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Volume 3

Equity Portfolio Management

Workbook

WILEY

PORTFOLIO MANAGEMENT IN PRACTICE WORKBOOK

Volume 3

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PART I

LEARNING OBJECTIVES, SUMMARY OVERVIEW, AND PROBLEMS

CHAPTER 1

OVERVIEW OF EQUITY SECURITIES

LEARNING OUTCOMES

The candidate should be able to:

- describe characteristics of types of equity securities;
- describe differences in voting rights and other ownership characteristics among different equity classes;
- distinguish between public and private equity securities;
- describe methods for investing in non-domestic equity securities;
- compare the risk and return characteristics of different types of equity securities;
- explain the role of equity securities in the financing of a company's assets;
- distinguish between the market value and book value of equity securities;
- compare a company's cost of equity, its (accounting) return on equity, and investors' required rates of return.

SUMMARY

Equity securities play a fundamental role in investment analysis and portfolio management. The importance of this asset class continues to grow on a global scale because of the need for equity capital in developed and emerging markets, technological innovation, and the growing sophistication of electronic information exchange. Given their absolute return potential and ability to impact the risk and return characteristics of portfolios, equity securities are of importance to both individual and institutional investors.

This chapter introduces equity securities and provides an overview of global equity markets. A detailed analysis of their historical performance shows that equity securities have offered average real annual returns superior to government bills and bonds, which have provided average real annual returns that have only kept pace with inflation. The different types and

characteristics of common and preference equity securities are examined, and the primary differences between public and private equity securities are outlined. An overview of the various types of equity securities listed and traded in global markets is provided, including a discussion of their risk and return characteristics. Finally, the role of equity securities in creating company value is examined as well as the relationship between a company's cost of equity, its accounting return on equity, investors' required rate of return, and the company's intrinsic value.

We conclude with a summary of the key components of this chapter:

- Common shares represent an ownership interest in a company and give investors a claim on its operating performance, the opportunity to participate in the corporate decision-making process, and a claim on the company's net assets in the case of liquidation.
- Callable common shares give the issuer the right to buy back the shares from shareholders at a price determined when the shares are originally issued.
- Putable common shares give shareholders the right to sell the shares back to the issuer at a price specified when the shares are originally issued.
- Preference shares are a form of equity in which payments made to preference shareholders take precedence over any payments made to common stockholders.
- Cumulative preference shares are preference shares on which dividend payments are accrued so that any payments omitted by the company must be paid before another dividend can be paid to common shareholders. Non-cumulative preference shares have no such provisions, implying that the dividend payments are at the company's discretion and are thus similar to payments made to common shareholders.
- Participating preference shares allow investors to receive the standard preferred dividend plus the opportunity to receive a share of corporate profits above a pre-specified amount. Non-participating preference shares allow investors to simply receive the initial investment plus any accrued dividends in the event of liquidation.
- Callable and putable preference shares provide issuers and investors with the same rights and obligations as their common share counterparts.
- Private equity securities are issued primarily to institutional investors in private placements and do not trade in secondary equity markets. There are three types of private equity investments: venture capital, leveraged buyouts, and private investments in public equity (PIPE).
- The objective of private equity investing is to increase the ability of the company's management to focus on its operating activities for long-term value creation. The strategy is to take the "private" company "public" after certain profit and other benchmarks have been met.
- Depository receipts are securities that trade like ordinary shares on a local exchange but which represent an economic interest in a foreign company. They allow the publicly listed shares of foreign companies to be traded on an exchange outside their domestic market.
- American depository receipts are US dollar-denominated securities trading much like standard US securities on US markets. Global depository receipts are similar to ADRs but contain certain restrictions in terms of their ability to be resold among investors.
- Underlying characteristics of equity securities can greatly affect their risk and return.
- A company's accounting return on equity is the total return that it earns on shareholders' book equity.
- A company's cost of equity is the minimum rate of return that stockholders require the company to pay them for investing in its equity.

PRACTICE PROBLEMS

1. Which of the following is *not* a characteristic of common equity?
   A. It represents an ownership interest in the company.
   B. Shareholders participate in the decision-making process.
   C. The company is obligated to make periodic dividend payments.

2. The type of equity voting right that grants one vote for each share of equity owned is referred to as:
   A. proxy voting.
   B. statutory voting.
   C. cumulative voting.

3. All of the following are characteristics of preference shares *except*:
   A. They are either callable or putable.
   B. They generally do not have voting rights.
   C. They do not share in the operating performance of the company.

4. Participating preference shares entitle shareholders to:
   A. participate in the decision-making process of the company.
   B. convert their shares into a specified number of common shares.
   C. receive an additional dividend if the company's profits exceed a pre-determined level.

5. Which of the following statements about private equity securities is *incorrect*?
   A. They cannot be sold on secondary markets.
   B. They have market-determined quoted prices.
   C. They are primarily issued to institutional investors.

6. Venture capital investments:
   A. can be publicly traded.
   B. do not require a long-term commitment of funds.
   C. provide mezzanine financing to early-stage companies.

7. Which of the following statements *most accurately* describes one difference between private and public equity firms?
   A. Private equity firms are focused more on short-term results than public firms.
   B. Private equity firms' regulatory and investor relations operations are less costly than those of public firms.
   C. Private equity firms are incentivized to be more open with investors about governance and compensation than public firms.

8. Emerging markets have benefited from recent trends in international markets. Which of the following has *not* been a benefit of these trends?
   A. Emerging market companies do not have to worry about a lack of liquidity in their home equity markets.
   B. Emerging market companies have found it easier to raise capital in the markets of developed countries.
   C. Emerging market companies have benefited from the stability of foreign exchange markets.

9. When investing in unsponsored depository receipts, the voting rights to the shares in the trust belong to:
   A. the depository bank.
   B. the investors in the depository receipts.
   C. the issuer of the shares held in the trust.

10. With respect to Level III sponsored ADRs, which of the following is *least likely* to be accurate? They:
   A. have low listing fees.
   B. are traded on the NYSE, NASDAQ, and AMEX.
   C. are used to raise equity capital in US markets.

11. A basket of listed depository receipts, or an exchange-traded fund, would *most likely* be used for:
   A. gaining exposure to a single equity.
   B. hedging exposure to a single equity.
   C. gaining exposure to multiple equities.

12. Calculate the total return on a share of equity using the following data:
   Purchase price: $50
   Sale price: $42
   Dividend paid during holding period: $2
   A. –12.0%
   B. –14.3%
   C. –16.0%

13. If a US-based investor purchases a euro-denominated ETF and the euro subsequently depreciates in value relative to the dollar, the investor will have a total return that is:
   A. lower than the ETF's total return.
   B. higher than the ETF's total return.
   C. the same as the ETF's total return.

14. Which of the following is *incorrect* about the risk of an equity security? The risk of an equity security is:
   A. based on the uncertainty of its cash flows.
   B. based on the uncertainty of its future price.
   C. measured using the standard deviation of its dividends.

15. From an investor's point of view, which of the following equity securities is the *least* risky?
   A. Putable preference shares.
   B. Callable preference shares.
   C. Non-callable preference shares.

16. Which of the following is *least likely* to be a reason for a company to issue equity securities on the primary market?
   A. To raise capital.
   B. To increase liquidity.
   C. To increase return on equity.

17. Which of the following is *not* a primary goal of raising equity capital?
    A. To finance the purchase of long-lived assets.
    B. To finance the company's revenue-generating activities.
    C. To ensure that the company continues as a going concern.

18. Which of the following statements is *most accurate* in describing a company's book value?
    A. Book value increases when a company retains its net income.
    B. Book value is usually equal to the company's market value.
    C. The ultimate goal of management is to maximize book value.

19. Calculate the book value of a company using the following information:

Number of shares outstanding	100,000
Price per share	€52
Total assets	€12,000,000
Total liabilities	€7,500,000
Net Income	€2,000,000

    A. €4,500,000.
    B. €5,200,000.
    C. €6,500,000.

20. Which of the following statements is *least accurate* in describing a company's market value?
    A. Management's decisions do not influence the company's market value.
    B. Increases in book value may not be reflected in the company's market value.
    C. Market value reflects the collective and differing expectations of investors.

21. Calculate the return on equity (ROE) of a stable company using the following data:

Total sales	£2,500,000
Net income	£2,000,000
Beginning of year total assets	£50,000,000
Beginning of year total liabilities	£35,000,000
Number of shares outstanding at the end of the year	1,000,000
Price per share at the end of the year	£20

    A. 10.0%.
    B. 13.3%.
    C. 16.7%.

22. Holding all other factors constant, which of the following situations will *most likely* lead to an increase in a company's return on equity?
    A. The market price of the company's shares increases.
    B. Net income increases at a slower rate than shareholders' equity.
    C. The company issues debt to repurchase outstanding shares of equity.

23. Which of the following measures is the *most difficult* to estimate?
    A. The cost of debt.
    B. The cost of equity.
    C. Investors' required rate of return on debt.

24. A company's cost of equity is often used as a proxy for investors':
    A. average required rate of return.
    B. minimum required rate of return.
    C. maximum required rate of return.

CHAPTER 2

MARKET EFFICIENCY

LEARNING OUTCOMES

The candidate should be able to:

- describe market efficiency and related concepts, including their importance to investment practitioners;
- distinguish between market value and intrinsic value;
- explain factors that affect a market's efficiency;
- contrast weak-form, semi-strong-form, and strong-form market efficiency;
- explain the implications of each form of market efficiency for fundamental analysis, technical analysis, and the choice between active and passive portfolio management;
- describe market anomalies;
- describe behavioral finance and its potential relevance to understanding market anomalies.

SUMMARY

This chapter has provided an overview of the theory and evidence regarding market efficiency and has discussed the different forms of market efficiency as well as the implications for fundamental analysis, technical analysis, and portfolio management. The general conclusion drawn from the efficient market hypothesis is that it is not possible to beat the market on a consistent basis by generating returns in excess of those expected for the level of risk of the investment.

Additional key points include the following:

- The efficiency of a market is affected by the number of market participants and depth of analyst coverage, information availability, and limits to trading.
- There are three forms of efficient markets, each based on what is considered to be the information used in determining asset prices. In the weak form, asset prices fully reflect all

market data, which refers to all past price and trading volume information. In the semi-strong form, asset prices reflect all publicly known and available information. In the strong form, asset prices fully reflect all information, which includes both public and private information.

- Intrinsic value refers to the true value of an asset, whereas market value refers to the price at which an asset can be bought or sold. When markets are efficient, the two should be the same or very close. But when markets are not efficient, the two can diverge significantly.
- Most empirical evidence supports the idea that securities markets in developed countries are semi-strong-form efficient; however, empirical evidence does not support the strong form of the efficient market hypothesis.
- A number of anomalies have been documented that contradict the notion of market efficiency, including the size anomaly, the January anomaly, and the winners–losers anomalies. In most cases, however, contradictory evidence both supports and refutes the anomaly.
- Behavioral finance uses human psychology, such as behavioral biases, in an attempt to explain investment decisions. Whereas behavioral finance is helpful in understanding observed decisions, a market can still be considered efficient even if market participants exhibit seemingly irrational behaviors, such as herding.

PRACTICE PROBLEMS

1. In an efficient market, the change in a company's share price is *most likely* the result of:
   A. insiders' private information.
   B. the previous day's change in stock price.
   C. new information coming into the market.

2. Regulation that restricts some investors from participating in a market will *most likely*:
   A. impede market efficiency.
   B. not affect market efficiency.
   C. contribute to market efficiency.

3. With respect to efficient market theory, when a market allows short selling, the efficiency of the market is *most likely* to:
   A. increase.
   B. decrease.
   C. remain the same.

4. Which of the following regulations will *most likely* contribute to market efficiency? Regulatory restrictions on:
   A. short selling.
   B. foreign traders.
   C. insiders trading with nonpublic information.

5. Which of the following market regulations will *most likely* impede market efficiency?
   A. Restricting traders' ability to short sell.
   B. Allowing unrestricted foreign investor trading.
   C. Penalizing investors who trade with nonpublic information.

6. If markets are efficient, the difference between the intrinsic value and market value of a company's security is:
   A. negative.
   B. zero.
   C. positive.

7. The intrinsic value of an undervalued asset is:
   A. less than the asset's market value.
   B. greater than the asset's market value.
   C. the value at which the asset can currently be bought or sold.

8. The market value of an undervalued asset is:
   A. greater than the asset's intrinsic value.
   B. the value at which the asset can currently be bought or sold.
   C. equal to the present value of all the asset's expected cash flows.

9. With respect to the efficient market hypothesis, if security prices reflect *only* past prices and trading volume information, then the market is:
   A. weak-form efficient.
   B. strong-form efficient.
   C. semi-strong-form efficient.

10. Which one of the following statements *best* describes the semi-strong form of market efficiency?
   A. Empirical tests examine the historical patterns in security prices.
   B. Security prices reflect all publicly known and available information.
   C. Semi-strong-form efficient markets are not necessarily weak-form efficient.

11. If markets are semi-strong efficient, standard fundamental analysis will yield abnormal trading profits that are:
   A. negative.
   B. equal to zero.
   C. positive.

12. If prices reflect all public and private information, the market is *best* described as:
   A. weak-form efficient.
   B. strong-form efficient.
   C. semi-strong-form efficient.

13. If markets are semi-strong-form efficient, then passive portfolio management strategies are *most likely* to:
   A. earn abnormal returns.
   B. outperform active trading strategies.
   C. underperform active trading strategies.

14. If a market is semi-strong-form efficient, the risk-adjusted returns of a passively managed portfolio relative to an actively managed portfolio are *most likely*:
   A. lower.
   B. higher.
   C. the same.

15. Technical analysts assume that markets are:
    A. weak-form efficient.
    B. weak-form inefficient.
    C. semi-strong-form efficient.

16. Fundamental analysts assume that markets are:
    A. weak-form inefficient.
    B. semi-strong-form efficient.
    C. semi-strong-form inefficient.

17. If a market is weak-form efficient but semi-strong-form inefficient, then which of the following types of portfolio management is *most likely* to produce abnormal returns?
    A. Passive portfolio management.
    B. Active portfolio management based on technical analysis.
    C. Active portfolio management based on fundamental analysis.

18. An increase in the time between when an order to trade a security is placed and when the order is executed *most likely* indicates that market efficiency has:
    A. decreased.
    B. remained the same.
    C. increased.

19. With respect to efficient markets, a company whose share price reacts gradually to the public release of its annual report *most likely* indicates that the market where the company trades is:
    A. semi-strong-form efficient.
    B. subject to behavioral biases.
    C. receiving additional information about the company.

20. Which of the following is *least likely* to explain the January effect anomaly?
    A. Tax-loss selling.
    B. Release of new information in January.
    C. Window dressing of portfolio holdings.

21. If a researcher conducting empirical tests of a trading strategy using time series of returns finds statistically significant abnormal returns, then the researcher has *most likely* found:
    A. a market anomaly.
    B. evidence of market inefficiency.
    C. a strategy to produce future abnormal returns.

22. Which of the following market anomalies is inconsistent with weak-form market efficiency?
    A. Earnings surprise.
    B. Momentum pattern.
    C. Closed-end fund discount.

23. Researchers have found that value stocks have consistently outperformed growth stocks. An investor wishing to exploit the value effect should purchase the stock of companies with above-average:
    A. dividend yields.
    B. market-to-book ratios.
    C. price-to-earnings ratios.

24. With respect to rational and irrational investment decisions, the efficient market hypothesis requires:
    A. only that the market is rational.
    B. that all investors make rational decisions.
    C. that some investors make irrational decisions.

25. Observed overreactions in markets can be explained by an investor's degree of:
    A. risk aversion.
    B. loss aversion.
    C. confidence in the market.

26. Like traditional finance models, the behavioral theory of loss aversion assumes that investors dislike risk; however, the dislike of risk in behavioral theory is assumed to be:
    A. leptokurtic.
    B. symmetrical.
    C. asymmetrical.

CHAPTER 3

OVERVIEW OF EQUITY PORTFOLIO MANAGEMENT

LEARNING OUTCOMES

The candidate should be able to:

- describe the roles of equities in the overall portfolio;
- describe how an equity manager's investment universe can be segmented;
- describe the types of income and costs associated with owning and managing an equity portfolio and their potential effects on portfolio performance;
- describe the potential benefits of shareholder engagement and the role an equity manager might play in shareholder engagement;
- describe rationales for equity investment across the passive–active spectrum.

SUMMARY

This chapter provides an overview of the roles equity investments may play in the client's portfolio, how asset owners and investment managers segment the equity universe for purposes of defining an investment mandate, the costs and obligations of equity ownership (including shareholder engagement), and issues relevant to the decision to pursue active or passive management of an equity portfolio. Among the key points made in this chapter are the following:

- Equities can provide several roles or benefits to an overall portfolio, including capital appreciation, dividend income, diversification with other asset classes, and a potential hedge against inflation.

- The inclusion of equities in a portfolio can be driven by a client's goals or needs. Portfolio managers often consider the following investment objectives and constraints when deciding to include equities (or asset classes in general, for that matter) in a client's portfolio: *risk objective; return objective; liquidity requirement; time horizon; tax concerns; legal and regulatory factors*; and *unique circumstances.*
- Investors often segment the equity universe according to (1) size and style; (2) geography; and (3) economic activity.
- Sources of equity portfolio income include dividends; securities lending fees and interest; dividend capture; covered calls; and cash-covered puts (or cash-secured puts).
- Sources of equity portfolio costs include management fees; performance fees; administration fees; marketing/distribution fees; and trading costs.
- Shareholder engagement is the process whereby companies engage with their shareholders. The process typically includes voting on corporate matters at general meetings and other forms of communication, such as quarterly investor calls or in-person meetings.
- Shareholder engagement can provide benefits for both shareholders and companies. From a company's perspective, shareholder engagement can assist in developing a more effective corporate governance culture. In turn, shareholder engagement may lead to better company performance to the benefit of shareholders (as well as other stakeholders).
- Disadvantages of shareholder engagement include costs and time involved, pressure on a company to meet near-term share price or earnings targets, possible selective disclosure of information, and potential conflicts of interest.
- Activist investors (or activists) specialize in taking stakes in companies and creating change to generate a gain on the investment.
- The participation of shareholders in general meetings, also known as general assemblies, and the exercise of their voting rights are among the most influential tools available for shareholder engagement.
- The choice of using active management or passive management is not an "either/or" (binary) alternative but rather a decision involving a passive–active spectrum. Investors may decide to position their portfolios across the passive–active spectrum based on their confidence to outperform, client preference, suitable benchmarks, client-specific mandates, risks/costs of active management, and taxes.

PRACTICE PROBLEMS

The following information relates to questions 1–8

Three years ago, the Albright Investment Management Company (Albright) added four new funds—the Barboa Fund, the Caribou Fund, the DoGood Fund, and the Elmer Fund—to its existing fund offering. Albright's new funds are described in Exhibit 1.

EXHIBIT 1 Albright Investment Management Company New Funds

Fund	**Fund Description**
Barboa Fund	Invests solely in the equity of companies in oil production and transportation industries in many countries.
Caribou Fund	Uses an aggressive strategy focusing on relatively new, fast-growing companies in emerging industries.
DoGood Fund	Investment universe includes all US companies and sectors that have favorable environmental, social, and governance (ESG) ratings and specifically excludes companies with products or services related to aerospace and defense.
Elmer Fund	Investments selected to track the S&P 500 Index. Minimizes trading based on the assumption that markets are efficient.

Hans Smith, an Albright portfolio manager, makes the following notes after examining these funds:

Note 1. The fee on the Caribou Fund is a 15% share of any capital appreciation above a 7% threshold and the use of a high-water mark.

Note 2. The DoGood Fund invests in Fleeker Corporation stock, which is rated high in the ESG space, and Fleeker's pension fund has a significant investment in the DoGood Fund. This dynamic has the potential for a conflict of interest on the part of Fleeker Corporation but not for the DoGood Fund.

Note 3. The DoGood Fund's portfolio manager has written policies stating that the fund does not engage in shareholder activism. Therefore, the DoGood Fund may be a free-rider on the activism by these shareholders.

Note 4. Of the four funds, the Elmer Fund is most likely to appeal to investors who want to minimize fees and believe that the market is efficient.

Note 5. Adding investment-grade bonds to the Elmer Fund will decrease the portfolio's short-term risk.

Smith discusses means of enhancing income for the three funds with the junior analyst, Kolton Frey, including engaging in securities lending or writing covered calls. Frey tells Smith the following:

Statement 1. Securities lending would increase income through reinvestment of the cash collateral but would require the fund to miss out on dividend income from the lent securities.

Statement 2. Writing covered calls would generate income, but doing so would limit the upside share price appreciation for the underlying shares.

1. The Barboa Fund can be *best* described as a fund segmented by:
   A. size/style.
   B. geography.
   C. economic activity.

2. The Caribou Fund is *most likely* classified as a:
   A. large-cap value fund.
   B. small-cap value fund.
   C. small-cap growth fund.

3. The DoGood Fund's approach to the aerospace and defense industry is *best* described as:
   A. positive screening.
   B. negative screening.
   C. thematic investing.

