportunities exist.

    (Section 30.7)

Part 7: Due Diligence and Selecting Managers

Chapter 31: Active Management and New Investments

1. Suppose active manager A has the skill to select stocks from a universe of 150 securities and generate an information ratio (*IR*) of 1.4. Active manager B can generate the same information ratio (1.4) using 20 asset classes. What are the managers' information coefficients?

2. Consider two similarly skilled active managers, each with an information coefficient (*IC*) of 0.40. Active manager X can apply his skills to only 15 asset classes, whereas active manager Y can apply her skills to 150 securities. What level of transfer coefficient (*TC*) does each manager need to have in order to generate an information ratio (*IR*) of 1.1?

3. Suppose that in the previous exercise there is a third active manager, Z, having the same information coefficient as managers X and Y. Manager Z can apply his skills to only 8 asset classes. What level of transfer coefficient does he need to have in order to generate the same information ratio as managers X and Y? Interpret the result obtained.

4. Suppose that a manager experienced a drawdown of 30%, and has been replaced by a new manager. Assuming a 15% performance fee, how much will the new manager have to earn for the investor to break even?

Solutions

1. Using Equation 31.1:

$$IIRR = IICC \times \sqrt{BBRR} \qquad (31.1)$$

where *IR* is the information ratio, *IC* is the information coefficient of the manager, and *BR* is the strategy's breadth.

First, notice that an information ratio (*IR*) of 1.4 means that the expected alpha of each manager's portfolio is 40% higher than the volatility of the alpha.

Active manager A has an information coefficient of 0.114 (rounded):

$$1.4 = IICC\ xx\ \sqrt{150}, \qquad IICC = 0.114$$

Active manager B has an information coefficient of 0.313 (rounded):

$$1.4 = IICC\ xx\ \sqrt{20}, \qquad IICC = 0.313$$

Active manager B has to be about 2.75 times more skillful using active management among asset classes than active manager A, who is using security selection to achieve the same *IR*.

(Section 31.2.1)

2. Using Equation 31.2:

$$IIRR = IICC \times \sqrt{BBRR} \times TTCC \qquad (31.2)$$

Active Manager X (rounded):

$$1.1 = 0.40 \times \sqrt{15} \times TTCC, \qquad TTCC = 0.710$$

Active Manager Y (rounded):

$$1.1 = 0.40 \times \sqrt{150} \times TTCC, \qquad TTCC = 0.225$$

The transfer coefficient measures the ability of the manager to implement her recommendations. In this exercise, by having greater breadth, active manager Y can achieve an *IR* of 1.1 with a *TC* of only 0.225.

(Section 31.2.2)

3. From the previous exercise, we know that the information coefficient (*IC*) of managers X and Y is 0.4, and the information ratio (*IR*) of both managers is 1.1.

Once again, using Equation 31.2:

$$IIRR = IICC\ xx\ \sqrt{BBRR}\ xx\ TTCC \qquad (31.2)$$

We find that the transfer coefficient (*TC*) of active manager Z is (rounded):

$$1.1 = 0.40\ xx\ \sqrt{8}\ xx\ TTCC, \qquad TTCC = 0.972$$

The transfer coefficient of active manager Z is close to the upper limit for TC, which is one. Therefore, manager Z must able to implement almost all of his recommendations in a very efficient manner. In order to do so, manager Z must not subject to either hard constraints (such as no short selling of funds), or soft constraints (such as the high transaction costs usually associated with the rebalancing of alternative assets). As more constraints are applied and inefficiencies come in to the manager's process, the value of *TC* declines to levels well below one.

(Section 31.2.2)

4. First, the next 42.86% return [i.e., (1/0.7)-1] generated by the new manager will be passed on to investors gross of performance fees. Assuming a 15% performance fee, the new manager will have to thus earn 50.42% [i.e., 0.4286/(1-0.15) = 0.5042] for the investor just to break even.

(Section 31.3)

Chapter 32: Selection of a Fund Manager

1. Briefly describe the following four types of teams: Blue chip, established, emerging, and re-emerging.

2. What are the three fundamental screening questions regarding an investment process?

3. What is the distinction between information gathering and information filtering?

4. How does gaming relate to a historical performance review?

5. Comment on the following statement: "*Empirical evidence suggests that most top teams tend to give priority allocation to new investors.*"

6. In the context of operational risk, what is a fund culture?

Solutions

1. A blue-chip team is a team that has been able to produce top-quartile performance for all of its funds through at least two business cycles (i.e., a sequence of more than three funds).

   An established team is a team that has been able to generate a top-quartile performance for most of its funds (more than three funds) through at least two business cycles.

   An emerging team is a team with a thin joint history, but with all the features to become an established team.

   A re-emerging team is a previously blue-chip or established team that has been through a restructuring (after experiencing recent poor performance or some significant operational issues), and has the potential to re-emerge as an established or blue-chip team.

   (Section 32.3)

2.
   A. What is the investment objective of the fund?
   B. What is the investment process of the fund manager?
   C. What is the nature and source of any value added by the fund manager?

   (Section 32.5.1)

3. Information gathering indicates the ability of the manager to create access to information or to have access to better information than other managers. Information filtering is the fund manager's ability to use data available to others but to be better able to glean tradable insights from it.

   (Section 32.5.4)

4. The performance review is an analysis of past investment results that forms the heart of many due diligence reports. The due diligence review should ascertain whether financial performance has been gamed. Gaming in this context is investment activity that is driven by a desire to generate favorable measures of performance rather than truly enhanced performance. An example would be smoothing of returns that masks true volatility levels.

   (Section 32.6.5)

5. The statement is incorrect. General partners typically reward their previous investors with access to future funds. However, while top teams give priority allocations to loyal limited partners, they may also decide to allocate a share of the new fund to newcomers who could add value, such as exit opportunities, deal flow, and industry expertise. Nonetheless, it must be said that access is far less a problem for limited partners who are financially strong and have shown that they are long-term players. For new investors, however, this is an important barrier to entry.

   (Section 32.7)

6. A fund culture is a generally shared set of priorities and values within the fund's organization. One of the strongest protections against operational risk is a fund culture that fosters competence, honesty, and diligence.

   (Section 32.8)

Chapter 33: Investment Process Due Diligence

1. What are desk reviews? Why aren´t they considered best practice?

2. List the three potential reasons an actual investment strategy may differ from the stated investment strategy.

3. How does the investment due diligence process differ when evaluating and analyzing quantitative managers vs. discretionary managers?

4. How does investment process risk differ from market risk?

5. List the four implications of conflicts of interest in fund asset valuation.

6. Are assets that are best valued based active market price quotes for similar assets considered Level 1, 2, or 3 assets?

7. Are assets that are best valued based on nonactive market price quotes considered Level 1, 2, or 3 assets?

8. What is the purpose of the bias ratio?

9. List the three important questions in a risk management review.

10. What are the functions of a chief risk officer?

Solutions

1. A desk review is an ODD review based exclusively on documents collected, and possibly conference or video calls. LPs may argue in favor of desk reviews because of their lower costs (compared to on-site visits), shortened overall review time, and a belief that the quality of information collection is the same for desk reviews as it is for on-site visits. Desk reviews are not regarded to be best practice because they generally produce a less comprehensive review, thus exposing investors to higher levels of operational risk. Even though LPs can still collect compromise documentation when they conduct a desk review, they nonetheless miss the opportunity to review documentation on-site with the manager. Finally, the problem is compounded by the inherent illiquidity of private equity investing (the long lockup period of PE funds prevents redemption for many of the problems that

may come up after the capital has been committed).

(Section 33.1)

2. Style drift, operational errors, or fraud.

(Section 33.2.2)

3. Analysis of quantitative investment processes focuses on the software that captures the fund's investment strategy, while analysis of discretionary investment processes focuses directly on the judgment and skill of individuals.

(Section 33.3.1)

4. Investment process risk comes from the imperfect application of the investment mandate, resulting in errors or purposeful decisions that result in exposures that do not match the investment mandate. Market risk measures the risk of the overall market, not the risk of an investment strategy being improperly implemented.

(Section 33.3.2)

5. (1) obscure or delay losses, (2) smooth returns by shifting performance between reporting periods, (3) vary risks to recoup losses or lock in profits, and (4) inflate valuations to increase fees. Each of these implications is detailed next.

(Section 33.4.4)

6. Level 2 assets.

(Section 33.4.6)

7. Level 2 assets.

(Section 33.4.6)

8. The bias ratio attempts to indicate when returns have been manipulated and thus do not exhibit a distribution consistent with competitive markets.

(Section 33.5.3)

9. (1) What are the types and levels of risk involved in the fund manager's strategy? (2) What risks are measured, monitored, and managed? (3) How are risks measured, monitored, and managed?

   (Section 33.6.3)

10. The chief risk officer (CRO) oversees the fund manager's program for identifying, measuring, monitoring, and managing risk.

    (Section 33.6.2)

Chapter 34: Operational Due Diligence

Exercises

1. What are the four primary ways in which hedge funds deal with cash?

   Problems 2 to 5

   XYZ Due Diligence is a firm specializing in performing hedge fund due diligence on behalf of its clients, which are mostly institutional investors. Susan McGraw and Ernest Williams and are two of the firm's due diligence experts. They are having a preliminary meeting intended to estimate the operational risk of *123 Fund*, a long/short equity hedge fund dedicated to large and mid size U.S. stocks that was founded in 2011. *123 Fund* currently has $15 million in assets under management (AUM).

2. At the beginning of the meeting, Ms. McGraw points out to Mr. Williams that she is concerned about *123 Fund's* delays in reporting its NAV to investors. The fund's net asset values (NAVs) from the previous six months were distributed to investors as follows:

   -The NAV for January, was distributed to investors on February 21st
   -The NAV for February, was distributed to investors on March 22tnd
   -The NAV for March, was distributed to investors on April 23th
   -The NAV for April, was distributed to investors on May 25th
   -The NAV for May, was distributed to investors on June 25th
   -The NAV for June, was distributed to investors on July 28th

   Are the concerns expressed by Ms. McGraw justified?

3. Mr. Williams is worried because he found out that a month ago an employee working at *123 Fund* took a long position on ETF ABC, which is based on diversified world stock markets, for his personal account. Mr. Williams is convinced that this is a case of front running. Is Mr. Williams's concern justified?

4. Ms. McGraw has been going through a batch of brokerage statements of employees from *123 Fund*. The statements were provided to her by the fund's compliance department, which in turn received them directly from the employees. Ms. McGraw has just found out that an employee from the fund sold shares of a company from his personal account at a steep loss before the minimum holding period was reached. Are there any concerns from these findings?

5. Mr. Williams notices that *123 Fund* has an internal compliance department, with a third-party compliance consultant to supplement the work of the internal compliance function. Mr. Williams is concerned that the coexistence of an internal compliance department and a third-party compliance consultant may not be best practice for a hedge fund, as each one of them would be superseding the other. Is the concern by Mr. Williams justified?

6. What are the eight core elements of the operational due diligence process?

7. In an operational risk context, what are meta risks?

8. *XYZ Due Diligence* has produced a brief summary memorandum that outlines only the key concerns from the operational due diligence (ODD) process conducted on *123 Fund*. This is the only document that *XYZ* will provide to their clients on the ODD conducted on *123 Fund*. Is this considered best practice?

9. A potential investor in *123 Fund* has read the ODD report that *XYZ Due Diligence* produced on this fund. The investor concludes that *123 Fund* "*carries an unacceptable level of operational risk*." Should this investor decide to allocate assets to *123 Fund*?

Solutions

1. The ways in which hedge funds deal with cash can be grouped into the following four primary categories:

A. Cash for fund expenses. These include frequent recurring expenses (e.g., office rent and salaries), and less frequent expenses (e.g., audit and legal bills).
B. Cash to facilitate trading. Besides the usual expenses inherent to trading (e.g., brokerage commissions), hedge funds may also have positive cash balances on account with trading counterparties (e.g., with a swap counterparty).
C. Cash flows to and from investors. This is cash arising from capital inflows (i.e., subscriptions) and outflows (i.e., redemptions).
D. Unencumbered cash. This cash is not currently being used for trading but may be used in the future for either trading or for another reason. Hedge funds usually earn interest on this type of cash by depositing it in liquid assets (e.g., checking accounts or interest-bearing money market accounts).

(Section 34.3)

2. First, NAVs are typically distributed to investors within a number of days of the end of each month. This delay arises because the production of the final NAV is subject to independent valuations for positions, and can also be caused by other reasons such as personnel turnover (at either the hedge fund or the administration firm). Having said this, in the case of *123 Fund,* it seems to be somewhat difficult to justify distributing NAVs to investors three weeks or more after the end of the previous month, as can be seen it happened in the previous six months. Furthermore, *123 Fund* is a long/short equity fund dedicated to large and mid size U.S. stocks and thus, in principle, one would think that their positions would be relatively easy to value, and that there is no need for delays of three weeks or more. Perhaps more worrisome is the tendency for *123 Fund's* NAVs to be distributed to investors with larger delays each month, indicating the presence of an operational signaling effect. In summary, Ms. McGraw's concerns are justified, and *XYZ Due Diligence* should perform further due diligence in an attempt to further investigate any undiagnosed problems.

(Section 34.4)

3. The concerns by Mr. Williams are not warranted. Personal account dealing is an example of a common hedge fund compliance policy. The policies implemented regarding personal account dealing usually apply to employees, their significant others, as well as other immediate family members. The majority of personal account dealing procedures defines a universe of securities (known as covered securities), to which the policies apply. In practice, most hedge funds typically exclude investments in exchange-traded funds from the universe of covered securities, because of the reduced likelihood that an employee would front-run anticipated hedge fund trades through ETFs. Furthermore, also notice that the relatively small amount of AUM of *123 Fund* make it rather difficult to argue that an employee would be front running anticipated trades by the fund using an ETF that, to make the case even weaker, is based on world stock markets (and *123 Fund* invests in large and mid size U.S. stocks).

(Section 34.5)

4. Yes, there are a few concerns with this finding. First, it is considered best practice for the compliance department of a hedge fund to collect

employee brokerage statements *directly* from brokers and independent of the employee. This is not what happened at *123 Fund*, where statements were provided to the fund's compliance department directly by the employees.

The fact that an employee from the fund sold shares of a company from his personal account at a steep loss before the end of the minimum holding period is acceptable if *123 Fund* employs a hardship exemption procedure. This exemption is commonly allowed to limit excessive losses in employees' personal accounts.

(Section 34.5)

5. The concern by Mr. Williams is unwarranted. It is generally considered best practice for a hedge fund to use a third-party compliance consultant to supplement the work of the internal compliance function.

(Section 34.5)

6. The following are the eight core elements of the operational due diligence process:

    1. Document collection
    2. Document analysis
    3. On-site visit
    4. Service provider review and confirmation
    5. Investigative due diligence
    6. Process documentation
    7. Operational decision
    8. Ongoing monitoring (if investment made)

(Section 34.7)

7. Meta risks are all non-investment-related risks not covered by a particular category. An example would be the case of fund manager's expenditures of company funds on luxurious office decorations rather than on hiring additional employees. Another example would be a fund manager who is confrontational during an on-site meeting. Some investors may feel that such examples should be regarded as part of the overall evaluation of the fund manager. These types of risks are categorized as meta risks because they cannot be grouped precisely into any one specific operational risk category.

Assigning values to meta risks is intrinsically subjective and can differ from one investor to another.

(Section 34.8)

8. While such summary memos are efficient for review, it is often considered best practice to generate a more detailed document. These detailed documents typically begin with an executive summary section, which summarizes the key findings from the operational due diligence review. It is also considered best practice to detail fund and firm strengths uncovered during the ODD process. The other sections of the report typically provide detailed analysis of each of the operational risk review areas covered during the ODD process.

(Section 34.9)

9. The common conclusion for an investor in this case would be to make no immediate investment with the hedge fund. However, this decision may be reevaluated to make an allocation in the future if *123 Fund* makes operational improvements.

(Section 34.9)

Chapter 35: Due Diligence of Terms and Business Activities

Exercises

1. Which of the following types of actions should be reviewed in an administrative review: civil, criminal, and regulatory actions?

2. What is the distinction between a hard lockup period and a soft lockup period?

3. What is the rationale for the existence of the good-leaver termination clause?

Solutions

1. All three type of actions (civil, criminal and regulatory actions) should be reviewed in an administrative review.

   (Section 35.3.4)

2. In a hard lockup period, withdrawals are contractually not allowed for the entire duration of the lockup period. In a soft lockup period, investors may be allowed to withdraw capital from the fund before the expiration of the lockup period, but only after the payment of a redemption fee, which is frequently 1% to 5% of the withdrawal amount.

   (Section 35.4.2)

3. The good-leaver termination clause offers a clear framework for closing a partnership that is not functioning well, or when the confidence of the limited partners is lost. This without-cause clause allows limited partners to stop funding the partnership with a vote requiring a qualified majority (generally more than 75% of the limited partners).

   (Section 35.5)

Part 8: Volatility and Complex Strategies

Chapter 36: Volatility as a Factor Exposure

Exercises

1. Describe the three assumptions of a Geometric Brownian Motion (GBM).

2. Explain why traders tend to prefer to model volatility using a GARCH model.

3. Describe how a portfolio's vega can be interpreted in practice.

<u>Problems 4 to 7</u>

An analyst is describing the concepts of option vegas to his colleagues while at work. He makes four observations. First, he claims that vega is typically negative for long positions in call or put options. Second, he claims that the vega of a call and put with the same underlying asset, strike price, time to expiration, and implied volatility must be equal because they share the same formula for vega. Third, he claims the vega of an option approaches 1.0 as the time to expiration approaches zero. Fourth, and finally, he claims the vega of an option approaches zero as the value of the underlying asset approaches zero and approaches 1.0 as the value of the asset approaches infinity.

4. Is the analyst's first statement correct? Why or why not?

5. Is the analyst's second statement correct? Why or why not?

6. Is the analyst's third statement correct? Why or why not?

7. Is the analyst's fourth statement correct? Why or why not?

8. If an option's gamma is positive for a simple call, will the option's vega also be positive?

9. Why do long volatility products have a negative market beta and carry a negative risk premium?

10. Describe volatility clustering.

Solutions

1. (1) a constant variance through time, (2) are normally distributed, and (3) are uncorrelated through time.

   (Section 36.1.2)

2. Realized volatility is not constant and exhibits mean-reversion and clustering. The GARCH model is able to model this.

   (Section 36.1.3)

3. In practice, vega may be somewhat loosely viewed as measuring the response of the current *price* of a portfolio to a change in the market's *anticipated* volatility of the returns of the portfolio's underlying asset.

   (Section 36.2.1)

4. No, the statement is not correct. Vega is always positive for a long position in a call or put option because all three terms on the right side of Equation 36.1 are positive.

   (Section 36.2.4)

5. Yes, the statement is correct.

   (Section 36.2.4)

6. No, the statement is no correct. The vega of an option approaches zero as the time to expiration approaches zero.

   (Section 36.2.4)

7. No, the statement is not correct. While the first part of the statement is correct, the vega of an option also approaches zero when the underlying asset value approaches infinitiy.

(Section 36.2.4)

8. Yes.

(Section 36.2.5)

9. An investor establishing a long position in the VIX contract enjoys the hedging benefit of a negative equity beta but pays for that protection through the negative risk premium. In other words, products that generate hedging benefits by having returns that are positively correlated to volatility offer a negative volatility risk premium, which means they tend to have expected returns less than the riskless rate.

(Section 36.3.5)

10. Volatility clustering occurs in a price series when large changes are likely to be followed by more large changes and periods of small changes are likely to be followed by more small changes.

(Section 36.4.2)

Chapter 37: Volatility, Correlation, and Dispersion Products and Strategies

Problems 1 to 4

Suppose that the current price of an equity index is S_0 = \$100 with an annualized implied volatility of σ_0 = 25%. Both the dividend yield and the short-term risk rate are equal to zero. A volatility trader believes the implied volatility will increase from 25% to 40% within the next weeks. To profit if the forecast comes true, the trader is considering a hedged position in an at-the-money call option (i.e., K = \$100) with the time to expiration of 0.2 years. The current price of the call option for each share of the index is $C(100, 100, 25\%, 0.2)$ = \$4.46. Suppose that the trader borrows \$446 to establish a long position in the option (each option's contract is for 100 shares). The delta of the option is 0.522. The trader calculates the gamma (defined as $\partial\Delta/\partial S$) and the vega (defined as $\partial C/\partial\sigma$) of the positions, which are 3.56 and 1.781, respectively. Note: The value of vega indicates that the position will change by \$1.781 for each 1% change in implied volatility.

1. How can the position become delta hedged?

2. Calculate the change in the value of the position if there is an increase in implied volatility from 25% to 40%.

3. Calculate the return generated by the trader on the initial position (assuming that there is an increase in implied volatility from 25% to 40%). Is this profit likely to be obtainable?

4. Suppose that the price of the underlying stock declines to \$73 as time to maturity reaches 0.1 years, and implied volatility is 40%. In this case, the vega of the position will decline to 4.87. Calculate the estimated profit.

5. Suppose that 100 contracts are entered on the long side of a futures contracts on the VIX at a price of 18.00. If the contract settles at 18.90, how much will the trader be required to pay or receive?

6. Suppose that the nearby VIX futures contract has 12 days to settlement and a price of 18.10, while the first deferred contract has 42 days to settlement and a price of 18.30. Calculate the price of a hypothetical contract with 30 days to settlement.

7. A correlation swap based on four assets has a notional value of \$1,000,000 and a strike correlation rate of 0.30. One of the assets experiences returns that have zero correlations with the other three assets. Three of the assets

experience actual realized return correlations between each other of 0.70. The market weights of the assets are all equal. Calculate the net payment to be made and identify whether the net payment is received by the buyer or the seller.

8. Explain how a short position in an iron condor can be created.

9. 20 futures contracts on the VIX are entered on the long side at a price of 13.00. How much will the trader be required to pay or be entitled to receive if the contract settles at 14.70?

