Alternative Investments for Portfolio Management

CFA三级培训项目

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101% Contribution Breeds Professionalism

Jcy CFA/AQF/FRM/RFP

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Topic in CFA Level III

Session	Content
Study Session 1-2	ETHICS & PROFESSIONAL STANDARDS (1)&(2)
Study Session 3	BEHAVIORAL FINANCE
Study Session 4	CAPITAL MARKET EXPECTATIONS【NEW】
Study Session 5	ASSET ALLOCATION AND RELATED DECISIONS IN PORTFOLIO MANAGEMENT
Study Session 6	DERIVATIVES AND CURRENCY MANAGEMENT 【NEW】
Study Session 7-8	FIXED-INCOME PORTFOLIO MANAGEMENT (1)&(2)
Study Session 9-10	EQUITY PORTFOLIO MANAGEMENT (1)&(2)
Study Session 11	**ALTERNATIVE INVESTMENTS FOR PORTFOLIO MANAGEMENT** 【NEW】
Study Session 12-13	PRIVATE WEALTH MANAGEMENT (1)&(2) 【NEW】
Study Session 14	PORTFOLIO MANAGEMENT FOR INSTITUTIONAL INVESTORS 【NEW】
Study Session 15	TRADING, PERFORMANCE EVALUATION, AND MANAGER SELECTION 【NEW】
Study Session 16	CASES IN PORTFOLIO MANAGEMENT AND RISK MANAGEMENT 【NEW】

Framework

Alternative Investments

- **SS11: Alternative Investments for Portfolio Management**
  - R26 Hedge Fund Strategies
  - R27 Asset Allocation to Alternative Investments

Reading 26

Hedge Fund Strategies

Overview of Hedge Fund Strategies

- **Key features of hedge funds**
  - Lower regulatory and legal constraints (Lack of transparency).
  - Flexible mandates: Flexibility to use short selling and derivatives.
  - A larger investment universe.
  - Aggressive investment exposures.
  - Comparatively free use of leverage.
  - Liquidity constraints for investors.
  - Higher cost structures.
- **Types of hedge fund**
  - **Single-manager fund**
    - ✓ One portfolio manager invests in one strategy or style.
  - **Multi-manager fund**
    - ✓ **Multi-strategy fund**, in which teams of portfolio managers trade and invest in multiple different strategies within the same fund.
    - ✓ **FOFs**

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Summary

- **O-Chart**

- Hedge Fund Strategies
  - Equity strategies
    - Long/short equity
    - Dedicated short selling and short-biased
    - Equity market neutral
  - Event-driven strategies
    - Merger arbitrage
    - Distressed securities
  - Relative value strategies
    - Fixed-income arbitrage
    - Convertible bond arbitrage
  - Opportunistic strategies
    - Global macro strategies
    - Managed futures
  - Specialist strategies
    - Volatility trading
    - Reinsurance/life settlements
  - Multi-manager strategies
    - Fund-of-funds
    - Multi-strategy hedge funds

Equity Strategies

- Equity-related hedge fund strategies focus primarily on stock markets.
  - Equity hedge fund strategies invest primarily in equity and equity-related instruments.
- **Types of equity-related hedge fund**
  - The size and sign of equity market exposure often dictate the classification of equity hedge fund strategies.

- **The main risk: equity-oriented risk.**
- **Equity-related hedge fund strategies**
  - Long/short equity;
  - Dedicated short bias;
  - Equity market neutral.

Long/Short Equity

- **Strategy Implementation**
  - Identify overpriced and underpriced stocks, L/S equity hedge funds are straightforward to understand.
    - ✓ Purchases (long positions) stocks that will rise in value;
    - ✓ Sells (short positions) stocks that will fall in value.
  - **Sector-specific focus (specialist L/S fund managers)**
    - ✓ Search for single-name shorts for portfolio alpha and added absolute return.
  - **Generalist L/S managers**
    - ✓ Use index-based short hedges to reduce market risk.
    - ✓ They may also use index funds to achieve a desired exposure.
  - Overall, long/short equity investing in most instances is a mix of extracting alpha on the long and short sides from single-name stock selection combined with some naturally net long embedded beta.