4. The Elmer Fund's management strategy is:
   A. active.
   B. passive.
   C. blended.

5. Based on Note 1, the fee on the Caribou Fund is *best* described as a:
   A. performance fee.
   B. management fee.
   C. administrative fee.

6. Which of the following notes about the DoGood Fund is *correct*?
   A. Only Note 2
   B. Only Note 3
   C. Both Note 2 and Note 3

7. Which of the notes regarding the Elmer Fund is *correct*?
   A. Only Note 4
   B. Only Note 5
   C. Both Note 4 and Note 5

8. Which of Frey's statements about securities lending and covered call writing is *correct*?
   A. Only Statement 1
   B. Only Statement 2
   C. Both Statement 1 and Statement 2

CHAPTER 4

PASSIVE EQUITY INVESTING

LEARNING OUTCOMES

The candidate should be able to:

- discuss considerations in choosing a benchmark for a passively managed equity portfolio;
- compare passive factor-based strategies to market-capitalization-weighted indexing;
- compare different approaches to passive equity investing;
- compare the full replication, stratified sampling, and optimization approaches for the construction of passively managed equity portfolios;
- discuss potential causes of tracking error and methods to control tracking error for passively managed equity portfolios;
- explain sources of return and risk to a passively managed equity portfolio.

SUMMARY

This chapter explains the rationale for passive investing as well as the construction of equity market indexes and the various methods by which investors can track the indexes. Passive portfolio managers must understand benchmark index construction and the advantages and disadvantages of the various methods used to track index performance.

Among the key points made in this chapter are the following:

- Active equity portfolio managers who focus on individual security selection have long been unsuccessful at beating benchmarks and have charged high management fees to their end investors. Consequently, passive investing has increased in popularity.
- Passive equity investors seek to track the return of benchmark indexes and construct their portfolios to reflect the characteristics of the chosen benchmarks.
- Selection of a benchmark is driven by the equity investor's objectives and constraints as presented in the investment policy statement. The benchmark index must be rules-based, transparent, and investable. Specific important characteristics include the domestic or

foreign market covered, the market capitalization of the constituent stocks, where the index falls in the value–growth spectrum, and other risk factors.

- The equity benchmark index weighting scheme is another important consideration for investors. Weighting methods include market-cap weighting, price weighting, equal weighting, and fundamental weighting. Market cap-weighting has several advantages, including the fact that weights adjust automatically.
- Index rebalancing and reconstitution policies are important features. Rebalancing involves adjusting the portfolio's constituent weights after price changes, mergers, or other corporate events have caused those weights to deviate from the benchmark index. Reconstitution involves deleting names that are no longer in the index and adding names that have been approved as new index members.
- Increasingly, passive investors use index-based strategies to gain exposure to individual risk factors. Examples of known equity risk factors include Capitalization, Style, Yield, Momentum, Volatility, and Quality.
- For passive investors, portfolio tracking error is the standard deviation of the portfolio return net of the benchmark return.
- Indexing involves the goal of minimizing tracking error subject to realistic portfolio constraints.
- Methods of pursuing passive investing include the use of such pooled investments as mutual funds and exchange-traded funds (ETFs), a do-it-yourself approach of building the portfolio stock-by-stock, and using derivatives to obtain exposure.
- Conventional open-end index mutual funds generally maintain low fees. Their expense ratios are slightly higher than for ETFs, but a brokerage fee is usually required for investor purchases and sales of ETF shares.
- Index exposure can also be obtained through the use of derivatives, such as futures and swaps.
- Building a passive portfolio by full replication, meaning to hold all the index constituents, requires a large-scale portfolio and high-quality information about the constituent characteristics. Most equity index portfolios are managed using either a full replication strategy to keep tracking error low, are sampled to keep trading costs low, or use optimization techniques to match as closely as possible the characteristics and performance of the underlying index.
- The principal sources of passive portfolio tracking error are fees, trading costs, and cash drag. Cash drag refers to the dilution of the return on the equity assets because of cash held. Cash drag can be exacerbated by the receipt of dividends from constituent stocks and the delay in getting them converted into shares.
- Portfolio managers control tracking error by minimizing trading costs, netting investor cash inflows and redemptions, and using equitization tools like derivatives to compensate for cash drag.
- Many index fund managers offer the constituent securities held in their portfolios for lending to short sellers and other market participants. The income earned from lending those securities helps offset portfolio management costs, often resulting in lower net fees to investors.
- Investor activism is engagement with portfolio companies and recognizing the primacy of end investors. Forms of activism can include expressing views to company boards or management on executive compensation, operational risk, board governance, and other value-relevant matters.

- Successful passive equity investment requires an understanding of the investor's needs, benchmark index construction, and methods available to track the index.

PRACTICE PROBLEMS

The following information relates to questions 1–8

Evan Winthrop, a senior officer of a US-based corporation, meets with Rebecca Tong, a portfolio manager at Cobalt Wealth Management. Winthrop recently moved his investments to Cobalt in response to his previous manager's benchmark-relative underperformance and high expenses.

Winthrop resides in Canada and plans to retire there. His annual salary covers his current spending needs, and his vested defined benefit pension plan is sufficient to meet retirement income goals. Winthrop prefers passive exposure to global equity markets with a focus on low management costs and minimal tracking error to any index benchmarks. The fixed-income portion of the portfolio may consist of laddered maturities with a home-country bias.

Tong proposes using an equity index as a basis for an investment strategy and reviews the most important requirements for an appropriate benchmark. With regard to investable indexes, Tong tells Winthrop the following:

Statement 1. A free-float adjustment to a market-capitalization weighted index lowers its liquidity.

Statement 2. An index provider that incorporates a buffering policy makes the index more investable.

Winthrop asks Tong to select a benchmark for the domestic stock allocation that holds all sectors of the Canadian equity market and to focus the portfolio on highly liquid, well-known companies. In addition, Winthrop specifies that any stock purchased should have a relatively low beta, a high dividend yield, a low P/E, and a low price-to-book ratio (P/B).

Winthrop and Tong agree that only the existing equity investments need to be liquidated. Tong suggests that, as an alternative to direct equity investments, the new equity portfolio be composed of the exchange-traded funds (ETFs) shown in Exhibit 1.

EXHIBIT 1 Available Equity ETFs

Equity Benchmark	ETF Ticker	Number of Constituents	P/B	P/E	Fund Expense Ratio
S&P/TSX 60	XIU	60	2.02	17.44	0.18%
S&P 500	SPY	506	1.88	15.65	0.10%
MSCI EAFE	EFA	933	2.13	18.12	0.33%

Winthrop asks Tong about the techniques wealth managers and fund companies use to create index-tracking equity portfolios that minimize tracking error and costs. In response, Tong outlines two frequently used methods:

Method 1. One process requires that all index constituents are available for trading and liquid, but significant brokerage commissions can occur when the index is large.
Method 2. When tracking an index with a large number of constituents and/or managing a relatively low level of assets, a relatively straightforward and technically unsophisticated method can be used to build a passive portfolio that requires fewer individual securities than the index and reduces brokerage commission costs.

Tong adds that portfolio stocks may be used to generate incremental revenue, thereby partially offsetting administrative costs but potentially creating undesirable counterparty and collateral risks.

After determining Winthrop's objectives and constraints, the CAD147 million portfolio's new strategic policy is to target long-term market returns while being fully invested at all times. Tong recommends quarterly rebalancing, currency hedging, and a composite benchmark composed of equity and fixed-income indexes. Currently the USD is worth CAD1.2930, and this exchange rate is expected to remain stable during the next month. Exhibit 2 presents the strategic asset allocation and benchmark weights.

EXHIBIT 2 Composite Benchmark and Policy Weights

Asset Class	**Benchmark Index**	**Policy Weight**
Canadian equity	S&P/TSX 60	40.0%
US equity	S&P 500	15.0%
International developed markets equity	MSCI EAFE	15.0%
Canadian bonds	DEX Universe	30.0%
Total portfolio		100.0%

In one month, Winthrop will receive a performance bonus of USD5,750,000. He believes that the US equity market is likely to increase during this timeframe. To take advantage of Winthrop's market outlook, he instructs Tong to immediately initiate an equity transaction using the S&P 500 futures contract with a current price of 2,464.29 while respecting the policy weights in Exhibit 2. The S&P 500 futures contract multiplier is 250, and the S&P 500 E-mini multiplier is 50.

Tong cautions Winthrop that there is a potential pitfall with the proposed request when it comes time to analyze performance. She discloses to Winthrop that equity index futures returns can differ from the underlying index, primarily because of corporate actions such as the declaration of dividends and stock splits.

1. Which of Tong's statements regarding equity index benchmarks is *correct*?
   A. Only Statement 1
   B. Only Statement 2
   C. Both Statement 1 and Statement 2

2. To satisfy Winthrop's benchmark and security selection specifications, the Canadian equity index benchmark Tong selects should be:
   A. small-capitalization with a core tilt.
   B. large-capitalization with a value tilt.
   C. mid-capitalization with a growth tilt.

3. Based on Exhibit 1 and assuming a full-replication indexing approach, the tracking error is expected to be highest for:
   A. XIU.
   B. SPY.
   C. EFA.

4. Method 1's portfolio construction process is *most likely*:
   A. optimization.
   B. full replication.
   C. stratified sampling.

5. Method 2's portfolio construction process is *most likely*:
   A. optimization.
   B. full replication.
   C. stratified sampling.

6. The method that Tong suggests to add incremental revenue is:
   A. program trading.
   B. securities lending.
   C. attribution analysis.

7. In preparation for receipt of the performance bonus, Tong should immediately:
   A. buy two US E-mini equity futures contracts.
   B. sell nine US E-mini equity futures contracts.
   C. buy seven US E-mini equity futures contracts.

8. The risk that Tong discloses regarding the equity futures strategy is *most likely*:
   A. basis risk.
   B. currency risk.
   C. counterparty risk.

The following information relates to questions 9–14

The Mackenzie Education Foundation funds educational projects in a four-state region of the United States. Because of the investment portfolio's poor benchmark-relative returns, the foundation's board of directors hired a consultant, Stacy McMahon, to analyze performance and provide recommendations.

McMahon meets with Autumn Laubach, the foundation's executive director, to review the existing asset allocation strategy. Laubach believes the portfolio's underperformance is attributable to the equity holdings, which are allocated 55% to a US large-capitalization index fund, 30% to an actively managed US small-cap fund, and 15% to an actively managed developed international fund.

Laubach states that the board is interested in following a passive approach for some or all of the equity allocation. In addition, the board is open to approaches that could generate returns in excess of the benchmark for part of the equity allocation. McMahon suggests that the board consider following a passive factor-based momentum strategy for the allocation to international stocks.

McMahon observes that the benchmark used for the US large-cap equity component is a price-weighted index containing 150 stocks. The benchmark's Herfindahl–Hirschman Index (HHI) is 0.0286.

McMahon performs a sector attribution analysis based on Exhibit 1 to explain the large-cap portfolio's underperformance relative to the benchmark.

EXHIBIT 1 Trailing 12-Month US Large-Cap Returns and Foundation/Benchmark Weights

Sector	Sector Returns	Foundation Sector Weights	Benchmark Sector Weights
Information technology	10.75%	18.71%	19.06%
Consumer staples	12.31%	16.52%	16.10%
Energy	8.63%	9.38%	9.53%
Utilities	–3.92%	8.76%	8.25%
Financials	7.05%	6.89%	6.62%

The board decides to consider adding a mid-cap manager. McMahon presents candidates for the mid-cap portfolio. Exhibit 2 provides fees and cash holdings for three portfolios and an index fund.

EXHIBIT 2 Characteristics of US Mid-Cap Portfolios and Index Fund

	Portfolio 1	Portfolio 2	Portfolio 3	Index Fund
Fees	0.10%	0.09%	0.07%	0.03%
Cash holdings	6.95%	3.42%	2.13%	0.51%

9. Compared with broad-market-cap weighting, the international equity strategy suggested by McMahon is *most likely* to:
   A. concentrate risk exposure.
   B. be based on the efficient market hypothesis.
   C. overweight stocks that recently experienced large price decreases.

10. The international strategy suggested by McMahon is *most likely* characterized as:
   A. risk based.
   B. return oriented.
   C. diversification oriented.

11. The initial benchmark used for the US large-cap allocation:
   A. is unaffected by stocks splits.
   B. is essentially a liquidity-weighted index.
   C. holds the same number of shares in each component stock.

12. Based on its HHI, the initial US large-cap benchmark *most likely* has:
   A. a concentration level of 4.29.
   B. an effective number of stocks of approximately 35.
   C. individual stocks held in approximately equal weights.

13. Using a sector attribution analysis based on Exhibit 1, which US large-cap sector is the primary contributor to the portfolio's underperformance relative to the benchmark?
    A. Utilities
    B. Consumer staples
    C. Information technology

14. Based on Exhibit 2, which portfolio will *most likely* have the lowest tracking error?
    A. Portfolio 1
    B. Portfolio 2
    C. Portfolio 3

CHAPTER 5

ANALYSIS OF ACTIVE PORTFOLIO MANAGEMENT

LEARNING OUTCOMES

The candidate should be able to:

- describe how value added by active management is measured;
- calculate and interpret the information ratio (*ex post* and *ex ante*) and contrast it to the Sharpe ratio;
- state and interpret the fundamental law of active portfolio management, including its component terms—transfer coefficient, information coefficient, breadth, and active risk (aggressiveness);
- explain how the information ratio may be useful in investment manager selection and choosing the level of active portfolio risk;
- compare active management strategies, including market timing and security selection, and evaluate strategy changes in terms of the fundamental law of active management;
- describe the practical strengths and limitations of the fundamental law of active management.

SUMMARY

We have covered a number of key concepts and principles associated with active portfolio management. Active management is based on the mathematics and principles of risk and return from basic mean–variance portfolio theory but with a focus on value added compared with a benchmark portfolio. Critical concepts include the following:

- Value added is defined as the difference between the return on the managed portfolio and the return on a passive benchmark portfolio. This difference in returns might be positive or

negative after the fact but would be expected to be positive before the fact or active management would not be justified.

- Value added is related to active weights in the portfolio, defined as differences between the various asset weights in the managed portfolio and their weights in the benchmark portfolio. Individual assets can be overweighted (have positive active weights) or underweighted (have negative active weights), but the complete set of active weights sums to zero.
- Positive value added is generated when positive-active-weight assets have larger returns than negative-active-weight assets. By defining individual asset active returns as the difference between the asset total return and the benchmark return, value added is shown to be positive if and only if end-of-period realized active asset returns are positively correlated with the active asset weights established at the beginning of the period.
- Value added can come from a variety of active portfolio management decisions, including security selection, asset class allocation, and even further decompositions into economic sector weightings and geographic or country weights.
- The Sharpe ratio measures reward per unit of risk in absolute returns, whereas the information ratio measures reward per unit of risk in benchmark relative returns. Either ratio can be applied *ex ante* to expected returns or *ex post* to realized returns. The information ratio is a key criterion on which to evaluate actively managed portfolios.
- Higher information ratio portfolios can be used to create higher Sharpe ratio portfolios. The optimal amount of active management that maximizes a portfolio's Sharpe ratio is positively related to the assumed forecasting accuracy or *ex ante* information coefficient of the active strategy.
- The active risk of an actively managed strategy can be adjusted to its desired level by combining it with a position in the benchmark. Furthermore, once an investor has identified the maximum Sharpe ratio portfolio, the total volatility of a portfolio can be adjusted to its desired level by combining it with cash (two-fund separation concept).
- The fundamental law of active portfolio management began as a conceptual framework for evaluating the potential value added of various investment strategies, but it has also emerged as an operational system for measuring the essential components of those active strategies.
- Although the fundamental law provides a framework for analyzing investment strategies, the essential inputs of forecasted asset returns and risks still require judgment in formulating the expected returns.
- The fundamental law separates the expected value added, or portfolio return relative to the benchmark return, into the basic elements of the strategy:
  - *skill* as measured by the information coefficient,
  - *structuring* of the portfolio as measured by the transfer coefficient,
  - *breadth* of the strategy measured by the number of independent decisions per year, and
  - *aggressiveness* measured by the benchmark tracking risk.

  The last three of these four elements may be beyond the control of the investor if they are specified by investment policy or constrained by regulation.
- The fundamental law has been applied in settings that include the selection of country equity markets in a global equity fund and the timing of credit and duration exposures in a fixed-income fund.
- The fundamental law of active management has limitations, including uncertainty about the *ex ante* information coefficient and the conceptual definition of breadth as the number of independent decisions by the investor.

PRACTICE PROBLEMS

1. Wei Liu makes two statements about active portfolio management:
   Statement 1. The "active return" of an actively managed portfolio is the difference between the portfolio's return and the return on the benchmark portfolio, and it is equal to the managed portfolio's alpha.
   Statement 2. The active weights are the differences in the managed portfolio's weights and the benchmark's weights.
   Are Liu's statements correct?
   A. Only Statement 1 is correct.
   B. Only Statement 2 is correct.
   C. Both statements are correct.

2. The benchmark weights and returns for each of the five stocks in the Capitol Index are given in the following table. The Tukol Fund uses the Capitol Index as its benchmark, and the fund's portfolio weights are also shown in the table.

Stock	Portfolio Weight (%)	Benchmark Weight (%)	20X2 Return (%)
1	30	24	14
2	30	20	15
3	20	20	12
4	10	18	8
5	10	18	10

   What is the value added (active return) for the Tukol Fund?
   A. 0.00%
   B. 0.90%
   C. 1.92%

3. Consider the following asset class returns for calendar year 20X2:

Asset Class	Portfolio Weight (%)	Benchmark Weight (%)	Portfolio Return (%)	Benchmark Return (%)
Domestic equities	55	40	10	8
International equities	20	30	10	9
Bonds	25	30	5	6

   What is the value added (or active return) for the managed portfolio?
   A. 0.25%
   B. 0.35%
   C. 1.05%

4. Gertrude Fischer mentions two properties of the Sharpe ratio and the information ratio that she says are very useful.

Property 1. The Sharpe ratio is unaffected by the addition of cash or leverage in a portfolio.

Property 2. The information ratio for an unconstrained portfolio is unaffected by the aggressiveness of the active weights.

Are Fischer's two properties correct?

A. Yes.
B. No. Only Property 1 is correct.
C. No. Only Property 2 is correct.

The following information relates to Questions 5 and 6

	S&P 500	Indigo Fund
Expected annual return	9.0%	10.5%
Return standard deviation	18.0%	25.0%
Sharpe ratio	0.333	0.30
Active return		1.2%
Active risk		8.0%
Information ratio		0.15

Note: Data are based on a risk-free rate of 2.3%.

5. What is the maximum Sharpe ratio that a manager can achieve by combining the S&P 500 benchmark portfolio and the Indigo Fund?
   A. 0.333
   B. 0.365
   C. 0.448

6. Which of the following pairs of weights would be used to achieve the highest Sharpe ratio and optimal amount of active risk through combining the Indigo Fund and benchmark portfolio, respectively?
   A. 1.014 on Indigo and −0.014 on the benchmark
   B. 1.450 on Indigo and −0.450 on the benchmark
   C. 1.500 on Indigo and −0.500 on the benchmark

7. The benchmark portfolio is the S&P 500. Which of the following three portfolios can be combined with the benchmark portfolio to produce the highest combined Sharpe ratio?

	S&P 500	Portfolio A	Portfolio B	Portfolio C
Expected annual return	9.0%	10.0%	9.5%	9.0%
Return standard deviation	18.0%	20.0%	20.0%	18.0%
Sharpe ratio	0.333	0.350	0.325	0.333
Active return	0	1.0%	0.5%	0
Active risk	0	10.0%	3.0%	2.0%

Note: Data are based on a risk-free rate of 2.3%.

A. Portfolio A
B. Portfolio B
C. Portfolio C

8. Based on the fundamental law of active management, if a portfolio manager has an information ratio of 0.75, an information coefficient of 0.1819, and a transfer coefficient of 1.0, how many securities are in the portfolio manager's fund, making the assumption that the active returns are uncorrelated.
   A. About 2
   B. About 4
   C. About 17

9. Two analysts make the following statements about the transfer coefficient in the expanded fundamental law of active management:

   Analyst One says, "The transfer coefficient measures how well the realized returns correlate with the anticipated returns, adjusted for risk."

   Analyst Two says, "The transfer coefficient measures how well the realized returns correlate with the active weights, adjusted for risk."

   Which, if either, analyst is correct?
   A. Only Analyst One is correct.
   B. Only Analyst Two is correct.
   C. Neither analyst is correct.

10. The expanded fundamental law of active management is stated as follows:

$$\mathrm{E}(R_A) = (\mathrm{TC})(\mathrm{IC})\sqrt{\mathrm{BR}}\sigma_A$$

    Which component on the righthand side represents the extent to which the portfolio manager's expectations are realized? The
    A. transfer coefficient, TC.
    B. information coefficient, IC.
    C. breadth, BR.