10. Suppose that October calls on a certain stock with strike prices of $60 and $70 are available. Explain how a pure vertical spread and a ratio spread can be created.

11. Suppose that company XYZ is set to release earnings in a few days, and the implied volatility of one-month options has risen considerably more than the implied volatility of two-month options. A trader anticipates that the spread between the two implied volatilities will narrow after the earnings announcement due to a decline in the volatility of the one-month option. What options strategy should the trader implement?

Solutions

1. Since the delta of the option is 0.522, and each option contract is for 100 shares, the position will be delta hedged by shorting $\Delta = 05.22 \times 1$ option$\times$ 100 share $= 52.2$ shares of the underlying index.

   (Section 37.2)

2. Everything else being the same, an increase in implied volatility from 25% to 40% will increase the position's value (remember that each option is for 100 shares) by 1.781 × (0.40-0.25) x 100 shares per options contract = $26.715

   (Section 37.2 and 27.3)

3. The trader has apparently generated a 5.99% return on the initial position of $446 (i.e., ($26.715/$446) x 100). In reality, the profit is likely to be substantially lower and even close to zero. This is because as the volatility increases, the price of the underlying asset is likely to decline in price. Even though the position is delta hedged, one needs to account for changes in the vega as the price moves lower. In particular, the vega will decline substantially.

4. (Section 37.2 and 37.3)In this case, the profit could be around 4.87 × (0.40 − 0.25) × 100 shares per
options contract = $73.05.

(Section 37.2 and 37.3)

5. A long position in a single futures contract over the life of the contract will receive $1,000 for every point by which the VIX at the settlement date exceeds the price at which the contract was entered, or will pay $1,000 for every point by which the VIX falls short of the contract price. The trader is long and will thus receive:

   100 contracts × $1,000 per point × (18.90 points – 18.00 points) = $90,000 on a mark-to-market basis if the contract settles at 18.90.

(Section 37.4)

6. A hypothetical contract with 30 days to settlement can be estimated using Equation 37.2 as the following linear combination of the contracts with 12 and 42 days to settlement, noting that there are 30 days between the settlements of the two contracts:

$$30 - \text{MMaaPP HHPPHHHHII}\boldsymbol{h}\text{PPIIIleeaaII CCHHIIIIrraaeeII PPrrlleePP} = \frac{PP_{SS} \times TT_{SS}}{TT_1 - TT_{SS}} + PP_1 \frac{30 - TT_{SS}}{TT_1 - TT_{SS}} \qquad (37.2)$$

   Where: P_s is the price of the shorter-term contract, Ts is the number of days to settlement of the shorter-term contract, P_1 is the price of the longer-term contract, and T_1 is the number of days to settlement of the longer-term contract.

$$30 - \text{MMaaPP HHPPHHHHII}\boldsymbol{h}\text{PPIIIleeaaII CCHHIIIIrraaeeII PPrrlleePP} = \frac{18.10 \times 12}{42 - 12} + 18.30\frac{30 - 12}{42 - 12} = 18.22$$

(Section 37.4.5)

7. The four assets have six realized correlations. Three of the correlations are 0.70 and three are 0.00. Given that the asset weights are equal, the average realized correlation is 0.35. The payment amount is calculated as: (0.35 − 0.30) × $1,000,000 or $50,000. The payment is made by the seller to the buyer.

   (Section 37.5)

8. A short position in an iron condor is created when a trader sells an out-of-the-money bull spread and an out-of-the-money bear spread. A bull spread is created by going long a call option with a lower strike price and shorting a call with a higher strike price. A bear spread is created by going long a call option with a higher strike price and shorting a call option with a lower strike price. Bull and bear spreads can also be created using put options. Bull spreads and bear spreads were detailed in CAIA Level I. .

   (Section 37.1)

9. The trader will be entitled to receive $34,000 (i.e., 20 contracts × $1,000 per point × 1.70 points) on a mark-to-market basis if the contract settles at 14.70.

   (Section 37.4)

10. A pure vertical spread would be long October 60 strike calls and short the *same* number of contracts of October 70 strike calls.

    A ratio spread would be long October 60 strike calls and short a different number of contracts of October 70 strike calls.

    (Section 37.3)

11. A trader may sell one-month options and buy two-month options in anticipation that the spread between the two implied volatilities will narrow after the earnings announcement (due to the expected decline in the volatility of the one-month option). Notice that the trader profits when the spread between the implied volatilities of the two options narrows following the announcement, but only if the price movement of the stock does not cause larger losses due to the position's negative gamma.

    (Section 37.3)

Chapter 38: Complexity and Structured Products

Exercises

1. Describe the difference between risk and Knightian uncertainty.

2. What are some of the motivations behind opacity in the context of delegated portfolio management?

3. What is the relationship between the existence of complexity and active management?

4. Why is it difficult to hedge risks in the case of asset-based lending (ABL) strategies?

5. A firm has a fixed charge coverage ratio of 2.0, EBIT of $15 million, and a fixed charge of $5 million. What is the firm's interest amount?

6. What are the three most typical external credit enhancements from credit card receivables?

7. What are the four most common internal credit enhancements from credit card receivables?

Solutions

1. Risk occurs when an investor understands the probabilities of various outcomes, but is unsure as to which outcome will occur. Knightian uncertainty occurs when the investor cannot form reasonable quantified estimates of either the possible outcomes or their associated probabilities.

   (Section 38.1.1)

2. Opacity can emanate from principal-agent problems and the incentive for managers to obscure sources of return variability in order to reduce the likelihood of being perceived as an unskilled manager.

   (Section 38.1.3)

3. The existence of complexity and active management are complementary to one another.

(Section 38.2.1)

4. Asset-based lending strategies are usually long-only strategies. Hedging is difficult because borrowers tend to be small, due to the unique features of the specific ABL facility, and because the nature of small businesses is highly idiosyncratic. Furthermore, hedging a long portfolio constituted by small issuers with a short portfolio of larger bond issuers (because of the difficulty in finding borrowers for middle market bonds) creates basis risk.

(Section 38.5)

5. The fixed charge ratio can be calculated by finding (EBIT + fixed charge) / (fixed charge + interest). Since we already know the fixed charge ratio, we are simply solving for the fixed charge amount

   Fixed charge coverage ratio = ($15 + $5) / ($5 + interest) = 2.0

   Therefore, the interest amount is $5 million.

(Section 38.4.7)

6. (1) Cash collateral accounts, (2) third-party letters of credit, and (3) collateral invested amounts.

(Section 38.6.6)

7. (1) Senior/subordinated certificates, (2) spread accounts, (3) excess finance charges, and (4) overcollateralization.

(Section 38.6.6)

Chapter 39: Insurance-Linked and Hybrid Securities

1. Suppose a three-year cat bond covering U.S. wind has just been issued. Based on the equation estimated by Bodoff and Gan (2009), calculate the total coupon rate (%) to investors for this bond, assuming an expected loss of 1.20% per annum, and that three-year LIBOR is 1.30% per annum.

Note: Bodoff and Gan (2009) obtained the following equation, which approximates the spread, when issued, of any cat bond that covers U.S. wind:

$$\text{Spread} = 3.33\% + 2.40 \times \text{Expected Loss (\%)} \qquad (39.2)$$

2. A life insurance owner has a life expectancy of seven years and a life insurance policy with a death benefit of $1,000,000. His annual premium on the policy is 5%, and its cash surrender value is $250,000. Find the excess of the NPV of the policy to its cash surrender value if the market discount rate is 9%.

3. Consider a three-year, €1,000,000 non-amortizing loan at 10% PIK (payment in kind) annual compounding interest rate. Calculate the total PIK interest to be paid by the borrower.

4. A five-year bond with an initial principal amount of $5,000,000 is a non-amortizing loan with a 8% PIK annual compounding interest rate. Calculate all the cash payments that investors will receive assuming that there is no default.

5. Suppose a €20 million loan is arranged as part of a profit participation model. The loan starts in January 2016, and principal will be repaid at maturity, which is in six years. The profit participation scheme (PPS) is 5% of EBIT (earnings before interest and taxes), and annual floors and caps of €320,000 and €350,000, respectively, are set up. Calculate the profit participation amounts to be received by the lender during each year, assuming the yearly sales and EBIT shown in the following table:

Table: Profit Participation Model
(Amounts in thousands €)

Financials / Year	2016	2017	2018	2019	2020	2021
Sales	21,000	22,500	24,000	27,500	28,000	29,100
EBIT	6,200	6,500	6,800	7,200	7,100	7,800

Solutions

1. First, using Equation 39.2 the spread should be equal to:

   Spread (%) = 3.33% + 2.40 x 1.20% = 6.21%

   Then, the total coupon rate to investors should be equal to:

   Total Coupon Rate to Investors = LIBOR + Spread

   Total Coupon Rate = 1.30% + 6.21% = 7.51%

(Section 39.3.1)

2. The present value of seven years of $50,000 premium payments represents a liability to the policy owner of –$251,648 (i.e., *N* = 7, *i* = 9, *PMT* = $50,000, *FV* = 0, and calculate *PV*). The present value of the death benefit in seven years is +$547,034 (i.e., *N* = 7, *i* = 9, *PMT* = 0, *FV* = $1,000,000, and calculate *PV*). The net present value to the policy owner is $295,386 (i.e., $547,034 - $251,648), which exceeds the cash surrender value by $45,386 (i.e., $295,386 - $250,000).

(Section 39.5)

3. The total PIK interest to be paid by the borrower is calculated as follows. The PIK interest owed for the first year would be €100,000 (i.e., €1,000,000 x 0.10), which is paid in a security and is added to the principal amount of the debt, increasing the total amount owed to €1,100,000 at the end of the first year. During the second year, the 10% annual rate is applied against the new principal balance, resulting in a total amount of €110,000 (i.e., €1,100,000 million x 0.10). Finally, during the third year, the 10% annual rate is applied against the new principal balance, resulting in a total amount of €121,000 (i.e., €1,210,000 million x 0.10).The total PIK interest, which will be paid in the third year, amounts to €331,000 (rounded), which is calculated as €100,000 + €110,000 + €121,000 = €331,000. Notice that we could have also arrived at the result calculating: €1,000,000 x $(1.10)^3$ - €1,000,000 = €331,000.

(Section 39.7)

4. Without amortization and with the PIK feature, there will be no cash interest payments prior to maturity. The principal of the bond will increase at the 8% PIK annual compounding interest rate throughout the entire maturity of the bond (five years). The $5,000,000 principal amount increased with

compounding for five years at 8% grows to $7,346,640 which is the total cash due when the bond matures in five years (i.e., *N* = 5, *i* = 8, *PMT* = $0, *PV* = $5,000,000, and calculate *FV*)

(Section 39.7)

5. The following table shows the payments for each of the six years. For example, in 2016, the PPS provides a payment of €310,000 (i.e., 5% of €6,200,000). This is slightly lower than the floor payment of €320,000; therefore, the floor would be binding in 2016. In 2017 and 2018, and reflecting the continuing rise in sales and EBIT of the previous years, the PPS is now greater than the floor of €320,000, but still lower than the cap of €350,000. Therefore, the PPSs of €325,000 and €340,000 are the payments to be received by the lender during those two years, respectively. The PPS payments for 2019, 2020 and 2021 (€360,000; €355,000; and €390,000, respectively) exceed the cap payment of €350,000; reflecting the continued increase in sales and EBITs. Thus, PPS payments during those three years are capped at €350,000 in each year. Note that in the following table the highlighted cells correspond to the actual PPS applicable to each year.

Table: (Combined) Profit Participation Model (Amounts in thousands €)

Financials / Year	2016	2017	2018	2019	2020	2021
Sales	21,000	22,500	24,000	27,500	28,000	29,100
EBIT	6,200	6,500	6,800	7,200	7,100	7,800
PPS	310	325	340	360	355	390
CAP	350	350	350	350	350	350
FLOOR	320	320	320	320	320	320

€20 million PP loan starting in January 2016
PPS: 5% of EBIT
Tenor: 6 Years
Principal repayment at maturity

Floor: €320,000 annually
Cap: €350,000 annually

(Section 39.7)

Chapter 40: Complexity and the Case of Cross-Border Real Estate Investing

Exercises

1. A U.S. real estate investor purchases a lot of land in Canada for 50,000,000 Canadian dollars ($C). The spot exchange rate is $C 1 = USD 1. If the price of this lot of land is expected to increase 8% per year (in $C) and the Canadian dollar is expected to lose 5% per year with respect to the U.S. dollar, calculate the expected value of the property two years from now from the U.S. investor's point of view. Ignore any transaction costs. The investor has decided not to hedge the currency risk of this investment.

2. A European investor purchases a U.S. property and values that property at the beginning of the year as being worth 20 million U.S. dollars. The investor expects that the property's value will remain constant a year from now when measured in U.S. dollars. The investor is confident that the property will generate a 5% cash flow during the year (in U.S. dollars) but wishes to know the total return (in Euros) under the following two scenarios: (1) if the euro appreciates 3% relative to the U.S. dollar, and (2) if the euro depreciates 4% relative to the U.S. dollar. Find the total return measured in Euros for each scenario. The investor has decided not to hedge the currency risk of this investment.

3. A Japanese investor that purchased a property in the U.S. is concerned about the total return of the property when expressed in Japanese Yen. The investor considers that the U.S. dollar total return has a standard deviation of 18% and estimates that the standard deviation of the exchange rate between the Yen and the U.S. dollar is 12%. Find the total variance of the Yen-based return of the property under the following scenarios regarding the covariance between the foreign exchange rate and the return on foreign real estate: (1) covariance = 0%, (2) covariance = 1%, and (3) covariance = 0.5%.

4. Suppose that a real estate investment company based in Belgium has investments in commercial real estate in Boston, Massachusetts, and in Miami, Florida. If the standard deviation of the returns of the €/$ is estimated to be 14%, the standard deviation of the returns of the portfolio of U.S. properties is 13% (when computed in U.S. dollars), and the correlation coefficient between the €/$ returns and the U.S. property returns is 0.05, calculate the total risk (standard deviation) of this investment from the point of view of the Belgian real estate investment company, assuming that currency risk is not hedged.

5. Describe the relationship between price stickiness and the need to currency hedge an asset.

6. Why might an investor's relationship with real estate managers be particularly important in the case of direct property ownership through partnerships with a small number of investors?

Solutions

1. A U.S. investor would consider the value of the land in U.S. dollars. Therefore, from the U.S. investor's point of view, two years from now the property is expected to be worth (applying a slightly modified version of Equation 40.1 to a two-year setting):

   $C 50,000,000 × (1 + *r*)^2 × (1 + *fx*)^2 = $C 50,000,000 × (1 + 0.08)^2 × (1 – 0.05)^2 =

   USD 52,633,800

   (Section 40.1)

2. Under the scenario of a 3% appreciation in the euro relative to the U.S. dollar, the total return in Euros (approximate) would be 2%, found as the sum of the 5% U.S. dollar return minus the 3% strengthening in the euro relative to the dollar. Under the scenario of a 4% depreciation in the euro, the total return in Euros (approximate) would be 9% (i.e., 5% dollar cash return + 4% euro depreciation). The exact answer can be found using Equation 40.1:

   Under the scenario of a 3% appreciation in the euro relative to the U.S. dollar, the total return in Euros (approximate) would be: 1 × (1 + *r*) × (1 + *fx*) = [$1 × (1 + 0.05) × (1 – 0.03)] – 1 = 1.85%

   Under the scenario of a 4% depreciation in the euro, the total return in Euros (approximate) would be: 1 × (1 + *r*) × (1 + *fx*) = [$1 × (1 + 0.05) × (1 + 0.04)] - 1 = 9.2%

   (Section 40.1)

3. Equation 40.2 expresses the variance of the investor's total return viewed in the investor's home currency as the sum of two variances (i.e., the variance of the foreign exchange rate and the variance of the foreign real estate asset return in its currency), and twice the covariance between the two:

$$\sigma_d^2 = \sigma_{fx}^2 + \sigma^2 + 2\,\mathrm{cov}(fx, r) \qquad (40.2)$$

First, note that the variances are 0.0324 (i.e., 0.18^2) and 0.0144 (i.e., 0.12^2). For scenario 1, the total variance is the sum of the variances: 0.0324 + 0.0144 = 0.0468. Under scenario 2, the total variance adds in twice the covariance for a total of 0.0668. Finally, for scenario 3, the total variance is 0.0568 [i.e., 0.0324 + 0.0144 + (2 × 0.5%)].

(Section 40.1.3)

4. The total risk of this investment from the point of view of the Belgian company is the variance of the international real estate investment return, expressed in domestic currency terms (i.e., in € for a Belgian-based company) or σ_a^2:

$$\sigma_d^2 = \sigma_{fx}^2 + \sigma_r^2 + 2\,\mathrm{cov}(fx, r) \qquad (40.2)$$

Given that $\rho_{fx,r} = \dfrac{\mathrm{cov}(fx, r)}{\sigma_{fx}\sigma_r}$, we can find

cov (*fx*, *r*) = 0.05 × 0.14 × 0.13 = 0.000910

Therefore,

$$\sigma_{rr}^2 = \sigma_{ffTT}^2 + \sigma_{rr}^2 + 2\mathrm{cov}(fx, r) = 0.14^2 + 0.13^2 + 2 \times 0.000910 = 0.03832$$

The standard deviation of the international real estate investment returns is 19.58% (rounded), which is the square root of the variance 0.03832.

(Section 40.1.3)

5. To the extent that assets have barriers to international trade, substantial transportation costs, high trading costs, and substantial taxation, the prices of those assets may deviate from those predicted by the law of one price for substantial periods of time. If prices are stickier, then currency hedging may be more necessary.

(Section 40.3.2)

6. An investor's relationship with real estate managers may be particularly important in this case, because the real estate investor cannot rely on other investors to control and monitor the real estate manager. Compare this situation to the case of public equity investing, where an investor can remain passive in most cases.

(Section 40.7)

Glossary of Keywords

Section	Keyword	Definition
3.1.1	public interest theory of regulation	The **public interest theory of regulation** proposes that people act through government for the benefit of the society and seek to prevent and control problems associated with free markets such as imperfect competition, environmental damage, and other market failures with potential dangers to the public.
3.1.1	private interest theories of regulation	**Private interest theories of regulation** view regulation as primarily emanating from self-interested motivations of various parties including legislators and other government employees as well as business competitors and industry groups.
3.1.3	qualified opportunity zones	**Qualified opportunity zones** are geographical areas in the U.S. designated for special income tax breaks for investors funding private equity projects and real estate developments in those zones.
3.2.1	SEC's responsibilities	As the primary overseer and regulator of the U.S. securities markets, the **SEC's responsibilities** include: protecting investors, maintaining fair, orderly, and efficient markets, and facilitating capital formation.
3.2.1	principles-based disclosure requirements	The SEC disclosure regime includes **principles-based disclosure requirements**, which are intended to provide investors with the material information they need about companies and their securities offerings to make informed investment decisions.
3.2.1	Financial Industry Regulatory Authority (FINRA)	**Financial Industry Regulatory Authority (FINRA):** Overseen by the SEC, FINRA is a non-governmental, self-regulatory organization (SRO) that supervises and regulates the broker-dealer industry to ensure that it operates fairly and honestly including writing and enforcing rules governing the activities of all registered broker-dealer firms and registered brokers in the U.S.
3.2.1	U.S. Commodity Futures Trading Commission (CFTC)	**U.S. Commodity Futures Trading Commission (CFTC):** The derivatives market is overseen by the CFTC. The CFTC oversees individuals and organizations, including commodity pool operators and futures commission merchants, and seeks to protect market users and their funds, consumers, and the public from fraud, manipulation, and abusive practices related to derivatives.
3.2.1	National Futures Association (NFA)	**National Futures Association (NFA):** The NFA was designated a registered futures association in 1981 and charged with the role of a self-regulatory organization (SRO). The NFA is responsible for the regulation of firms and individuals that engage in futures trading with and for investors.
3.2.1	blue sky laws	**Blue sky laws** in the U.S. are a state's own set of securities laws designed to protect state interests and prevent fraudulent activities within its borders.
3.2.2	The Securities Act of 1933 (Securities Act)	**The Securities Act of 1933** (**Securities Act**) requires registration of securities with the SEC, unless an exemption is available, to ensure that investors receive financial and other significant information concerning the securities being offered and prohibits deceit, misrepresentations, and other fraud in the sale of securities.
3.2.2	The Securities Exchange Act of 1934 (Exchange Act)	**The Securities Exchange Act of 1934** (**Exchange Act**) provides governance of securities transactions on the secondary market (i.e., after the initial public offering) and regulates the exchanges and broker-dealers in order to protect the investing public.