Example

➢ An equity-related hedge fund strategy with gross exposures of 80% long and 35% short is most likely to be classified as:

A. a dedicated short strategy.

B. a short-biased strategy.

C. a long/short equity strategy.

Solution: C

Equity L/S strategies typically have gross exposures of 70%—90% long and 20%-50% short. Dedicated short strategies are usually 60%-120% short at all times. Short-biased strategies are usually around 30%—-60% net short.

Dedicated Short Selling and Short-Biased

- These managers <u>look for poorly managed companies</u>, firms in declining market segments, or even firms with deceitful accounting.
  - **Dedicated short-selling funds** seek out securities that are overpriced in order to sell them short.
  - **Short-biased** managers use a similar strategy, except that the short position is somewhat offset by a long exposure.
  - **Activist short selling,** in which the fund manager not only takes a short position in a stock, but also presents research that contends that the stock is overpriced.
- One major challenge of being a short seller is that markets inevitably rise over time, which creates a tendency toward negative returns for shorts.

Dedicated Short Selling and Short-Biased

- **Strategy Implementation**
  - Short-selling managers typically take a bottom-up approach by scanning the universe of potential sell targets to uncover and sell short.
    - ✓ Methods: Altman Z-score & Beneish M-score.
  - However, although some stocks tend to be attractive targets, the stock's high short-interest ratio and high cost to borrow ("on special") are very concerning. Both factors suggest significant potential that a dangerous short-squeeze situation.

Dedicated Short Selling and Short-Biased

- **Characteristics**
  - Lower return but with a negative correlation benefit.
  - More volatile than a typical L/S equity hedge fund given short beta exposure.
  - Managers have some ability to add alpha via market timing of portfolio beta tilt, but it is difficult to do with consistency or added alpha.
  - This strategy is typically handled best in a limited partnership because of difficult operational aspects of short selling.
  - Leverage Usage
    - ✓ Low: There is typically sufficient natural volatility that short-selling managers do not need to add much leverage.
- **Role of portfolio**
  - Liquid, negatively correlated alpha to that of most other strategies, with mark-to-market pricing from public prices.
  - But historic returns generally disappointing.

Equity Market Neutral

- **Equity market-neutral (EMN)**
  - Equity market-neutral (EMN) hedge fund strategies take opposite (i.e., long and short) positions in similar or related equities that have divergent valuations.
  - The overall goal of EMN funds is to create a portfolio that not only generates alpha, but is also relatively immune to movements in the overall market.
- **Types of EMN**
  - **Pairs trading.** Two stocks with similar characteristics are identified that are respectively overvalued and undervalued.
  - **Stub trading.** This EMN strategy involves going long and short shares of a subsidiary and its parent company.
  - **Multi-class trading.** This strategy entails going long and short relatively mispriced share classes of the same firm.

Equity Market Neutral

- **Characteristics**
  - They have relatively modest return profiles, with portfolios aimed to be market neutral, and differing constraints to other factors and sector exposures are allowed.
  - They generally have high levels of diversification and liquidity and lower standard deviation.
  - Shorter horizons and more active trading.
  - High leverage
  - EMN strategies typically do not meet regulatory leverage limits for mutual fund vehicles. So, limited partnerships are the preferred vehicle.
- **Role in portfolio**
  - EMN strategies are especially attractive during periods of market vulnerability and weakness, since their sources of return and alpha do not require accepting beta risk.

Example

- Considering various equity-related hedge fund strategies, a strategy that is most likely to apply relatively high levels of leverage is:

  A. an EMN strategy.

  B. a dedicated short strategy.

  C. a short-biased strategy.

Solution: A

EMN strategies usually apply somewhat high levels of leverage in order to produce meaningful levels of return. Neither dedicated short strategies nor short-biased strategies typically make significant use of leverage.

Example

➢ Relative to other hedge fund strategies, EMN strategies are most likely to:

A. exhibit relatively modest returns.

B. be vulnerable to periods of market weakness.

C. earn return from alpha and beta risk.

Solution: A

Compared to various other hedge fund strategies, EMN strategies generally have relatively modest return profiles. EMN funds' primary source of return is alpha. They do not take on beta risk. Their lack of market exposure make EMN strategies attractive in periods of market weakness.