11. An analyst is given the following information about a portfolio and its benchmark. In particular, the analyst is concerned that the portfolio is a closet index fund. The T-bill return chosen to represent the risk-free rate is 0.50%.

	Benchmark	**Portfolio**
Return	8.75%	8.90%
Risk	17.50%	17.60%
Active return	0.00%	0.15%
Active risk	0.00%	0.79%
Sharpe ratio	0.4714	0.4773
Information ratio	N/A	0.1896

    Which of the following three statements *does not* justify your belief that the portfolio is a closet index?

I. The Sharpe ratio of the portfolio is close to the Sharpe ratio of the benchmark.
II. The information ratio of the portfolio is relatively small.
III. The active risk of the portfolio is very low.

A. Statement I
B. Statement II
C. Statement III

12. You are considering three managers for a small-cap growth mandate. After careful analysis, you produce the following forward-looking expectations about the managers' active risk and active return:

	Manager A	**Manager B**	**Manager C**
Active return	0.7%	0.6%	1.2%
Active risk	3.2%	3.1%	6.3%

If you intend to rely on the information ratio to make your decision, which manager should you choose?

A. Manager A
B. Manager B
C. Manager C

13. You have a portfolio 100% allocated to a manager with an *ex post*, active risk at 8.0%. You choose to allocate a 75% position to the active manager and 25% to the benchmark to bring the portfolio back to your target active risk of 6.0%. If the manager's information ratio is 0.50, what happens to the information ratio of the portfolio after the reallocation?

A. The information ratio increases because the lower active risk reduces the denominator of the ratio.
B. The information ratio remains unchanged because allocations between the active portfolio and the benchmark don't affect the information ratio.
C. The information ratio decreases because allocating some of the portfolio to the benchmark means that the external manager generates less active return.

The following information relates to Questions 14 and 15

You are analyzing three investment managers for a new mandate. The following table provides the managers' ex-ante active return expectations and portfolio weights. The last two columns include the risk and the *ex post*, realized active returns for the four stocks. Use the following data for the following two questions:

	Manager 1		**Manager 2**		**Manager 3**			
	Δw	$E(R_A)$	Δw	$E(R_A)$	Δw	$E(R_A)$	**Risk**	**Realized R_A**
Security 1	−0.125	0.03	0.2	0.04	−0.05	0.025	0.17	0.06
Security 2	0.025	0.04	0	0.01	0.05	0.015	0.10	0.07
Security 3	0.075	0.05	−0.1	0	0.05	0.005	0.12	0.04
Security 4	0.025	0.06	−0.1	0.02	−0.05	0.015	0.25	0.02

14. Suppose all three managers claim to be good at forecasting returns. According to the expanded fundamental law of active management, which manager is the best at efficiently building portfolios by anticipating future returns?
    A. Manager 1
    B. Manager 2
    C. Manager 3

15. Suppose all three managers claim to be efficient in portfolio construction. According to the expanded fundamental law of active management, which manager is the best at building portfolios to make full use of their ability to correctly anticipate returns?
    A. Manager 1
    B. Manager 2
    C. Manager 3

16. Manager 1 has an information coefficient of 0.15, a transfer coefficient of 1.0, and invests in 50 securities. Manager 2 has a different strategy, investing in more securities; however, he is subject to investment constraints that reduce his transfer coefficient. Manager 2 has an information coefficient of 0.10, a transfer coefficient of 0.8, and invests in 100 securities. The investment selections of each manager are independent decisions. If both managers target an active risk of 5.0%, which manager will have the greater expected active return?
    A. Manager 1
    B. Manager 2
    C. Both managers will have the same active return.

17. Nick Young is concerned that Goudon Partners, one of his money managers, overestimates its expected active return because Goudon overstates its strategy breadth. Young makes two notes about his concern:
    Note 1. Although Goudon claims that the number of independent asset decisions is high because it uses 200 stocks, many of these stocks cluster in industries where the same general analysis applies to several stocks.
    Note 2. Goudon claims that each stock is independent and evaluated each month, or 12 times per year. These analyses are not independent because some of their strategies, such as favoring a particular industry or favoring value stocks, persist beyond one month. For example, a strategy of favoring low-P/E stocks will persist for several months and the investment decisions are not independent.

    If his judgments are correct, are Young's notes about the overstatement of breadth correct?
    A. Only Note 1 is correct.
    B. Only Note 2 is correct.
    C. Both Notes 1 and 2 are correct.

18. Caramel Associates uses the fundamental law to estimate its expected active returns. Two things have changed. First, Caramel will lower its estimate of the information coefficient because they felt their prior estimates reflected overconfidence. Second, their major clients have relaxed several constraints on their portfolios—including social screens, prohibitions on short selling, and constraints on turnover. Which of these changes will increase the expected active return?

A. Only the lower information coefficient.
B. Only the relaxation of several portfolio constraints.
C. Both the lower information coefficient and the relaxation of portfolio constraints.

The following information relates to Questions 19–25

James Frazee is chief investment officer at H&F Capital Investors. Frazee hires a third-party adviser to develop a custom benchmark for three actively managed balanced funds he oversees: Fund X, Fund Y, and Fund Z. (Balanced funds are funds invested in equities and bonds.) The benchmark needs to be composed of 60% global equities and 40% global bonds. The third-party adviser submits the proposed benchmark to Frazee, who rejects the benchmark based on the following concerns:

Concern 1. Many securities he wants to purchase are not included in the benchmark portfolio.
Concern 2. One position in the benchmark portfolio will be somewhat costly to replicate.
Concern 3. The benchmark portfolio is a float-adjusted, capitalization-weighted portfolio.

After the third-party adviser makes adjustments to the benchmark to alleviate Frazee's concerns, Frazee accepts the benchmark portfolio. He then asks his research staff to develop risk and expected return forecasts for Funds X, Y, and Z as well as for the benchmark. The forecasts are presented in Exhibit 1.

EXHIBIT 1 Forecasted Portfolio Statistics for Funds X, Y, and Z and the Benchmark

	Fund X	**Fund Y**	**Fund Z**	**Benchmark**
Portfolio weights:				
Global equities (%)	60.0	65.0	68.0	60.0
Global bonds (%)	40.0	35.0	32.0	40.0
Expected return (%)	10.0	11.6	13.2	9.4
Expected volatility (%)	17.1	18.7	22.2	16.3
Active risk (%)	5.2	9.2	15.1	N/A
Sharpe ratio (SR)	0.45	0.50	0.49	0.44

Note: Data are based on a risk-free rate of 2.3%.

Frazee decides to add a fourth offering to his group of funds, Fund W, which will use the same benchmark as in Exhibit 1. Frazee estimates Fund W's information ratio to be 0.35. He is considering adding the following constraint to his portfolio construction model: Fund W would now have maximum over- and underweight constraints of 7% on single-country positions.

Frazee conducts a search to hire a manager for the global equity portion of Fund W and identifies three candidates. He asks the candidates to prepare risk and return forecasts relative to Fund W's benchmark based on their investment strategy, with the only constraint being no short selling. Each candidate develops independent annual forecasts with active return projections that are uncorrelated and constructs a portfolio made up of stocks that are diverse

both geographically and across economic sectors. Selected data for the three candidates' portfolios are presented in Exhibit 2.

EXHIBIT 2 Forecasted Portfolio Data for Equity Portion of Fund W

	Candidate A	**Candidate B**	**Candidate C**
Rebalancing	Annually	Annually	Annually
Number of securities	100	64	36
Information ratio (IR)	0.582	0.746	0.723
Transfer coefficient (TC)	0.832	0.777	0.548
Information coefficient*	0.07	0.12	0.22

* Information coefficient based on previously managed funds.

Frazee asks Candidate C to re-evaluate portfolio data given the following changes:

Change 1: Fix the number of securities to 50.
Change 2: Rebalance on a semi-annual basis.
Change 3: Add maximum over- or underweight constraints on sector weightings.

19. Which of Frazee's concerns *best* justifies his decision to reject the proposed benchmark?
    A. Concern 1
    B. Concern 2
    C. Concern 3

20. Based on Exhibit 1, the expected active return from asset allocation for Fund X is:
    A. negative.
    B. zero.
    C. positive.

21. Based on Exhibit 1, which fund is expected to produce the greatest consistency of active return?
    A. Fund X
    B. Fund Y
    C. Fund Z

22. Based on Exhibit 1, combining Fund W with a fund that replicates the benchmark would produce a Sharpe ratio *closest* to:
    A. 0.44.
    B. 0.56.
    C. 0.89.

23. If Frazee added the assumption he is considering in Fund W's portfolio construction, it would *most likely* result in:
    A. a decrease in the optimal aggressiveness of the active strategy.
    B. the information ratio becoming invariant to the level of active risk.
    C. an increase in the transfer of active return forecasts into active weights.

24. Based on the data presented in Exhibit 2, the candidate with the greatest skill at achieving active returns appears to be:
    A. Candidate A.
    B. Candidate B.
    C. Candidate C.

25. Which proposed change to Fund W would *most likely* decrease Candidate C's information ratio?
    A. Change 1
    B. Change 2
    C. Change 3

The following information relates to Questions 26–29

John Martinez is assessing the performance of the actively managed diversified asset portfolio. The diversified asset portfolio is invested in equities, bonds, and real estate, and allocations to these asset classes and to the holdings within them are unconstrained.

Selected return and financial data for the portfolio for 2019 are presented in Exhibit 1.

EXHIBIT 1 Diversified Asset Portfolio 2019 Portfolio Performance

	Sub-Portfolio Return (%)	**Benchmark Return (%)**	**Portfolio Allocation (%)**	**Strategic Asset Allocation (%)**
Equities sub-portfolio	36.9	31.6	63	60
Bond sub-portfolio	−2.4	−2.6	28	35
Real estate sub-portfolio	33.4	28.3	9	5

Martinez uses several risk-adjusted return metrics to assess the performance of the diversified asset portfolio, including the information ratio and the Sharpe ratio. Selected risk, return, and statistical data for the portfolio are presented in Exhibit 2.

EXHIBIT 2 Diversified Asset Portfolio Data, 2000-2019

	Transfer Coefficient (TC)	**Information Coefficient (IC)**	**Breadth (BR)**
Equities sub-portfolio	0.90	0.091	21
Bond sub-portfolio	0.79	0.087	23
Real estate sub-portfolio	0.86	0.093	19

Martinez has recently hired Kenneth Singh to help him evaluate portfolios. Martinez asks Singh about the possible effects on the portfolio's information ratio if cash were added to the diversified asset portfolio or if the aggressiveness of the portfolio's active weights were increased. Singh responds with two statements:

Statement 1. Adding cash to the portfolio would change the portfolio's information ratio.
Statement 2. Increasing the aggressiveness of active weights would not change the portfolio's information ratio.

26. Based on Exhibit 1, the value added to the diversified asset portfolio attributable to the security selection decision in 2019 was *closest* to:
    A. 2.3%.
    B. 3.9%.
    C. 6.1%.

27. Based on Exhibit 1, the value added of the diversified asset portfolio attributable to the asset allocation decision in 2019 was *closest* to:
    A. 2.3%.
    B. 3.9%.
    C. 6.1%.

28. Based on data in Exhibit 2 and using the information ratio as the criterion for evaluating performance, which sub-portfolio had the best performance in the period 2000–2019?
    A. The bond sub-portfolio.
    B. The equities sub-portfolio.
    C. The real estate sub-portfolio.

29. Which of Singh's statements regarding the information ratio is correct?
    A. Only Statement 1
    B. Only Statement 2
    C. Both Statement 1 and Statement 2

CHAPTER 6

ACTIVE EQUITY INVESTING: STRATEGIES

LEARNING OUTCOMES

The candidate should be able to:

- compare fundamental and quantitative approaches to active management;
- analyze bottom-up active strategies, including their rationale and associated processes;
- analyze top-down active strategies, including their rationale and associated processes;
- analyze factor-based active strategies, including their rationale and associated processes;
- analyze activist strategies, including their rationale and associated processes;
- describe active strategies based on statistical arbitrage and market microstructure;
- describe how fundamental active investment strategies are created;
- describe how quantitative active investment strategies are created;
- discuss equity investment style classifications.

SUMMARY

This chapter discusses the different approaches to active equity management and describes how the various strategies are created. It also addresses the style classification of active approaches.

- Active equity management approaches can be generally divided into two groups: fundamental (also referred to as discretionary) and quantitative (also known as systematic or rules-based). Fundamental approaches stress the use of human judgment in arriving at an investment decision, whereas quantitative approaches stress the use of rules-based, quantitative models to arrive at a decision.
- The main differences between fundamental and quantitative approaches include the following characteristics: approach to the decision-making process (subjective versus

objective); forecast focus (stock returns versus factor returns); information used (research versus data); focus of the analysis (depth versus breadth); orientation to the data (forward looking versus backward looking); and approach to portfolio risk (emphasis on judgment versus emphasis on optimization techniques).

- The main types of active management strategies include bottom-up, top-down, factor-based, and activist.
- Bottom-up strategies begin at the company level, and use company and industry analyses to assess the intrinsic value of the company and determine whether the stock is undervalued or overvalued relative to its market price.
- Fundamental managers often focus on one or more of the following company and industry characteristics: business model and branding, competitive advantages, and management and corporate governance.
- Bottom-up strategies are often divided into value-based approaches and growth-based approaches.
- Top-down strategies focus on the macroeconomic environment, demographic trends, and government policies to arrive at investment decisions.
- Top-down strategies are used in several investment decision processes, including the following: country and geographic allocation, sector and industry rotation, equity style rotation, volatility-based strategies, and thematic investment strategies.
- Quantitative equity investment strategies often use factor-based models. A factor-based strategy aims to identify significant factors that drive stock prices and to construct a portfolio with a positive bias toward such factors.
- Factors can be grouped based on fundamental characteristics—such as value, growth, and price momentum—or on unconventional data.
- Activist investors specialize in taking meaningful stakes in listed companies and influencing those companies to make changes to their management, strategy, or capital structures for the purpose of increasing the stock's value and realizing a gain on their investment.
- Statistical arbitrage (or "stat arb") strategies use statistical and technical analysis to exploit pricing anomalies and achieve superior returns. Pairs trading is an example of a popular and simple statistical arbitrage strategy.
- Event-driven strategies exploit market inefficiencies that may occur around corporate events such as mergers and acquisitions, earnings announcements, bankruptcies, share buybacks, special dividends, and spinoffs.
- The fundamental active investment process includes the following steps: define the investment universe; prescreen the universe; understand the industry and business; forecast the company's financial performance; convert forecasts into a target price; construct the portfolio with the desired risk profile; and rebalance the portfolio according to a buy and sell discipline.
- Pitfalls in fundamental investing include behavioral biases, the value trap, and the growth trap.
- Behavioral biases can be divided into two groups: cognitive errors and emotional biases. Typical biases that are relevant to active equity management include confirmation bias, illusion of control, availability bias, loss aversion, overconfidence, and regret aversion.
- The quantitative active investment process includes the following steps: define the investment thesis; acquire, clean, and process the data; backtest the strategy; evaluate the strategy; and construct an efficient portfolio using risk and trading cost models.

- The pitfalls in quantitative investing include look-ahead and survivorship biases, overfitting, data mining, unrealistic turnover assumptions, transaction costs, and short availability.
- An investment style generally splits the stock universe into two or three groups, such that each group contains stocks with similar characteristics. The common style characteristics used in active management include value, size, price momentum, volatility, high dividend, and earnings quality. A stock's membership in an industry, sector, or country group is also used to classify the investment style.
- Two main approaches are often used in style analysis: a returns-based approach and a holdings-based approach. Holdings-based approaches aggregate the style scores of individual holdings, while returns-based approaches analyze the investment style of portfolio managers by comparing the returns of the strategy to those of a set of style indexes.

PRACTICE PROBLEMS

The following information relates to questions 1–6

James Leonard is a fund-of-funds manager with Future Generation, a large sovereign fund. He is considering whether to pursue more in-depth due diligence processes with three large-cap long-only funds proposed by his analysts. Although the funds emphasize different financial metrics and use different implementation methodologies, they operate in the same market segment and are evaluated against the same benchmark. The analysts prepared a short description of each fund, presented in Exhibit 1.

EXHIBIT 1 Description of Each Candidate Fund

Fund	Description
Furlings	Furlings Investment Partners combines sector views and security selection. The firm's head manager uses several industry and economic indicators identified from his own experience during the last two decades, as well as his personal views on market flow dynamics, to determine how to position the fund on a sector basis. Sector deviations from the benchmark of 10% or more are common and are usually maintained for 12 to 24 months. At the same time, sector managers at Furlings use their expertise in dissecting financial statements and their understanding of the corporate branding and competitive landscape within sectors to build equally weighted baskets of securities within sectors. Each basket contains their 7 to 10 highest-conviction securities, favoring firms that have good governance, strong growth potential, competitive advantages such as branding, and attractive relative valuations. The Furlings master fund holds approximately 90 securities.

Fund	Description
Asgard	Asgard Investment Partners is a very large asset manager. It believes in investing in firms that have a strong business model and governance, reasonable valuations, solid capital structures with limited financial leverage, and above-average expected earnings growth for the next three years. Although the Asgard master fund invests in fewer than 125 securities, each sector analyst builds financial models that track as many as 50 firms. To support them in their task, analysts benefit from software developed by the Asgard research and technology group that provides access to detailed market and accounting information on 5,000 global firms, allowing for the calculation of many valuation and growth metrics and precise modeling of sources of cash-flow strengths and weaknesses within each business. Asgard analysts can also use the application to backtest strategies and build their own models to rank securities' attractiveness according to their preferred characteristics. Security allocation is determined by a management team but depends heavily on a quantitative risk model developed by Asgard. Asgard has a low portfolio turnover.
Tokra	Tokra Capital uses a factor-based strategy to rank securities from most attractive to least attractive. Each security is scored based on three metrics: price to book value (P/B), 12-month increase in stock price, and return on assets. Tokra's managers have a strong risk management background. Their objective is to maximize their exposure to the most attractive securities using a total scoring approach subject to limiting single-security concentration below 2%, sector deviations below 3%, active risk below 4%, and annual turnover less than 40%, while having a market beta close to 1. The master fund holds approximately 400 positions out of a possible universe of more than 2,000 securities evaluated.

When Leonard's analysts met with Asgard, they inquired whether its managers engage in activist investing because Asgard's portfolio frequently holds significant positions, because of their large asset size, and because of their emphasis on strong governance and their ability to model sources of cash-flow strengths and weaknesses within each business. The manager indicated that Asgard engages with companies from a long-term shareholder's perspective, which is consistent with the firm's low portfolio turnover, and uses its voice, and its vote, on matters that can influence companies' long-term value.

Leonard wants to confirm that each manager's portfolios are consistent with its declared style. To this end, Exhibit 2 presents key financial information associated with each manager's portfolio and also with the index that all three managers use.

EXHIBIT 2 Key Financial Data

Fund	Index	Furlings	Asgard	Tokra
Dividend/price (trailing 12-month)	2.3%	2.2%	2.2%	2.6%
P/E (trailing 12-month)	26.5	24.7	26.6	27.3
Price/cash flows (12-month forward)	12.5	13.8	12.5	11.6
P/B	4.8	4.30	4.35	5.4
Average EPS growth (three to five years forward)	11.9%	11.0%	13.1%	10.8%
Net income/assets	2.8%	4.5%	4.3%	3.2%
Average price momentum (trailing 12 months)	10.5%	14.0%	10.0%	12.0%

1. Which fund manager's investing approach is *most consistent* with fundamental management?
   A. Furlings
   B. Asgard
   C. Tokra

2. Which of the following statements about the approaches and styles of either Furlings, Asgard, or Tokra is *incorrect*?
   A. Furlings is a top-down sector rotator with a value orientation within sectors.
   B. Asgard is a bottom-up manager with a GARP (growth at a reasonable price) style.
   C. Tokra is a factor-based manager using value, growth, and profitability metrics.

3. Which manager is *most likely* to get caught in a value trap?
   A. Furlings
   B. Asgard
   C. Tokra

4. Which activist investing tactic is Asgard *least likely* to use?
   A. Engaging with management by writing letters to management, calling for and explaining suggested changes, and participating in management discussions with analysts or meeting the management team privately
   B. Launching legal proceedings against existing management for breach of fiduciary duties
   C. Proposing restructuring of the balance sheet to better utilize capital and potentially initiate share buybacks or increase dividends

5. Based on the information provided in Exhibits 1 and 2, which manager's portfolio characteristics is *most likely* at odds with its declared style?
   A. Furlings
   B. Asgard
   C. Tokra

6. Leonard is looking at the style classification from Asgard as reported by Morningstar and Thomson Reuters Lipper. He is surprised to find that Asgard is classified as a blend fund by Morningstar and a value fund by Lipper. Which of the following statements is *correct*?
   A. Although the Morningstar methodology classifies securities as either value, growth, or core, the Lipper methodology assumes a stock can have the characteristics of many styles. This approach can result in a different classification for the same portfolio.
   B. The Lipper methodology can only lead to a value or growth classification. It does not offer a core/blend component.
   C. The Morningstar methodology classifies securities as either value, growth, or core by looking at the difference between their respective growth and value scores. It is possible that the Asgard funds hold a balanced exposure to both value and growth and/or core stocks.