3.2.2	The Investment Advisers Act of 1940 (Advisers Act)	**The Investment Advisers Act of 1940** (**Advisers Act**) provides for the registration and regulation of persons and entities who are engaged in providing advice to others regarding securities investments by the SEC and defines the role and responsibilities of an investment adviser.
3.2.2	investment adviser	In the U.S., an **investment adviser** is any person or firm that, for compensation, is engaged in the business of providing advice to others or issuing reports or analyses regarding securities.
3.2.2	The Investment Company Act of 1940 (40 Act)	**The Investment Company Act of 1940** (**40 Act**) regulates the organization of companies, including mutual funds, that engage primarily in investing, reinvesting, and trading in securities, and whose own securities are offered to the investing public.
3.2.2	Dodd-Frank Act	The **Dodd-Frank Act** was enacted to promote the financial stability of the U.S. by improving accountability and transparency in the financial system, to end "too big to fail", to protect the American taxpayer by ending bailouts, to protect consumers from abusive financial services practices, and for other purposes.
3.2.3	SEC registration requirements for non-U.S. hedge funds	**SEC registration requirements for non-U.S. hedge funds** is triggered for funds with more than 15 U.S. clients and investors with assets under management of more than $25 million unless exempted for an adviser solely advising private funds with less than $150 million in assets under management (i.e., the private fund adviser exemption).
3.2.3	anti-fraud prohibitions	**Anti-fraud prohibitions** include that it is unlawful to employ any device, scheme, or artifice to obtain money or property by using material misstatements or omission, or to engage in any transaction, practice, or course of business which operates or would operate as a fraud or deceit upon the purchaser.
3.2.4	illegal insider trading	**Illegal insider trading** refers generally to buying or selling a security, in breach of a fiduciary duty or other relationship of trust and confidence, on the basis of material, nonpublic information about the security and may also include "tipping" such information, securities trading by the person "tipped," and securities trading by those who misappropriate such information.
3.2.4	twelve matters regulated under the Advisers Act	Among other matters, **twelve matters regulated under the Advisers Act** are (1) advisory agreement terms, (2) performance fees, (3) client solicitation, (4) political contributions, (5) trading practices, (6) advertising, (7) record-keeping, (8) personal securities reporting, (9) custody, (10) proxy voting, (11) compliance program, and (12) gifts and entertainment.
3.2.4	adviser's legal obligation includes	An **adviser's legal obligation includes** delivering Form ADV Part 2 to its clients initially, annually, and when certain disclosure items are updated.
3.2.4	cybersecurity	**Cybersecurity** concerns include a broad range of risks such as threats through cyber intrusion, denial of service attacks, manipulation, misuse by insiders and other cyber misconduct. An adviser is required to safeguard client information, thus advisers are expected to properly consider and address cybersecurity related risks.
3.2.6	initial coin offerings (ICOs)	While an IPO sells shares of a company for the first time, **initial coin offerings (ICOs)**, which sell ownership of an asset as tracked through a coin or a digital token, may be securities offerings and thus the securities laws would apply, such as registration of the securities with the SEC (unless an exemption is available).

3.2.6	accredited investors	The definition of an **accredited investor** includes a natural person who either has a net worth (along with his or her spouse) that exceeds $1 million, excluding the value of the person's primary residence; or income in excess of $200,000 (or joint income in excess of $300,000 with spouse) in each of the prior two years with a reasonable expectation of reaching the same income level in the current year.
3.2.7	two tests for the private investment fund exemption	The fund must meet **two tests for the private investment fund exemption**: (1) it must have no more than 100 beneficial owners; and (2) it must not make or propose to make any public offering.
3.2.7	qualified purchaser	A **qualified purchaser** is either (1) a natural person with at least $5 million in investments, (2) an institutional investor with at least $25 million in investments, or (3) an entity of which each beneficial owner is a qualified purchaser.
3.2.8	Chief Compliance Officer (CCO)	The **Chief Compliance Officer (CCO)** has the role of being primarily responsible for overseeing and managing regulatory compliance issues.
3.2.8	code of ethics	A **code of ethics** sets forth standards of conduct and requires compliance with federal securities laws and is required to be established in writing, maintained, and enforced in the U.S. for any fund manager registered under the Advisers Act, and must include requiring access persons to: (1) report personal securities transactions and holdings periodically, and (2) obtain the adviser's preapproval before investing in reportable securities, including but not limited to IPOs or limited offerings (such as interests in hedge funds).
3.2.8	access persons	**Access persons** include the adviser's directors, officers, partners, and supervised persons who have access to nonpublic information regarding securities transactions.
3.2.9	advertisement	An **advertisement** includes any written communication addressed to more than one person, or any notice or other announcement in any publication or by radio or television, that offers any analysis, report, or publication regarding securities; any graph, chart, formula, or other device for making securities decisions; or any other investment advisory services regarding securities.
3.2.10	three types of SEC exams	There are **three types of SEC exams**: (1) regular periodic inspections, (2) cause inspections, and (3) sweep inspections. Regular periodic inspections are generally based on an adviser's promotional materials, including what is written in Form ADV, and are looking to ensure that there are no misleading or fraudulent statements.
3.2.10	cause exams	**Cause exams** are triggered by tips, complaints, and referrals.
3.2.10	sweep exams	**Sweep exams** (or theme inspections) are used to review a compliance issue that the SEC considers a risk across multiple firms.
3.2.11	Section 13(d) of the Exchange Act	An adviser who beneficially owns, in aggregate, more than 5% of a class of publicly traded voting equity securities may be required to file disclosure reports identifying, among other things, the source and amount of funds used for the acquisition and the purpose of the acquisition.
3.2.11	Section 13(f) of the Exchange Act	An investment adviser managing discretionary accounts, that, in aggregate, hold publicly-traded equity securities with an aggregate fair market value of $100 million or more may be required to file reports disclosing those holdings and the type of investment and voting authority exercised by the manager.

3.2.11	Form PF	A registered investment adviser with regulatory assets under management attributable to private funds exceeding $150 million is required to file Form PF with the SEC. The form requires information on fund size, leverage, investor types and concentration, liquidity, and fund performance. Hedge fund managers must also include information regarding their investment strategy, counterparty credit risk, and use of trading and clearing mechanisms.
3.3.1	competent authority	A **competent authority** is any regulator or other authority that possesses the authorized power to regulate or otherwise exert control
3.3.1	European Securities and Markets Authority (ESMA)	The **European Securities and Markets Authority (ESMA)** is responsible for safeguarding the stability of the EU's financial system by enhancing investor protection and promoting orderly markets and financial stability, and has the power to write technical standards and bring about systems of mutual recognition. ESMA's role in the AIFMD is one of legislation.
3.3.1	European Banking Authority (EBA)	The **European Banking Authority (EBA)** has as its main objective to safeguard the integrity, efficiency, and orderly functioning of the banking sector.
3.3.1	European Insurance and Occupational Pensions Authority (EIOPA)	The **European Insurance and Occupational Pensions Authority (EIOPA)** is responsible for occupational pensions and insurance.
3.3.1	European Systemic Risk Board (ESRB)	The **European Systemic Risk Board** (**ESRB)** is an independent body within the EU responsible for macro-prudential oversight of the financial system within the EU.
3.3.2	national private placement rules	**National private placement rules** impose rules for selling non-EU funds in the EU at an EU level, but also each EU member country may impose their own requirements on any sale of fund interests within their own border.
3.3.2	Undertakings for Collective Investments in Transferable Securities (UCITS)	**Undertakings for Collective Investments in Transferable Securities (UCITS)**, is the main European framework covering collective investment schemes.
3.3.2	Alternative Investment Fund Managers Directive (AIFMD)	The **Alternative Investment Fund Managers Directive** (**AIFMD**) regulates alternative investment managers – meaning any whose regular business is managing one or more alternative investment funds (AIFs**)**.
3.3.2	collective investment schemes (CIS)	**Collective investment schemes (CIS)** are either a UCITS or an AIF.
3.3.2	AIFMD key features	**AIFMD key features** include, among others: (1) AIFMs managing AIFs must be authorized, unless an exemption is available, (2) restrictions are placed on the levels of remuneration for senior management and risk-takers, (3) AIFMs are required to set a maximum level of leverage for each AIF, and (4) AIFMs are required to manage and monitor liquidity risks and conduct regular stress tests.
3.3.3	home member state	The **home member state** is the EU country where the AIFM is authorized. Once an authority is delegated to perform a certain act, only the competent authority is entitled to take accounts therefrom and no one else.
3.3.4	marketing of AIFs by AIFMs	**Marketing of AIFs by AIFMs** is allowed by: (1) using a marketing passport available under the AIFMD that provides that once a fund is approved in one EU member country, the AIF can be marketed to professional investors located in other EU countries, and (2) marketing in a specific EU member country in accordance with that country's private placement regime, subject to certain conditions being met.

3.3.4	marketing passport	A **marketing passport** permits marketing across the EU as a single marketplace for the marketing of AIFs to professional investors.
3.3.6	asset stripping rules	**Asset stripping rules** prevent an AIF from making a controlling private equity investment, having the nonlisted company take a loan, and then distributing the loan proceeds to themselves, and thereby creating leverage that may or may not create unnecessary risk.
3.3.8	host state	**Host state** refers to the EU country (other than the home country) where the AIF is being marketed.
3.3.	AIFMD sovereignty exception	The **AIFMD sovereignty exception** provides that member states may refuse to cooperate if "cooperating adversely affects the sovereignty, security, or public order of the member state addressed."
3.4.	Securities and Futures Ordinance (SFO)	The **Securities and Futures Ordinance (SFO)** is the primary legislation for the regulation of asset management activity in Hong Kong.
3.4.	Securities and Futures Commission (SFC)	The **Securities and Futures Commission (SFC)** is the regulator responsible for overseeing the SFO in Hong Kong.
3.4.	Securities and Futures Act (SFA)	The **Securities and Futures Act (SFA)** is the primary legislation for the regulation of asset management activity in Singapore.
3.4.	Monetary Authority of Singapore (MAS)	The **Monetary Authority of Singapore (MAS)** is the regulator responsible for administering the SFA.
3.4.	collective investment schemes (CIS)	A **collective investment scheme (CIS)** is the statutory term used in Singapore to describe an investment fund.
3.4.3	Financial Investment Services and Capital Markets Act (FSCMA)	The **Financial Investment Services and Capital Markets Act** (**FSCMA**) and its regulations are the primary legislation for the regulation of asset management activity in South Korea.
3.4.	Financial Services Commission (FSC)	The **Financial Services Commission (FSC)** is the primary regulator in South Korea and directs the Financial Supervisory Service (FSS).
3.4.	Financial Supervisory Service (FSS)	The **Financial Supervisory Service (FSS)** in South Korea is responsible for inspection of financial institutions as well as enforcement of relevant regulations as directed by the FSC.
3.4.4	Financial Instruments and Exchange Act (FIEA)	The **Financial Instruments and Exchange Act (FIEA)** and **The Act on Investment Trust and Investment Corporation (ITIC)** are the primary legislation for the regulation of asset management activity in Japan.
3.4.	The Act on Investment Trust and Investment Corporation (ITIC)	The **Financial Instruments and Exchange Act (FIEA)** and **The Act on Investment Trust and Investment Corporation (ITIC)** are the primary legislation for the regulation of asset management activity in Japan.
3.4.4	The Kanto Local Finance Bureau of Ministry of Finance Japan (KLFB)	**The Kanto Local Finance Bureau of Ministry of Finance Japan (KLFB)** is the regulator for the purposes of disclosure in Japan under the FIEA.
4.0.0	ESG	**ESG** stands for environmental, social and governance, and refers to the use of these three issues as key factors when making decisions including investment and business decisions.
4.5.3	Open Protocol	**Open Protocol** provides a standard and consistent framework around: (1) Data and inputs, (2) calculations and methods, (3) timely and regular reporting, and (4) protocols and standards, where appropriate.
5.3.0	ESG materiality	**ESG materiality** is the property of being likely to be considered important (i.e., potentially having a substantial impact) from the reasonable perspective of stakeholders in the context of ESG principles.
5.3.1	The Global Reporting Initiative (GRI)	**The Global Reporting Initiative (GRI)** is a non-governmental organization (NGO) that promotes improved reporting principles

		and disclosure of ESG-related issues through the development of the GRI Standards.
5.3.1	G4 Materiality Principle	The **G4 Materiality Principle** asserts that: "[An ESG-related] report should cover aspects that: reflect the organization's significant economic, environmental, and social impacts; or substantively influence the assessments and decisions of stakeholders."
5.3.3	SASB Materiality Map	The **SASB Materiality Map** analyzes ESG-related issues along two major dimensions: ESG category (e.g., environment) and industry (e.g., consumer goods).
5.3.4	three phases of the impact of adverse ESG events	**three phases of the impact of adverse ESG events**: (1) In the emerging, or "pre-financial" phase of an ESG lifecycle, a shift (subtle or overt) commences that ultimately has environmental, social, and/or governance consequences for a sector. (2) In the "transitional" phase, the ESG shift becomes increasingly visible, but neither its timing nor its ultimate financial impact are particularly clear. (3) In the ultimate phase of the lifecycle - the "financial" phase - the full financial impacts of the ESG event are felt.
5.4.1	Principles for Responsible Investment (PRI)	The **Principles for Responsible Investment (PRI)**, formerly known as the UN PRI or United Nations Principles for Responsible Investment, is a non-exhaustive set of six proposals designed to "provide a global standard for responsible investing as it relates to environmental, social, and corporate governance (ESG) factors."
5.5.1	greenwashing	**Greenwashing** occurs when investment promoters mislead prospective investors with overstated claims regarding the likely social impact of an investment opportunity.
5.6.1	negative or exclusionary screening	These investors focused on **negative or exclusionary screening**, which chose not to invest in entire industries of publicly-traded companies due to the firm's involvement in activities deemed objectionable, often based on the morals or religion of the investor.
5.6.1	sin stocks	**Sin stocks** include firms profiting from products and services such as gambling, tobacco, or alcohol sales.
5.6.1	positive screening	A later version of screening was **positive screening**, where an investor's portfolio was designed to focus on publicly-traded firms that were judged to have operations that performed in an exemplary manner on one or more ESG issues.
5.6.2	engagement strategy	In an **engagement strategy**, an investor with a long position in the stock starts a dialogue with the company with a specific agenda on how to improve the ESG standing of the company.
5.6.2	proxy voting	P**roxy voting** is where shareholders vote on issues put up for election by management, typically focused on routine elections of board members and service providers.
5.6.3	impact investing	**Impact investing** is the inclusion of ESG and related issues in the asset allocation and security decisions of the investor with the goal of generating positive environmental and social influence alongside financial returns.
5.6.3	mission related investments (MRI)	**Mission related investments (MRI)** are investments viewed as offering a combination of ESG impact as well as financial return.
5.6.3	program related investments (PRI)	**Program related investments (PRI)** are investments offering ESG impact and no financial return or offering a combination of ESG impact as well as a sub-competitive risk adjusted financial return.

5.6.3	three characteristics of a program related investment	The U.S. Internal Revenue Service specifies **three characteristics of a program related investment**: (1) 1. "The primary purpose is to accomplish one or more of the foundation's exempt purposes, (2) production of income or appreciation of property is not a significant purpose, and (3) influencing legislation or taking part in political campaigns on behalf of candidates is not a purpose."
5.6.3	enviropreneurship	**Enviropreneurship** is an emerging branch of entrepreneurship that deals with a mixed motive of profit-seeking and concern regarding ESG-related issues, specifically using entrepreneurship to address environmental issues.
5.7.1	negative externalities	**Negative externalities** are adverse consequences on third-party entities caused by contracts or transactions controlled by two or more primary parties and can include pollution, noise, congestion, and other potentially deleterious consequences to parties that did not have control of the contract or transaction.
5.7.1	tragedy of the commons	In economics, the **tragedy of the commons** is the problem that individuals or entities will tend to over-consume or under-value natural resources and other assets that are available for common use (i.e., shared or non-excludable) since the costs are borne by all.
5.7.2	coase theorem	The **Coase theorem** asserts that, in competitive and frictionless markets, economically efficient production and distribution will occur regardless of how governments divide property rights.
5.7.3	cap and trade	**Cap and trade** is a government program regarding pollution or other externalities that specifies caps (allowances) on the activity for each entity but allows each entity to trade its rights (e.g., its allotment of pollution).
6.0.0	exogenous variable	An **exogenous variable** is a value that is determined outside a model and is therefore taken as a given.
6.0.0	endogenous variable	An **endogenous variable** is determined inside a model and therefore takes on whatever value the model prescribes.
6.1.1	normative model	In financial economics, a **normative model** attempts to describe how people and prices *ought* to behave.
6.1.1	positive model	A **positive model** attempts to describe how people and prices *actually* behave.
6.1.2	theoretical models	**Theoretical models** describe behavior using deduction and assumptions that reflect well-established underlying behavior.
6.1.2	empirical models	**Empirical models** tend to explain complex behavior relatively well when there are many data points available and when the relative behavior of the variables is fixed or is changing in predictable ways.
6.1.3	abstract models	**Abstract models,** also called basic models, tend to have applicability only in solving real-world challenges of the future.
6.1.4	cross-sectional models	**Cross-sectional models** analyze relationships across characteristics or variables observed at a single point in time such as when investment returns are used to explain the differences in risk premiums.
6.1.4	time-series models	**Time-series models** analyze behavior of a single subject or set of subjects through time.
6.1.4	panel data sets	**Panel data sets** combine the two approaches by tracking multiple subjects through time and can also be referred to as longitudinal data sets and cross-sectional time-series data sets.
6.2.0	equilibrium models of the term structure	**Equilibrium models of the term structure** (also referred to as first-generation models) make assumptions about the structure of fixed-income markets and then use economic reasoning to model bond prices and the term structure of interest rates.

6.2.1	Vasicek's model	**Vasicek's model** is a single-factor model of the term structure that assumes constant volatility and that the short-term interest rate drifts toward a prespecified long-term mean level.
6.2.5	Cox, Ingersoll, and Ross model	The **Cox, Ingersoll, and Ross model** (CIR model) is a single-factor model that alters the Vasicek model to make the variance of the short-term interest rate proportional to the rate itself, thereby disallowing negative interest rates.
6.3.0	arbitrage-free models of the term structure	**Arbitrage-free models of the term structure** (also referred to as second-generation models) use a different approach to model bond prices and the yield curve that is parametrized based on observed current interest rates.
6.3.2	Ho and Lee model	The **Ho and Lee model** is a single-factor model that assumes that the short-term interest rate follows a normally distributed process, with a drift parameter that is chosen so that the modeled term structure of interest rates fits the observed term structure of interest rates.
6.4.0	Black-Derman-Toy Model (BDT model)	The **Black–Derman–Toy Model (BDT model)** is a popular interest rate model useful for valuing fixed income derivatives consistent with both the observed term structure of interest rates and the implied volatilities of interest rate caplets.
6.5.0	P-Measure	A **P-Measure** indicates a probability or other value that reflects an actual statistical probability meaning that the probability is an unbiased indication of the chance occurring.
6.5.0	Q-Measure	A **Q-Measure** is based on a quasi probability in the sense that it functions as if based on an actual statistical probability but it is generally a biased indication of the chance occurring.
7.1.0	credit events	**Credit events** that give rise to credit risk include bankruptcy, downgrading, failure to make timely payments, certain corporate events, and government actions.
7.2.0	three types of credit risk modeling approaches	There are **three types of credit risk modeling approaches:** the structural approach, the reduced-form approach, and the empirical approach.
7.2.0	empirical approach to credit risk modeling	The **empirical approach to credit risk modeling** is based on the assumption that it is too difficult to model the company and its environment accurately.
7.4.1	KMV model	The **KMV model** is a structural credit risk model that uses Merton's model and estimates of the volatility and total value of the firm's underlying equity and assets to estimate the credit risk of the debt.
7.4.1	default trigger	The Merton model **default trigger** for the firm's total asset value is the face value of the zero-coupon bond, because it represents the asset value at which the firm would be on the brink of default.
7.4.2	distance to default (DD)	The **distance to default (DD)** is the number of standard deviations away from default and is approximately measured as the percentage difference between a firm's assets and its default trigger relative to the volatility of its assets.
7.4.3	expected default frequency (EDF)	As mentioned in the last section, an important output from the KMV model is the calculation of the **expected default frequency (EDF)**, which will measure theoretically or empirically the probability that loans of certain characteristics could default.
7.5.1	default intensity	The higher the **default intensity,** the shorter the expected time to default
7.6.1	credit score	A **credit score** is a measure that can be used to rank or assess the relative riskiness of firms or securities.

7.6.2	Z-score model	The **Z-score model** focuses on a set of financial ratios that are based on a firm's financial statements as well as the market value of the firm's equity to generate a Z-score which is a relative rank of the likelihood of default.
7.6.5	The absolute values of Z-scores	**The absolute values of Z-scores** do not have intuitive interpretations; one can use them to rank firms in terms of their levels of credit risk or likelihood of default.
8.1.0	factor	A **factor** represents a unique source of return and a unique premium in financial markets such that the observed return cannot be fully explained by other factors.
8.1.1	multi-factor models	**Multi-factor models** of asset pricing express systematic risk using multiple factors and are extremely popular throughout traditional and alternative investing.
8.1.5	macroeconomic factors	**Macroeconomic factors** drive asset returns throughout the entire economy and across asset classes, and include productivity, inflation, credit, economic growth, and liquidity.
8.1.5	fundamental, style, investment, or dynamic factors	**Fundamental, style, investment, or dynamic factors** tend to drive equity returns within asset classes and include well-known style factors such as value, size, momentum, quality, and low volatility.
8.1.5	statistical factors	**Statistical factors** drive asset returns within an entire economy, asset class, or sector and are distinguished by having been identified purely on empirical characteristics rather than style or economic characteristics.
8.1.7	tradable assets	As its name implies, a **tradable asset** is a position that can be readily established and liquidated in the financial market, such as a stock position, a bond position, or a portfolio of liquid positions.
8.2.1	Fama-French model	The **Fama–French model** links the returns of assets to three factors: (1) the market portfolio; (2) a factor representing a value versus growth effect; and (3) a factor representing a small-cap versus large-cap effect.
8.2.2	Fame-French-Carhart model	The **Fama–French–Carhart model** adds a fourth factor to the Fama–French model: momentum.
8.2.3	The Fama-French five-factor model	**The Fama–French five-factor model** adds two factors to the Fama–French three-factor model: robust minus weak, and conservative minus aggressive.
8.2.3	robust minus weak factor	The **robust minus weak factor** is designed to distinguish firms by a specific measure of their reported accounting profitability (with robust firms having exhibited higher accounting profits as a proportion of equity).
8.2.3	conservative minus aggressive factor	The **conservative minus aggressive factor** is designed to distinguish firms by the rate of reported corporate asset investment (with conservative firms exhibiting a lower rate of investment in corporate assets).
8.4.4	momentum crash	A **momentum crash** occurs when those assets with recent overperformance (i.e., those assets with momentum) experience extremely poor performance relative to other assets.
8.5.0	Adaptive Markets Hypothesis (AMH)	As first proposed by Lo (2004), the **Adaptive Markets Hypothesis (AMH)** is an approach to understanding how markets evolve, how opportunities occur, and how market players succeed or fail based on principles of evolutionary biology.
8.6.0	time-varying volatility	**Time-varying volatility** is the characteristic of a return series in which the asset's returns experience varying levels of true (as opposed to realized) return variation.
8.6.3	heston model	The **Heston model** is much like the classic Brownian motion (Weiner process) used for equity returns in the Black–Scholes model except that the volatility coefficient is itself a mean-reverting stochastic process.