Example

- Ling Chang, a Hong Kong-based EMN manager, has been monitoring PepsiCo Inc. (PEP) and Coca-Cola Co. (KO), two global beverage industry giants. After examining the Asia marketing strategy for a new PEP drink, Chang feels the marketing campaign is too controversial and the overall market is too narrow. Although PEP has relatively weak earnings prospects compared to KO, 3-month valuation metrics show PEP shares are substantially overvalued versus KO shares (relative valuations have moved beyond their historical ranges). As part of a larger portfolio, Chang wants to allocate $1 million to the PEP versus KO trade and notes the historical betas and S&P 500 Index weights, as shown in the following table.

Stock	Beta	S&P 500 Index Weight
PEP	0.65	0.663
KO	0.55	0.718

Discuss how Chang might implement an EMN pairs trading strategy.

Example

Solution:

Chang should take a short position in PEP and a long position in KO with equal beta-weighted exposures. Given Chang wants to allocate $1 million to the trade, she would take on a long KO position of $1 million. Assuming realized betas will be similar to historical betas, to achieve an equal beta-weighted exposure for the short PEP position, Chang needs to short $846,154 worth of PEP shares [= –$1,000,000 / (0.65/0.55)].

Only the overall difference in performance between PEP and KO shares would affect the performance of the strategy because it will be insulated from the effect of market fluctuations. If over the next 3 months the valuations of PEP and KO revert to within normal ranges, then this pairs trading EMN strategy should reap profits.

Event-Driven Strategies

- Event-driven hedge fund strategies are those that attempt to profit from predicting the outcome of corporate events, such as bankruptcies, mergers, restructurings, acquisitions, et cetera.
- **Types of event-driven approach**
  - **Soft-catalyst event-driven approach**
    - ✓ Investments can be made either proactively in anticipation of an event that has yet to occur
  - **Hard-catalyst event-driven approach**
    - ✓ investments can be made in reaction to an already announced corporate event in which security prices related to the event have yet to fully converge
  - The hard approach is generally less volatile and less risky than soft-catalyst investing.
- **The main risk: event risk**.

Event-Driven Strategies

- **Event-driven strategies**
  - Merger Arbitrage;
  - Distressed Securities.

Merger Arbitrage

- **Strategy implementation**
  - **Cash-for-stock**
    - ✓ In a cash-for-stock acquisition, the acquiring company (A) offers the target company (T) a cash price per share to acquire T.
    - ✓ The manager <u>buys the target company (T).</u>
  - **Stock-for-stock acquisition**
    - ✓ A offers a specific number of its shares in exchange for 1 T share.
    - ✓ The manager <u>buys T and sells the acquiring company (A)</u> in the same ratio as the offer.
- Merger arbitrage is comparable to <u>writing insurance on an acquisition</u>.
  - If the acquisition is completed as planned, the hedge fund earns an insurance premium.
  - If the transaction fails, however, then the hedge fund stands to lose money, analogous to an insurance company making a payout.
- **Cross-border merger and acquisition (M&A)** where two countries and two regulatory authorities are involved are **more risky**.

Merger Arbitrage

- **Characteristics**
  - Relatively liquid strategy.
  - If the deals fail, this strategy has market sensitivity and left-tail risk attributes.
  - Its return profile is insurance-like plus a short put option.
  - The preferred vehicle is limited partnership because of merger arbitrage's use of significant leverage, but some low-leverage, low-volatility liquid alts merger arbitrage funds do exist.
  - Leverage Usage:
    - ✓ High: typically apply 300%-500% leverage in order to achieve low-double-digit returns.
- **Role in portfolio**
  - Relatively high Sharpe ratios with typically low double-digit returns and mid–single digit standard deviation (depending on specific levels of leverage applied), but left-tail risk is associated with an otherwise steady return profile.

Merger Arbitrage

- An acquiring firm (A) is trading at $45/share and has offered to buy target firm (T) in a stock-for-stock deal. The offer ratio is 1 share of A in exchange for 2 shares of T. Target firm T was trading at $15 per share just prior to the announcement of the offer. Shortly thereafter, T's share price jumps up to $19 while A's share price falls to $42 in anticipation of the merger receiving required approvals and the deal closing successfully. A hedge fund manager is confident this deal will be completed, so he buys 20,000 shares of T and sells short 10,000 shares of A.

- What are the payoffs of the merger arbitrage strategy if the deal is successfully completed or if the merger fails?