The following information relates to questions 7–14

Aleksy Nowacki is a new portfolio manager at Heydon Investments. The firm currently offers a single equity fund, which uses a top-down investment strategy based on fundamentals. Vicky Knight, a junior analyst at Heydon, assists with managing the fund.

Nowacki has been hired to start a second fund, the Heydon Quant Fund, which will use quantitative active equity strategies. Nowacki and Knight meet to discuss distinct characteristics of the quantitative approach to active management, and Knight suggests three such characteristics:

Characteristic 1. The focus is on factors across a potentially large group of stocks.
Characteristic 2. The decision-making process is systematic and non-discretionary.
Characteristic 3. The approach places an emphasis on forecasting the future prospects of underlying companies.

Nowacki states that quantitative investing generally follows a structured and well-defined process. Knight asks Nowacki:

"What is the starting point for the quantitative investment process?"

The new Heydon Quant Fund will use a factor-based strategy. Nowacki assembles a large dataset with monthly standardized scores and monthly returns for the strategy to back-test a new investment strategy and calculates the information coefficient. $FS(t)$ is the factor score for the current month, and $FS(t + 1)$ is the score for the next month. $SR(t)$ is the strategy's holding period return for the current month, and $SR(t + 1)$ is the strategy's holding period return for the next month.

As an additional step in backtesting of the strategy, Nowacki computes historical price/book ratios (P/Bs) and price/earnings ratios (P/Es) using calendar year-end (31 December) stock prices and companies' financial statement data for the same calendar year. He notes that the financial statement data for a given calendar year are not typically published until weeks after the end of that year.

Because the Heydon Quant Fund occasionally performs pairs trading using statistical arbitrage, Nowacki creates three examples of pairs trading candidates, presented in Exhibit 1. Nowacki asks Knight to recommend a suitable pair trade.

EXHIBIT 1 Possible Pairs Trades Based on Statistical Arbitrage

Stock Pair	Current Price Ratio Compared with Long-Term Average	Historical Price Ratio Relationship	Historical Correlation between Returns
1 and 2	Not significantly different	Mean reverting	High
3 and 4	Significantly different	Mean reverting	High
5 and 6	Significantly different	Not mean reverting	Low

Knight foresees a possible scenario in which the investment universe for the Heydon Quant Fund is unchanged but a new factor is added to its multifactor model. Knight asks Nowacki whether this scenario could affect the fund's investment-style classifications using either the returns-based or holdings-based approaches.

7. Which of the following asset allocation methods would *not likely* be used by Nowacki and Knight to select investments for the existing equity fund?
   A. Sector and industry rotation
   B. Growth at a reasonable price
   C. Country and geographic allocation

8. Relative to Heydon's existing fund, the new fund will *most likely*:
   A. hold a smaller number of stocks.
   B. rebalance at more regular intervals.
   C. see risk at the company level rather than the portfolio level.

9. Which characteristic suggested by Knight to describe the quantitative approach to active management is *incorrect*?
   A. Characteristic 1
   B. Characteristic 2
   C. Characteristic 3

10. Nowacki's *most appropriate* response to Knight's question about the quantitative investment process is to:
    A. backtest the new strategy.
    B. define the market opportunity.
    C. identify the factors to include and their weights.

11. In Nowacki's backtesting of the factor-based strategy for the new fund, the calculated information coefficient should be based on:
    A. $FS(t)$ and $SR(t)$.
    B. $FS(t)$ and $SR(t + 1)$.
    C. $SR(t)$ and $FS(t + 1)$.

12. Nowacki's calculated price/book ratios (P/Bs) and price/earnings ratios (P/Es), in his backtesting of the new strategy, are a problem because of:
    A. data mining.
    B. look-ahead bias.
    C. survivorship bias.

13. Based on Exhibit 1, which stock pair should Knight recommend as the *best* candidate for statistical arbitrage?
    A. Stock 1 and Stock 2
    B. Stock 3 and Stock 4
    C. Stock 5 and Stock 6

14. The *most appropriate* response to Knight's question regarding the potential future scenario for the Heydon Quant Fund is:
    A. only the returns-based approach.
    B. only the holdings-based approach.
    C. both the returns-based approach and the holdings-based approach.

The following information relates to questions 15–19

Jack Dewey is managing partner of DC&H, an investment management firm, and Supriya Sardar is an equity analyst with the firm. Dewey recently took over management of the firm's Purity Fund. He is developing a fundamental active investment process for managing this fund that emphasizes financial strength and demonstrated profitability of portfolio companies. At his previous employer, Dewey managed a fund for which his investment process involved taking active exposures in sectors based on the macroeconomic environment and demographic trends.

Dewey and Sardar meet to discuss developing a fundamental active investment process for the Purity Fund. They start by defining the investment universe and market opportunity for the fund, and then they pre-screen the universe to obtain a manageable set of securities for further, more detailed analysis. Next, Dewey notes that industry and competitive analysis of the list of securities must be performed. He then asks Sardar to recommend the next step in development of the fundamental active management process.

During the next few months, Dewey rebalances the Purity Fund to reflect his fundamental active investment process. Dewey and Sardar meet again to discuss potential new investment opportunities for the fund. Sardar recommends the purchase of AZ Industrial, which she believes is trading below its intrinsic value, despite its high price-to-book value (P/B) relative to the industry average.

Dewey asks Sardar to perform a bottom-up style analysis of the Purity Fund based on the aggregation of attributes from individual stocks in the portfolio. Dewey plans to include the results of this style analysis in a profile he is preparing for the fund.

15. In managing the fund at his previous employer, Dewey's investment process can be *best* described as:
    A. an activist strategy.
    B. a top-down strategy.
    C. a bottom-up strategy.

16. Sardar's recommendation for the next step should be to:
    A. review results from backtesting the strategy.
    B. make recommendations for rebalancing the portfolio.
    C. forecast companies' performances and convert those forecasts into valuations.

17. Based upon Dewey's chosen investment process for the management of the Purity Fund, rebalancing of the fund will *most likely* occur:
    A. at regular intervals.
    B. in response to changes in company-specific information.
    C. in response to updated output from optimization models.

18. Which investment approach is the *most likely* basis for Sardar's buy recommendation for AZ Industrial?
    A. Relative value
    B. High-quality value
    C. Deep-value investing

19. The analysis performed by Sardar on the Purity Fund can be *best* described as being based on:
    A. a holdings-based approach.
    B. manager self-identification.
    C. a returns-based style analysis.

CHAPTER 7

ACTIVE EQUITY INVESTING: PORTFOLIO CONSTRUCTION

LEARNING OUTCOMES

The candidate should be able to:

- describe elements of a manager's investment philosophy that influence the portfolio construction process;
- discuss approaches for constructing actively managed equity portfolios;
- distinguish between Active Share and active risk and discuss how each measure relates to a manager's investment strategy;
- discuss the application of risk budgeting concepts in portfolio construction;
- discuss risk measures that are incorporated in equity portfolio construction and describe how limits set on these measures affect portfolio construction;
- discuss how assets under management, position size, market liquidity, and portfolio turnover affect equity portfolio construction decisions;
- evaluate the efficiency of a portfolio structure given its investment mandate;
- discuss the long-only, long extension, long/short, and equitized market-neutral approaches to equity portfolio construction, including their risks, costs, and effects on potential alphas.

SUMMARY

Active equity portfolio construction strives to make sure that superior insights about forecasted returns get efficiently reflected in realized portfolio performance. Active equity portfolio construction is about thoroughly understanding the return objectives of a portfolio, as well as its acceptable risk levels, and then finding the right mix of securities that balances predicted returns against risk and other impediments that can interfere with realizing these

returns. These principles apply to long-only, long/short, long-extension, and market-neutral approaches. Below, we highlight the discussions of this chapter.

- The four main building blocks of portfolio construction are the following:
  - Overweight, underweight, or neutralize rewarded factors: The four most recognized factors known to offer a persistent return premium are Market, Size, Value, and Momentum.
  - Alpha skills: Timing factors, securities, and markets. Finding new factors and enhancing existing factors.
  - Sizing positions to account for risk and active weights.
  - Breadth of expertise: A manager's ability to consistently outperform his benchmark increases when that performance can be attributed to a larger sample of independent decisions. Independent decisions are uncorrelated decisions.
- Managers can rely on a combination of approaches to implement their core beliefs:
  - Systematic vs. discretionary
    - Systematic strategies incorporate research-based rules across a broad universe of securities.
    - Discretionary strategies integrate the judgment of the manager on a smaller subset of securities.
  - Bottom up vs. top down
    - A bottom-up manager evaluates the risk and return characteristics of individual securities. The aggregate of these risk and return expectations implies expectations for the overall economic and market environment.
    - A top-down manager starts with an understanding of the overall market environment and then projects how the expected environment will affect countries, asset classes, sectors, and securities.
  - Benchmark aware vs. benchmark agnostic
- Portfolio construction can be framed as an optimization problem using an objective function and a set of constraints. The objective function of a systematic manager will be specified explicitly, whereas that of a discretionary manager may be set implicitly.
- Risk budgeting is a process by which the total risk appetite of the portfolio is allocated among the various components of portfolio choice.
- Active risk (tracking error) is a function of the portfolio's exposure to systematic risks and the level of idiosyncratic, security-specific risk. It is a relevant risk measure for benchmark-relative portfolios.
- Absolute risk is the total volatility of portfolio returns independent of a benchmark. It is the most appropriate risk measure for portfolios with an absolute return objective.
- Active Share measures the extent to which the number and sizing of positions in a manager's portfolio differ from the benchmark.
- Benchmark-agnostic managers usually have a greater level of Active Share and most likely have a greater level of active risk.
- An effective risk management process requires that the portfolio manager
  - determine which type of risk measure is most appropriate,
  - understand how each aspect of the strategy contributes to its overall risk,
  - determine what level of risk budget is appropriate, and
  - effectively allocate risk among individual positions/factors.

- Risk constraints may be either formal or heuristic. Heuristic constraints may impose limits on
  - concentration by security, sector, industry, or geography;
  - net exposures to risk factors, such as Beta, Size, Value, and Momentum;
  - net exposures to currencies;
  - the degree of leverage;
  - the degree of illiquidity;
  - exposures to reputational/environmental risks, such as carbon emissions; and
  - other attributes related to an investor's core concerns.
- Formal risk constraints are statistical in nature. Formal risk measures include the following:
  - Volatility—the standard deviation of portfolio returns
  - Active risk—also called *tracking error* or *tracking risk*
  - Skewness—a measure of the degree to which return expectations are non-normally distributed
  - Drawdown—a measure of portfolio loss from its high point until it begins to recover
  - Value at risk (VaR)—the minimum loss that would be expected a certain percentage of the time over a certain period of time given the modeled market conditions, typically expressed as the minimum loss that can be expected to occur 5% of the time
  - CVaR (expected tail loss or expected shortfall)—the average loss that would be incurred if the VaR cutoff is exceeded
  - IVaR—the change in portfolio VaR when adding a new position to a portfolio
  - MVaR—the effect on portfolio risk of a change in the position size. In a diversified portfolio, it may be used to determine the contribution of each asset to the overall VaR.
- Portfolio management costs fall into two categories: explicit costs and implicit costs. Implicit costs include delay and slippage.
- The costs of managing assets may affect the investment strategy and the portfolio construction process.
  - Slippage costs are significantly greater for smaller-cap securities and during periods of high volatility.
  - A strategy that demands immediate execution is likely to incur higher market impact costs.
  - A patient manager can mitigate market impact costs by slowly building up positions as liquidity becomes available, but he exposes himself to greater volatility/trend price risk.
- A well-constructed portfolio exhibits
  - a clear investment philosophy and a consistent investment process,
  - risk and structural characteristics as promised to investors,
  - a risk-efficient delivery methodology, and
  - reasonably low operating costs.
- Long/short investing is a compromise between
  - reducing risk and not capturing fully the market risk premium,
  - expanding the return potential from alpha and other risk premiums at the potential expense of increasing active risk, and
  - achieving greater diversification and higher costs and complexity.

PRACTICE PROBLEMS

The following information relates to questions 1–8

Monongahela Ap is an equity fund analyst. His manager asks him to evaluate three actively managed equity funds from a single sponsor, Chiyodasenko Investment Corp. Ap's assessments of the funds based on assets under management (AUM), the three main building blocks of portfolio construction, and the funds' approaches to portfolio management are presented in Exhibit 1. Selected data for Fund 1 is presented in Exhibit 2.

EXHIBIT 1 Ap's Assessments of Funds 1, 2, and 3

Fund	Fund Category	Fund Size (AUM)	Number of Securities	Description
1	Small-cap stocks	Large	Small	Fund 1 focuses on skillfully timing exposures to factors, both rewarded and unrewarded, and to other asset classes. The fund's managers use timing skills to opportunistically shift their portfolio to capture returns from factors such as country, asset class, and sector. Fund 1 prefers to make large trades.
2	Large-cap stocks	Large	Large	Fund 2 holds a diversified portfolio and is concentrated in terms of factors. It targets individual securities that reflect the manager's view that growth firms will outperform value firms. Fund 2 builds up its positions slowly, using unlit venues when possible.
3	Small-cap stocks	Small	Large	Fund 3 holds a highly diversified portfolio. The fund's managers start by evaluating the risk and return characteristics of individual securities and then build their portfolio based on their stock-specific forecasts. Fund 3 prefers to make large trades.

EXHIBIT 2 Selected Data for Fund 1

Factor	Market	Size	Value	Momentum
Coefficient	1.080	0.098	–0.401	0.034
Variance of the market factor return and covariances with the market factor return	0.00109	0.00053	0.00022	–0.00025
Portfolio's monthly standard deviation of returns				3.74%

Ap learns that Chiyodasenko has initiated a new equity fund. It is similar to Fund 1 but scales up active risk by doubling all of the active weights relative to Fund 1. The new fund aims to scale active return linearly with active risk, but implementation is problematic. Because of the cost and difficulty of borrowing some securities, the new fund cannot scale up its short positions to the same extent that it can scale up its long positions.

Ap reviews quarterly holdings reports for Fund 3. In comparing the two most recent quarterly reports, he notices differences in holdings that indicate that Fund 3 executed two trades, with each trade involving pairs of stocks. Initially, Fund 3 held active positions in two automobile stocks—one was overweight by 1 percentage point (pp), and the other was underweight by 1pp. Fund 3 traded back to benchmark weights on those two stocks. In the second trade, Fund 3 selected two different stocks that were held at benchmark weights, one energy stock and one financial stock. Fund 3 overweighted the energy stock by 1pp and underweighted the financial stock by 1pp.

In Fund 3's latest quarterly report, Ap reads that Fund 3 implemented a new formal risk control for its forecasting model that constrains the predicted return distribution so that no more than 60% of the deviations from the mean are negative.

1. Based on Exhibit 1, the main building block of portfolio construction on which Fund 1 focuses is *most likely*:
   A. alpha skills.
   B. position sizing.
   C. rewarded factor weightings.

2. Which fund in Exhibit 1 *most likely* follows a bottom-up approach?
   A. Fund 1
   B. Fund 2
   C. Fund 3

3. Which fund in Exhibit 1 *most likely* has the greatest implicit costs to implement its strategy?
   A. Fund 1
   B. Fund 2
   C. Fund 3

4. Based on Exhibit 2, the portion of total portfolio risk that is explained by the market factor in Fund 1's existing portfolio is *closest* to:
   A. 3%.
   B. 81%.
   C. 87%.

5. Relative to Fund 1, Chiyodasenko's new equity fund will *most likely* exhibit a lower:
   A. information ratio.
   B. idiosyncratic risk.
   C. collateral requirement.

6. As a result of Fund 3's two trades, the portfolio's active risk *most likely*:
   A. decreased.
   B. remained unchanged.
   C. increased.

7. What was the effect of Fund 3's two trades on its active share? Fund 3's active share:
   A. decreased.
   B. remained unchanged.
   C. increased.

8. Which risk measure does Fund 3's new risk control explicitly constrain?
   A. Volatility
   B. Skewness
   C. Drawdown

The following information relates to questions 9–15

Ayanna Chen is a portfolio manager at Aycrig Fund, where she supervises assistant portfolio manager Mordechai Garcia. Aycrig Fund invests money for high-net-worth and institutional investors. Chen asks Garcia to analyze certain information relating to Aycrig Fund's three sub-managers, Managers A, B, and C.

Manager A has $250 million in assets under management (AUM), an active risk of 5%, an information coefficient of 0.15, and a transfer coefficient of 0.40. Manager A's portfolio has a 2.5% expected active return this year.

Chen directs Garcia to determine the maximum position size that Manager A can hold in shares of Pasliant Corporation, which has a market capitalization of $3.0 billion, an index weight of 0.20%, and an average daily trading volume (ADV) of 1% of its market capitalization.

Manager A has the following position size policy constraints:

- Allocation: No investment in any security may represent more than 3% of total AUM.
- Liquidity: No position size may represent more than 10% of the dollar value of the security's ADV.
- Index weight: The maximum position weight must be less than or equal to 10 times the security's weight in the index.

Manager B holds a highly diversified portfolio that has balanced exposures to rewarded risk factors, high active share, and a relatively low active risk target.

Selected data on Manager C's portfolio, which contains three assets, is presented in Exhibit 1.

EXHIBIT 1 Selected Data on Manager C's Portfolio

			Covariance		
	Portfolio Weight	**Standard Deviation**	**Asset 1**	**Asset 2**	**Asset 3**
Asset 1	30%	25.00%	0.06250	0.01050	0.00800
Asset 2	45%	14.00%	0.01050	0.01960	0.00224
Asset 3	25%	8.00%	0.00800	0.00224	0.00640

Chen considers adding a fourth sub-manager and evaluates three managers' portfolios, Portfolios X, Y, and Z. The managers for Portfolios X, Y, and Z all have similar costs, fees, and alpha skills, and their factor exposures align with both Aycrig's and investors' expectations

and constraints. The portfolio factor exposures, risk contributions, and risk characteristics are presented in Exhibits 2 and 3.

EXHIBIT 2 Portfolio Factor Exposures and Factor Risk Contribution

	Factor Exposure			Factor Risk Contribution		
	Portfolio X	**Portfolio Y**	**Portfolio Z**	**Portfolio X**	**Portfolio Y**	**Portfolio Z**
Market	1.07	0.84	1.08	103%	82%	104%
Size	–0.13	0.15	–0.12	–2%	7%	–3%
Value	0.04	0.30	0.05	–5%	18%	–6%
Momentum	0.08	0.02	0.07	7%	–3%	7%
Quality	0.10	0.35	0.11	–4%	–21%	–5%
Unexplained	—	—	—	1%	17%	3%
Total	n/a	n/a	n/a	100%	100%	100%

EXHIBIT 3 Portfolio Risk Characteristics

	Portfolio X	**Portfolio Y**	**Portfolio Z**
Annualized volatility	10.50%	13.15%	15.20%
Annualized active risk	2.90%	8.40%	4.20%
Active share	0.71	0.74	0.63

Chen and Garcia next discuss characteristics of long–short and long-only investing. Garcia makes the following statements about investing with long–short and long-only managers:

Statement 1. A long–short portfolio allows for a gross exposure of 100%.
Statement 2. A long-only portfolio generally allows for greater investment capacity than other approaches, particularly when using strategies that focus on large-cap stocks.

Chen and Garcia then turn their attention to portfolio management approaches. Chen prefers an approach that emphasizes security-specific factors, does not engage in factor timing, and builds a diversified portfolio.

9. The number of truly independent decisions Manager A would need to make in order to earn her expected active portfolio return this year is *closest* to:
   A. 8.
   B. 11.
   C. 69.

10. Which of the following position size policy constraints is the most restrictive in setting Manager A's maximum position size in shares of Pasliant Corporation?
   A. Liquidity
   B. Allocation
   C. Index weight

11. Manager B's portfolio is *most likely* consistent with the characteristics of a:
    A. pure indexer.
    B. sector rotator.
    C. multi-factor manager.

12. Based on Exhibit 1, the proportion of Manager C's total portfolio variance contributed by Asset 2 is *closest to*:
    A. 0.0025.
    B. 0.0056.
    C. 0.0088.

13. Based on Exhibits 2 and 3, which portfolio *best* exhibits the risk characteristics of a well-constructed portfolio?
    A. Portfolio X
    B. Portfolio Y
    C. Portfolio Z

14. Which of Garcia's statements regarding investing with long–short and long-only managers is *correct*?
    A. Only Statement 1
    B. Only Statement 2
    C. Both Statement 1 and Statement 2

15. Chen's preferred portfolio management approach would be *best* described as:
    A. top down.
    B. systematic.
    C. discretionary.