8.6.3	bates model	The **Bates model** treats volatility as a stochastic process much like the Heston model except that it includes a jump process for the underlying asset's price that permits price jumps at random time intervals and with random magnitude.
8.7.0	stochastic discount factors	**Stochastic discount factors** (pricing kernels) are used in asset valuation models to allow the present value of each cash flow (across each potential economic state) to be formed with potentially different discount rates rather than imposing that all potential cash flows be discounted with the same rate.
9.1.0	strategic asset allocation decision	The **strategic asset allocation decision** is the long-term target asset allocation based on investor objectives and long-term expectations of returns and risk.
9.1.0	tactical asset allocation	**Tactical asset allocation** is the process of making portfolio decisions to alter the systematic risks of the portfolio through time in an attempt to earn superior risk-adjusted returns.
9.1.1	modern portfolio theory (MPT)	**Modern portfolio theory (MPT)** is based on Nobel Prize-winning economist Harry Markowitz's insight that because they have unique risk and return characteristics, less than perfectly correlated assets can be combined in a way that maximizes return for any given level of risk.
9.1.2	dominate	A portfolio is said to **dominate** another portfolio if it offers a higher expected return with the same level of risk, a lower risk with the same expected return, or both higher expected return and lower risk.
9.1.3	utility	Therefore, in the context of investments, we define **utility** as a measurement of the satisfaction that an individual receives from investment wealth or return.
9.1.3	expected utility	**Expected utility** is the probability weighted average value of utility over all possible outcomes.
9.1.3	utility function	A **utility function** is the relationship that converts an investment's financial outcome into the investor's level of utility.
9.1.4	risk averse	An investor is said to be **risk averse** if his or her utility function is concave, which in turn means that the investor requires higher expected return to bear risk.
9.1.5	degree of risk aversion	The **degree of risk aversion** indicates the tradeoff between risk and return for a particular investor.
9.1.6	assumed investor preferences	The **assumed investor preferences** are that most investors dislike variance, like positive skewness, and dislike kurtosis.
9.3.0	efficient frontier	The **efficient frontier** is the set of all feasible combinations of expected return and standard deviation that can serve as an optimal solution for one or more risk-averse investors.
9.4.0	hurdle rate	The **hurdle rate** is the minimum expected rate of return that a new asset (i.e., an asset not already included in a portfolio) must offer in order to be a beneficial inclusion in an otherwise existing optimal portfolio.
9.6.0	market liquidity risk	**Market liquidity risk** arises when an event forces an investor to sell an asset that is not actively traded and there are a limited number of active market participants.
9.6.0	funding liquidity risk	**Funding liquidity risk** arises when a borrower or investor is unable to immediately pay what is owed.
9.6.1	liquidity penalty function	The **liquidity penalty function** reflects the cost of illiquidity and the preference for liquidity.

9.8.2	resampling returns	In the context of mean-variance portfolio optimization (i.e., estimation of the efficient frontier), the method of **resampling returns** strives to reduce estimation error and typically is executed by: (1) repeated analysis of *hypothetical* returns simulated from the statistical parameters estimated from the original sample of returns; or (2) repeated analysis of new samples of returns generated from the original sample using draws with *replacement*.
9.8.3	shrinkage	In the context of mean-variance portfolio optimization, **shrinkage** is the process of implementing a statistical method designed to generate estimated statistical parameters (means, variances, and/or covariances of returns) that differ from those obtained from an unconstrained analysis of historical returns and that provide improved solutions with narrower confidence intervals.
10.1.0	core-satellite approach	Broadly speaking, the **core-satellite approach** seeks to merge passive investing with active management in an attempt to outperform a benchmark.
10.1.0	core portfolio	Typically, the **core portfolio** consists of passive and often low-cost investments that track the overall performance of an asset class.
10.1.0	satellite portfolio	Positions in the **satellite portfolio** are added in the form of actively managed and higher-cost investments.
10.2.1	bottom-up approach	The **bottom-up approach** is based on fund manager or security specific research, in which the emphasis is on screening all investment opportunities and picking the perceived best.
10.2.1	top-down approach	A **top-down approach** analyzes the macroeconomic environment and then determines the weights and the combination of industry sectors, countries, and so on that best meet the program objectives under the likely scenarios.
10.2.1	mixed approach	This method, called the **mixed approach**, either starts with a bottom-up strategy, to which increasing top-down optimization is added, or starts as an iterative short process cycle, in which bottom-up screenings are followed by top-down analysis and then by bottom-up screenings.
10.3.0	risk budgeting	**Risk budgeting** refers to a broad spectrum of approaches to portfolio construction and maintenance that emphasize the selection of targeted amounts of risk and the allocation of the portfolio's aggregate risk to those various categories of risk.
10.3.3	risk bucket	A **risk bucket** indicates the amount of a particular type of risk that can be tolerated.
10.5.0	risk parity	**Risk parity** is an asset allocation approach that identifies asset allocations based on balancing the *contribution* of each asset to portfolio risk without regard for expected return.
10.5.6	leverage aversion theory	The **leverage aversion theory** argues that large classes of investors cannot lever up low-volatility portfolios to generate attractive returns and that, as a result, low-volatility stocks and portfolios are underpriced.
10.5.7	volatility anomaly	The **volatility anomaly** is the idea that low-volatility stocks are underpriced and therefore offer higher expected risk-adjusted returns and may be justified by market imperfections and the leverage aversion theory.
10.5.7	betting against beta	Related to the volatility anomaly is the "**betting against *beta***" anomaly, which has been documented with the observation that portfolios consisting of low-beta stocks have outperformed the market in the past on a risk-adjusted basis.
10.5.8	funding liquidity risk	**Funding liquidity risk** introduces a risk associated with leverage that is not present in unlevered portfolios.

10.6.2	naïve asset allocation startegy	An equally-weighted, 1/*N*, or **naïve asset allocation strategy** refers to constructing a portfolio with an equally-sized allocation assigned to each asset (or sector).
10.6.4	minimum volatility portfolio	Graphically, the **minimum volatility portfolio** may be envisioned in a mean-variance framework as the leftmost point on a mean-variance efficient frontier where the frontier is tangent to a vertical line.
10.7.0	new investment model	In the **new investment model,** investments are allocated with flexibility and in the explicit context of alpha and beta management.
11.2.0	national pension funds	**National pension funds** are run by national governments and are meant to provide basic retirement income to the citizens of a country.
11.2.0	individually managed accounts	**Individually managed accounts** are no different from private savings plans, in which the asset allocation is directed entirely by the employee.
11.6.0	objective	An **objective** is a preference that distinguishes an optimal solution from a suboptimal solution.
11.7.0	constraint	A **constraint** is a condition that any solution must meet.
11.7.1	internal constraints	**Internal constraints** refer to those constraints that are imposed by the asset owner as a result of its specific needs and circumstances and may be a function of the owner's time horizon, liquidity needs, and desire to avoid certain sectors.
11.7.1	external constraints	**External constraints** refer to constraints that are driven by factors that are not directly under the control of the investor.
11.8.0	investment policy statement (IPS)	At its core, the **investment policy statement (IPS)** is a document that describes the primary goals for an investment program and lays out a framework to achieve those goals.
11.8.4	A common investment objective of endowments	**A common investment objective of endowments** is a return target X% above inflation, specifically connected to long-term spending needs.
11.8.4	A common investment objective of pension funds	**A Common investment objective of pension funds** is a return target X% above the liability discount rate.
12.1.0	restricted gifts	An endowment fund may have specific restrictions on the capital, **restricted gifts**, that may require that the university maintain the **corpus**, the nominal value of the initial gift, while spending the income generated by the gift to benefit the stated purpose.
12.1.0	corpus	An endowment fund may have specific restrictions on the capital, **restricted gifts**, that may require that the university maintain the **corpus**, the nominal value of the initial gift, while spending the income generated by the gift to benefit the stated purpose.
12.1.0	foundations	**Foundations** are similar to endowments but tend to differ in a number of ways: (1) foundations are grant-making institutions, whereas endowments tend to be funds established by educational, health-care, or religious organizations; (2) foundations tend to be finite lived, whereas endowments tend to be perpetual; (3) foundations are more subject to minimum spending requirements; and (4) foundations are less likely to be funded from ongoing donations.
12.1.0	operating foundations	**Operating foundations** have the greatest similarity to endowments, as the income generated by an endowment is used to fund the operations of the charitable organization.
12.1.0	community foundations	**Community foundations** are based in a specific geographical area, concentrating the charitable giving of the region's residents.
12.1.0	corporate foundations	**Corporate foundations** are sponsored by corporations, with gifts provided by the corporation and its employees.

12.1.0	independent foundations	Most **independent foundations** are funded by an individual or a family. These foundations may be founded by a single gift, often by the senior executive of a large corporation who donates wealth in the form of stock.
12.2.0	intergenerational equity	The investment goal of an endowment manager should be to maintain **intergenerational equity**, balancing the need for spending on the current generation of beneficiaries with the goal of maintaining a perpetual pool of assets that can fund the operations of the organization to benefit future generations.
12.2.0	spending rate	In contrast to endowments, which typically have flexibility in their **spending rate** (which is the fraction of asset value spend each year. year), U.S. law requires that foundations spend a minimum of 5% per year on operating expenses and charitable activities.
12.2.0	return target	A **return target** is a level of performance deemed necessary to satisfy the goals of the owners or beneficiaries of the associated assets.
12.3.0	endowment model	The asset allocation of major endowments and foundations, which typically includes substantial allocations to alternative investments and limited investments to listed stocks and bonds, has been called the **endowment model**.
12.4.2	security selection	**Security selection**, the second component, is defined as the return within asset classes relative to a benchmark such as the return to the domestic fixed-income portfolio when compared to the domestic fixed-income benchmark.
12.4.2	market or tactical asset allocation	**Market timing or tactical asset allocation** is measured as the return earned from the variation of asset class weights versus the policy or target asset class weights.
12.4.2	rebalance	Swensen sought to aggressively **rebalance** (i.e., transact so as to cause portfolio weights to return to prespecified values) to strategic asset allocation weights by selling outperforming asset classes and buying underperforming ones.
12.4.4	first-mover advantage	The **first-mover advantage refers to** benefits emanating from being an initial participant in a competitive environment.
12.4.5	network effect	An institution has a positive **network effect** when it has built relationships with successful people and businesses that may be difficult for others to emulate.
12.4.6	illiquidity premiums	As the longest-term investors, charged with protecting the real value of endowment principal for future generations of students, universities are seeking to earn **illiquidity premiums**, which are higher returns earned by investing in less liquid assets that require long lockup periods.
12.4.7	non-discretionary investment consultant	A **non-discretionary investment consultant** makes recommendations to the endowment on asset allocation, manager selection, and a wide variety of other issues, but leaves the ultimate decision to a vote of the investment committee.
12.4.7	outsourced CIO (OCIO) model	There is growing use of the **outsourced CIO (OCIO) model**, in which the endowment gives discretionary authority to an external consultant who may make and implement prespecified decisions, such as manager selection and asset allocation decisions, without taking those decisions to a vote.
12.5.1	total return investor	A **total return investor** (i.e., an investor considers both income and capital appreciation as components of return), and therefore may realize that a 5% current yield is not needed in order for the endowment to have a spending rate of 5%.

12.5.2	inflation beta	An **inflation beta** is analogous to a market beta except that an index of price changes is used in place of the market index, creating a measure of the sensitivity of an asset's returns to changes in inflation.
12.5.4	liquidity-driven investing	**Liquidity-driven investing** refers to an investment approach emphasizing the role of the liquidity of investments and the time horizon of the investor in the asset allocation decisions.
12.7.0	equity option hedges	**Equity options hedges** are positions established in equity options for the primary purpose of reducing the equity risk of a portfolio, such as the purchase of a put option.
13.0.0	pension plans	**Pension plans** (also known as pension schemes or superannuation plans) manage assets that are used to provide employees with a flow of income during their retirement years.
13.1.3	cash balance plan	A **cash balance plan** is basically a defined benefit plan, where the pension benefits are maintained in individual record-keeping accounts that show the participant the current value of his or her accrued benefit and facilitate portability to a new plan.
13.2.4	duration matching approach	In the **duration matching approach**, the duration of the hedging bucket is matched to the duration of the liabilities.
13.2.4	cash flow matching approach	In the **cash flow matching approach**, the hedging portfolio is constructed such that its estimated future cash inflows match the expected outflows associated with liabilities at each prospective point in time.
13.2.4	overlay approach	In the **overlay approach**, the plan sponsor employs finance derivatives to create a hedging bucket.
13.3.0	defined benefit plan	In a **defined benefit plan**, the employer takes all of the investment risk while offering a guaranteed, formulaic benefit to retirees.
13.3.0	retirement income-replacement ratio	**Retirement income-replacement ratio** is the pension benefit as a portion of final salary.
13.3.1	portable	A plan is **portable** if benefits earned at one employer can continue to be accrued at another employer.
13.3.2	accumulated benefit obligation (ABO)	The **accumulated benefit obligation (ABO)** is the present value of the amount of benefits currently accumulated by workers and retirees.
13.3.2	projected benefit obligation (PBO)	The **projected benefit obligation (PBO)** is the present value of the amount of benefits assumed to be paid to all future retirees of the firm.
13.3.3	funded status	The **funded status** of a pension plan is a measure of the plan's current assets compared to its projected benefit obligation (PBO) or accumulated benefit obligation (ABO).
13.3.3	pension surplus	The **pension surplus** is the amount of assets in excess of a pension plan's projected pension benefit (PBO).
13.3.3	surplus risk	The **surplus risk** of a pension plan is the economic exposure to the spread between the assets and liabilities of a pension plan and can be measured as the volatility and tracking error of the difference between the value of the assets relative to the present value of the liabilities.
13.3.4	frozen pension plan	A **frozen pension plan** is one where employees scheduled to receive defined benefit (DB) pension benefits will no longer continue to accrue additional years of service in the plan.
13.3.4	terminated pension plan	A **terminated pension plan** is no longer operated by the employer
13.3.6	liability-driven investing (LDI)	**Liability-driven investing (LDI)** seeks to reduce surplus volatility by building a portfolio of assets that produces returns that are highly correlated with the change in the plan's liabilities.

13.3.6	cost of living adjustment (COLA)	Some plans offer retirees a **cost of living adjustment (COLA)**, which increases the benefits paid to employees along with the rate of inflation.
13.3.6	inflation-protected bonds	**Inflation-protected bonds** earn a nominal coupon while the principal value rises with the rate of inflation.
13.4.0	progressive system	A **progressive system** is when lower paid workers get relatively higher benefits than those earned by higher paid workers when measured by a percentage of salary.
13.5.1	defined contribution plan	Another common retirement plan offered by employers is a **defined contribution plan**, where the employer and/or employee make a specified contribution on behalf of each covered employee on a regular basis such as a percentage of the employee's salary.
13.5.1	matching contribution	A **matching contribution** is a voluntary contribution made by an employee that is augmented by additional contributions by the employer.
13.5.1	drifting asset allocation	A **drifting asset allocation** is when the allocations to asset classes change based on returns of each asset class with the highest-returning asset classes growing as a share of the portfolio.
13.5.4	target-date fund	A **target-date fund** has risks that are managed relative to a specified horizon date, which allows employees to choose a single investment option without needing to rebalance or change investments as the horizon date approaches.
13.5.4	glide path	Target-date funds follow a **glide path** where the allocation becomes more conservative over time.
13.6.1	accumulation phase	When individuals are working, they are in the **accumulation phase** of their lives where they are saving a portion of their income and growing their assets to provide for a comfortable retirement.
13.6.1	decumulation phase	After retirement, the ability to earn income declines substantially, and the investor enters the **decumulation phase**, where assets are drawn down to support spending during retirement.
13.6.2	mortality tables	Actuaries calculate **mortality tables**, which show the distribution of the expected age of death or probability of death for various current ages across a specified population.
13.6.4	immediate annuity	In an **immediate annuity**, an investor pays a lump sum to an insurance company for cash flows starting in the first year of the contract and guaranteed for some period.
13.6.4	deferred annuity	In a **deferred annuity**, an investor pays a lump sum to an insurance company for cash flows that are scheduled to start at some date in the future.
14.1.1	reserve account	The **reserve account** of a central bank consists of the central bank's holdings of foreign currencies and is operated by the central bank to conduct transactions involving foreign currencies.
14.1.1	balance of payments	The **balance of payments** considers three accounts, which must offset each other in any given year: ΔReserve Account = ΔCurrent Account + ΔCapital Acccount
14.1.1	current account deficit	A country is said to have a **current account deficit** when the value of its imports of goods and services exceeds the value of its exports, meaning that more currency is flowing out of the country to purchase these goods and services than is flowing in from selling goods and services.
14.1.1	capital account surplus	A **capital account surplus** occurs in a country when the amount of imported capital exceeds the amount of exported capital.
14.1.4	depletion	**Depletion** is the rate of extraction of a commodity relative to the remaining in-ground stocks.

14.2.1	stabilization fund	A sovereign wealth **stabilization fund** serves a countercyclical purpose through collecting excess commodity revenues during times of high commodity prices, and distributing saved wealth during times of low commodity prices.
14.2.2	savings funds	Sovereign wealth **savings funds** are designed to bring intergenerational equity to a commodity-producing country by investing today's commodity revenues into a total return fund designed to benefit future generations.
14.2.3	pension reserve funds	Sovereign wealth **pension reserve funds** are designed to invest for high total returns in preparation for estimated future pension-like liabilities.
14.2.3	reserve investment funds	Sovereign wealth **reserve investment funds** are included in a country's reserve accounting as part of its reserves, but the funds invest in a total return portfolio in order to overcome the opportunity costs of the cash and fixed income dominated stabilization funds.
14.2.4	development funds	D**evelopment funds** are investment holding companies that have socio-economic objectives such as economic diversification, the development of strategic industries, or poverty alleviation.
14.3.3	Dutch disease	**Dutch disease** occurs when large currency inflows (such as from the sale of large quantities of commodities) damages the long-run health of a country's other sources of economic prosperity (such as the country's manufacturing sector).
14.3.3	sterilization	**Sterilization** is a macroeconomic policy in which a central bank or the government takes actions to counter the effects of an economic event (such as a commodity boom) and a balance of payments surplus on the country's economy.
14.3.4	conservative investment opportunity cost	**Conservative investment opportunity cost** refers to the longer conservative assets are left in cash, the greater the lost returns relative to what could have been earned on a balanced portfolio that includes investments in risky assets.
14.3.4	reserve adequacy	**Reserve adequacy** is the estimated size for stabilization fund reserves that is considered necessary before starting to invest in risky assets and moving funds into a total return portfolio.
14.4.3	Linaburg-Maduell Transparency Index	The **Linaburg-Maduell Transparency Index** consists of the following 10 principles, where one point is assigned to a given fund for having satisfied its requirement.
14.4.4	Santiago Principles	The International Working Group of SWFs set out the **Santiago Principles**, which define the generally accepted principles and practices (GAPP) of good governance of SWFs.
14.5.1	Norway model	In the **Norway model**, asset allocations are dominated by highly diversified liquid assets that are managed at extremely low costs, which seem to be the opposite of the Yale model, which maximizes exposure to illiquid assets invested with external managers.
15.1.0	ultra-high net worth	Typically, a multifamily office pools assets of a small number of **ultra-high net worth** families, those with over $30 million in assets.
15.3.1	new money	The first generation of wealth creation (**new money**) is more likely to be concerned with wealth preservation—keeping the newly created wealth intact.
15.3.1	old money	It is successive generations (**old money**) that turn to generating wealth growth with an established pool of assets.
15.3.2	concentrated wealth	There are special concerns that arise from **concentrated wealth**, which occurs when the vast majority of the assets are poorly diversified such as being held in a single company.

15.3.2	completion portfolio	A **completion portfolio** is a collection of assets that is managed with the objective of diversifying the aggregated risks of the concentrated portfolio.
15.3.2	liquidity event	Much of the wealth that is managed by family offices is generated by a **liquidity event** such as the sale of the family business in a merger transaction or in an initial public offering.
15.5.1	tax efficiency	Taxable investors are concerned with **tax efficiency**, which is the efficacy with which wealth is managed so as to maximize after-tax risk-adjusted return.
15.5.2	short-term capital gains	Gains from forward contracts or six-month swap agreements are considered **short-term capital gains** in the United States, which are trading profits recognized on an investment held for less than one year.
15.5.2	long-term capital gains	In non–Section 1256 securities, the lower tax rate on **long-term capital gains** is levied only on investment gains in which assets are held for longer than one year.
15.6.0	lifestyle assets or passion assets	**Lifestyle assets or passion assets** include art, homes, wine, airplanes, cars, and boats, where the purchase and collection follows from the lifestyle preferences or the passions of one or more family members.
15.6.2	free ports	**Free ports** are specialized, climate-controlled repositories for art and other valuable goods belonging to the very wealthy—similar to a custody bank for stock certificates.
15.6.3	balancing portfolios	Sometimes these two buckets are referred to as **balancing portfolios**, which are used as counterweights to a pool of assets that, for some reason, cannot be adjusted itself.
15.6.4	concierge services	Closely related to lifestyle assets is a growing part of family office management known as **concierge services**, where the family office will attend to mundane details that most people have to deal with in their daily lives such as personal shopping and travel arrangements.
15.7.2	dynastic wealth	**Dynastic wealth** is an amount of wealth so large that is has substantial potential to be maintained for a large number of generations.
15.7.3	beneficiaries	The income or assets distributed per beneficiary inevitably decline over time, as there could be 60 **beneficiaries**, or descendants who receive a share of the family wealth, over the course of five generations or 120 years.
15.7.4	inheritance	One of the key questions is determining a strategy for **inheritance**, which is the distribution of assets after the death of members of the older generation.
15.7.4	succession planning	Once the children have proven themselves both externally as well as in the management of the family business and family office, the **succession planning** process starts, which is the process of naming a new leader of the family business and potentially a new governance structure after the death or retirement of the founder or current leader of the business.
15.8.1	family estate planning	**Family estate planning** is the process for planning the distribution of assets upon the death of preceding generations.
15.8.1	estate taxes	**Estate taxes** are levied in many jurisdictions by governments on accumulated wealth after the death of its owner.
15.8.1	charity	**Charity** is the giving of money or time to social causes, typically to meet more immediate needs and without accountability on behalf of the recipient.
15.8.1	philanthropy	**Philanthropy** is the giving of money or time with the intent of making a lasting change.