Merger Arbitrage

- **Solution:**
  - At current prices it costs $380,000 to buy 20,000 shares of T, and $420,000 would be received for short selling 10,000 shares of A. This provides a net spread of $40,000 to the hedge fund manager if the merger is successfully completed.
  - If the merger fails, then prices should revert to their pre-merger announcement levels. The manager would need to buy back 10,000 shares of A at $45 (costing $450,000) to close the short position, while the long position in 20,000 shares of T would fall to $15 per share (value at $300,000).
  - This would cause a total loss of $110,000 [= (A: +$420,000 – $450,000) + (T: –$380,000 + $300,000)]. In sum, this merger strategy is equivalent to holding a riskless bond with a face value of $40,000 (the payoff for a successful deal) and a short binary put option, which expires worthless if the merger succeeds but pays out $110,000 if the merger fails.

Distressed Securities

- **Outcomes of bankruptcy process**
  - **In liquidation,** the firm's assets are sold off and securities holders are paid sequentially based on priority of their claims
    - ✓ Senior secured debt (high),
    - ✓ Junior secured debt,
    - ✓ Unsecured debt,
    - ✓ Convertible debt,
    - ✓ Preferred stock,
    - ✓ Common stock (finally).
  - **In re-organization,** a firm's capital structure is re-organized and terms for current claims are negotiated and revised.
    - ✓ Debtholders either may agree to maturity extensions or to exchanging their debt for new equity shares (existing shares are canceled) that are sold to new investors to improve the firm's financial condition.

Distressed Securities

➢ **Strategy implementation**

- In a liquidation situation, the focus is on determining the recovery value for different classes of claimants.
  - ✓ If the fund manager's estimate of recovery value is higher than market expectations, perhaps due to illiquidity issues, then he/she can buy the undervalued debt securities in hopes of realizing the higher recovery rate.
- In a reorganization situation, the hedge fund manager's focus is on how the firm's finances will be restructured and on assessing the value of the business enterprise and the future value of different classes of claims.

Distressed Securities

- **Characteristics**
  - The return profile for distressed securities investing is typically at the higher end of event-driven strategies but with more variability.
  - Outright shorts or hedged positions are possible, but distressed securities investing is usually long-biased. It is subject to security-specific outcomes but still impacted by the health of the macro-economy.
  - Distressed securities investing typically entails relatively high levels of illiquidity, especially if using a concentrated activist approach.
  - Leverage: generally uses moderate to low leverage.

- **Role in portfolio**
  - Returns tend to be "lumpy" and somewhat cyclical. Distressed investing is particularly attractive in the early stages of an economic recovery after a period of market dislocation.

Example

- An investment in distressed securities is most likely to be characterized by:

  A. a long bias.

  B. a high level of liquidity.

  C. a large amount of leverage.

  Solution: A

  While short positions are possible in distressed securities investing, it is usually long biased. Illiquidity tends to be high, and the strategy generally uses moderate to low leverage.

Example

- In a sequential payoff during a liquidation, the security holder that is most likely to be paid off first is the holder of:

  A. junior secured debt.

  B. convertible debt.

  C. preferred stock.

  Solution: A

  When a firm's assets are sold off in liquidation, securities holders are paid sequentially depending on the priority of their claims: first senior secured debt, then junior secured debt, unsecured debt, convertible debt, preferred stock, and lastly common stock.

Relative Values Strategies

- As the name suggests, relative value strategies attempt to exploit valuation differences between securities.
  - Changes in credit quality, liquidity, and implied volatility (for securities with embedded options) are some of the causes of relative valuation differences.
- **Relative values strategies**
  - Fixed-Income Arbitrage;
  - Convertible Bond Arbitrage.

Fixed-Income Arbitrage

- Fixed-income arbitrage strategies attempt to **exploit pricing inefficiencies** by taking **long and short positions** across a range of debt securities, including sovereign and corporate bonds, bank loans, and consumer debt.
  - For example, credit card loans, student loans, mortgage-backed securities.
- **Arbitrage opportunities sources**
  - Duration
  - Credit quality
  - Liquidity
  - Optionality

Fixed-Income Arbitrage

- **Strategy implementation**
  - **Most common types of fixed-income arbitrage strategies**
    - ✓ **Considering yield curve trades,** the prevalent calendar spread strategy involves taking <u>long and short positions at different points on the yield curve</u> where the relative mispricing of securities offers the best opportunities, such as in a curve flattening or steepening, to profit.
    - ✓ **Carry trades** involve going <u>long a higher yielding security and shorting a lower yielding security</u> with the expectation of receiving the positive carry and of profiting on long and short sides of the trade when the temporary relative mispricing reverts to normal.
  - **The payoff profile** of this fixed-income arbitrage strategy resembles a <u>short put option</u>.