CHAPTER 8

TECHNICAL ANALYSIS

LEARNING OUTCOMES

The candidate should be able to:

- explain principles and assumptions of technical analysis;
- describe potential links between technical analysis and behavioral finance;
- compare principles of technical analysis and fundamental analysis;
- describe and interpret different types of technical analysis charts;
- explain uses of trend, support, and resistance lines;
- explain common chart patterns;
- explain common technical indicators;
- describe principles of intermarket analysis;
- explain technical analysis applications to portfolio management.

SUMMARY

- Technical analysis is a form of security analysis that uses price data and volume data, typically displayed graphically in charts. The charts are analyzed using various indicators in order to make investment recommendations.
- Technical analysis has three main principles and assumptions: (1) The market discounts everything, (2) prices move in trends and countertrends, and (3) price action is repetitive, with certain patterns reoccurring.
- Increasingly, analysts, fund managers, and individual investors are studying the basic principles of technical analysis to support their decision-making in financial markets. Behavioral finance, which is the study of the influence of psychology on the behavior of investors, focuses on the fact that investors are not always rational, have limits to their self-control, and are influenced by their own biases. This relatively new field of finance is motivating more practitioners to consider technical analysis as a tool for understanding and explaining irrationalities in financial markets.

- Technical analysis can be used on any freely traded security in the global market and is used on a wide range of financial instruments, such as equities, bonds, commodities, currencies, and futures. However, in general, technical analysis is most effectively applied to liquid markets. Therefore, technical analysis has limited usefulness for illiquid securities, where a small trade can have a large impact on prices.
- The primary tools used in technical analysis are charts and indicators. Charts are graphical displays of price and volume data. Indicators are approaches to analyzing the charts. While the tools can be used on a standalone basis, many analysts, fund managers, and investors will find added value in combining the techniques of chart analysis with their own research and investment approach.
- Charts provide information about past price behavior and provide a basis for inferences about likely future price behavior. Basic charts include line charts, bar charts, and candlestick charts.
- Charts can be drawn either to a linear scale or to a logarithmic scale. A logarithmic scale is appropriate when the data move through a range of values representing several orders of magnitude (e.g., from 10 to 10,000), whereas a linear scale is better suited to narrower ranges (e.g., $35 to $50).
- Volume is an important element of technical analysis and is often included on charts. Volume can be viewed as a confirmation in that it indicates the strength or conviction of buyers and sellers in determining a security's price.
- One of the most important steps in successfully applying technical analysis is to define the time period being analyzed. Technical analysis and charting become more reliable as the time scale increases from intraday to daily, weekly, and even monthly. Analysts and investors whose primary research method is fundamental analysis will find more value in charting instruments on a weekly and/or a monthly scale. Longer time frames will allow analysts and investors to better identify the consolidation and trend periods and time their purchases or sales of securities.
- Several basic concepts can be applied to charts. These include relative strength analysis, trend, consolidation, support, resistance, and change in polarity.
- Relative strength analysis is based on the ratio of the prices of a security and a benchmark and is used to compare the performance of one asset with the performance of another asset.
- The concept of trend is an important aspect of technical analysis. An uptrend is defined as a sequence of higher highs and higher lows. To draw an uptrend line, a technician draws a line connecting the lows on the price chart. A downtrend is defined as a sequence of lower highs and lower lows. To draw a downtrend line, a technician draws a line connecting the highs on the price chart.
- Support is defined as a low price range in which the price stops declining because of buying activity. It is the opposite of resistance, which is a price range in which price stops rising because of selling activity.
- Chart patterns are formations appearing on price charts that create some type of recognizable shape. There are two major types of chart patterns: reversal patterns and continuation patterns.
- Reversal patterns signal the end of a trend. Common reversal patterns are head and shoulders (H&S), inverse H&S, double top, double bottom, triple top, and triple bottom.
- Continuation patterns indicate that a market trend that was in place prior to the pattern formation will continue once the pattern is completed. Common continuation patterns are

triangles (symmetrical, ascending, and descending), rectangles (bullish and bearish), flags, and pennants.

- Technical indicators are used to derive additional information from basic chart patterns. An indicator is any measure based on price, market sentiment, or fund flows that can be used to predict changes in price. Mathematically calculated indicators usually have a supply and demand underpinning. Basic types of indicators include price-based indicators, momentum oscillators, and sentiment indicators.
- Price-based indicators incorporate information contained in market prices. Common price-based indicators include the moving average and Bollinger Bands.
- The moving average is the average of the closing prices of a security over a specified number of periods. Moving averages are a smoothing technique that gives the technical analyst a view of market trends. So, a moving average can be viewed as a trend filter. Long-term moving averages can provide important signals. A price move above the long-term moving average is a sign of an uptrend. A price move below the long-term moving average is a sign of a downtrend.
- When a short-term moving average crosses over a longer-term moving average from underneath, this movement is considered a bullish indicator and is called a "bullish crossover." When a short-term moving-average crosses over a longer-term moving average from above, this movement is a bearish indicator and is called a "bearish crossover."
- Bollinger Bands combine the concept of a moving average with standard deviations around the moving average. This tool is useful in defining a trading range for the security being analyzed. The Bollinger Band width indicator provides an indication of volatility. The idea is that periods of low volatility are followed by periods of high volatility, so that relatively narrow band width can foreshadow an advance or decline in the security under analysis.
- Momentum oscillators are constructed from price data, but they are calculated so that they fluctuate between a low and a high, typically between 0 and 100. Some examples of momentum oscillators include rate of change (ROC) oscillators, the relative strength index (RSI), stochastic oscillators, and the MACD (moving-average convergence/divergence oscillator).
- Momentum oscillators can be viewed as graphical representations of market sentiment that show when selling or buying activity is more aggressive than usual. Technical analysts also look for convergence or divergence between oscillators and price. For example, when the price reaches a new high, this outcome is usually considered "bullish." But if the momentum oscillator does not also reach a new high, this scenario is considered divergence and an early warning sign of weakness.
- Momentum oscillators also alert the technical analyst to overbought or oversold conditions. For example, in an oversold condition, market sentiment is considered unsustainably bearish.
- Sentiment indicators attempt to gauge investor activity for signs of increasing bullishness or bearishness. Commonly used calculated statistical indexes are the put/call ratio, the VIX, and margin debt.
- Intermarket analysis combines technical analysis of the major categories of securities—namely, equities, bonds, currencies, and commodities—to identify market trends and possible inflections in trends. Intermarket analysis also looks at industry subsectors and their relationship to sectors and industries. In addition, it measures the relative performance of major equity benchmarks around the globe.
- Technical analysis can use either a top-down approach or a bottom-up approach to analyze securities. The top-down method is useful for identifying outperforming asset classes,

countries, or sectors. This approach can add value to asset allocation decisions. Allocation shifts can occur within an asset class or across asset classes. The bottom-up method is useful for identifying individual stocks, commodities, or currencies that are outperforming, irrespective of market, industry, or macro trends.

- The technical analyst can add value to an investment team by providing trading/investment ideas through either top-down or bottom-up analysis, depending on the nature of the investment firm or fund. In addition, technical analysis can add value to a fundamental portfolio approach by providing input on the timing of the purchase or sale of a security.

PRACTICE PROBLEMS

1. Technical analysis relies *most importantly* on:
   A. price and volume data.
   B. accurate financial statements.
   C. fundamental analysis to confirm conclusions.

2. Which of the following is *not* an assumption of technical analysis?
   A. Security markets are efficient.
   B. The security under analysis is freely traded.
   C. Market trends and patterns tend to repeat themselves.

3. Drawbacks of technical analysis include which of the following?
   A. It identifies changes in trends only after the fact.
   B. Deviations from intrinsic value can persist for long periods.
   C. It usually requires detailed knowledge of the financial instrument under analysis.

4. Why is technical analysis especially useful in the analysis of commodities and currencies?
   A. Valuation models cannot be used to determine fundamental intrinsic value for these securities.
   B. Government regulators are more likely to intervene in these markets.
   C. These types of securities display clearer trends than equities and bonds do.

5. Technical analysis is a form of security analysis that:
   A. assesses past price action to project future prices.
   B. requires in-depth knowledge of financial instruments.
   C. is ineffective when evaluating long-term price movements.

6. One principle of technical analysis is that a security's price:
   A. tends to move in a random fashion.
   B. moves in patterns that tend to reoccur.
   C. does not reflect all known factor information relating to the security.

7. A daily bar chart provides:
   A. a logarithmically scaled horizontal axis.
   B. a horizontal axis that represents changes in price.
   C. high and low prices during the day and the day's opening and closing prices.

8. A candlestick chart is similar to a bar chart *except* that the candlestick chart:
   A. represents upward movements in price with X's.
   B. also graphically shows the range of the period's highs and lows.
   C. has a body that is light or dark depending on whether the security closed higher or lower than its open.

9. In a candlestick chart, a shaded candlestick body indicates that the opening price was:
   A. equal to the closing price.
   B. lower than the closing price.
   C. higher than the closing price.

10. A chart constructed with a single data point per time interval is a:
   A. bar chart.
   B. line chart.
   C. candlestick chart.

11. In analyzing a price chart, high or increasing volume *most likely* indicates which of the following?
   A. Predicts a reversal in the price trend.
   B. Predicts that a trendless period will follow.
   C. Confirms a rising or declining trend in prices.

12. In constructing a chart, using a logarithmic scale on the vertical axis is likely to be *most useful* for which of the following applications?
   A. The price of gold for the past 100 years.
   B. The share price of a company over the past month.
   C. Yields on 10-year US Treasuries for the past 5 years.

13. A linear price scale is:
   A. inappropriate for a candlestick chart.
   B. better suited for analysis of short-term price movements.
   C. constructed with equal vertical distances corresponding to an equal percentage price change.

14. A downtrend line is constructed by drawing a line connecting:
   A. the lows of the price chart.
   B. the highs of the price chart.
   C. the highest high to the lowest low of the price chart.

15. Relative strength analysis typically compares the performance of an asset with that of a benchmark or other security using a:
   A. bar chart that reflects the two assets' price history.
   B. line chart that reflects the ratio of the two assets' prices.
   C. candlestick chart that reflects ratios measuring the magnitude of each asset's up days versus down days.

16. Exhibit 1 depicts ABC Co., Ltd., ordinary shares, traded on the Shenzhen Stock Exchange, for the months of November through September in renminbi (RMB).

EXHIBIT 1 Candlestick Chart: ABC Co., Ltd. Price Data, November–September (Price Measured in RMB × 10)

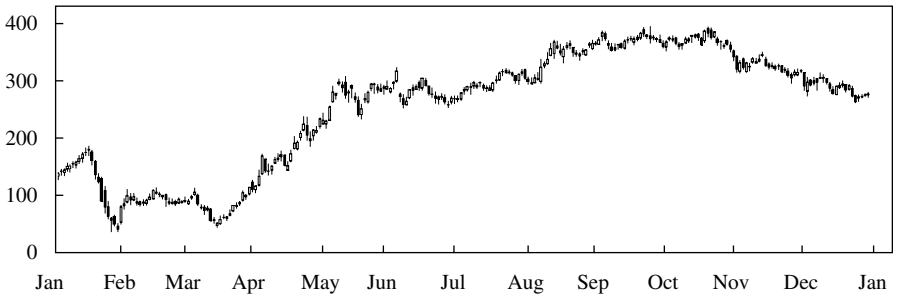
Based on Exhibit 1, the uptrend was *most likely* broken at a price level nearest to:

A. 7 RMB.
B. 8.5 RMB.
C. 10 RMB.

17. The "change in polarity" principle states which of the following?
    A. Once an uptrend is broken, it becomes a downtrend.
    B. Once a resistance level is breached, it becomes a support level.
    C. The short-term moving average has crossed over the longer-term moving average.

18. Exhibit 2 depicts XYZ Co. ordinary shares, traded on the London Stock Exchange, in British pence.

EXHIBIT 2 Candlestick Chart: XYZ Co. Price Data, January–January (Price Measured in British Pence)



Based on Exhibit 2, Barclays appears to show resistance at a level nearest to:

A. 50p.
B. 275p.
C. 390p.

19. When a security is not trending, it is considered to be in a:
A. breakout.
B. retracement.
C. consolidation.

20. A technical analyst who observes a downtrending security break out of a consolidation range on the downside will *most likely* predict that the downtrend will:
A. resume.
B. reverse trend with an upside breakout.
C. retrace back to the consolidation range.

21. Which of the following statements regarding technical support and resistance is correct?
A. A breached support level becomes a new level of resistance.
B. Support is a price range where selling activity is sufficient to stop a rise in price.
C. Resistance is a price range where buying activity is sufficient to stop a decline in price.

22. Exhibit 3 depicts DGF Company common shares, traded on the New York Stock Exchange, for five years in US dollars.

EXHIBIT 3 Candlestick Chart: DGF Company, five years, February–February

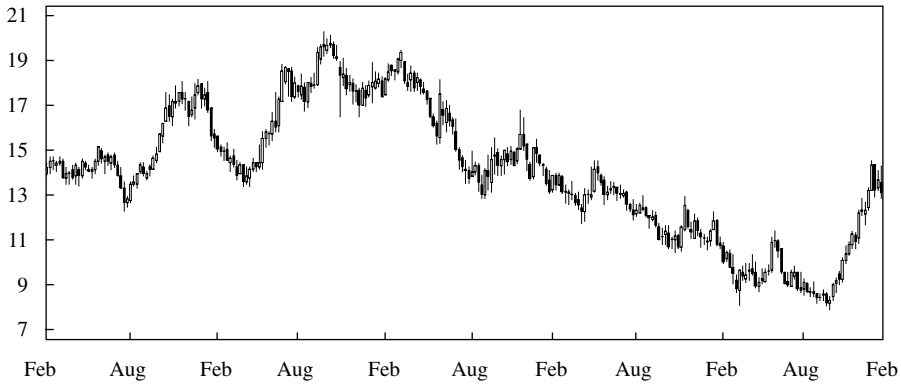


Exhibit 3 illustrates *most clearly* which type of pattern?
A. Triangle
B. Triple top
C. Head and shoulders

23. A triangle chart pattern that indicates a consolidation period and has bullish trading implications would *most likely* be classified as a(n):
A. ascending triangle.
B. descending triangle.
C. symmetrical triangle.

24. In an inverted head and shoulders pattern, if the neckline is at €100, the shoulders at €90, and the head at €75, the price target is *closest* to which of the following?
    A. €50.
    B. €110.
    C. €125.

25. Which of the following chart patterns signals the end of an uptrend in price?
    A. Bearish rectangle
    B. Head and shoulders
    C. Symmetrical triangle

26. An inverse head and shoulders acts as a reversal pattern for a preceding:
    A. uptrend.
    B. downtrend.
    C. consolidation.

27. A fully formed head and shoulders pattern is *most likely* an indicator to:
    A. buy.
    B. sell.
    C. hold.

28. To profit from a head and shoulders formation, a technician often sets a price target below the neckline price by an increment equal to the:
    A. head minus neckline.
    B. head minus top of right shoulder.
    C. top of right shoulder minus neckline.

29. A "healthy correction" chart pattern:
    A. is classified as a type of reversal pattern.
    B. does not change long-term price trends since supply and demand remain in balance.
    C. is formed when the price reaches a low, rebounds, and then sells off back to the first low level.

30. Which flow-of-funds indicator is considered bearish for equities?
    A. A large increase in the number of IPOs.
    B. Higher-than-average cash balances in mutual funds.
    C. An upturn in margin debt but one that is still below the long-term average.

31. If the 5-day moving average for AZB Company crossed over its 60-day moving average from underneath, it would be considered a:
    A. bullish indicator.
    B. bearish indicator.
    C. new level of resistance.

32. A trader observes that the 50-day moving average for the S&P 500 Index recently crossed below its long-term 200-day moving average. This situation is referred to as a:
    A. death cross.
    B. golden cross.
    C. Bollinger Band.

33. Bollinger Bands are constructed by plotting:
    A. a MACD line and a signal line.
    B. a moving-average line with an uptrend line above and downtrend line below.
    C. a moving-average line with upper and lower lines that are at a set number of standard deviations apart.

34. A Bollinger Band "squeeze" occurs when volatility:
    A. falls to low levels as the Bollinger Band widens.
    B. falls to low levels as the Bollinger Band narrows.
    C. rises to high levels as the Bollinger Band narrows.

35. Which of the following is *not* a momentum oscillator?
    A. MACD
    B. Stochastic oscillator
    C. Bollinger Bands

36. Which of the following is a continuation pattern?
    A. Triangle
    B. Triple top
    C. Head and shoulders

37. Which of the following is a reversal pattern?
    A. Pennant
    B. Rectangle
    C. Double bottom

38. Which of the following is generally true of the head and shoulders pattern?
    A. Volume is important in interpreting the data.
    B. The neckline, once breached, becomes a support level.
    C. Head and shoulders patterns are generally followed by an uptrend in the security's price.

39. Intermarket analysis focuses on the:
    A. valuation drivers of intermarket asset price relationships.
    B. bottom-up economic fundamentals of intermarket relationships.
    C. identification of inflection points in intermarket relationships using relative strength indicators.

40. A technical analyst following a bottom-up investing approach focusing on momentum and breakout strategies should favor long positions in stocks with:
    A. shorter consolidation periods.
    B. high Bollinger Band readings.
    C. low volatility prior to an upside breakout.

PART II

SOLUTIONS

CHAPTER 1

OVERVIEW OF EQUITY SECURITIES

SOLUTIONS

1. C is correct. The company is not obligated to make dividend payments. It is at the discretion of the company whether or not it chooses to pay dividends.
2. B is correct. Statutory voting is the type of equity voting right that grants one vote per share owned.
3. A is correct. Preference shares do not have to be either callable or putable.
4. C is correct. Participating preference shares entitle shareholders to receive an additional dividend if the company's profits exceed a pre-determined level.
5. B is correct. Private equity securities do not have market-determined quoted prices.
6. C is correct. Venture capital investments can be used to provide mezzanine financing to companies in their early stage of development.
7. B is correct. Regulatory and investor relations costs are lower for private equity firms than for public firms. There are no stock exchange, regulatory, or shareholder involvements with private equity, whereas for public firms these costs can be high.
8. C is correct. The trends in emerging markets have not led to the stability of foreign exchange markets.
9. A is correct. In an unsponsored DR, the depository bank owns the voting rights to the shares. The bank purchases the shares, places them into a trust, and then sells shares in the trust—not the underlying shares—in other markets.
10. A is correct. The listing fees on Level III sponsored ADRs are high.
11. C is correct. An ETF is used to gain exposure to a basket of securities (equity, fixed income, commodity futures, etc.).
12. A is correct. The formula states $R_t = (P_t - P_{t-1} + D_t)/P_{t-1}$. Therefore, total return $= (42 - 50 + 2)/50 = -12.0\%$.
13. A is correct. The depreciated value of the euro will create an additional loss in the form of currency return that is lower than the ETF's return.
14. C is correct. Some equity securities do not pay dividends, and therefore the standard deviation of dividends cannot be used to measure the risk of all equity securities.

15. A is correct. Putable shares, whether common or preference, give the investor the option to sell the shares back to the issuer at a pre-determined price. This pre-determined price creates a floor for the share's price that reduces the uncertainty of future cash flows for the investor (i.e., lowers risk relative to the other two types of shares listed).
16. C is correct. Issuing shares in the primary (and secondary) market *reduces* a company's return on equity because it increases the total amount of equity capital invested in the company (i.e., the denominator in the ROE formula).
17. C is correct. Capital is raised to ensure the company's existence only when it is required. It is not a typical goal of raising capital.
18. A is correct. A company's book value increases when a company retains its net income.
19. A is correct. The book value of the company is equal to total assets minus total liabilities, which is €12,000,000 – €7,500,000 = €4,500,000.
20. A is correct. A company's market value is affected by management's decisions. Management's decisions can directly affect the company's *book* value, which can then affect its market value.
21. B is correct. A company's ROE is calculated as (NI_t/BVE_{t-1}). The BVE_{t-1} is equal to the beginning total assets minus the beginning total liabilities, which equals £50,000,000 – £35,000,000 = £15,000,000. Therefore, ROE = £2,000,000/£15,000,000 = 13.3%.
22. C is correct. A company's ROE will increase if it issues debt to repurchase outstanding shares of equity.
23. B is correct. The cost of equity is not easily determined. It is dependent on investors' required rate of return on equity, which reflects the different risk levels of investors and their expectations about the company's future cash flows.
24. B is correct. Companies try to raise funds at the lowest possible cost. Therefore, cost of equity is used as a proxy for the minimum required rate of return.