15.8.2	impact investing	The World Economic Forum (2014) defines **impact investing** as an investment approach that seeks to earn financial returns while generating measurable and positive social impact.
15.8.2	negative screening	In **negative screening**, investors intentionally eliminate companies from their portfolio that are deemed to have a negative impact on the world, such as from pollution, harmful products, or unfair employment practices.
15.8.2	positive screening	A newer concept is **positive screening**, where companies are added to the portfolio when they are perceived to do good in the world, such as producing helpful products and having high wages and benefits and good working conditions for their workers and suppliers worldwide, even in areas of extreme poverty.
15.8.2	impact first	Some investments are **impact first**, where investors have a greater focus on the social good of their investments, and may accept projects with higher financial risk or lower financial returns.
15.8.2	finance first	**Finance first** investors would like to earn an investment return competitive with market returns and commensurate with the risk of the investment and place relatively less priority on social impact.
15.8.2	impact alpha	**Impact alpha** is the theory that ventures choosing to do the right things from a social perspective will ultimately be rewarded in the marketplace with above-market financial returns, or that ventures that have socially objectionable operations have substantial risks of generating below-market financial returns.
16.1.4	return on equity (ROE)	**Return on equity (ROE)** is profit after financing costs, expressed as a percentage of equity.
16.1.4	return on assets (ROA)	**Return on assets (ROA)** is profit before financing costs (and taxes), expressed as a percentage of assets.
16.1.5	behavioral finance	**Behavioral finance** studies the potential impacts of cognitive, emotional, and social factors on financing decision-making.
16.1.5	behavioral biases	**Behavioral biases** are tendencies or patterns exhibited by humans that conflict with prescriptions based on rationality and empiricism.
16.2.1	unwind hypothesis	The **unwind hypothesis** suggests that hedge fund losses began with the forced liquidation of one or more large equity market-neutral portfolios, primarily to raise cash or reduce leverage.
16.2.1	crowded trade	When large investors hold substantial positions in the same asset or similar assets, it is known as a **crowded trade**.
16.2.2	spoofing	**Spoofing** is the placing of large orders to influence market prices with no intention of honoring the orders if executed.
16.2.2	circuit breaker	A **circuit breaker** is a decision rule and procedure wherein exchange authorities invoke trading restrictions (even exchange closures) in an attempt to mute market fluctuations and to give market participants time to digest information and formulate their trading responses.
16.3.0	fraud	**Fraud** is intentional deception typically for the purpose of financial gain. Although
16.3.2	Ponzi scheme	A **Ponzi scheme** is a fraudulent program that returns deposits to investors and identifies the returned capital as a distribution of profit in order to overstate the profitability of the enterprise and to attract additional and larger deposits.
16.3.2	affinity fraud	**Affinity fraud** is the commission of fraud against people or entities with which the perpetrator of the fraud shares a common bond, such as race, ethnicity, or religious affiliation.

16.3.3	window dressing	**Window dressing** is a term used in the investment industry to denote a variety of legal and illegal strategies to improve the outward appearance of an investment vehicle.
16.3.3	painting the tape	Placing transactions to record high or low prices on the transaction records of public markets is a fraudulent activity often termed **painting the tape**, in reference to the historical use of ticker tape to broadcast prices.
17.1.1	fund style index	A **fund style index** is a performance index based on a collection of fund managers operating with a similar strategy to the fund manager in question that can be used as a benchmark.
17.1.2	Bailey criteria	Bailey, Richards, and Tierney (1990) define the so-called **Bailey criteria** as a grouping of seven characteristics or properties that an investment benchmark should possess in order to be a useful gauge: (1) Unambiguous/knowable: The names and weights of entities that make up the benchmark should be clearly identifiable. (2) Investable: There should be an option to forgo active management and simply hold all assets that make up the benchmark. (3) Measurable: It is possible to frequently calculate the benchmark performance. (4) Specified in advance: The benchmark is constructed and mutually agreed on before the manager's evaluation. (5) Appropriate: The benchmark is consistent with the manager's investment style. (6) Reflective of current investment opinion: This requires understanding a benchmark enough to have opinions about whether to deviate from it, and (7) Owned: Investment managers have to agree with their sponsor that they are being measured against this benchmark and are accountable for the results.
17.1.3	optimal benchmark	An **optimal benchmark** is a standard that best differentiates whether the investment manager has generated superior or inferior returns through skill and in so doing provides evidence to the asset owner regarding which assets to own.
17.5.1	value-based index	A **value-based index** has fixed-component weights expressed as percentages of the value of the index.
17.5.1	quantity-based index	A **quantity-based index** holds a fixed quantity of contracts for each commodity, so that the index weights change each day in terms of percentage of value as futures prices change.
17.5.3	total return index	A **total return index** is a fully collateralized investment strategy, with the collateralization generally taking the form of Treasury bills.
17.5.3	excess return index	An **excess return index** provides returns over cash and is linked to the price movements of a basket of commodity futures contracts.
17.5.4	futures curve positioning	**Futures curve positioning** determines the time to expiration of a futures contract at the *initiation* of the position, and the length of time the contract will be held before rolling to a further-out contract.
17.5.5	first-generation commodity indices	**First-generation commodity indices** tend to be heavily weighted in energy and hold long-only positions in front month contracts, rolling to the second month contracts at pre-specified times regardless of the shape of the current term structure.
17.5.5	second-generation commodity indices	**Second-generation commodity indices** attempt to enhance returns through forward curve positioning to spread the roll period across points along the forward curve or target different segments of the curve.

17.5.	third-generation commodity indices	**Third-generation commodity indices** add yet another enhancement to second-generation commodity indices by including active commodity selection, which may be predicated on objective rules (such as using algorithms to assign weights based on specific criteria related to momentum, inventory levels, term structure signals, and so on) or could be discretionary.
17.7.1	listed PE index	A **listed PE index** refers to an index (such as the LPX 50) whose components are share prices of publicly-traded PE firms.
17.7.	Public Market Equivalent (PME) Method	A key approach to benchmarking private equity is the **Public Market Equivalent (PME) Method** which was introduced in Level 1 of the CAIA curriculum for investments involving only two cash flows: an initial cashflow into the investment and one liquidating cashflow out of the investment.
17.7.2	LN PME method	The **LN PME method** focuses on computing two IRRs, one based on the actual cash flows of private equity and another based on hypothetical use of a public market index, and comparing them.
17.8.0	peer-group cohort	A **peer-group cohort** refers to a group of private equity funds or investments that share some important characteristics.
17.9.1	cap rate spread	The **cap rate spread** is the excess of the cap rate over the yield of a default-free 10-year bond (such as the 10-year Treasury rate in the United States).
18.1.1	trading level	**Trading level** is simply the base amount or denominator used in calculating returns of leveraged positions and is the amount of capital that is traded in the active risk account.
18.1.1	funding level	The **funding level** is the total amount of cash or collateral that the investor posts or invests to support the trading level.
18.1.1	notional funding	The **notional funding** is the added exposure to the trading level that the CTA allows above and beyond the trading level.
18.1.2	margin-to-equity	The **margin-to-equity** ratio is expressed as the amount of assets held for meeting margin requirements as a percentage of the net asset value (NAV) of the investment account.
18.1.3	cross-margin benefit	A **cross-margin benefit** is available when a CTA has multiple positions in contracts traded on the same exchange, which allows the total amount of margin that the CTA must post to be smaller than the sum of the margin amount of each contract.
18.1.3	variation margin	In futures markets, it is standard practice to settle all gains and losses in cash every day. These daily cash settlements of gains and losses are known as **variation margin**.
18.1.4	stop losses	S**top losses** are specific prices at which the strategy will exit a futures position should the price move adversely.
18.1.4	capital at risk (CaR)	**Capital at risk (CaR)** represents the total loss that would be incurred should each position hit its stop-loss price level on that day.
18.1.4	stop loss order limit order	A **stop loss order** becomes a market order when the loss level is reached
18.1.4	stop limit order	A **stop limit order** becomes a limit order when the loss level is reached, and may not be executed if the market price has moved quickly beyond the stated limit.
18.2.0	value at risk (VaR)	**Value at risk (VaR)** is a method of measuring the potential loss in an investment portfolio given a particular holding period, with no changes to the portfolio during the holding period, and at a particular confidence level.
18.3.1	stress test	A portfolio **stress test** or **scenario analysis** is a simulation applied to a portfolio to determine how it will perform under different market scenarios.

18.3.1	scenario analysis	A portfolio **stress test** or **scenario analysis** is a simulation applied to a portfolio to determine how it will perform under different market scenarios.
18.3.2	omega ratio	The **omega ratio** is the ratio of the total realized returns in excess of a given target return relative to the total realized loss relative to the same target return.
18.5.1	decay function	A **decay function** in a valuation method is a numeric construct that puts less weight on older valuations and more weight on more recent valuations.
18.6.0	unsmoothing	**Unsmoothing** is the process of estimating a true but unobservable price or return series from an observable but smoothed price or return series.
19.2.4	slack variable	A **slack variable** is the variable in an optimization problem that takes on whatever value is necessary to allow an optimum to be feasible but, while doing so, does not directly alter the value of the objective function.
19.6.5	rebalancing yield	**Rebalancing yield** is the additional observed or expected return produced by the periodic rebalancing of a portfolio to an initial set of weights.
19.7.2	diversification return	The enhanced average or expected geometric mean return from rebalancing (or other volatility reduction) is often termed **diversification return**.
20.1.0	risk management	**Risk management** includes the decisions and actions associated with overseeing and controlling exposure to uncertainty.
20.1.0	risk measurement	**Risk measurement** includes all the steps associated with gathering and reporting the information required to capture an investor's exposure to uncertainty.
20.1.3	pricing matrix	A **pricing matrix** describes valuation of assets typically with labels for the types of asset (e.g., the labels Level I, Level 2 and Level 3, as one dimension), with descriptions of the valuation model-type as the other dimension, with total aggregated asset values as the data entries.
20.1.4	exception report	An **exception report** filters data to describe only those instances in which risk measures and other data are outside predetermined bands deemed to be appropriate for further analysis at a more senior level.
20.2.3	watch list	Managers are placed on a **watch list** when the investor wishes to monitor the manager more closely with a concern that investment performance or organizational changes may soon warrant redemption.
20.9.0	risk manager	A **risk manager** is a duly qualified professional with trading and investment enforcement authority to be able to review, analyze, and understand the information derived from the risk measurement process to take action, as appropriate, to ensure risk exposures within the portfolio are as intended and in compliance with the investment mandates associated with each investment and the portfolio as a whole.
21.3.2	backward induction	**Backward induction** is the recursive process of starting with the potential values of an asset in a final time period and working backwards through time finding the values in each previous period until the value at time 0 (i.e., the current value) is found.
21.5.0	visualization	In the context of models, **visualization** refers to the ability to understand the relations between the components of a model and is often substantially enhanced by expressing the model via a spreadsheet.
22.0.0	directional strategies	**Directional strategies** have intentional exposures to a market's direction from either a net long or a net short exposure.

22.1.0	two paradoxes of informational market efficiency	The **two paradoxes of informational market efficiency** are: (1) If financial asset markets are perfectly efficient, no one will have an incentive to collect information and so there would be no mechanism to keep markets informationally efficient, and (2) If financial asset markets are perfectly efficient then fees paid to active managers of financial assets imply that the markets for asset management are highly inefficient.
22.1.0	efficiently inefficient markets	**Efficiently inefficient markets** occur when markets prices are, on average, just informationally inefficient enough to compensate managers and investors for the costs and risks of pursuing skill-based strategies, but not too inefficient to present a large number of money managers with easy-to-exploit arbitrage opportunities.
22.2.0	technical directional strategies	**Technical directional strategies** purposefully take on exposure to one or more risk factors based on analysis of past trading information including past prices and volumes.
22.2.0	mean-reversion	**Mean-reversion** exists when an asset's future value changes (returns) are more likely to reverse from unusually high or low previous performance by exhibiting the opposite performance in the future (i.e., exhibiting negative autocorrelations of returns).
22.2.1	point and figure chart	A **point and figure chart** is a diagram of X's and O's that denote upward and downward price movements through time (i.e., trends) in an attempt to discern tradeable patterns.
22.2.2	momentum strategy	A **momentum strategy** seeks to generate superior risk-adjusted performance by identifying assets more likely to continue the unusually high (or low) previous performance rather than to reverse a past trend.
22.2.2	cross-sectional momentum	**Cross-sectional momentum** is defined and measured by the relative performance of a security within a group of securities such as classifying a stock as having positive momentum if its recent performance is in the top 50% of all stocks.
22.2.2	time-series momentum	**Time-series momentum** is defined and measured by the absolute performance of a security based on its own performance such as classifying a stock as having positive momentum if its recent performance was positive.
22.2.3	divergence	In financial markets, **divergence** can be defined as the tendency or process of an asset, market index, or indicator to move in opposition to the movement or behavior anticipated by a particular model or expectation.
22.2.4	signal-to-noise ratio	The **signal-to-noise ratio** is the ratio of a measure of a potential trend to a measure of all price changes during the same period.
22.2.6	market divergence index (MDI)	The **market divergence index (MDI)** is the average signal-to-noise ratio for a group of sub-markets.
22.2.7	genetic algorithms	**Genetic algorithms** seek to identify patterns in data using an approach modeled after the natural selection process found in biological evolution with various "genes" representing trading rules that survive within the model or perish based on the their estimated value in generating trading profits.
22.2.7	neural network	Artificial **neural network** software seeks to identify patterns in data using an approach modeled after the learning process of the human brain with various "nodes" and "layers" forming connections and associations that are modified within the model (are "learned") to form trading rules that are included or omitted based on the their estimated value in generating trading profits.
22.2.8	crisis alpha	The potential for some strategies to generate superior return during periods of financial crisis can be termed **crisis alpha**.

22.3.2	bottom-up fundamental analysis	The strategy of **bottom-up fundamental analysis** is to estimate the value of a company's stock based on firm-level forecasted sales, expenses, earnings, and other data linked economically to the eventual cash distributions of a firm in an attempt to enhance portfolio returns.
22.3.3	enterprise value	The **enterprise value** of a firm is defined as the market value of its operating assets.
22.3.3	free cash flow to the firm (FCFF)	**Free cash flow to the firm (FCFF)** is the total cash flow that is available for distribution to shareholders and bondholders of the firm.
22.3.4	DuPont model	The **DuPont model** evaluates a firm based on a company's gross value rather than its net value, and breaks a firm's ROE into three major components: profit margin, asset turnover, and leverage.
22.3.6	top-down fundamental analysis	**Top-down fundamental analysis** is the use of economy-wide or industry-wide information to obtain enhanced abilities to predict levels and changes of key economic characteristics.
22.3.7	feedback-based global macro managers	**Feedback-based global macro managers** assume that markets are rational most of the time but that there can exist periods of severe irrationality.
22.3.7	information-based global macro managers	**Information-based global macro managers** rely primarily on collecting microlevel information to better understand the global macro picture.
22.3.7	model-based global macro managers	**Model-based global macro managers** rely primarily on financial models and economic theories to analyze market movements, detect policy mistakes of central banks and governments, or extract implied market expectations and compare them to sensible estimates.
22.3.8	fundamental risk	**Fundamental risk** emanates from an unexpected change in the fundamental value of a security, causing an apparent arbitrage opportunity to generate losses on the part of the investor.
22.3.8	noise traders	The term **noise traders** refers to those investors who trade securities for reasons not related to the fundamental value of securities.
22.4.0	cognitive psychology	**Cognitive psychology** is a broad category that attempts to capture the many types of deviations from full rationality to reflect how people think including analysis of the emotional components that may affect investors' decision-making abilities.
22.4.1	sentiment	**Sentiment,** in the context of investment analysis, is broadly defined as beliefs about future cash flows and risks that are not justified by an objective analysis of the facts.
22.4.1	six sentiment indicators	The **six sentiment indicators** are: (1) the discounts on closed-end funds, (2) the turnover of New York Stock Exchange (NYSE) shares, (3) the number of initial public offerings (IPOs), (4) the average first-day returns on IPOs, (5) the equity share in new issues, and (6) the dividend premium.
22.4.1	dividend premium	The **dividend premium** is defined as the difference between the average market-to-book-value ratios of dividend payers and nonpayers.
22.4.3	anchorin	**Anchoring** occurs when a person is biased due to prior views and cannot properly integrate new information.
22.4.3	confirmation bias	**Confirmation bias** occurs when one selectively employs evidence that supports a given claim or belief and minimizes contradictory evidence (aka "selective hearing").
22.4.3	loss aversion/disposition effect	The **loss aversion/disposition effect** captures the notion that investors typically prefer to avoid losses more than to acquire gains. Empirical and laboratory evidence demonstrates that people have stronger reactions to losses than to gains.

22.4.3	prospect theory	In **prospect theory**, agents underweight those outcomes that are probable vis-`a-vis those outcomes that are certain.
22.4.4	market frictions	**Market frictions** are impediments to costless trading—such as transaction costs, taxes, and regulations—that can create market imperfections and make it too costly or too risky to implement certain arbitrage strategies.
22.5.1	value long/short managers	**Value long/short managers** employ traditional valuation metrics, such as the book-to-market ratio, earnings-to-price (E/P) ratio, dividend yield, and the ratio of P/E to earnings growth rate (i.e., the PEG ratio), to look for undervalued companies.
22.5.1	growth approach	The **growth approach** to fundamental long/short equity investing is to overweight companies perceived as having higher potential to deliver large increases in revenues, earnings, and/or cash flows.
23.1.1	Principal Component Analysis (PCA)	**Principal Component Analysis (PCA)** is a linear statistical method that identifies the set of orthogonal factors from a dataset that maximize the percentage of explained variation.
23.1.3	eigenvalue	An **eigenvalue** is a number that, in the case of an analysis of investment returns, can be used to indicate the proportion of the return variance that is explained by each.
23.1.3	factor loadings	The **factor loadings** of each principal component are a vector of values (scores) with one loading for each asset (e.g., bond) that inform the researcher of the responsiveness of each asset to each principal component.
23.1.5	factor analysis (FA)	**Factor analysis (FA)** is a statistical method that seeks to identify factors and their coefficients through optimization of a specified model with explicit statistical assumptions.
23.2.0	multiple regression model	A **multiple regression model** is a regression model with more than one independent variable.
23.2.2	multicollinearity	**Multicollinearity** is when two or more independent variables in a regression model have high correlation to each other.
23.2.2	two primary adverse effect of multicollinearity	The **two primary adverse effects of multicollinearity** are: (1) The estimates of the slope coefficients for each of the correlated independent variables may be highly inaccurate, and (2) the standard errors for the correlated independent variables may be inflated (large).
23.2.3	stepwise regression	**Stepwise regression** is an iterative technique in which variables are added or deleted from the regression equation based on their statistical significance.
23.2.3	overfitted models	**Overfitted models** explain the past well (i.e., the model explains the data used to fit the model), but they do not predict future relations well.
23.3.1	nth order partial autocorrelation coefficient	The **n^{th} order partial autocorrelation coefficient** is designed to denote the marginal or incremental autocorrelation contribution of only the return that is lagged *n* periods.
23.4.0	nonlinear exposure	A **nonlinear exposure** of a position to a market factor is when the sensitivity of the position's value varies based on the magnitude of the change in the market factor's value.
23.4.1	three dynamic risk exposure models	This section describes **three dynamic risk exposure models** that can be used to estimate the effectiveness of market-timing strategies and other nonlinear exposures: a dummy variable approach, a separate regression approach, and a quadratic approach.
23.5.1	conditional correlation	A **conditional correlation** is a correlation between two variables under specified circumstances.