CHAPTER 2

MARKET EFFICIENCY

SOLUTIONS

1. C is correct. Today's price change is independent of the one from yesterday, and in an efficient market, investors will react to new, independent information as it is made public.
2. A is correct. Reducing the number of market participants can accentuate market imperfections and impede market efficiency (e.g., restrictions on foreign investor trading).
3. A is correct. According to theory, reducing the restrictions on trading will allow for more arbitrage trading, thereby promoting more efficient pricing. Although regulators argue that short selling exaggerates downward price movements, empirical research indicates that short selling is helpful in price discovery.
4. C is correct. Regulation to restrict unfair use of nonpublic information encourages greater participation in the market, which increases market efficiency. Regulators (e.g., US SEC) discourage illegal insider trading by issuing penalties to violators of their insider trading rules.
5. A is correct. Restricting short selling will reduce arbitrage trading, which promotes market efficiency. Permitting foreign investor trading increases market participation, which makes markets more efficient. Penalizing insider trading encourages greater market participation, which increases market efficiency.
6. B is correct. A security's intrinsic value and market value should be equal when markets are efficient.
7. B is correct. The intrinsic value of an undervalued asset is greater than the market value of the asset, where the market value is the transaction price at which an asset can be currently bought or sold.
8. B is correct. The market value is the transaction price at which an asset can be currently bought or sold.
9. A is correct. The weak-form efficient market hypothesis is defined as a market where security prices fully reflect all market data, which refers to all past price and trading volume information.
10. B is correct. In semi-strong-form efficient markets, security prices reflect all publicly available information.

11. B is correct. If all public information should already be reflected in the market price, then the abnormal trading profit will be equal to zero when fundamental analysis is used.
12. B is correct. The strong-form efficient market hypothesis assumes all information, public or private, has already been reflected in the prices.
13. B is correct. Costs associated with active trading strategies would be difficult to recover; thus, such active trading strategies would have difficulty outperforming passive strategies on a consistent after-cost basis.
14. B is correct. In a semi-strong-form efficient market, passive portfolio strategies should outperform active portfolio strategies on a risk-adjusted basis.
15. B is correct. Technical analysts use past prices and volume to predict future prices, which is inconsistent with the weakest form of market efficiency (i.e., weak-form market efficiency). Weak-form market efficiency states that investors cannot earn abnormal returns by trading on the basis of past trends in price and volume.
16. C is correct. Fundamental analysts use publicly available information to estimate a security's intrinsic value to determine if the security is mispriced, which is inconsistent with the semi-strong form of market efficiency. Semi-strong-form market efficiency states that investors cannot earn abnormal returns by trading based on publicly available information.
17. C is correct. If markets are not semi-strong-form efficient, then fundamental analysts are able to use publicly available information to estimate a security's intrinsic value and identify misvalued securities. Technical analysis is not able to earn abnormal returns if markets are weak-form efficient. Passive portfolio managers outperform fundamental analysis if markets are semi-strong-form efficient.
18. A is correct. Operating inefficiencies reduce market efficiency.
19. C is correct. If markets are efficient, the information from the annual report is reflected in the stock prices; therefore, the gradual changes must be from the release of additional information.
20. B is correct. The excess returns in January are not attributed to any new information or news; however, research has found that part of the seasonal pattern can be explained by tax-loss selling and portfolio window dressing.
21. A is correct. Finding significant abnormal returns does not necessarily indicate that markets are inefficient or that abnormal returns can be realized by applying the strategy to future time periods. Abnormal returns are considered market anomalies because they may be the result of the model used to estimate the expected returns or may be the result of underestimating transaction costs or other expenses associated with implementing the strategy, rather than because of market inefficiency.
22. B is correct. Trading based on historical momentum indicates that price patterns exist and can be exploited by using historical price information. A momentum trading strategy that produces abnormal returns contradicts the weak form of the efficient market hypothesis, which states that investors cannot earn abnormal returns on the basis of past trends in prices.
23. A is correct. Higher than average dividend yield is a characteristic of a value stock, along with low price-to-earnings and low market-to-book ratios. Growth stocks are characterized by low dividend yields and high price-to-earnings and high market-to-book ratios.

24. A is correct. The efficient market hypothesis and asset-pricing models only require that the market is rational. Behavioral finance is used to explain *some* of the market anomalies as irrational decisions.
25. B is correct. Behavioral theories of loss aversion can explain observed overreaction in markets, such that investors dislike losses more than comparable gains (i.e., risk is not symmetrical).
26. C is correct. Behavioral theories of loss aversion allow for the possibility that the dislike for risk is not symmetrical, which allows for loss aversion to explain observed overreaction in markets such that investors dislike losses more than they like comparable gains.

CHAPTER 3

OVERVIEW OF EQUITY PORTFOLIO MANAGEMENT

SOLUTIONS

1. C is correct. The Barboa Fund invests solely in the equity of companies in the oil production and transportation industries in many countries. The fund's description is consistent with the production-oriented approach, which groups companies that manufacture similar products or use similar inputs in their manufacturing processes.
   A is incorrect because the fund description does not mention the firms' size or style (i.e., value, growth, or blend). Size is typically measured by market capitalization and often categorized as large cap, mid-cap, or small cap. Style is typically classified as value, growth, or a blend of value and growth. In addition, style is often determined through a "scoring" system that incorporates multiple metrics or ratios, such as price-to-book ratios, price-to-earnings ratios, earnings growth, dividend yield, and book value growth. These metrics are then typically "scored" individually for each company, assigned certain weights, and then aggregated.
   B is incorrect because the fund is invested across many countries, which indicates that the fund is not segmented by geography. Segmentation by geography is typically based upon the stage of countries' macroeconomic development and wealth. Common geographic categories are developed markets, emerging markets, and frontier markets.
2. C is correct because the fund focuses on new funds that are generally classified as small firms, and the fund has a style classified as aggressive. A widely used approach to segment the equity universe incorporates two factors: size and style. Size is typically measured by market capitalization and often categorized as large cap, mid-cap, or small cap. Style is typically classified as value, growth, or a blend of value and growth.
3. B is correct. The DoGood Fund excludes companies based on specified activities (e.g., aerospace and defense), which is a process of negative screening. Negative or

exclusionary screening refers to the practice of excluding certain sectors or companies that deviate from accepted standards in areas such as human rights or environmental concerns.

A is incorrect because positive screening attempts to identify companies or sectors that score most favorably regarding ESG-related risks and/or opportunities. The restrictions on investing indicates that a negative screen is established.

C is incorrect because thematic investing focuses on investing in companies within a specific sector or following a specific theme, such as energy efficiency or climate change. The DoGood Fund's investment universe includes all companies and sectors that have favorable ESG (no specific sectors or screens) but with specific exclusions.

4. B is correct. The fund is managed assuming that the market is efficient, and investments are selected to mimic an index. Compared with active strategies, passive strategies generally have lower turnover and generate a higher percentage of long-term gains. An index fund that replicates its benchmark can have minimal rebalancing.
5. A is correct. Performance fees serve as an incentive for portfolio managers to achieve or outperform return objectives, to the benefit of both the manager and investors. Several performance fee structures exist, although performance fees tend to be "upward only"—that is, fees are earned by the manager when performance objectives are met, but fund investors are not reimbursed when performance is negative. Performance fees could be reduced following a period of poor performance, however. Fee calculations also reflect high-water marks**.** As described in Note 1, the fee for the Caribou Fund is a 15% share of any capital appreciation above a 7% threshold, with the use of a high-water mark, and is therefore a performance fee.

   B is incorrect because management fees include direct costs of research (such as remuneration and expenses for investment analysts and portfolio managers) and the direct costs of portfolio management (e.g., software, trade processing costs, and compliance). Management fees are typically determined as a percentage of the funds under management.

   C is incorrect because administrative fees include the processing of corporate actions such as rights issues and optional stock dividends, the measurement of performance and risk of a portfolio, and voting at company meetings. Generally, these functions are provided by an investment management firm itself and are included as part of the management fee.
6. B is correct because the fund becomes a free-rider if it allows other shareholders to engage in actions that benefit the fund, and therefore Note 3 is correct. In theory, some investors could benefit from the shareholder engagement of others under the so-called "free-rider problem." Specifically, assume that a portfolio manager using an active strategy actively engages with a company to improve its operations and was successful in increasing the company's stock price. The manager's actions in this case improved the value of his portfolio and also benefited other investors that own the same stock in their portfolios. Those investors that did not participate in shareholder engagement benefit from improved performance but without the costs necessary for engagement.

   Note 2 is incorrect because a conflict of interest arises on the part of the DoGood Fund if it owns shares of a company that invests in the fund. Conflicts of interest can result for a company. For example, a portfolio manager could engage with a company that also happens to be an investor in the manager's portfolio. In such a situation, a portfolio manager may be unduly influenced to support the company's management so as not to jeopardize the company's investment mandate with the portfolio manager.

7. A is correct. For passively managed portfolios, management fees are typically low because of lower direct costs of research and portfolio management relative to actively managed portfolios. Therefore, Note 4 is correct.
   Note 5 is incorrect because the predictability of correlations is uncertain.
8. B is correct. Writing covered calls also generates additional income for an equity portfolio, but doing so limits the upside from share price appreciation of the underlying shares. Therefore, Statement 2 is correct.
   A is incorrect because dividends on loaned stock are "manufactured" by the stock borrower for the stock lender—that is, the stock borrower ensures that the stock lender is compensated for any dividends that the lender would have received had the stock not been loaned. Therefore, Statement 1 is incorrect. Frey is incorrect in stating that the funds would miss out on dividend income on lent securities.

CHAPTER 4

PASSIVE EQUITY INVESTING

SOLUTIONS

1. B is correct. The three requirements for an index to become the basis for an equity investment strategy are that the index be (a) rules based, (b) transparent, and (c) investable. Buffering makes index benchmarks more investable (Statement 2) by making index transitions a more gradual and orderly process.
   A is incorrect because basing the index weight of an individual security solely on the total number of shares outstanding without using a free-float adjustment may make the index less investable. If a stock market cap excludes shares held by founders, governments, or other companies, then the remaining shares more accurately reflect the stock's true liquidity. Thus a free-float adjustment (Statement 1) to a market index more accurately reflects its actual liquidity (it does not lower its liquidity). Many indexes require that individual stocks have float and average shares traded above a certain percentage of shares outstanding.
2. B is correct. To address Winthrop's concerns (sector diversification, liquidity, risk, dividend yield, P/E, and P/B), the Canadian equity index benchmark should consist of large-capitalization stocks with a value tilt. A large-capitalization index contains the largest-cap stocks, which tend to have the highest liquidity. Value stocks tend to exhibit high dividend yields and low P/E and P/B ratios.
   A is incorrect because small-capitalization stocks tend to be riskier than large-capitalization stocks. Winthrop has a preference for low-beta (risk) stocks.
   C is incorrect because a growth index will not address Winthrop's preference for a low P/E. Growth stocks exhibit characteristics such as high price momentum, high P/Es, and high EPS growth.
3. C is correct. An index that contains a large number of constituents will tend to create higher tracking error than one with fewer constituents. Based on the number of constituents in the three indexes (S&P/TSX 60 has 60, S&P 500 has 506, and MSCI

EAFE has 933), EFA (the MSCI EAFE ETF) is expected to have the highest tracking error. Higher expense ratios (XIU: 0.18%; SPY: 0.10%; and EFA: 0.33%) also contribute to lower excess returns and higher tracking error, which implies that EFA has the highest expected tracking error.

4. B is correct. Full replication occurs when a manager holds all securities represented by the index in weightings that closely match the actual index weightings. Thus it requires that all index constituents are liquid and available for trading, and the asset size of the mandate must also be sufficient. Significant brokerage commissions can occur, however, when the index is large.
5. C is correct. Stratified sampling methods are most frequently used when a portfolio manager is tracking an index that has a large number of constituents, or when managing a relatively low level of assets. Brokerage fees can become excessive when the number of constituents in the index is large.

   A is incorrect because optimization does not involve simple techniques. Optimization requires a high level of technical sophistication, including familiarity with computerized optimization software or algorithms, and a good understanding of the output.

   B is incorrect because full replication occurs when a manager holds all (not fewer) securities represented by the index in weightings that closely match actual index weightings. Full replication techniques require that the mandate's asset size is sufficient and that the index constituents are available for trading. Full replication can create significant brokerage commissions when the index is large.
6. B is correct. Securities lending is typically used to offset the costs associated with portfolio management. By lending stocks, however, the investor is exposed to the credit quality of the stocks' borrower (counterparty or credit risk) and to risks involved with the posted collateral (market risk).

   A is incorrect because program trading is a strategy of buying or selling many stocks simultaneously. It is used primarily by institutional investors, typically for large-volume trades. Orders from the trader's computer are entered directly into the market's computer system and executed automatically.

   C is incorrect because attribution analysis is not a method of generating incremental revenue. Attribution analysis is a method that helps the manager understand the sources of return.
7. C is correct. The amount of the performance bonus that will be received in one month (USD5,750,000) needs to be invested passively based upon the strategic allocation recommended by Tong. Using the strategic allocation of the portfolio, 15% (USD862,500.00) should be allocated to US equity exposure using the S&P 500 E-mini contract, which trades in US dollars. Because the futures price is 2,464.29 and the S&P 500 E-mini multiplier is 50, the contract unit value is USD123,214.50 ($2{,}464.29 \times 50$).

   The correct number of futures contracts is $(5{,}750{,}000.00 \times 0.15)/123{,}214.50 = 7.00$. Therefore, Tong will buy seven S&P 500 E-mini futures contracts.
8. A is correct. Basis risk results from using a hedging instrument that is imperfectly matched to the investment being hedged. Basis risk can arise when the underlying securities pay dividends, because the futures contract tracks only the price of the underlying index. Stock splits do not affect investment performance comparisons.
9. A is correct. Compared with broad-market-cap weighting, passive factor-based strategies tend to concentrate risk exposure, leaving investors vulnerable during periods when the risk factor (e.g., momentum) is out of favor.

10. B is correct. McMahon suggests that the foundation follow a passive factor-based momentum strategy, which is generally defined by the amount of a stock's excess price return relative to the market during a specified period. Factor-based momentum strategies are classified as return oriented.
11. C is correct. The initial benchmark used for the US large-cap allocation is a price-weighted index. In a price-weighted index, the weight of each stock is its price per share divided by the sum of all the share prices in the index. As a result, a price-weighted index can be interpreted as a portfolio composed of one share of each constituent security.
12. B is correct. The HHI measures stock concentration risk in a portfolio, calculated as the sum of the constituent weightings squared:

$$\text{HHI} = \sum_{i=1}^{n} w_i^2$$

Using the HHI, one can estimate the effective number of stocks, held in equal weights, that would mimic the concentration level of the respective index. The effective number of stocks for a portfolio is calculated as the reciprocal of the HHI. The HHI is 0.0286; the reciprocal (1/0.0286) is 34.97. Therefore, the effective number of stocks to mimic the US large-cap benchmark is approximately 35.

13. C is correct. Below is the attribution analysis for selected sectors of the US large-cap portfolio.

		US Large-Cap Core Portfolio		**Large-Cap Benchmark**		**Attribution Analysis**
Sector	**Sector Return (A)**	**Sector Weight (B)**	**Contribution to Return (C) = (A) × (B)**	**Sector Weight (D)**	**Contribution to Return (E) = (A) × (D)**	**Difference (F) = (C) – (E)**
Information technology	10.75%	18.71%	2.01%	19.06%	2.05%	–0.04%
Consumer staples	12.31%	16.52%	2.03%	16.10%	1.98%	0.05%
Energy	8.63%	9.38%	0.81%	9.53%	0.82%	–0.01%
Utilities	–3.92%	8.76%	–0.34%	8.25%	–0.32%	–0.02%
Financials	7.05%	6.89%	0.49%	6.62%	0.47%	0.02%

Based on this analysis, the US large-cap portfolio's information technology sector is the primary contributor to the portfolio's disappointing equity returns because it provided the largest negative differential relative to the benchmark, with a differential of –0.04%. Although the information technology sector had a positive return, this sector was underweighted relative to the benchmark, resulting in a negative contribution to the portfolio's returns.

14. C is correct. Of the three portfolios, Portfolio 3 has the lowest cash holding and the lowest fees. As a result, Portfolio 3 has the potential for the lowest tracking error compared with the other proposed portfolios.

CHAPTER 5

ANALYSIS OF ACTIVE PORTFOLIO MANAGEMENT

SOLUTIONS

1. B is correct. Although the first part of Statement 1 is correct (active return, or value added, equals the difference between the managed portfolio return and the benchmark return), active return is not the same as alpha. In other words, $R_A = R_P - R_B$, while $\alpha_P = R_P - \beta_P \times R_B$. Statement 2 correctly defines active weights.
2. B is correct. The portfolio active return is equal to the portfolio return minus the benchmark return:

   $R_A = R_P - R_B$

   The portfolio return is $R_P = \sum_{i=1}^{n} w_{P,i} R_i$.

   $R_P = 0.30(14\%) + 0.30(15\%) + 0.20(12\%) + 0.10(8\%) + 0.10(10\%) = 12.9\%$

   The benchmark return is $R_B = \sum_{i=1}^{n} w_{B,i} R_i$.

   $R_B = 0.24(14\%) + 0.20(15\%) + 0.20(12\%) + 0.18(8\%) + 0.18(10\%) = 12.0\%$

   Thus, the active return is

   $R_A = R_P - R_B = 12.9\% - 12.0\% = 0.9\%$

Note that this same correct answer can be obtained in two other equivalent ways. The active weights are the differences between the portfolio and benchmark weights, or $\Delta w_i = w_{P,i} - w_{B,i}$. Computing the active weights from the table provided, the active return is

$$\begin{aligned} R_A &= \sum_{i=1}^{N} \Delta w_i R_i \\ &= 0.06(14\%) + 0.10(15\%) + 0(12\%) - 0.08(8\%) - 0.08(10\%) \\ &= 0.9\% \end{aligned}$$

Finally, we could express the active security returns as their differences from the benchmark return, or $R_{Ai} = R_i - R_B$. Computing the active security returns from the table provided, the portfolio active return is the sum product of the active weights and the active security returns:

$$\begin{aligned} R_A &= \sum_{i=1}^{N} \Delta w_i R_{Ai} \\ &= 0.06(2\%) + 0.10(3\%) + 0(0\%) - 0.08(-4\%) - 0.08(-2\%) \\ &= 0.9\% \end{aligned}$$

3. C is correct. The active return is equal to the portfolio return minus the benchmark return:

$$R_A = R_P - R_B = \sum_{j=1}^{M} w_{P,j} R_{P,j} - \sum_{j=1}^{M} w_{B,j} R_{B,j}$$

The portfolio return is $R_P = \sum_{i=1}^{n} w_{P,i} R_i = 0.55(10\%) + 0.20(10\%) + 0.25(5\%) = 8.75\%$.

The benchmark return is $R_B = \sum_{i=1}^{n} w_{B,i} R_i = 0.40(8\%) + 0.30(9\%) + 0.30(6\%) = 7.70\%$.

$$\text{Thus, } R_A = R_P - R_B = 8.75\% - 7.70\% = 1.05\%$$

4. A is correct. Both properties are correct. For Property 1, if w_P is the weight of an actively managed portfolio and $(1 - w_P)$ is the weight on risk-free cash, changing w_P does not change the Sharpe ratio, as can be seen in this equation:

$$\text{SR}_C = \frac{R_C - R_F}{\sigma_C} = \frac{w_P(R_P - R_F)}{w_P \sigma_P} = \text{SR}_P$$

For Property 2, the information ratio of an unconstrained portfolio is unaffected by multiplying the active security weights, Δw_i, by a constant.

5. B is correct. The highest squared Sharpe ratio of an actively managed portfolio is

$$\text{SR}_P^2 = \text{SR}_B^2 + \text{IR}^2 = 0.333^2 + 0.15^2 = 0.1334$$

The highest Sharpe ratio is $\text{SR}_P = \sqrt{0.1334} = 0.365$.

6. A is correct. The optimal amount of active risk is

$$\sigma_A = \frac{\text{IR}}{\text{SR}_B}\sigma_B = \frac{0.15}{0.333}18.0\% = 8.11\%$$

The weight on the active portfolio (Indigo) would be 8.11%/8.0% = 1.014, and the weight on the benchmark portfolio would be 1 − 1.014 = −0.014.
We can demonstrate that these weights achieve the maximum Sharpe ratio (of 0.365). Note that 8.11% is the optimal level of active risk and that Indigo has an expected active return of 1.014(1.2%) = 1.217% over the benchmark and a total excess return of 6.0% + 1.217% = 7.217%. The portfolio total risk is

$$\sigma_P{}^2 = \sigma_B{}^2 + \sigma_A{}^2 = 18.0^2 + 8.111^2 = 389.788$$

Taking the square root, $\sigma_P = 19.743$, and the optimal Sharpe ratio is indeed 7.217/19.743 = 0.365.

7. B is correct. The optimal active portfolio is the portfolio with the highest information ratio, the ratio of active return to active risk. The IRs for the three active portfolios are as follows:

$$\text{IR}_\text{A} = 1.0/10.0 = 0.10$$

$$\text{IR}_\text{B} = 0.5/3.0 = 0.167$$

$$\text{IR}_\text{C} = 0/2.0 = 0.00$$

Portfolio B has the highest IR and is the best active portfolio; it is therefore the best portfolio to combine with the benchmark.

8. C is correct. Using the equation $\text{IR}^* = \text{IC} \times \sqrt{\text{BR}}$ and assuming that breadth can be interpreted as number of securities in the portfolio, solving for breadth in the equation yields $\left(\frac{0.75}{0.1819}\right)^2 = 17.000$.
9. C is correct. The transfer coefficient measures how well the anticipated (*ex ante*), risk-adjusted returns correlate with the risk-adjusted active weights. This is also expressed in the equation for the transfer coefficient: $\text{TC} = \rho(\mu_i/\sigma_i, \Delta w_i \sigma_i)$.
10. B is correct. The IC measures an investment manager's ability to forecast returns.
11. B is correct. A closet index will have a very low active risk and will also have a Sharpe ratio very close to the benchmark. Therefore, Statements I and III are consistent with a closet index portfolio. A closet index's information ratio can be indeterminate (because the active risk is so low) and is often negative due to management fees.
12. A is correct. Manager A has the highest information ratio. The information ratio is defined as $\text{IR} = \frac{\text{active return}}{\text{active risk}}$. The managers in this example have the following information ratios:

	Manager A	**Manager B**	**Manager C**
Information ratio	0.7/3.2 = 0.219	0.6/3.1 = 0.194	1.2/6.3 = 0.190

13. B is correct. The information ratio is unaffected by rebalancing the active portfolio and the benchmark portfolio. In this case, the active return and active risk are both reduced by 25% and the information ratio will be unchanged.
14. C is correct. The proper statistic to calculate is the information coefficient, and it is defined as follows:

$$\text{IC} = \rho\left(\frac{R_{Ai}}{\sigma_i}, \frac{\mu_i}{\sigma i}\right)$$

A manager is a good forecaster if his or her *ex ante*, active return expectations (forecasts) are highly correlated with the realized active returns. The information coefficient requires that these forecasts and realized returns be risk-weighted. When this is done for the three managers, the risk-weighted forecasts and realized returns are:

	Risk-Weighted Forecasts, μ_i/σ_i			R_{Ai}/σ_i
	Manager 1	**Manager 2**	**Manager 3**	**Realized**
Security 1	0.176	0.235	0.147	0.353
Security 2	0.400	0.100	0.150	0.700
Security 3	0.417	0.000	0.042	0.333
Security 4	0.240	0.080	0.060	0.080

The ICs are found by calculating the correlations between each manager's forecasts and the realized risk-weighted returns. The three managers have the following ICs:

	Manager 1	**Manager 2**	**Manager 3**
Information coefficient	0.5335	0.0966	0.6769

Manager 3 has the highest IC.

15. B is correct. The proper statistic to calculate is the transfer coefficient, and it is defined as follows:

$$\text{TC} = \rho(\mu_i/\sigma_i, \Delta w_i \sigma_i)$$

The TC is the cross-sectional correlation between the forecasted active security returns and the actual active weights, adjusted for risk.

	Risk-Weighted Forecasts, μ_i/σ_i			**Risk-Adjusted Weights, $\Delta w_i \sigma_i$**		
	Manager 1	**Manager 2**	**Manager 3**	**Manager 1**	**Manager 2**	**Manager 3**
Security 1	0.1765	0.2353	0.1471	−0.0213	0.0340	−0.0085
Security 2	0.4000	0.1000	0.1500	0.0025	0.0000	0.0050
Security 3	0.4167	0.0000	0.0417	0.0090	−0.0120	0.0060
Security 4	0.2400	0.0800	0.0600	0.0063	−0.0250	−0.0125

The three managers have the following TCs:

	Manager 1	**Manager 2**	**Manager 3**
Transfer coefficient	0.7267	0.8504	−0.0020

Manager 2 has the highest TC.

16. A is correct. Manager 1's IR = TC × IC × $\sqrt{\text{BR}}$ = 1.0 × 0.15 × $\sqrt{50}$ = 1.06. Manager 2's IR = 0.8 × 0.10 × $\sqrt{100}$ = 0.80. Manager 1's active return is 1.06(5.0) = 5.3%, and Manager 2's expected active return is 0.80(5.0) = 4.0%. Manager 1 has the greater expected active return.
17. C is correct. If the decisions about each of the 200 stocks are not independent, and if the decisions about a stock from one month to the next are not independent, then Goudon Partners is overstating its estimates of its breadth and its expected active returns.
18. B is correct. Although the relaxation of portfolio constraints will increase the transfer coefficient (and expected active returns), the lower information coefficient reduces the information ratio and the expected active return.
19. A is correct. Because the benchmark does not contain many assets that Frazee wants to invest in, the benchmark may not be representative of his investment approach. Concern 2, as stated, is less important because it does not imply that the cost of replicating the benchmark is a serious concern. Finally, Concern 3 actually states a generally positive feature of the benchmark.
20. B is correct. Active return from asset allocation is derived from differences between the benchmark weight and the portfolio weight across asset classes. For Fund X, the expected active return from asset allocation is calculated as

$$\sum_{j=1}^{M} \Delta w_j R_{B,j} = (60 - 60)R_{B,e} + (40 - 40)R_{B,b} = 0$$

where Δw_j is the difference in the active portfolio and the benchmark asset weights, $R_{B,e}$ is the benchmark's return from global equities, and $R_{B,b}$ is the benchmark's return from global bonds.

Because Fund X has the same asset weights as the benchmark across the two asset classes (60% global equities, 40% global bonds), the expected active return from asset allocation is zero.

21. C is correct. The IR measures the consistency of active return. The IR is calculated for the three funds as follows:

$$\text{IR} = \frac{R_P - R_B}{\sigma(P_P - R_B)} = \frac{R_A}{\sigma_A}.$$

$$\text{IR for Fund X} = (10.0 - 9.4)/5.2 = 0.6/5.2 = 0.12$$

$$\text{IR for Fund Y} = (11.6 - 9.4)/9.2 = 2.2/9.2 = 0.24$$

$$\text{IR for Fund Z} = (13.2 - 9.4)/15.1 = 3.8/15.1 = 0.25$$

Fund Z has the largest IR and thus is expected to produce the greatest consistency of active return.

22. B is correct. Given the IR for Fund W of 0.35 and the benchmark's SR of 0.44, the combination of the benchmark portfolio and Fund W would produce an SR of 0.56, calculated as follows:

$$SR_P^2 = SR_B^2 + IR^2$$

$$SR_P = (0.44^2 + 0.35^2)^{0.5} = 0.56$$

23. A is correct. The new assumption adds constraints to Fund W. The IR for a constrained portfolio generally decreases with the aggressiveness of the strategy because portfolio constraints reduce the transfer of active return forecasts into active weights. Furthermore, the optimal active risk is given by the following formula:

$$\sigma_A = TC\frac{IR}{SR_B}\sigma_B$$

The addition of portfolio constraints reduces the TC, thus also reducing the optimal active risk.

So, having maximum over- and underweight constraints on single-country positions decreases the optimal aggressiveness of the active management strategy.

24. B is correct. The IR measures the consistency of active return generation. A higher ratio generally indicates better managerial skill at achieving active returns on a risk-adjusted basis. The IR for Candidate B (0.746) is higher than the IR for Candidate A (0.582) and Candidate C (0.723).

Thus, Candidate B appears to have the greatest skill, as indicated by the highest IR of 0.746.

25. C is correct. The IR is calculated as $IR = (TC)(IC)\sqrt{BR}$, where BR is breadth. Change 3, establishing new constraints of caps on the over- and underweight of sectors, reduces the correlation of optimal active weights with the actual active weights, which results in a decreased TC and thus a decrease in the IR. Change 1 (increasing portfolio size from 36 to 50) and Change 2 (increasing the frequency of rebalancing from annually to semi-annually) would both likely have the effect of increasing the BR of the portfolio, which would increase the IR.

26. B is correct. Based on the differences in returns for the portfolio and benchmark in Exhibit 1, the value added by each asset class within the portfolio is shown in the following table:

	Sub-Portfolio Return (%)	**Benchmark Return (%)**	**Value Added (%)**	**Portfolio Allocation (%)**
Equities sub-portfolio	36.9	31.6	5.3	63
Bond sub-portfolio	−2.4	−2.6	0.2	28
Real estate sub-portfolio	33.4	28.3	5.1	9

The value added from security selection is calculated as the sum of the actual portfolio weights multiplied by each sub-portfolio's value added measure. Thus, the value added

from security selection is calculated as: Value added from security selection = 0.63 (5.3%) + 0.28(0.2%) + 0.09(5.1%) = 3.9%.

A is incorrect. It represents the value added from asset allocation.

C is incorrect. It represents the total value added (3% + 3.9% = 6.1%).

27. A is correct. The value added from asset allocation is calculated as the sum of the differences in the weights between the strategic (benchmark) allocation and the actual sub-portfolio allocation multiplied by each sub-portfolio's benchmark return.

	Benchmark Return (%)	Actual Asset Allocation (%)	Strategic Asset Allocation (%)	Actual − Strategic Asset Allocation (%)
Equities sub-portfolio	31.6	63	60	+3
Bond sub-portfolio	−2.6	28	35	−7
Real estate sub-portfolio	28.3	9	5	+4

Thus, the value added by the active asset allocation decision is calculated as

$$\text{Value added from asset allocation decision} = 0.03(31.6\%) - 0.07(-2.6\%) + 0.04(28.3\%) = 2.3\%$$

B is incorrect. It is the value added from security selection.

C is incorrect. It is the total value added.

28. B is correct. The information ratio for a portfolio can be expressed as follows:

$$\text{IR} = (\text{TC})(\text{IC})\sqrt{\text{BR}}$$

The information ratios for the three sub-portfolios are calculated as follows:

	Information Ratio
Equities sub-portfolio	$0.90 \times 0.091 \times (21)^{0.5} = 0.38$
Bond sub-portfolio	$0.79 \times 0.087 \times (23)^{0.5} = 0.33$
Real estate sub-portfolio	$0.86 \times 0.093 \times (19)^{0.5} = 0.35$

Based on the information ratio, the equities sub-portfolio outperformed the real estate sub-portfolio. The information ratio for the equities sub-portfolio of 0.38 was higher than the information ratio for the real estate sub-portfolio of 0.35 and the bond sub-portfolio of 0.33.

29. C is correct. The information ratio for a portfolio of risky assets will generally shrink if cash is added to the portfolio. Because the diversified asset portfolio is an unconstrained portfolio, its information ratio would be unaffected by an increase in the aggressiveness of active weights.

CHAPTER 6

ACTIVE EQUITY INVESTING: STRATEGIES

SOLUTIONS

1. A is correct. Furlings combines a top-down and bottom-up approach, but in both cases, the allocation process is significantly determined according to the managers' discretion and judgment. There is a strong emphasis on understanding financial reporting, and the sector managers focus on a relatively small number for firms. They also extend their analysis to other areas associated with fundamental management, such as valuation, competitive advantages, and governance. Finally, Furlings's top-down process depends largely on the views and experience of its head manager.
   B is incorrect. Asgard has many of the attributes associated with a fundamental manager. It invests in a relatively small number of securities and focuses on the companies' business model, valuations, and future growth prospects. Because of the scope of the securities coverage by each manager, however, Asgard depends heavily on technology and tools to support screening and ranking of securities attractiveness. Each manager can use his judgment to build his own quantitative models. Furthermore, the allocation process, although overlaid by a management team, also depends heavily on technology. Asgard has characteristics of both fundamental and quantitative managers.
   C is incorrect. Tokra exhibits the characteristics of a quantitative manager. The firm uses quantitative metrics to rank securities based on valuation, profitability, and momentum criteria and uses portfolio optimization to determine the final allocation. Tokra holds many positions typical of quantitative approaches.
2. C is an incorrect statement. Although Tokra is a factor manager, and although it uses a value proxy such as P/B and a profitability proxy such as return on assets, it does not use a growth proxy such as earnings growth over the last 12 or 36 months but rather a price momentum proxy.

A is a correct statement. Furlings is a top-down manager. It makes significant sector bets based on industry and economic indicators derived from the head manager's experience, and it does select its securities within sectors while considering relative valuation.

B is a correct statement. Asgard favors securities that have reasonable valuations and above-average growth prospects. It has a bottom-up approach and builds its portfolio starting at the security level.

3. C is the correct answer. A value trap occurs when a stock that appears to have an attractive valuation because of a low P/E and/or P/B multiple (or other relevant value proxies) appears cheap only because of its worsening growth prospects. Although a pitfall such as value trap is more common in fundamental investing, a quantitative process that relies on historical information and does not integrate future expectations about cash flows or profitability may be unable to detect a value trap.

   A is an incorrect answer. Although Furlings is a top-down manager, its sector portfolios are built through investing in a small number of high-conviction securities after its analysts have dissected the financial statements and analyzed the competitive landscape and growth prospects. Managers at Furlings are more likely than managers at Tokra to be aware of the significant deteriorating prospects of a security they are considering for investment.

   B is an incorrect answer. One of Asgard's investment criteria is identifying firms that have good potential cash flow growth over the next three years. The firm has access to database and support tools, allowing its analysts to evaluate many potential growth metrics. Managers at Asgard are more likely than managers at Tokra to be aware of the significant deteriorating prospects of a security they are considering for investment.

4. B is the correct answer. Asgard invests in firms that have strong business models and good governance. Also, it approaches investing as a long-term investor looking to use its voice to improve the company's asset management. Asgard is unlikely to use an aggressive posturing or to invest or stay invested in companies with weak governance or where managers may be in breach of fiduciary duties.

   A is an incorrect answer. Engaging in positive conversations with management of companies with which Asgard has invested reflects a use of its voice to improve these companies' long-term value.

   C is an incorrect answer. Because Asgard is strong at modeling sources of cash flows and is known for investing in companies with a strong capital structure, it would be consistent for Asgard to propose ways to optimize the capital structure and shareholders' compensation.

5. C is the correct answer. Tokra indicates that it emphasizes three metrics: P/B, 12-month price momentum, and return on assets. Although the portfolio consists of securities that have stronger momentum than those of the index on average, and although the ratio of net income to assets is also favorable, the average P/B is somehow higher than that of the index. Although this scenario could normally be explained by an emphasis on specific sectors with a higher P/B than other sectors, the low level of sector deviation tolerated within the strategy weakens that explanation. This should be explored with Tokra's managers.

   A is an incorrect answer. Furlings is a top-down sector rotator with a value orientation within sectors. The lower P/B and P/E and higher net income over assets are consistent with a relative value orientation. Because Furlings can take significant positions in specific sectors, however, there could be other circumstances in which the portfolio

would have a higher P/B and/or P/E and or a lower net income/assets than the index if the fund were to emphasize sectors having such characteristics. Yet, this would not necessarily imply that the firm does not favor the most attractive relative valuations within sectors.

B is an incorrect answer. Asgard invests in firms that offer reasonable valuations and above-average expected cash flow growth during the next three years. The data, such as P/B and average expected three-year profit growth, are consistent with its declared style. Again, it is not necessarily inconsistent to emphasize these aspects while investing in a portfolio that has a lower dividend yield, slightly higher P/E, and lower price momentum.

6. C is a correct answer. Morningstar calculates a score for value and growth on a scale of 0 to 100 using five proxy measures for each. The value score is subtracted from the growth score. A strongly positive net score leads to a growth classification, and a strongly negative score leads to a value classification. A score relatively close to zero indicates a core classification. To achieve a blend classification, the portfolio must have a balanced exposure to stocks classified as value and growth, a dominant exposure to stocks classified as core, or a combination of both.

   A is an incorrect answer. Both Morningstar and Lipper classify individual stocks in a specific style category. Neither assumes a security can belong to several styles in specific proportion.

   B is an incorrect answer. The Lipper methodology does have a core classification. It sums the *Z*-score of six portfolio characteristics over several years to determine an overall *Z*-score that determines either a value, core, or growth classification.

7. B is correct. The firm currently offers a single equity fund, which uses a top-down investment strategy. Country and geographic allocation and sector and industry rotation are both top-down strategies that begin at the top or macro level and are consistent with the fund's top-down investment strategy. Growth at a reasonable price (GARP), however —a growth-based approach—is a bottom-up asset selection strategy that begins with data at the company level. Therefore, Nowacki and Knight likely would not use the GARP approach to select investments for the existing equity fund, which uses a top-down investment strategy. A is incorrect because sector and industry rotation is a top-down strategy, consistent with the fund's top-down approach. C is incorrect because country and geography selection is a top-down strategy, consistent with the fund's top-down approach.

8. B is correct. Portfolios managed using a quantitative approach are usually rebalanced at regular intervals, such as monthly or quarterly. In contrast, portfolios managed using a fundamental approach usually monitor the portfolio's holdings continuously and may increase, decrease, or eliminate positions at any time.

   Also, the focus of a quantitative approach is on factors across a potentially large group of stocks, whereas fundamental strategies focus on a relatively small group of stocks. Consequently, Heydon's new quantitative fund will likely hold a larger number of stocks than the existing equity fund.

   Finally, managers following a fundamental approach typically select stocks by performing extensive research on individual companies; thus, fundamental investors see risk at the company level. In contrast, with a quantitative approach, the risk is that factor returns will not perform as expected. Because the quantitative approach invests in baskets of stocks, the risks lie at the portfolio level rather than at the level of specific

stocks (company level). Consequently, Nowacki's new quantitative fund will likely see risk at the portfolio level, rather than the company level as the existing equity fund does.

9. C is correct. Quantitative analysis uses a company's history to arrive at investment decisions. The quantitative decision-making process is systematic and non-discretionary (whereas the fundamental decision-making process is more discretionary), and the focus of the quantitative approach is on factors across a potentially large group of stocks (whereas fundamental strategies focus on a relatively small group of stocks). In contrast, fundamental analysis (not quantitative analysis) emphasizes forecasting future prospects, including the future earnings and cash flows of a company.
10. B is correct. The first step in creating a quantitative, active strategy is to define the market opportunity or investment thesis. Then, relevant data is acquired, processed, and transformed into a usable format. This step is followed by backtesting the strategy, which involves identifying the factors to include as well as their weights. Finally, the strategy performance should be evaluated using an out-of-sample backtest.
11. B is correct. The purpose of backtesting is to identify correlations between the current period's factor scores, $FS(t)$, and the next period's holding period strategy returns, $SR(t + 1)$.
12. B is correct. Look-ahead bias results from using information that was unknown or unavailable at the time the investment decision was made. An example of this bias is using financial accounting data for a company at a point before the data were actually released by the company. Nowacki computed historical P/Bs and P/Es using calendar year-end (31 December) stock prices and companies' financial statement data for the same calendar year, even though the financial statement data for that calendar year were likely unavailable at year-end.

    Data mining refers to automated computational procedures for discovering patterns in large datasets, which can introduce a bias known as overfitting. Survivorship bias occurs when backtesting uses companies that are in business today but ignores companies that have left the investment universe.
13. B is correct. Knight should recommend the Stock 3 and Stock 4 pair trade. Two stocks make for an ideal pairs trade if (1) the current price ratio differs from its long-term average and shows historical mean reversion and (2) the two stocks' returns are highly correlated. The relationship between Stock 3 and Stock 4 meets these conditions.
14. C is correct. Because the Heydon Quant Fund would be changing its factor model by adding a new factor, the correlations of the fund's returns with the factors would likely change and the returns-based style would change. Even though the investment universe is unchanged, the portfolio holdings would likely change and the holdings-based style classification would also will be affected.
15. B is correct. At his previous firm, Dewey managed a fund for which his investment process involved taking active exposures in sectors based on the macroeconomic environment and demographic trends. An investment process that begins at a top, or macro level, is a top-down strategy. Top-down portfolio strategies study variables affecting many companies or whole sectors, such as the macroeconomic environment, demographic trends, and government policies. This approach differs from bottom-up strategies, which focus on individual company variables in making investment decisions. It also differs from activist strategies, which take stakes in listed companies and advocate changes for the purpose of producing a gain on the investment.

16. C is correct. The steps to developing a fundamental active investment process are as follows:
    1. Define the investment universe and the market opportunity—the perceived opportunity to earn a positive risk-adjusted return to active investing, net of costs—in accordance with the investment mandate. The market opportunity is also known as the investment thesis.
    2. Prescreen the investment universe to obtain a manageable set of securities for further, more detailed analysis.
    3. Understand the industry and business for this screened set by performing industry and competitive analysis and analyzing financial reports.
    4. Forecast company performance, most commonly in terms of cash flows or earnings.
    5. Convert forecasts to valuations and identify *ex ante* profitable investments.
    6. Construct a portfolio of these investments with the desired risk profile.
    7. Rebalance the portfolio with buy and sell disciplines.