23.5.4	rolling window analysis	**Rolling window analysis** is a relatively advanced technique for analyzing statistical behavior over time, using overlapping subsamples that move evenly through time.
23.6.1	style analysis	**Style analysis** is the process of understanding an investment strategy, especially using a statistical approach, based on grouping funds by their investment strategies or styles.
23.6.3	look-back option	A **look-back option** has a payoff that is based on the value of the underlying asset over a reference period rather than simply the value of the underlying asset at the option's expiration date.
23.6.4	specialized market factors	The **specialized market factors** in a specialized market factor approach are specifically identified and selected to represent the returns to a specific fund rather than the overall market.
23.7.2	joint hypothesis	A **joint hypothesis** is a test with results that depend on two hypotheses: (1) the hypothesis that the test method is valid, and (2) the hypothesis being tested such as a null hypothesis that return persistence does not exist.
24.0.0	relative value strategy	A **relative value strategy** attempts to identify two or more positions that have diverged from their predicted price relation and to seek superior risk-adjusted performance by establishing positions (typically long and short) that will gain if the assets move closer to the predicted relation (i.e., converge).
24.1.1	arbitrage	The textbook definition of **arbitrage** refers to a situation in which an investor is able to earn virtually riskless positive profits while making little or no investment.
24.1.2	pure arbitrage	The term **pure arbitrage** is often used to denote an arbitrage opportunity that involves a level of risk so near zero (or some might argue is "zero risk") that any risk can be ignored as inconsequential.
24.1.2	risk arbitrage	The term **risk arbitrage** is often used by the investment industry to describe profit opportunities that involve enough risk that it is appropriate to explicitly indicate that the supposed arbitrage comes with nontrivial risk.
24.1.3	limites to arbitrage	**Limits to arbitrage** refers to the idea that investment strategies that seek to earn superior risk-adjusted returns are limited in size by a constraint on investors with regard to the degree of leverage that they can cost-effectively arrange and the level of risk that they can tolerate.
24.2.0	pairs trading	**Pairs trading** generally refers to a simultaneous long and short position in two securities that share many similarities such as bonds with similar ratings, equities in similar industries, and futures contracts with the same underlying but different delivery dates.
24.3.0	statistical pairs trading	**Statistical pairs trading** is a relative value strategy trade with one long and one short position in securities with an observed long-term close statistical relation of returns and a recent observation of a marked but presumably short-term departure from that statistical relation.
24.3.1	co-integration approach	The **co-integration approach** is a statistical technique that detects whether a linear combination of two nonstationary time-series variables is itself stationary.
24.3.1	co-integrated stock prices	**Co-integrated stock prices** exist when a linear combination of the two is a stationary process.
24.3.1	stationary	Loosely speaking, a process is said to be **stationary** if its statistical properties do not change through time; for example, its means and standard deviations remain the same.
24.4.0	three dimensions of commodity relative value strategies	The **three dimensions of commodity relative value strategies** are: (1) location, (2) correlation, and (3) time.

24.4.1	commodity spreads	**Commodity spreads** are strategies that seek to take advantage of trading opportunities based on relative commodity prices that can be executed entirely in derivatives markets.
24.4.1	calendar spread	A **calendar spread** involves taking opposing long/short positions in the futures market for delivery at different times in the future.
24.4.1	bull calendar spread	A **bull calendar spread** is long the nearby (near-term) contract and short the distant (long-term) contract.
24.4.1	bear calendar spread	A **bear calendar spread** is long the distant (long-term) contract and short the nearby (near-term) contract.
24.4.1	synthetic weather derivative	A **synthetic weather derivative** is a set of derivative positions with returns that are substantially driven by weather conditions.
24.4.3	processing spreads	**Processing spreads** seek to take advantage of the relative price difference between a commodity and products the commodity can be used to produce.
24.4.3	crack spread	A **crack spread** is a processing spread that involves buying crude oil (in the spot or futures markets) while selling a combination of products derived from crude oil (heating oil and gasoline).
24.4.3	crush spreads	**Crush spreads** are a processing spread typically used as hedges by soybean processors, with its name derived from the physical crushing of soybeans into oil and meal.
24.4.5	substitution spreads	**Substitution spreads** are positions across commodities that can serve as alternatives for one another in terms of either production or consumption.
24.4.5	two types of commodity substitutes	There are **two types of commodity substitutes**: production substitutes and consumption substitutes.
24.4.6	quality spreads	**Quality spreads** are similar to substitution spreads, except that the spread is across different grades of the same commodity.
24.4.6	location spreads	**Location spreads** are trades that involve the same commodity but different delivery and storage locations.
24.4.6	correlation trade	**A correlation trade** is a trade that will have an outcome that is driven by the statistical correlation between two values.
24.4.7	storage strategies	**Storage strategies** seek to profit from changes in the benefits and costs of commodity storage and often use leased storage facilities to hold physical commodities for delivery at a later date, when the return on storing a commodity exceeds its costs.
24.4.7	transportation strategies	**Transportation strategies** use spot commodity markets to execute location trades by moving commodities when the benefits of price differentials exceed transportation costs.
24.5.0	carry trade	In its simplest form, a **carry trade** consists of being short one rate (e.g., borrowing in a low-interest-rate currency) and being long another rate (e.g., lending in a high-interest-rate currency) in an attempt to earn the spread without hedging the risk that the spread will change.
24.5.0	covered interest rate parity	**Covered interest rate parity** relates the spot and forward exchange rates to differences in short-term interest rates in the two currencies.
24.6.1	noise traders' risk	**Noise traders' risk** is performance dispersion caused by idiosyncratic trading.
24.6.1	synchronization risk	**Synchronization risk** arises when market participants are slow to react to increased divergence between two stocks, leading the portfolio manager to consider closing the positions because the convergence has not taken place during a specific period.
24.6.1	short-sale risk	**Short-sale risk** could arise if the investor is forced to cover the short positions at unattractive prices because either the shares have been called in by the lenders or there is a short squeeze.

24.6.3	monetary neutral	A portfolio that is **monetary neutral** has equal long and short exposures to a specified currency.
24.6.3	beta neutral	A **beta neutral** portfolio generates returns that are not linearly correlated with the market risk associated with the specified beta.
24.6.3	sector neutral	A **sector neutral** portfolio generates returns that are uncorrelated with economic sectors, including industries or industry groups.
25.1.1	depreciation tax shield	The **depreciation tax shield** is the prospective stream of reduced income taxation that a particular investor will experience as a result of being able to deduct depreciation.
25.1.1	discount rate for the depreciation tax shield	The **discount rate for the depreciation tax shield** should take into account the uncertainty of the investor having adequate future profits or other mechanisms of utilizing the taxation benefits of the depreciation and should exceed the riskless rate to the extent that the uncertainty exists.
25.1.2	recaptured depreciation	**Recaptured depreciation** is the amount of the accumulated depreciation taken on an asset between the purchase and sales date that is recovered by the sales price exceeding the purchase price.
25.3.2	stated rate of income tax	A **stated rate of income tax** is the statutory income tax rate applied to reported income each period. The stated tax rate can differ from the effective tax rate.
25.3.2	effective tax rate	The **effective tax rate** is the actual reduction in value that occurs in practice when other aspects of taxation are included in the analysis, such as exemptions, penalties, and timing of cash flows.
25.3.2	first principle of depreciation and returns	The **first principle of depreciation and returns**: When accounting depreciation either is not allowed for tax purposes or is allowed at a rate that is slower than the true economic depreciation, the after-tax IRR will be less than the pre-tax IRR reduced by the tax rate.
25.3.3	second principle of depreciation and returns	The **second principle of depreciation and returns**: When depreciation for tax accounting purposes matches true economic depreciation in timing, the after-tax return generally equals the pre-tax return reduced by the stated income tax rate.
25.3.4	accelerated depreciation	**Accelerated depreciation** is when accounting depreciation for tax purposes writes off the value of an asset more quickly than it is actually declining in market value.
25.3.4	third principle of depreciation and returns	The **third principle of depreciation and returns**: When depreciation for tax accounting purposes is accelerated in time relative to true economic depreciation, the after-tax return generally exceeds the pre-tax return reduced by the stated income tax rate.
25.3.5	fourth principle of depreciation and returns	The **fourth principle of depreciation and returns**: When all investment outlays can be fully and instantly expensed for tax accounting purposes, the after-tax return generally equals the pre-tax return.
25.4.0	transaction-based real estate indices	**Transaction-based real estate indices** are estimated based on actual contemporaneous property sales of sample properties that trade in each period.
25.4.0	main problems of transaction-based indices	The **main problems of transaction-based indices** are that each individual property is unique and each individual property is sold infrequently and at erratic time intervals.
25.4.1	repeat-sales method (RSM)	The **repeat-sales method (RSM)** regresses the percentage price changes observed in properties on a sequence of time-dummy variables.
25.5.1	hedonic pricing method (HPM)	The **hedonic pricing method (HPM)** assumes that each of these attributes has its own market price. Examples of these attributes include the number of rooms, the size of the lot, the number of bathrooms, and so on.

25.7.0	appraisal-based indices	**Appraisal-based indices** are derived from the asset values estimated by appraisers, which may track a particular subpopulation.
25.7.1	sales comparison approach	The **sales comparison approach**, in which a real estate asset is evaluated against those of comparable (substitute) properties that have recently been sold.
25.7.1	cost approach	The **cost approach**, which assumes that a buyer will not pay more for a property than it would cost to build an equivalent one.
25.7.1	income approach	The **income approach**, which is similar to the discounted cash flow method used for valuing stocks and bonds.
25.8.1	purely random error or noise	The **purely random error or noise** arises because of the structure of the real estate market, where transactions involve negotiations between two parties and the resulting transaction price is one value from a range of prices that could have resulted from those negotiations.
25.8.1	temporal lag bias	**Temporal lag bias** arises when transaction prices are related to past prices because of the structure of the market.
25.8.1	reservation price	The **reservation price** is the lowest price at which a potential seller is willing to sell a property, or the highest price a potential buyer is willing to pay for a property.
25.8.1	transaction price noise	The **transaction price noise** or **transaction price error** is the difference between any given price observation and the unobservable true market value.
25.8.1	transaction price error	The **transaction price noise** or **transaction price error** is the difference between any given price observation and the unobservable true market value.
25.8.2	appraisal error	The **appraisal error** is difference between a particular empirical appraised value and the unobservable true market value.
26.1.0	hedge fund replication products	Fundamentally, **hedge fund replication products** (also called clones or trackers) are created to capture the traditional and alternative betas underlying the expected return and risk of a hedge fund benchmark.
26.1.0	alternative betas	**Alternative betas** refer to exposures to risk, risk premiums, and sources of return that are not normally available through investments in traditional assets—or, if they are available, are commonly bundled with other risks.
26.1.0	algorithmic factor replication approach	The **algorithmic factor replication approach** (i.e., the bottom-up approach) attempts to trade the underlying securities in a manner consistent with the trading approach taken by most active managers within a particular strategy.
26.3.2	fund bubble hypothesis	The **fund bubble hypothesis** assumes that successful hedge fund managers can earn substantially greater returns than successful fund managers in the traditional space but that bubbles cause inferior managers to dilute overall industry performance.
26.3.2	capacity constraint hypothesis	The **capacity constraint hypothesis** argues that most alpha is a zero-sum game and that increased supply of managers pursuing alpha dilutes superior performance.
26.3.2	increased allocation to active funds hypothesis	The **increased allocation to active funds hypothesis** argues that as hedge fund investment becomes more popular, the risk-adjusted performance of hedge funds will be adversely affected by the trading decisions of investors who have allocations to both these funds and traditional assets.
26.5.0	underlying assumption of the factor-based replication approach	The **underlying assumption of the factor-based replication approach** is that a substantial portion of a fund's returns can be explained by a set of asset-based factors such that construction of a portfolio composed of long and/or short positions in a set of

		suitably selected risk factors can minimize the tracking error with respect to a predefined benchmark.
26.5.3	view commonality	**View commonality** refers to the fact that when the views of individual hedge fund managers (measured by their exposures) are aggregated in a hedge fund index, they tend to cluster into common themes that drive the overall performance of the index.
26.5.3	exposure inertia	**Exposure inertia** asserts that the overall weights of an index consisting of actively managed portfolios can be empirically estimated because the overall exposures change relatively slowly through time.
26.5.5	payoff-distribution approach	The **payoff-distribution approach** to replication aims to produce a return distribution that matches a desired distribution (e.g., that of the benchmark).
26.6.0	algorithmic approach	The **algorithmic approach** does not rely on a predefined benchmark; it involves implementing a simplified version of the actual trading strategy employed by funds that follow the particular strategy.
27.3.2	diversified funds of hedge funds	**Diversified funds of hedge funds** attempt to diversify a portfolio by allocating assets to a larger number of hedge funds (typically 30 to 50) that follow different strategies and are generally expected to have returns that have low correlations with one another.
27.3.2	concentrated funds of hedge funds	**Concentrated funds of hedge funds** typically allocate assets to a relatively small number of hedge funds compared to diversified fund of hedge funds (typically 5 to 10).
27.3.2	single-strategy funds of hedge funds	**Single-strategy funds of hedge funds** allocate assets across several hedge funds (typically 5 to 15) following the same strategy, theme, or group of strategies.
27.3.2	tactical funds of hedge funds	**Tactical funds of hedge funds** invest in a group of hedge funds (typically 5 to 10) to opportunistically gain exposure to a specific market factor.
28.1.1	open-end real estate funds	**Open-end real estate funds** allow investments and redemptions (usually after an initial lockup period) at any time, have an indefinite life, and can cause performance problems due to using stale redemption prices.
28.1.1	property unit trusts (PUTs)	**Property unit trusts (PUTs)** are the main open-end investment product used by pension funds and insurance funds in the UK to obtain a diversified exposure to the UK real estate market.
28.1.1	unauthorized PUTs	**Unauthorized PUTs** are unregulated unit trusts that may be offered only to institutional investors in the UK.
28.1.1	authorized PUTs (APUTs)	**Authorized PUTs (APUTs)** are issued in the UK and are intended mainly for retail investors and offer exemption from capital gains tax on disposals of investments in the fund.
28.1.1	property authorized investment funds (PAIFs)	**Property authorized investment funds (PAIFs)** are investment vehicles authorized by the UK's Financial Conduct Authority that can invest in real estate directly or indirectly (mainly though shares in UK REITs).
28.1.2	closed-end real estate funds	**Closed-end real estate funds** issue an initial number of shares to investors before any real estate investments are made and are unlisted, have a specific investment period (e.g., three years) and fund-termination period (e.g., four to six years before the termination period concludes), at which time the fund must distribute all cash flows to investors.

28.1.2	matched-bargain system	A **matched-bargain system** for trading securities functions by matching buy offers directly with sell offers rather than involving a market-maker who can provide liquidity.
28.1.2	tax-transparent investment vehicle	A **tax-transparent investment vehicle** is non-taxable and simply flows through all accounting information to its investors.
28.1.2	closed-end real estate mutual funds (CEMFs)	The closed-end real estate funds just described should not be confused with **closed-end real estate *mutual* funds (CEMFs)**, which are exchange-traded mutual funds that have a fixed number of shares outstanding and that represent only a small portion of the listed real estate industry.
28.1.3	real estate funds of funds	**Real estate funds of funds** invest in other real estate funds rather than investing directly in real estate assets.
28.1.4	non-traded REITs	**Non-traded REITs** were created in the United States in 1990, and even though they are registered with the Securities and Exchange Commission as public companies, their shares are not available on an exchange and are thus essentially illiquid (and therefore difficult to value).
28.1.4	life cycle of a non-traded REIT	The **life cycle of a non-traded REIT** has four distinct phases, although in practice some of the phases may overlap to some extent. The first phase is the capital-raising stage. Usually no additional new capital is available after this initial stage ends. In the second phase, the REIT acquires its portfolio of properties with the capital raised in the initial phase. In the third phase, the REIT manages the assets it owns, attempting to generate positive cash flows and to increase value (this is the asset management phase). The final stage is known as the disposition phase. During this stage, an exit strategy is executed to return the investors' original investment and any capital gains or losses that may result from the liquidity event.
28.1.4	three main criticisms of non-listed REITs	The **three main criticisms of non-listed REITs** are: (1) their illiquid nature may give investors a misleading sense of low return volatility, (2) they command high fees, and often involve significant conflicts of interests, and (3) they often use leverage to fund current dividend payments, a practice that may divert attention from their potential inability to generate future dividends.
28.2.1	real estate operating company (ROEC)	A **real estate operating company (REOC)** is similar to a REIT, except that a REOC reinvests its earnings into the business rather than passing them along to shareholders (and hence they do not get the same tax advantage enjoyed by investors in REITs).
28.3.0	return to commodity beta	The **return to commodity beta** may be defined as the return from direct exposure to changes in commodity prices, which result from holding a passive long position in a commodity.
28.3.2	indirect commodity investments	The most common method of obtaining commodity exposure is through synthetic or **indirect commodity investments** involving equity, fixed income, and derivative instruments.
28.3.3	commodity index swap	A **commodity index swap** is an exchange of two cash flows in which one of the cash flows is based on the price of a specific commodity or a commodity index, whereas the other cash flow is fixed.
28.3.8	commodity exchange-traded note	A **commodity exchange-traded note** (ETN) is a debt instrument that is traded on an exchange but is different from an ETF; instead of being a share in an actual portfolio of assets, the ETN is a note issued by a financial institution that promises to pay ETN holders the return on some index over a certain period of time, and then return the principal of the investment at maturity.

28.3.8	prepaid forward contracts	**Prepaid forward contracts** are fully collateralized forward contracts for delivery.
28.3.8	commodity index-linked note	A **commodity index-linked note** is a debt instrument that pays a return linked to the performance of a commodity (e.g., natural gas or aluminum) or a basket of commodities over a defined period
28.5.2	leveraged note	A **leveraged note** is an indexed note that offers leveraged exposure (e.g., 3×) to a specified commodity index.
28.5.3	principal-guaranteed commodity notes	**Principal-guaranteed commodity notes** are structured products that offer investors the upside opportunity to profit if commodity prices rise, combined with a downside guarantee that some, potentially all (depending on the note's terms), of the principal amount will be returned at the maturity of the structure.
28.5.3	cash-and-call strategy or participation note	The first structure, and the most common, is the **cash-and-call strategy or participation note**, in which the principal guarantee comes from the issuer purchasing maturity- and principal-matched zero-coupon bonds, while the commodity-linked upside exposure comes through the issuer purchasing call options.
28.5.3	constant proportion portfolio insurnace (CPPI)	The second, less common, structure for principal-guaranteed notes is a dynamic strategy, or **constant proportion portfolio insurance (CPPI)**, which varies the size of the commodity investment based on the cost of insuring the principal guarantee.
29.1.1	market clientele	In finance, a **market clientele** is a general type of market participant that dominates a particular market.
29.2.0	three ILPA guiding principles	There are **three ILPA guiding principles**: (1) alignment of interest, (2) governance, and (3) transparency.
29.3.0	most favored nation status	**Most favored nation status** is a term from international trade that is used in private partnership negotiations to refer to the negotiated right of an LP to be treated with any and all benefits being offered to any other LP.
29.3.0	use of name clauses	**Use of name clauses** in a side-letter provide limits to the disclosure of the identity of LPs by the sponsor to provide LPs with anonymity (subject to limits imposed on the sponsor such as requirements to disclose LP identities in reporting to regulators or other government authorities).
29.3.0	excuse rights	**Excuse rights** potentially allow LPs to opt-out of particular investments in the main fund with three main areas for negotiation of excuse rights: (1) legal requirements (based on jurisdictions), (2) LP internal policy requirements (e.g., ESG), and (3) religious (e.g., *Shari'ah*).
29.4.0	blind pool equity fund	A **blind pool equity fund** aggregates capital obtained from its partners into a single fund (i.e., the main fund) that has a stated investment mandate but that generally does not involve limited partners in deal sourcing.
29.4.1	co-investment	**Co-investment** refers to the practice of investors being invited by the sponsors of private equity funds (typically GPs) to make investments into one or more pre-specified portfolio companies using structures other than a main private equity fund.
29.4.1	three alternative co-investing structures	**Three alternative co-investing structures** involve: (1) the LP invests directly into one or more of the portfolio companies of the main fund, (2) one or more LPs use a GP-controlled fund created apart from the main fund for the purposes of investing in one or more of the same portfolio companies selected for the main fund, and (3) making investments in co-investment programs in which the specific investments are identified and decisions of whether to co-invest are made on an ongoing and deal-by-deal basis.