    So, Sardar should recommend that the next step in the development of the fundamental active management process be forecasting companies' performances and converting those forecasts into valuations.
17. B is correct. Managers using an active fundamental investment process, like Dewey's, usually monitor the portfolio's holdings continuously and may rebalance at any time. In contrast, portfolios using a quantitative approach are usually rebalanced at regular intervals, such as monthly or quarterly, or in response to updated output from optimization models. A is incorrect because portfolios using a quantitative (not fundamental) active approach are usually rebalanced at regular intervals, such as monthly or quarterly. C is incorrect because construction of a quantitative portfolio (not a fundamental portfolio) typically involves using a portfolio optimizer, which controls for risk at the portfolio level in arriving at individual stock weights and leads to rebalancing decisions.
18. B is correct. Dewey has developed a fundamental active investment process for the Purity Fund that emphasizes financial strength and demonstrated profitability. High-quality value investors focus on companies' intrinsic values that are supported by attractive valuation metrics, with an emphasis on financial strength and demonstrated profitability. In their view, investors sometimes behave irrationally, making stocks trade at prices very different from intrinsic value based on company fundamentals. A is incorrect because investors who pursue a relative value strategy evaluate companies by comparing their value indicators (e.g., P/E or P/B multiples) with the average valuation of companies in the same industry sector, in an effort to identify stocks that offer value relative to their sector peers. AZ Industrial is trading at a high P/B relative to the industry average, which is contrary to relative value and suggests that the relative value approach was not the basis for Sardar's buy recommendation. C is incorrect because a deep-value investing approach focuses on undervalued companies that are available at extremely low valuation relative to their assets. Such companies are often those in financial distress, which is not reflective of financial strength or demonstrated profitability. Therefore, Sardar's buy recommendation was not based on a deep-value investing orientation.
19. A is correct. Dewey asks Sardar to perform a bottom-up style analysis of the Purity Fund based on the aggregation of attributes from individual stocks in the portfolio, which describes a holdings-based approach to style analysis. The overall equity investment style is an aggregation of attributes from individual stocks in the portfolio, weighted by their positions.

CHAPTER 7

ACTIVE EQUITY INVESTING: PORTFOLIO CONSTRUCTION

SOLUTIONS

1. A is correct. The three main building blocks of portfolio construction are alpha skills, position sizing, and rewarded factor weightings. Fund 1 generates active returns by skillfully timing exposures to factors, both rewarded and unrewarded, and to other asset classes, which constitute a manager's alpha skills.
2. C is correct. Bottom-up managers evaluate the risk and return characteristics of individual securities and build portfolios based on stock-specific forecasts; Fund 3 follows this exact approach. Example views of bottom-up managers include expecting one auto company to outperform another, expecting a pharmaceutical company to outperform an auto company, and expecting a technology company to outperform a pharmaceutical company. Both bottom-up and top-down managers can be either diversified or concentrated in terms of securities.
3. A is correct. Because Fund 1 has a large AUM but focuses on small-cap stocks, holds a relatively small number of securities in its portfolio, and prefers to make large trades, Fund 1 likely has the highest implicit costs. Each of these characteristics serves to increase the market impact of its trades. Market impact is a function of the security's liquidity and trade size. The larger a trade size relative to a stock's average daily volume, the more likely it is that the trade will affect prices. The relatively low level of trading volume of small-cap stocks can be a significant implementation hurdle for a manager running a strategy with significant assets under management and significant positive active weights on smaller companies.
4. C is correct. The portion of total portfolio risk explained by the market factor is calculated in two steps. The first step is to calculate the contribution of the market factor to total portfolio variance as follows:

$$CV_{market\ factor} = \sum_{j=1}^{n} x_{market\ factor} x_j C_{mf,j} = x_{market\ factor} \sum_{j=1}^{n} x_j C_{mf,j}$$

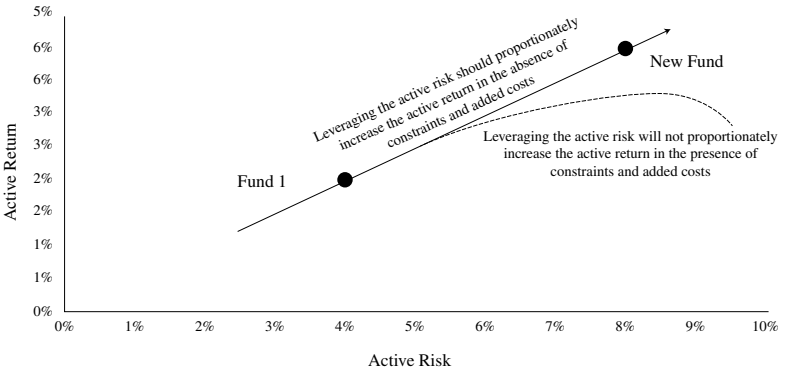
where
$CV_{market\ factor}$ = contribution of the market factor to total portfolio variance
$x_{market\ factor}$ = weight of the market factor in the portfolio
x_j = weight of factor j in the portfolio
$C_{mf,j}$ = covariance between the market factor and factor j
The variance attributed to the market factor is as follows:
$CV_{market\ factor} = (1.080 \times 0.00109 \times 1.080) + (1.080 \times 0.00053 \times 0.098) + (1.080 \times 0.00022 \times -0.401) + (1.080 \times -0.00025 \times 0.034)$
$CV_{market\ factor} = 0.001223$

The second step is to divide the resulting variance attributed to the market factor by the portfolio variance of returns, which is the square of the standard deviation of returns:

Portion of total portfolio risk explained by the market factor = $0.001223/(0.0374)^2$

Portion of total portfolio risk explained by the market factor = 87%

5. A is correct. As the new fund scales up active risk by doubling active weights, it will face implementation constraints that will prevent it from increasing the weights of many of its short positions. The information ratio (IR) is defined as the ratio of active return to active risk. If there were no constraints preventing the new fund from scaling up active weights, it could scale up active risk by scaling up active weights, proportionally increase active return, and keep the IR unchanged. Implementation constraints experienced by the new fund, however, such as the cost and difficulty in borrowing securities to support the scaled-up short positions, will prevent the active return from proportionally increasing with the active risk. Therefore, the IR would most likely be lower for the new fund than for Fund 1. As the following chart illustrates, as active risk is scaled up, implementation constraints create diminishing returns to scale for active returns, thereby degrading the IR.



6. C is correct. Active risk is affected by the degree of cross-correlation. The correlation of two stocks in different sectors is most likely lower than the correlation of two stocks in the same sector. Therefore, the correlation of the energy/financial pair is most likely lower than that of the automobile/automobile pair. Because both positions were implemented as an overweight and underweight, the lower correlation of the two stocks in the new position should contribute more to active risk than the two-stock position that it replaced.
7. B is correct. Active share changes only if the total of the absolute values of the portfolio's active weights changes. For the two trades in Fund 3, both the initial position and the new position involved two stocks such that one was 1pp underweighted and the other was 1pp overweighted. Although the active weights of particular securities did change between the initial position and the new position, the total absolute active weights did not change. Therefore, the portfolio's active share did not change.
8. B is correct. Skewness measures the degree to which return expectations are non-normally distributed. If a distribution is positively skewed, the mean of the distribution is greater than its median—more than half of the deviations from the mean are negative and less than half are positive—and the average magnitude of positive deviations is larger than the average magnitude of negative deviations. Negative skew indicates that the mean of the distribution lies below its median, and the average magnitude of negative deviations is larger than the average magnitude of positive deviations. Fund 3's new risk control constrains its model's predicted return distribution so that no more than 60% of the deviations from the mean are negative. This is an explicit constraint on skewness.
9. C is correct. The breadth (number of truly independent decisions made each year by the manager) required to earn the expected portfolio active return of 2.5% per year is approximately 69 decisions, calculated as follows:

$$
\begin{aligned}
E(R_A) &= IC \times \sqrt{BR} \times \sigma_{R_A} \times TC \\
E(R_A) &= 0.15 \times \sqrt{BR} \times 5\% \times 0.40 = 2.5\% \\
2.5\% &= 0.15 \times \sqrt{BR} \times 5\% \times 0.40 \\
\sqrt{BR} &= \frac{2.5\%}{0.3\%} = 8.33 \\
BR &= 69.44
\end{aligned}
$$

10. A is correct. The maximum position size in shares of Pasliant Corporation (PC) is determined by the constraint with the lowest dollar amount. The maximum position size for PC under each constraint is calculated as follows:

    Liquidity Constraint

    Dollar value of PC traded daily = PC market cap × Average daily trading volume

    Dollar value of PC traded daily = $3 billion × 1.0% = $30 million

    Liquidity constraint = Dollar value of PC traded daily × Liquidity % threshold

Liquidity constraint = \$30 million × 10% = \$3 million

Allocation Constraint

Allocation constraint = AUM × Maximum position size threshold

Allocation constraint = \$250 million × 3.0% = \$7.5 million

Index Weight Constraint

Index weight constraint = AUM × (Index weight × 10)

Index weight constraint = \$250 million × (0.20% × 10) = \$5.0 million

The liquidity constraint of \$3.0 million is less than both the \$5.0 million index weight constraint and the \$7.5 million allocation constraint. Therefore, the maximum allowable position size that Manager A may take in PC is \$3.0 million.

11. C is correct. Most multi-factor products are diversified across factors and securities and typically have high active share but have reasonably low active risk (tracking error), often in the range of 3%. Most multi-factor products have a low concentration among securities in order to achieve a balanced exposure to risk factors and minimize idiosyncratic risks. Manager B holds a highly diversified portfolio that has balanced exposures to rewarded risk factors, a high active share, and a relatively low target active risk—consistent with the characteristics of a multi-factor manager.
12. B is correct. The contribution of an asset to total portfolio variance equals the summation of the multiplication between the weight of the asset whose contribution is being measured, the weight of each asset (x_j), and the covariance between the asset being measured and each asset (C_{ij}), as follows:

$$\text{Contribution of each asset to portfolio variance} = CV_i = \sum_{j=1}^{n} x_i x_j C_{ij}$$

The contribution of Asset 2 to portfolio variance is computed as the sum of the following products:

Weight of Asset 2 × Weight of Asset 1 × Covariance of Asset 2 with Asset 1, plus	0.45 × 0.30 × 0.01050
Weight of Asset 2 × Weight of Asset 2 × Covariance of Asset 2 with Asset 2, plus	0.45 × 0.45 × 0.01960
Weight of Asset 2 × Weight of Asset 3 × Covariance of Asset 2 with Asset 3	0.45 × 0.25 × 0.00224
= Asset 2's contribution to total portfolio variance	0.005639

13. A is correct. Well-constructed portfolios should have low idiosyncratic (unexplained) risk relative to total risk. Portfolio Y exhibits extremely high unexplained risk relative to total risk, and Portfolios X and Z have low unexplained risk relative to total risk. Therefore, Portfolio Y may be eliminated.
Portfolios X and Z have comparable factor exposures. In comparing portfolios with comparable factor exposures, the portfolio with lower absolute volatility and lower active risk will likely be preferred, assuming similar costs. Portfolio X has lower absolute volatility and lower active risk than Portfolio Z, although both have similar costs.
Finally, for managers with similar costs, fees, and alpha skills, if two products have similar active and absolute risks, the portfolio having a higher active share is preferred. Portfolio X has lower absolute volatility, lower active risk, and higher active share than Portfolio Z. As a result, Portfolio X best exhibits the risk characteristics of a well-constructed portfolio.
14. C is correct. Both Statement 1 and Statement 2 are correct.
Statement 1 is correct because, similar to a long-only portfolio, a long–short portfolio can be structured to have a gross exposure of 100%. Gross exposure of the portfolio is calculated as the sum of the long positions and the absolute value of the short positions, expressed as percentages of the portfolio's capital.

$$\text{Gross exposure} = \text{Long positions} + |\text{Short positions}|$$

$$\begin{aligned}\text{Gross exposure long-only portfolio} &= 100\% \text{ (Long positions)} + 0\% \text{ (Short positions)} \\ &= 100\%\end{aligned}$$

$$\begin{aligned}\text{Gross exposure long–short portfolio} &= 50\% \text{ (Long positions)} + |{-50\%}| \text{ (Short positions)} \\ &= 100\%\end{aligned}$$

Statement 2 is correct because long-only investing generally offers greater investment capacity than other approaches, particularly when using strategies that focus on large-cap stocks. For large institutional investors such as pension plans, there are no effective capacity constraints in terms of the total market cap available for long-only investing.
15. C is correct. Chen prefers an approach that emphasizes security specific factors, does not engage in factor timing, and runs a concentrated portfolio. These characteristics all reflect a discretionary bottom-up portfolio management approach.

CHAPTER 8

TECHNICAL ANALYSIS

SOLUTIONS

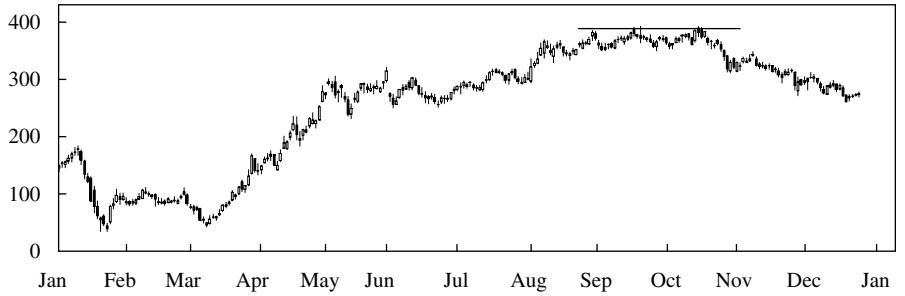
1. A is correct. Almost all technical analysis relies on these data inputs.
2. A is correct. Technical analysis works because markets are *not* efficient and rational and because human beings tend to behave similarly in similar circumstances. The result is market trends and patterns that repeat themselves and are somewhat predictable.
3. A is correct. Trends generally must be in place for some time before they are recognizable. Thus, some time may be needed for a change in trend to be identified.
4. A is correct. Commodities and currencies do not have underlying financial statements or an income stream; thus, fundamental analysis is useless in determining theoretical values for them or whether they are over- or undervalued.
5. A is correct. The underlying logic of technical analysis is that past price action can be useful to anticipate and project potential future prices with charts and other technical tools.
6. B is correct. According to technical analysts, market psychology leads to repetition of price movements. Because investor behavior repeats itself, price movement patterns can be charted out, allowing technicians to recognize patterns.
7. C is correct. The top and bottom of the bars indicate the highs and lows for the day; the line on the left indicates the opening price and the line on the right indicates the closing price.
8. C is correct. Dark and light shading is a unique feature of candlestick charts.
9. C is correct. A shaded candlestick body indicates that the price of the security closed down from its opening price, whereas a clear body indicates that the price closed up from its opening price. Thus, a shaded candlestick body indicates that the opening price was higher than the closing price.
10. B is correct. A line chart has one data point per time interval, with price on the vertical axis and unit of time on the horizontal axis.
11. C is correct. Rising volume shows conviction by many market participants, which is likely to lead to a continuation of the trend.

12. A is correct. The price of gold in nominal dollars was several orders of magnitude cheaper 100 years ago than it is today (roughly US$20 then versus US$1,100 today). Such a wide range of prices lends itself well to being graphically displayed on a logarithmic scale.
13. B is correct. A linearly scaled (rather than a logarithmically scaled) chart is better suited for analysis of short-term price movements. A linear scale plots price against a vertical axis with an equal distance between prices, whereas with a logarithmic scale, equal vertical distances correspond to an equal percentage change. The difference between a logarithmic price chart and an arithmetic (linear) price chart can be small when analyzing a chart in the short term. However, major differences are apparent when analyzing longer-term charts (more than two years of price data).
14. B is correct. A downtrend line is constructed by drawing a line connecting the highs of the price chart.
15. B is correct. In relative strength analysis, the analyst typically prepares a line chart of the ratio of the two assets' prices, with the asset under analysis as the numerator and with the benchmark or other security as the denominator. With this single line chart, the analyst can readily visualize relative performance by the positive or negative slope of the line. A rising line shows the asset is performing better than the index or other stock; a declining line shows the opposite.
16. B is correct. It is demonstrated in the following chart:

EXHIBIT 1 Candlestick Chart: ABC Co., Ltd. Price Data, November–September (Price Measured in RMB × 10)

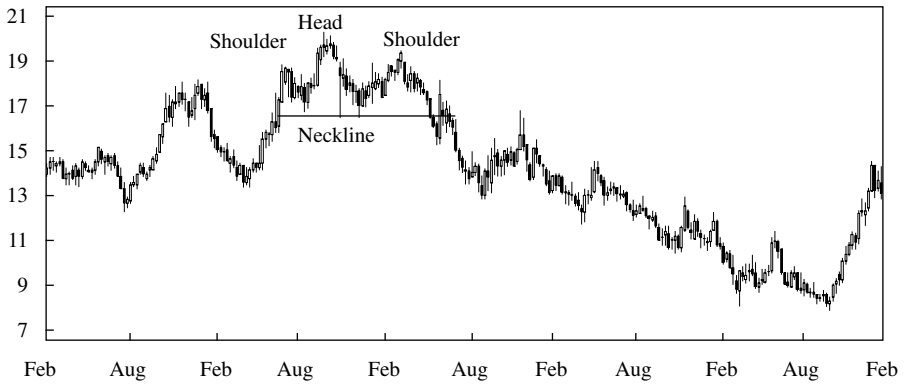
17. B is correct.
18. C is correct. As shown in the following chart, XYZ Co. shares traded up to 390p on three occasions, each several weeks apart, and declined thereafter each time.

EXHIBIT 2 Candlestick Chart: XYZ Co. Price Data, January–January (Price Measured in British Pence)



19. C is correct. In technical analysis, when a security is not trending, it is considered to be in consolidation. A consolidation phase is characterized by a fairly narrow trading range in which the price moves sideways (indicative of relative supply/demand balance) without much upward or downward movement. The key to technical analysis is the ability to differentiate between a consolidation and a trend phase.
20. A is correct. When a previously downtrending price breaks out of its consolidation range on the downside, it suggests that the price will enter a new downtrend phase.
21. A is correct. According to the change in polarity principle, once a support level is breached, it becomes a level of resistance. Likewise, when a resistance level is breached, it becomes a level of support.
22. C is correct. The left shoulder formed at around US$18.50, the head formed at around US$20.50, and the second shoulder formed at around US$19.

EXHIBIT 3 Candlestick Chart: DGF Company, five years, February–February



23. A is correct. In the ascending triangle pattern, irrespective of where the ascending triangle is identified, it should be considered as a consolidation with bullish implications.

24. C is correct. Target = Neckline + (Neckline − Head): €100 + (€100 − €75) = €125
25. B is correct. A head and shoulders pattern is a reversal pattern that signals the end of an uptrend in price. Once a head and shoulders pattern has been formed, the expectation is that the price will decline through the neckline price of the formation.
26. B is correct. An inverse head and shoulders is a reversal pattern for a downtrend that preceded the formation of the pattern. An inverse head and shoulders is also referred to as a head and shoulders bottom and signals a potential reversal from the preceding downtrend to an uptrend. An inverse head and shoulders is the opposite of a head and shoulders pattern that signals a reversal from a preceding uptrend to a downtrend.
27. B is correct. A head and shoulders formation is a sell indicator that signals a reversal of a preceding uptrend. Once the head and shoulders pattern forms, the expectation is that the price will decline through the neckline price, setting the stage for a downtrend phase.
28. A is correct. When attempting to profit from a head and shoulders formation, a technician will often use the price difference between the head and neckline to set a price target below the neckline. The price target is therefore set as follows: Price target = Neckline – (Head – Neckline).
29. B is correct. With a "healthy correction," a type of continuation pattern, the long-term price trend does not change as supply and demand remains in balance while ownership transitions from one investor group to another.
30. A is correct. A large increase in the number of IPOs increases the supply of equity and if overall demand remains the same, puts downward pressure on equities. Also, companies tend to issue shares of equity when the managers believe they will receive a premium price, which is also an indicator of a market top.
31. A is correct. When the short-term moving average crosses above the long-term moving average, it can be viewed as a bullish buy signal. For example, a 5-day short-term moving average (a proxy for short-term momentum) breaking up through a 60-day longer-term moving average (an indicator of intermediate trend) can be used as a buy signal.
32. A is correct. A widely followed moving average crossover signal is the one that takes place between the 50-day moving average and the 200-day moving average. When the short-term (50-day) moving average crosses below the long-term (200-day) moving average, it is called a death cross and is a bearish signal.
33. C is correct. Bollinger Bands consist of a moving average and a higher line representing the moving average plus a set number of standard deviations from average price (for the same number of periods as used to calculate the moving average) and a lower line that is a moving average minus the same number of standard deviations.
34. B is correct. A Bollinger Band "squeeze" occurs when volatility falls to a very low level, as evidenced by the narrowing bands.
35. C is correct. Bollinger Bands are price-based indicators, *not* momentum oscillators, which are constructed so that they oscillate between a high and a low or around 0 or 100.
36. A is correct. Triangles are one of several continuation patterns.
37. C is correct. It is one of several reversal patterns.
38. A is correct. Volume is necessary to confirm the various market rallies and reversals during the formation of the head and shoulders pattern.

39. C is correct. Intermarket analysis is a field within technical analysis that combines analysis of major categories of securities, industries, benchmarks, and geographies to identify intermarket relationships, trends, and possible inflections in a trend. To identify these intermarket relationships and trends, a commonly used tool is relative strength analysis, which charts the ratio of the price of two assets.
40. C is correct. Securities that break out from low-volatility conditions are likely to experience high volatility, and high volatility in the direction of an existing trend will usually help the trend pick up momentum. Breakouts from consolidation periods in an uptrend or entering an uptrend are usually followed by a continuation of the existing trend.

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