29.4.1	top-up fund	A **top-up fund** is used to co-invest in one or more future investments of the main fund.
29.4.1	annex fund	An **annex fund** is used to co-invest in one or more pre-existing investments.
29.4.1	lock-step provision	A **lock-step provision** in a co-investment agreement specifies that the terms and conditions of the co-investor-GP relationship is the same as the terms and conditions of the LP-GP relationship.
29.4.1	bridging	In the context of private equity financing, **bridging** is when the GP makes an investment in the main fund while agreeing to sell that investment at a subsequent time to co-investors such that co-investors receive bridge-financing from the main fund between the time the investment is made and the time that the co-investor(s) takes ownership. Side letters are detailed in Section 29.3.
29.4.1	promote	In the context of private equity, **promote** is a fee based on profits that is similar to carried interest but is typically associated with more specific duties such as the creation and marketing of a specific investment opportunity.
29.5.3	overcommitment	An **overcommitment** is a pledge to invest more in funds than the investor has currently available as resources. The purpose is to increase private investments and avoid idle cash.
29.5.3	overcommitment strategy	In an **overcommitment strategy,** future anticipated distributions (or other anticipated cash inflows) are forecast as being available to honor the capital calls to new funds.
29.5.3	commitment risk	**Commitment risk** describes the situation in which an LP may become a defaulting investor if the proceeds from exiting funds are not sufficient to pay the capital calls of newly committed funds.
29.5.4	funding risk	**Funding risk**, also referred to as default risk within the private equity industry, is the risk that an investor will not be able to meet capital commitments to a private equity fund in accordance with the terms of its obligation to do so.
29.5.7	optimal overcommitment ratio	The **optimal overcommitment ratio** is the level of the overcommitment ratio that minimizes the sum of two discounted expected costs: (1) the opportunity cost of idle capital from excess liquidity, and (2) the costs of adverse events from inadequate liquidity including lost investment opportunities and forced liquidations.
29.6.0	secondary private equity market transactions	**Secondary private equity market transactions** refer to the buying and selling of pre-existing limited partnership interests in private equity and other alternative investment funds.
29.6.1	advantages of secondary market PE purchases	The potential **advantages of secondary market PE purchases** are: (1) the potential discount at which a transaction may take place, (2) the shorter period during which the invested capital is locked in and management fees are paid, and (3) the portfolio diversification properties of secondaries.
29.6.1	synthetic secondaries	In such **synthetic secondaries**, portfolio companies are packaged up and sold to another manager, usually with the backing of a secondary fund specialist.
29.6.4	denominator effect	This so-called **denominator effect** usually arises in periods of financial stress, when prices of marketable instruments decline much faster than valuations of illiquid investments, resulting in a higher-than-targeted share of the latter.
29.6.7	exit value	**Exit value** refers to the price that the fund can receive when portfolio companies are sold through initial public offerings (IPOs) or strategic sales

30.1.0	asset illiquidity	In the context of a position in an asset or a portfolio of assets, **asset illiquidity** refers to the difficulty of closing a position on a timely basis at a price that is minimally affected by the urgency with which the position is closed.
30.1.0	illiquidity of assets	The **illiquidity of assets** can be viewed in two primary ways: the amount of *time* required to close a position at a price that is not affected by matters of urgency, or the amount of lost *value* from closing a position with urgency rather than with patience.
30.1.2	on-the-run issue	An **on-the-run issue** is the most recently issued Treasury security or other asset that is regularly issued with a given maturity.
30.3.5	subscription-secured line of credit (SLOC)	In the case of a private equity fund, a **subscription-secured line of credit (SLOC)** is a borrowing facility that is collateralized with the capital commitments to the fund from its investors.
30.4.0	distribution to paid-in (DPI) ratio	The **distribution to paid-in (DPI) ratio**, or realized return, is the ratio of the cumulative distribution to investors to the total capital drawn from investors.
30.4.0	residual value to paid-in (RVPI) ratio	The **residual value to paid-in (RVPI) ratio**, or unrealized return, is the ratio of the total value of the unrealized investments (as measured by NAV) to the total capital drawn from investors during the previous time periods.
30.4.0	total value to paid-in (TVPI) ratio	The **total value to paid-in (TVPI) ratio** is a measure of the cumulative distribution to investors plus the total value of the unrealized investments relative to the total capital drawn from investors.
30.4.2	PME ratio	An important ratio based on the PME approach is the **PME ratio**, which uses future values calculated by compounding cash flows forward through time using the annual returns of a public market index and then adding in the NAV at time T to form a ratio of value received to value paid out.
30.5.2	commitment-weighted IRR	The **commitment-weighted IRR** is an average calculated by weighting the rates of return by commitment.
30.5.3	pooled IRR or IIRR	The **pooled IRR or IIRR** is a measure that attempts to capture investment timing and scale, and is calculated by estimating all actual and projected cash flows, aggregating them, and treating all funds as if they were one composite fund.
30.5.4	time-zero based pooling (or time-zero pooling)	**Time-zero based pooling** (or **time-zero pooling**) is the process of pooling or summing cash flows across funds of different vintages by treating the funds as if they all started on the same date.
30.6.0	three key empirical findings regarding PE fund performance	The **three key empirical findings regarding PE fund performance** are: (1) Venture capital fund performance tended to exceed that of buyout funds, (2) Private equity out-performance and performance persistence have generally been lower in more recent years (e.g., since 2000) than in early years (e.g., prior to 2000), and (3) Risk-adjustment of returns and netting of fees tended to lower private equity performance to unattractive levels except for venture capital returns in earlier years and especially for those investors who enjoyed an "early mover advantage" and access to the best managers.
31.2.0	Fundamental Law of Active Management (FLOAM)	The **Fundamental Law of Active Management (FLOAM)**, explained by Grinold (1989), expresses the risk-adjusted value added by an active portfolio manager as a function of the manager's skill to forecast asset returns and the number of markets to which the manager's skill can be applied (breadth).
31.2.1	information ratio	The **information ratio** (IR) is equal to the ratio of the manager's estimated alpha (i.e., risk-adjusted expected outperformance) divided by the estimated volatility of that alpha.

31.2.1	information coefficient	The **information coefficient** (IC) is a measure of the manager's skill, and represents the correlation between the manager's forecast of asset returns and the actual returns to those assets.
31.2.1	breadth	The **breadth** (BR) is the number of independent forecasts (or "bets") that the manager can skillfully make during a given period of time (e.g., one year).
31.2.2	transfer coefficient	The **transfer coefficient** (TC): (1) measures the ability of the manager to implement her recommendations, (2) has an upper limit of one and a lower limit of zero, and (3) indicates the correlation between the forecasted active returns and the active weights.
31.3.1	foregone loss carryforward	The **forgone loss carryforward** of a fund with incentive fees is an opportunity cost potentially borne by every investor in a fund with an asymmetric incentive fee structure that arises from the inability to recapture incentive fees.
31.4.4	unconditional empirical analysis approach to asset allocation	An **unconditional empirical analysis approach to asset allocation** uses the historic means and volatilities (and correlations) within an SAA approach to form asset weights without regard to the current condition of the economy and markets.
31.4.5	conditional empirical analysis approach to asset allocation	A **conditional empirical analysis approach to asset allocation** uses the current condition of the economy and markets (along with empirical measures such as means, volatilities, and correlations) within a TAA approach to form asset weights (tactical weights) that change with current conditions.
31.6.6	exit timing	**Exit timing** refers to the period during which portfolio companies are expected to be sold and exit values are realized.
32.2.2	consequence of adverse selection in PE funds	The **consequence of adverse selection in PE funds** is the higher probability that both unproven GPs and inexperienced LPs will form relationships with each other, both will underperform and both may eventually exit the market.
32.2.3	GP-LP lifecycle	The **GP–LP lifecycle** can be divided into three phases: (1) entry and establish (the phase involving the GP's initial funds); (2) build and harvest (or grow and compete, the phase in which the GP's funds thrive and grow); and (3) decline (lost competition), exit (gave up or made it), or transition to new managers (spinouts).
32.2.3	transition matrix	A **transition matrix** is a square matrix that denotes the frequency (or probability) of subsequent outcomes based on prior outcomes.
32.2.4	entry and establish phase	During the **entry and establish phase**, substantial entry barriers into the PE market exist for both GPs and LPs and, lacking a verifiable track record, new teams find it difficult to raise their first fund.
32.2.5	build and harvest phase	The **build and harvest phase** of PE funds is when the size of the investments tend to grow, the profitability of the investments is strong and both the GPs and LPs receive the greatest rewards.
32.3.0	fund performance persistence	**Fund performance persistence** refers to the tendency of a fund's under- or over-performance in one time period to be likely to be followed be similar under- or over-performance.
32.3.1	fund performance persistence hypothesis	The **fund performance persistence hypothesis** is the proposition that fund managers generate returns that contradict the weak-form efficient markets hypothesis by offering excess returns in two or more non-overlapping time periods that exhibit statistically significant correlation.
32.3.1	gatekeepers	**Gatekeepers** are professional advisers operating in the PE market on behalf of their clients: in particular, consultants and account managers, funds of funds, and placement agents.

32.4.0	adverse selection within funds	**Adverse selection within funds** takes place before a transaction is completed, when the decisions made by one party (e.g., a GP or LP) cause less desirable parties to be attracted to the transaction.
32.4.0	holdup problem	In economics, the **holdup problem** is a situation in which two parties (in the case of private equity, a GP and an LP) refrain from cooperating due to concerns that they might give the other party increased bargaining power and thereby reduce their own profits.
32.5.0	fund screening process	The **fund screening process** involves reducing the universe of potential investments into a much smaller subset on which full due diligence can be performed.
32.5.3	investment process risk	**Investment process risk** is the potential loss from failure to properly execute the stated investment strategy.
32.5.4	information gathering	**Information gathering** indicates the ability of the manager to create access to information or to have access to better information than do other managers.
32.5.4	information filtering	**Information filtering** is the fund manager's ability to use data available to others but to be better able to glean tradable insights from it.
32.6.1	herd behavior	**Herd behavior** is the extent to which people are overly eager to adopt beliefs that conform to those of their peers.
32.6.1	bias blind spot	Leading these biases is the **bias blind spot**, which is people's tendency to underestimate the extent to which they possess biases.
32.6.5	expectation bias	**Expectation bias** is synonymous with confirmation bias and is a tendency to overweight those findings that most agree with one's prior beliefs.
32.6.5	gaming	In the context of investment management, **gaming** is investment activity driven by a desire to generate favorable statistical measures of performance rather than to benefit investors.
32.7.2	blue-chip management team	A **blue-chip management team** is a team that has been able to generate a top-quartile performance for all of its funds through at least two business cycles (i.e., a sequence of more than three funds).
32.7.2	established management team	An **established management team** is a team that has been able to generate a top-quartile performance for most of its funds (more than three funds) through at least two business cycles.
32.7.2	emerging management team	An **emerging management team** is a team with limited joint history but with all the characteristics to become an established team.
32.7.2	reemerging management team	A **reemerging management team** is a previously blue-chip or established team that has been through a restructuring following recent poor performance or some significant operational issues and has regained the potential to reemerge as an established or a blue-chip team.
32.7.3	reactive deal sourcing	**Reactive deal sourcing**, in which investors evaluate a portion of the large number of general partners who contact them to ask for an investment, is not an efficient way of approaching selection.
32.8.0	fund culture	**Fund culture** refers to the principles, professionalism, ethics, character, and governance exhibited by and integrated within fund management.
33.0.0	fund due diligence	In the context of investing, **fund due diligence** is the process of performing a review of an investment fund with an appropriate level of competence, care, and thoroughness.
33.1.1	desk review	An onsite visit is considered to be part of best practices, although due diligence without an onsite visit, called a **desk review**, is sometimes used.

33.1.3	business activities	**Business activities** include the indirect support of the investment activities of the fund, including all of the normal activities of running any similarly sized organization, such as human resources management, technology, infrastructure, and facility maintenance.
33.2.0	investment strategy or mandate of a fund	The **investment strategy or mandate of a fund** refers to the sets of objectives, principles, techniques, and procedures the fund uses to construct and modify its portfolio.
33.2.2	stated investment strategy of a fund	The **stated investment strategy of a fund** is the investment strategy that a diligent investor would expect the fund to pursue, based on a reasonable analysis of information made available by the fund.
33.2.6	fund capacity	**Fund capacity** refers to the maximum amount of assets under management that allows the fund manager to implement the investment strategy effectively.
33.3.0	investment process	The **investment process** includes the methods a manager uses to formulate, execute, and monitor investment decisions, and spans the range of investment activities including: the design and revision of the investment strategy, sourcing of ideas, determination of transactions, setting of leverage, and the placing, execution and allocation of trades.
33.3.2	investment process risk	**Investment process risk** is economic dispersion caused by imperfect application of the decisions, activities, policies, and procedures within the front office and resulting errors or purposeful decisions that result in exposures that are inconsistent with the investment mandate, such as inappropriate levels of leverage and inappropriate levels or types of asset risk.
33.4.1	custody	**Custody** refers to the holding of assets by a financial institution for the benefit of a customer.
33.4.1	position-level transparency	**Position-level transparency** in the context of funds refers to regular, prompt, and detailed disclosure by the fund manager of the fund's securities holdings and the ability of the fund advisers or investors to see the exact positions underlying their funds and the values as reported by the custodian.
33.4.6	mark to model	**Mark to model** means the use of valuation models to estimate the likely prices at which illiquid securities would transact.
33.4.6	level 1 assets	**Level 1 assets** are those assets that can be valued based on an unadjusted market price quote from an actively traded market of identical assets.
33.4.6	level 2 assets	**Level 2 assets** are best valued based on nonactive market price quotes, active market price quotes for similar assets, or non-quoted values based on observable inputs that can be corroborated.
33.4.6	level 3 assets	**Level 3 assets** are valued based on the estimated fair values for assets that are subject to the greatest uncertainty and may be valued based on models with ambiguous inputs such as volatility.
33.5.0	portfolio information aggregators (risk aggregators)	**Portfolio information aggregators (risk aggregators)** are third-party service providers who collect and process information from various private investments to report and assess the combined risks to investment advisers.
33.5.3	bias ratio	The **bias ratio** attempts to indicate when returns have been manipulated and thus do not exhibit a distribution consistent with competitive markets.
33.6.2	synergistic risk effect	A **synergistic risk effect** is the potential for the combination of two or more risks to have a greater total risk than the sum of the individual risks.

33.6.2	chief risk officer (CRO)	The **chief risk officer (CRO)** oversees the fund manager's program for identifying, measuring, monitoring, and managing risk.
34.0.0	operational due diligence (ODD)	**Operational due diligence (ODD)** refers to the process of evaluating operational risk to ensure that investors will not be subject to financial or reputational risks of investing in funds (or the applicable fund advisors) that may experience losses and/or suspend redemptions for noninvestment reasons.
34.1.0	operational risk of a fund	The **operational risk of a fund** may be viewed as having three sources: operational errors, agency conflicts, and operational fraud.
34.1.1	rogue trader	An extreme example of a conflict of interest is a **rogue trader** who intentionally departs from the investment mandate due to incentives to generate performance or to recoup losses that jeopardize a trader's career.
34.1.1	operational fraud	**Operational fraud** from the perspective of an investor is any intentional, self-serving, deceptive behavior in the operational activities of a fund that is generally harmful to the investor.
34.1.6	tasks of portfolio management	Trading and risk management are **tasks of portfolio management** that should be performed by different people to have the optimal reduction in operational risk.
34.2.1	trade execution	**Trade execution** refers to the process by which a fund completes a securities trade. In practice, after the decision has been made to trade, an execution process commonly begins.
34.2.1	trade blotter	The running list of all trades desired and completed during each trading day is commonly referred to as a **trade blotter**.
34.2.2	posting	**Posting** is a term commonly used to refer to the process by which trades are logged internally at a fund, whether through order management or through fund accounting systems.
34.2.2	internal settlement	**Internal settlement** refers to the firm's or fund's process of reconciling third-party trade confirmations for executed trades with its internal systems and trade blotters, and transferring the cash and securities to complete the trade.
34.2.3	trade allocation	**Trade allocation** refers to the process by which trades are divided among the firm's various funds and/or accounts with best practice for a fund to maintain a pre-determined trade allocation policy that does not favor one of the firm's funds or accounts at the expense of another.
34.2.4	pro rata allocation	**Pro rata allocation** is a common allocation method by which a firm allots shares in the securities purchased to different funds and accounts based on predetermined proportionate amounts, such as assets under management, or a fund's predetermined target allocation size.
34.2.4	reconciliation	**Reconciliation** refers to the process by which a fund conducts another internal review to ensure that the internal details of the trade (buy/sell, security description, trade size, and price) are accurately matched with the details provided by the fund's counterparties.
34.2.4	two-way reconciliation	A **two-way reconciliation** is a reconciliation between the fund's trading records and the prime broker.
34.2.4	three-way reconciliation (or triangular reconciliation)	A **three-way reconciliation (or triangular reconciliation)** is performed between the trading counterparties, the fund itself, and the administrator.
34.2.4	trade break	The timing of the completion of the reconciliation process depends on a number of factors, including whether a trade anticipated by the fund failed to execute, which is commonly known as a trade break.

34.2.4	T+1 basis	For liquid securities, most reconciliations are typically completed on what is known as a **T+1 basis**, which means that one business day after the trade date—referred to as T— the trade would be reconciled.
34.3.4	subscriptions and redemptions	The third primary category of fund cash relates to cash used to process capital inflows and outflows, which are also called **subscriptions and redemptions**, respectively.
34.3.5	unencumbered cash	The fourth primary category of fund cash relates to cash that is not currently being used for trading but may be used in the future for either trading or another purpose; this type of cash is referred to **unencumbered cash**.
34.4.1	fund prime brokers	**Fund prime brokers** are institutions that facilitate fund trading by aggregating a portion, or all, of a fund's cash and securities as well as providing services for leverage and short selling.
34.4.2	valuation agent	In cases in which the manager directly prices a large portion of a fund's holdings, it is considered best practice for the fund to engage a third party, known as a **valuation agent**, to conduct an independent valuation of these positions.
34.4.2	net asset value (NAV)	Fund administrators help produce the fund's **net asset value (NAV)**, which is the value of the fund after liabilities have been subtracted and is used in the production of investor statements to report the value of investors' holdings in the fund at different points in time and to calculate fees, redemptions, and subscriptions.
34.4.2	cutting the NAV	After the administrator and the fund are both satisfied with the valuations obtained for a fund during a particular period (e.g., monthly), a final NAV is agreed on, which is known as **cutting the NAV**.
34.4.4	equity ownership model	Under the **equity ownership model** approach, an investigation would be performed on all personnel who have equity ownership in the management company of the fund organization.
34.4.4	investment decision-making authority model	The **investment decision-making authority model** approach focuses on performing background investigations on those individuals who have authority to make investment decisions and act (i.e., trade) on such decisions.
34.4.4	risk control model	Under the **risk control model** approach, background investigations are performed on all individuals, both investment and noninvestment focused, who control risk within an organization.
34.4.7	asset verification	**Asset verification** refers to the process by which an investor independently confirms a fund's level of asset holdings with third parties, such as fund administrators, prime brokers, and banks.
34.5.0	four areas commonly overseen by the compliance department	The **four areas commonly overseen by the compliance department** are: (1) Initial and ongoing personnel training on compliance-related matters, (2) Testing of the implementation of compliance policies, and (3) Monitoring and managing conflicts of interest and (4) ensuring adherence with regulatory requirements in the jurisdictions in which the firm operates.
34.5.1	personal account dealing	A key fund compliance policy, which is known as **personal account dealing**, relates to the trading of securities by employees of the firm for their own accounts.
34.5.1	front running	One of the key concerns is **front running**, or trading ahead, in which employees or others attempt to trade for their own accounts in advance of the firm's trading for client accounts.
34.5.1	covered securities	The majority of personal trading procedures specify a list of securities, known as **covered securities**, which are securities

		commonly held in client accounts and to which the policies apply.
34.5.2	pre-clearance	**Pre-clearance** of personal account trades is a process by which employees must seek approval from compliance before executing a trade.
34.5.2	post-clearance	**Post-clearance** refers to the process by which the compliance department collects employee brokerage statements and then attempts to reconcile them to pre-clearance requests.
34.5.2	restricted list	A **restricted list** is a list of securities that the firm has prohibited employees from trading because the firm has received material nonpublic information regarding a particular security, which is commonly referred to as being *conflicted out of a security*.
34.5.2	blackout periods	**Blackout periods** are common practice in situations where employees are able to trade names within firm portfolios, whereby employees cannot trade these securities within a specified number of days before or after a portfolio trades that security.
34.5.2	minimum holding periods	**Minimum holding periods** are requirements that prohibit an employee from purchasing a security and then selling it within a predefined period of time and have the goal of preventing employees from actively trading in their personal accounts.
34.5.2	maximum number of trades	**Maximum number of trades** in a given time frame may also be imposed to avoid individuals from trading excessively.
34.5.2	hardship exemption procedure	In certain cases, funds may employ a **hardship exemption procedure**, wherein an employee is allowed, with permission, to sell a security, especially at a loss, even if it is within the minimum holding period.
34.5.3	expert networks	**Expert networks** are comprised of professionals and academics from various disciplines and industries that provide advice and consultations to funds conducting research, but in some cases have been found to use currently employed or recently retired employees from publicly-traded companies to obtain MNPI.
34.8.1	operational scalability	**Operational scalability** refers to the firm's ability to build on existing systems in order to continue to support growth in an organized manner, including via the addition of new resources, without material disruption.
34.8.3	meta risks	In 2008, a report of the Investors' Committee of the President's Working Group on Financial Markets titled "Principles and Best Practices for Fund Investors" references the concept of **meta risks**, which are defined as "the qualitative risks beyond explicit measurable financial risks.
34.9.1	dedicated operational due diligence approach	A **dedicated operational due diligence approach** is an ODD framework in which an investment organization has at least one employee whose full-time responsibility is vetting the operational risks of fund managers.
34.9.1	shared operational due diligence approach	A **shared operational due diligence approach** is a framework in which the responsibility for ODD is shared by multiple individuals who have responsibility for investment due diligence but in which no full-time, dedicated ODD staff are employed.
34.9.1	modular operational due diligence approach	A **modular operational due diligence approach** is one whereby the ODD process is classified into functional components and divided among specialists with relevant domain-specific knowledge.
34.9.1	hybrid operational due diligence approach	A **hybrid operational due diligence approach** refers to some combination of the dedicated, shared, and modular approaches.

34.9.3	operational decision	An **operational decision** by an investor, or investment organization, can typically result in a number of common allocation conclusions (no investment, reduced allocation, or originally anticipated investment) .
34.9.3	factor weighting in the context of ODD	**Factor weighting in the context of ODD** refers to the importance (i.e., weight) that individual investors give to different operational risk considerations when coming to an overall operational decision.
34.9.3	operational benchmarking	**Operational benchmarking** is the process of comparing operational best practices to the actual procedures in place at a fund.
34.9.3	operational threshold issue	In some cases the issue of self-administration would be referred to as an **operational threshold issue**, meaning that it is an issue that must be satisfied in order to have a particular investor continue to consider allocating to a particular fund.
35.1.0	operational risk profile	An **operational risk profile** is an outline or summary of potential losses or other exposures of a fund due to errors or failures within the fund's functions other than those purely attributable to the fund's investment strategy.
35.2.0	fund governance	**Fund governance** is the interconnected system of controls and procedures that determine oversight, independence, and transparency throughout the fund.
35.2.1	five common operational fund committees	There are **five common operational fund committees**: 1. Operations committee, 2. Valuation committee, 3. Business continuity and disaster recovery committee, 4. Best execution committee and 5. Compliance committee.
35.2.2	fund's board of directors	The **fund's board of directors** is a group of individuals who are responsible for fulfilling regulatory obligations, exercising legal rights, and providing limited independent oversight of funds.
35.2.2	common duties of fund board members	**Common duties of fund board members** include these six: 1. Overseeing the enforcement of any redemption gates, 2. Reviewing and approving the audited financial statements of a fund, 3. Approving amendments to legal documentation, 4. Approving the fund manager's use of certain mechanisms or altering the original terms of the mechanisms, 5. Reviewing fund manager valuations and overseeing the enforcement of valuation practices and procedures, and 6. Reviewing the ongoing performance of fund service providers and approving new fund service provider appointments.
35.2.2	audit holdback	An **audit holdback** is a mechanism by which a fund manager retains a portion of an investor's redeemed capital until the finalization of a fund's audit to provide a capital buffer to the fund manager should the final financial figures be different from expectations.
35.2.3	limited partnership agreement (LPA)	The law and the **limited partnership agreement (LPA)** define and restrict the degree of control LPs have over the activities of GPs, relating, for example, to waiving or accepting investment restrictions, extending the investment period or fund duration, handling key-person-related issues, or participating in an LP advisory committee.
35.2.3	LP advisory committee	An **LP advisory committee** (LPAC) has responsibilities that are defined in the LPA and normally relate to dealing with conflicts of interest, reviewing valuation methodologies, and any other consents predefined in the LPA.
35.2.3	qualified majority	A **qualified majority** is generally more than 75% of LPs rather than the 50% required for a simple majority.

35.3.0	structural review	The **structural review** is a key part of the due diligence process and involves analysis of the organization of the fund, the organization of the fund manager, registrations, and outside service providers.
35.3.1	primary equity investor motivations of designing fund legal structures	The **primary equity investor motivations of designing fund legal structures** are: (1) to facilitate the implementation of tax efficiency, and (2) to limit liability among the entities involved.
35.3.2	master trust	The **master trust** is the legal structure used to invest the assets of both onshore investors and offshore investors in a consistent if not identical manner, so that both funds share the benefit of the fund manager's insights and avoid tax inefficiency.
35.3.2	feeder fund	A **feeder fund** is a legal structure through which investors have access to the investment performance of the master trust.
35.3.2	purpose of the mast trust	The **purpose of the master trust** is tax neutrality, not evasion.
35.3.2	side pocket arrangement	In a **side pocket arrangement**, illiquid investments held by a fund (e.g., commonly a hedge fund) are segregated from the rest of the portfolio commonly because they are difficult to value, can interfere with equitable treatment of investors entering and leaving the fund, and prevent future investors from participating in the returns to assets in the side pocket.
35.3.5	chief financial officer (CFO)	The **chief financial officer (CFO)** is typically the investor's most important link of investors to the fund manager because the CFO is ultimately responsible for reporting the fund's performance numbers.
35.4.1	terms regarding redemptions	**Terms regarding redemptions** and withdrawals are specified in the subscription agreement. Some funds provide monthly liquidity (i.e., transfers are made at or immediately after the end of each month), but the norm is quarterly or semiannual redemption rights.
35.4.1	notice period	The **notice period** is a fund requirement, typically ranging from 30 to 90 days, for LPs to inform the GP in advance of a redemption to give the fund manager the ability to position the fund's portfolio and liquidity to meet the redemption request.
35.4.2	lockup period	A **lockup period** is a provision preventing, or providing financial disincentives for, redemption or withdrawal of an investor's funds for a designated period, typically one to three years for hedge funds, and up to ten years or more for real estate and private equity funds.
35.4.2	hard lockup period	A **hard lockup period** disallows withdrawals for the entire duration of the lockup period.
35.4.2	soft lockup period	A **soft lockup period** allows investors to withdraw capital from the fund before the expiration of the lockup period but only after the payment of a redemption fee, which is frequently 1% to 5% of the withdrawal amount, discouraging investors from causing liquidity disruptions by leaving the fund and allowing the fund manager to recoup some of the costs associated with liquidating a portion of the fund portfolio to redeem shares or to make up for the drag on performance from a cash balance that the fund manager maintains to fund investor redemptions.
35.4.3	gate	A **gate** is a provision describing the terms under which the fund may limit investor withdrawals even when the investor has satisfied the lockup period.
35.5.2	fund advisory committees	**Fund advisory committees** serve as a source of objective input for fund managers. An advisory committee is composed of representatives from the fund and investors in the fund. The advisory committee may provide advice on the valuation of particular investments, especially illiquid investments.

35.5.3	bad-leaver clause	LPAs may foresee a for-cause removal of the GP and include a **bad-leaver clause**, which, if exercised (normally following a simple majority vote of the LPs), causes investments to be suspended until a new fund manager is elected or, in the extreme, the fund is liquidated.
35.6.1	limited liability shield	A **limited liability shield** or financial firewall is a legal construct that prevents creditors from pursuing restitution from investors or other participants involved in an economic activity beyond the amount of capital that they have contributed.
35.7.0	The offering memorandum (OM) or private placement memorandum (PPM)	**The offering memorandum (OM) or private placement memorandum (PPM)** is the central controlling legal document for the fund.
35.7.1	risk assignment	**Risk assignment** in the context of fund documentation refers to anticipated ways for placing responsibility for different risks with different parties.
35.7.1	exculpation	**Exculpation** is a contractual term that relates to freeing someone from blame.
35.7.1	indemnification	**Indemnification** relates to a duty to make good on a loss. Exculpation and indemnification clauses are used in OM/PPMs to outline a limited set of legal standards at which predefined parties would be liable for certain actions or losses.
35.7.2	side letter	Investors can often request to enter into what is known as a **side letter** to negotiate such terms, which is an agreement between an investor and the fund that amends the OM/PPM to afford a specific investor with certain negotiated provisions.
35.8.4	hurt money	A capital contribution by GPs, also known as **hurt money**, should be contributed in cash rather than through the waiver of management fees (or as surplus from the management company's budget).
35.10.1	business continuity planning	**Business continuity planning** includes the development and management of an organization's overall strategies, practices and procedures for maintaining the critical functions of the organization in the event of an unexpected business interruption.
35.10.1	disaster recovery (DR)	**Disaster recovery (DR)** represents the specific plans and processes to re-establish critical business functions in a crisis.
35.10.3	common types of fund insurance coverage	The **common types of fund insurance coverage** include errors and omissions (E&O), directors' and officers' liability coverage (D&O), general partner liability coverage, and employment practices liability coverage.
35.10.3	E&O insurance	**E&O insurance** (i.e., errors and omissions or professional liability insurance) covers the insured against financial damages from mistakes, negligence, inaccuracies and other professional failures (subject to exclusions and limits).
36.1.1	implied return volatility	**Implied return volatility** is the volatility over the remaining life of an option that is inferred from an option price under assumptions including risk-neutrality, the validity of the specified option pricing model, and the accuracy of the model's inputs other than volatility.
36.1.1	realized return volatility	The **realized return volatility** of an asset is the actual variation (typically measured as the standard deviation of returns) that occurs over a specified time period using a specified return measurement interval (e.g., daily or weekly return granularity).
36.3.1	short volatility	When an option or any other investment has returns that are negatively correlated with the volatility level of the market index, the position is said to be **short volatility** or "short vol" (i.e., short the volatility of the market or other specified asset).

36.3.1	long volatility	When an investment's value tends to rise with increases in the volatility level of market returns, the position is said to be **long volatility** (i.e., long vol).
36.3.4	volatility derivatives	**Volatility derivatives** are engineered to provide pure plays on volatility with returns that are driven substantially, explicitly, and directly by exposure to the volatility factor.
36.3.5	negative volatility risk premium	Products that generate hedging benefits by having returns that are positively correlated to volatility offer a **negative volatility risk premium**, which means they tend to have expected returns less than the riskless rate.
36.4.0	volatility risk	**Volatility risk** is the economic dispersion caused by changes in volatility
36.4.1	volatility diffusion risk	**Volatility diffusion risk** is the risk of volatility changes that represent the continuous accrual of small changes in the volatility of an asset through time.
36.4.1	volatility jump risk	**Volatility jump risk** is the risk of potentially large periodic and sudden upward changes in the level of volatility.
36.4.2	regime change	In financial markets, a **regime change** occurs when an observed behavior of a financial series experiences a dramatic shift.
36.4.2	mixture model or a regime switching model	Some investors model stock market volatility as a **mixture model or a regime switching model**, which models equity market volatility as some mixture of two return distributions.
36.4.2	volatility clustering	**Volatility clustering** occurs in a price series when large changes are likely to be followed by more large changes and periods of small changes are likely to be followed by more small changes.
36.5.0	implied volatility structure	An **implied volatility structure** is a representation of the various implied volatilities of a set of options relative to their tenor, moneyness, or type.
36.5.2	volatility skew	A **volatility skew** indicates that options that differ by moneyness have different implied volatilities.
36.5.2	smile or a smirk	A volatility structure with a **smile or a smirk** is where out-of-the-money put options have higher levels of implied volatility than other options.
36.5.3	options volatility surface	An **options volatility surface** is a volatility structure that plots implied volatility for a wide variety of options in a given instrument across both expiration dates and strike prices.
37.1.2	short straddle	A **short straddle** position contains a short call option and short put option on the same asset and with the same strike price.
37.1.2	short strangle	A **short strangle** position contains a short call option and short put option on the same asset but with different strike prices.
37.1.3	iron butterfly	In a short position in an **iron butterfly**, the trader sells a bull spread and a bear spread such that the two spreads share the same middle strike price.
37.1.3	iron condor	. In a short position in an **iron condor**, a trader sells an out-of-the-money bull spread and an out-of-the-money bear spread.
37.2.3	vega normalization	**Vega normalization** across options is the process of adjusting the vegas of each option to represent identical relative changes.
37.3.1	vertical spread	A **vertical spread** is a combination of long calls and short calls (or short puts and long puts) having the long options with one strike price (the long leg) and the short options with a different strike price but with the same expiration dates.
37.3.1	ratio spread	While a vertical spread that is created using the same number of long and short options is a pure vertical spread, a **ratio spread** is a vertical spread with unequal numbers of long and short option positions.

37.3.3	horizontal spread	A **horizontal spread** is a combination of long calls and short calls (or short puts and long puts) having the long options with one expiration date (the long leg) and the short options with a different expiration date but with the same strike prices.
37.3.4	inter-asset option spread	An **inter-asset option spread** involves a long option position in one asset and a short option position in another asset.
37.4.2	Cboe volatility index (VIX)	The **Cboe Volatility Index (VIX)** (less formally, the VIX Index or simply the VIX) is a trademarked market-based approximation of the 30-day implied volatility of the S&P 500 that is calculated and disseminated in real time by the Cboe.
37.4.4	VIX term structure	The **VIX term structure** is the relation between the prices of VIX futures contracts and their settlement dates, usually expressed as a graph.
37.4.	S&P 500 Short-Term VIX Futures Index	The **S&P 500 Short-Term VIX Futures Index** is a benchmark index that mimics the performance of a hypothetical portfolio of VIX futures contracts with a fixed weighted time-to-settlement of 30 days, formed using a time-weighted combination of the prices of the front and second month VIX futures contracts.
37.5.0	correlation swap	A **correlation swap** is a derivative that transfers the risk from the swap's seller to its buyer that the actual average correlation among a specified set of individual stocks is higher than the swap's strike correlation.
37.8.1	tail risk funds	**Tail risk funds** are designed specifically to provide their investors with protection against large broad market declines.
37.8.4	black swan	Nassim Taleb defines a **black swan** as an event or occurrence that deviates beyond what is normally expected of a situation and that would be extremely difficult to predict.
38.1.1	Knightian uncertainty	**Knightian uncertainty** occurs when an investor cannot form reasonable quantified estimates of either the possible outcomes or their associated probabilities.
38.1.2	ambiguity	**Ambiguity** in the context of investment risk, like Knightian uncertainty, is lack of knowledge with regard to the potential future returns of an asset and their associated probabilities.
38.2.3	complexity risk premium	The **complexity risk premium**, if it exists, would be the enhanced return offered to opaque investments to compensate the investors for the risk of increased losses and/or the added costs of financial analysis in evaluating complex products.
38.3.1	US Treasury Strips	**US Treasury Strips** are financially engineered zero-coupon securities formed by parsing a non-callable US Treasury note or bond into a set of securities with maturities corresponding to each of the promised coupon and principal payments.
38.4.0	asset-based loan (ABL)	An **asset-based loan (ABL)** is a secured loan backed by various types of collateral pledged by the borrower.
38.4.0	shadow banking system	The **shadow banking system** consists of various non-traditional lenders who fill a void in lending created when traditional lenders reduce credit availability due to increased capital requirements or other governmental policies.
38.4.1	lockbox	A **lockbox** is a bank account set up to protect the lender by receiving collections of accounts receivable so that the proceeds can be used to support the debt.
38.4.3	collateral amount	The **collateral amount** is the sum of available assets to support debt
38.4.3	borrowing base	The **borrowing base** is therefore the maximum potential quantity of credit the lender is willing to extend after reducing collateral values considering the level of outstanding debt that would be senior to the loan.

38.4.3	advance rate	An **advance rate** is the ratio of credit extended for every dollar of collateral (i.e., the borrowing base).
38.4.3	seasonal overadvance	**Seasonal overadvance** is a temporary allowance by which the lender allows for a higher advance rate to account for seasonal effects in which the working capital need of the borrower is higher.
38.4.3	traditional overadvance	In a **traditional overadvance**, lenders allow for a greater advance rate, and the additional borrowing is then amortized over several years and can be added to an existing term loan or as a separate facility.
38.4.6	revolve	A **revolver**, or a **revolving line of credit**, is a credit line with a preapproved limit that's available for a prespecified period.
38.4.6	revolving line of credit	A **revolver**, or a **revolving line of credit**, is a credit line with a preapproved limit that's available for a prespecified period.
38.4.6	term loan	A **term loan** typically has either an amortizing or a bullet structure to reduce and terminate the loan, and is secured against longer-term assets (real estate, or machinery).
38.4.7	net leverage covenant	For a cash flow–based loan, one of the key covenants is the **net leverage covenant**, which is a restriction on maximum leverage calculated as the amount of senior or total debt, net of cash, as a multiple of EBITDA.
38.4.7	fixed charge coverage ratio	The **fixed charge coverage ratio** is a ratio equal to (EBIT + fixed charge)/(fixed charge + interest) where fixed charges include rent/lease payments, utilities, insurance, and salaries.
38.5.4	attachment of security interest	**Attachment of security interest** under U.S. law consists of the very important steps needed to make sure that the lender has the necessary legal rights to take possession of collateral in the event of default.
38.5.4	perfrecting the security interest	**Perfecting the security interest** occurs when the party seeking to establish ownership of an asset takes the necessary actions in order to assure that no other party, such as another creditor or a bankruptcy trustee, will be able to claim the same asset as collateral in the event that the debtor becomes insolvent.
38.6.2	recourse loans	Credit cards and auto loans are **recourse loans**, which means that the borrower is personally liable for repaying any outstanding balance on the loan.
38.6.2	non-recourse loans	in a **non-recourse loan**, the lender can collect only the collateral at hand.
38.6.3	auto loan-backed securities (ALBS)	**Auto loan–backed securities (ALBS)** receive cash flows from customer payments assembled from a specific pool of automobile loans or leases.
38.6.5	credit card receivable (CCR)	A **credit card receivable (CCR)** is an asset-backed security in which a pool of credit card receivables is used as collateral as in the case of auto loans discussed above.
39.1.0	insurance-linked securities (ILS	**Insurance-linked securities (ILS)** are tradable financial instruments with payoffs and values affected by an insured loss event, such as a natural disaster, longevity risk, or life insurance mortality.
39.1.	catastrophe bonds (cat bonds)	**Catastrophe bonds (cat bonds)** are risk-linked debt securities that represent the largest portion of the ILS market, are typically structured as private placements, and are designed to transfer specific risks from issuers—typically insurance or reinsurance companies—to investors.
39.1.4	reinsurance	**Reinsurance** is insurance that is purchased by an insurance company from one or more other insurance companies, known as the reinsurer.

39.2.1	indemnity trigger	An **indemnity trigger** is a type of trigger that initiates principal reductions based on the level of actual excess claims paid by the issuer.
39.2.1	cat bond attachment point of the trigger	The **cat bond attachment point of the trigger** is a numerical value indicating the point at which at least a fraction of principal must be "attached" to cover claims.
39.2.1	exhaustion point	The **exhaustion point** is the level of claims loss at which the principal is "exhausted" and investors are not legally responsible for any additional claims.
39.2.1	attachment probability	Related to attachment point is the **attachment probability**, which, typically based on historical information about natural disasters, indicates the estimated probability that the cat bond's attachment point will be reached.
39.2.2	industry loss trigger	An **industry loss trigger** is a trigger in which principal reductions in the cat bond are based on index estimates made by an independent third party of the total industry losses due to the occurrence of an insured event.
39.2.3	parametric trigger	A **parametric trigger** offers coverage when a certain threshold is surpassed based on previously specified natural parameters.
39.2.4	modeled trigger	In a **modeled trigger**, the coverage is based on claims generated by a computer model, developed by an independent modeling company.
39.3.3	complexity arbitrage	**Complexity arbitrage** is the process of attempting to earn short-term, very low-risk profits from pricing discrepancies attributable to highly complicated investment features.
39.4.1	longevity risk	**Longevity risk** is any potential risk that arises from a higher realized average life expectancy of pensioners and policyholders than initially projected.
39.4.2	longevity swap contract	A **longevity swap contract** takes place when a pension plan administrator agrees to make fixed payments to a counterparty based on specified mortality assumptions, while the counterparty agrees to make floating payments based on either the pension plan's actual mortalities (indemnity-based contract) or an agreed-upon mortality index (index-based contract).
39.4.4	mortality risk	**Mortality risk** is the risk of a person (or group of individuals) passing away sooner than expected.
39.4.4	extreme mortality risk	**Extreme mortality risk** arises because of the threat of very high mortality rates due to natural disasters, pandemics, and terrorist attacks rather than idiosyncratic causes of death.
39.4.5	credit wrap	A **credit wrap** is a credit enhancement in which an insurance company guarantees the payment of interest and principal of a specific debt in exchange for an insurance premium.
39.4.6	five mortality rate factors	The **five mortality rate factors** are (1) catastrophic events, (2) random fluctuations, (3) misestimation of mortality trends, (4) miscalculation of claim levels and (5) data issues.
39.4.6	three main elements of mortality rates	The **three main elements of mortality rates** are (1) baseline mortality, (2) the terrorism element (effect of terrorist acts on mortality rates), and (3) the pandemic component (effect of major epidemics of severe infectious diseases on mortality rates).
39.5.0	life insurance settlements	**Life insurance settlements**, or life settlements, consist of the transfer of the ownership of an existing life insurance policy (including the sale, bequest, or assignment of an existing life insurance policy or the benefits of such policies) by its owner to a third party.
39.5.1	cash surrender value of a life insurance policy	The **cash surrender value of a life insurance policy** is the price at which the insurance company will buy back its commitments under the contract.

39.6.0	viatical settlement	A **viatical settlement** is a transaction in which a sick policyholder sells his or her life insurance policy at a discount to its face value.
39.7.1	subordinated debt with step-up rates	**Subordinated Debt with Step-Up Rates** is a mezzanine debt product that is used in cases in which a firm cannot take on more debt with a fixed-rate scheme, because the current levels of senior and subordinated debt are exhausting the current cash flows.
39.7.2	payment-in-kind (PIK) interest	Subordinated debt with **payment-in-kind (PIK) interest** is a type of obligation that does not provide any cash flows (interest or principal repayment) from the borrower to the lender prior to the maturity of the loan(or the refinance date), but rather accrues an increasing debt balance.
39.7.2	ticking fee	A **ticking fee** is a payment paid by the borrower to the lender to account for the time lag between the commitment on a loan and the actual disbursement.
39.7.2	PIK toggle notes or bonds	**PIK toggle notes or bonds** are a variant of a PIK bond that allows the borrower to pay interest (partly or in full) in each period, or to accrue a part or the whole interest payment due.
39.7.3	subordinated debt with profit participation scheme	A **subordinated debt with profit participation scheme** provides a risk balance between debt and equity to mezzanine lenders, offering a level of downside protection and also a way to participate in the upside potential.
39.7.4	warrants	**Warrants** are similar to equity options, but they differ in that they (1) are generally issued by unlisted firms and are thus regarded as OTC securities, (2) are dilutive when issued by the firm itself since their exercise is satisfied by additional shares of common stock, (3) tend to have much longer maturities (often years) than traditional equity options (which usually have maturities measured in months), and (4) are not standardized securities.
39.7.4	subordinated debt with warrants	**Subordinated Debt with Warrants** differs from a convertible bond because in the case of convertibles, the option is exercised by handing over the underlying bond rather than being exercised independently of the debt security.
39.7.5	project finance	**Project finance** is capital intended to support a specific purpose, such as real estate projects and infrastructure projects, either on a private basis or in a public-private partnership.
39.7.5	public-private partnerships (PPPs)	**Public-private partnerships (PPPs)** represent cooperation between government and business jointly working toward a specific mutual target, assuming investment risks and sharing revenues and costs based on a predefined distribution. Projects are financed through a mixture of equity and debt financing, with debt financing in the neighborhood of 70% or more and may often use mezzanine finance products.
40.1.2	key traditional currency risk assumption	The **key traditional currency risk assumption** is that the return of a foreign investment to an investor expressed in the investor's home currency is subject to currency risk based on the belief that the nominal price of the foreign asset is non-negatively correlated with changes in the value of its currency.
40.3.1	price stickiness	**Price stickiness** is the extent to which some prices are slow to respond to changes in economic circumstances.
40.4.1	quanto derivative	A **quanto derivative** is generically viewed as a quantity-adjusted financial derivative in which payoffs are found as a quantity-adjusted product (i.e., the product of the change in the underlying asset price and another value such as an exchanged rate).

40.4.1	quanto option	A **quanto option** (quantity-adjusting option) contract might adjust the payoff of the option into a different currency using a pre-specified (fixed) exchange rate.
40.5.2	roundtrip costs	**Roundtrip costs** are the total costs of buying and selling a residential property, including legal fees, sales and transfer taxes, registration fees, and real estate agents' costs and fees, and also show a very high dispersion across countries.
40.7.5	economic risk	**Economic risk** in this context is the likelihood that macroeconomic conditions (e.g., changes in monetary and tax policies) and government regulation in a country will affect an investment.

CAIA Association Editorial Staff