Fixed-Income Arbitrage

- **Characteristics**
  - The risk/return profile of fixed-income arbitrage trading derives from the high correlations found across different securities, the yield spread pick-up to be captured, and the sheer number of different types of debt securities across different markets with different credit quality and convexity aspects in their pricing.
  - Yield curve and carry trades within the US government universe tend to be very liquid but typically have the fewest mispricing opportunities.
  - This strategy has high leverage usage, but leverage availability typically diminishes with product complexity.
- **Role in portfolio**
  - A function of correlations between different securities, the yield spread available, and the high number and wide diversity of debt securities across different markets.

Convertible Bond Arbitrage

- Convertible bonds are hybrid securities that can be viewed as a combination of straight debt plus a long equity call option with an exercise price equal to the strike price times **the conversion ratio** (also known as <u>conversion value</u>).
  - The conversion ratio is the number of shares for which the bond can be exchanged.
- **Strategy implementation**
  - Buy the <u>relatively undervalued</u> convertible bond;
  - Take a short position in the <u>relatively overvalued</u> underlying stock.
    - ✓ The number of shares to sell short to achieve a delta neutral overall position is determined by the delta of the convertible bond.

Convertible Bond Arbitrage

- **Characteristics**
  - Convertible arbitrage managers strive to extract and benefit from this structurally cheap source of implied volatility by **delta hedging** and **gamma trading** short equity hedges against their long convertible holdings.
  - Liquidity issues surface for convertible arbitrage strategies in two ways:
    - ✓ 1) naturally **less-liquid securities** because of their relatively small issue sizes and inherent complexities;
    - ✓ 2) availability and **cost** to borrow underlying equity for **short selling**.
  - Because of many legs needed to implement convertible arbitrage trades, relatively **high levels of leverage** are used to extract a modest ultimate gain from delta hedging.
    - ✓ For example, short sale, CDS transaction, interest rate hedge.
- **Role in portfolio**
  - Convertible arbitrage works best <u>during periods of high convertible issuance, moderate volatility, and reasonable market liquidity</u>.

Example

- In implementing a convertible arbitrage strategy, the portfolio manager is most likely to take a position that is:

  A. long convertible bonds and short equity.

  B. long straight bonds and short convertible bonds.

  C. long convertible bonds and short straight bonds.

Solution: A

Convertible arbitrage managers generally attempt to extract underpriced implied volatility from holdings of long convertible bonds. To delta and gamma hedge these exposures, the managers will take short equity positions.

Opportunistic Hedge Fund Strategies

- Opportunistic hedge fund strategies seek to profit from investment opportunities across a wide range of markets and securities using a variety of techniques.
  - They invest primarily in asset classes, sectors, regions, and across macro themes and multi-asset relationships <u>on a global basis</u>.
- **Categorization methods**
  - 1) The type of analysis and approach that drives the trading strategy,
    - ✓ For example, technical or fundamental.
  - 2) How trading decisions are implemented (discretionary or systematic).
  - 3) The types of instruments and/markets in which they trade.

Opportunistic Hedge Fund Strategies

- **Opportunistic hedge fund strategies**
  - Global macro strategies;
  - Managed futures.

Global Macro Strategies

- Global macro strategies focus on <u>global relationships across a wide range of asset classes</u> and investment instruments.
- **Strategy implementation**
  - Global macro strategies are typically **top-down** and employ a range of macroeconomic and fundamental models to express a view regarding the direction or relative value of an asset or asset class.
  - A mixture of positions
    - ✓ Individual securities,
    - ✓ Baskets of securities,
    - ✓ Index futures,
    - ✓ Foreign exchange futures/forwards,
    - ✓ Precious or base metals futures,
    - ✓ Agricultural futures,
    - ✓ Fixed-income products or futures,
    - ✓ Derivatives or options on any of these.

Global Macro Strategies

- **Characteristics**
  - Despite their **heterogeneity**, a common feature among most global macro managers is the **use of leverage**, often obtained through the use of derivatives, to magnify potential profits.
  - Generally, the key source of returns in global macro strategies revolves around correctly discerning and capitalizing on trends in global markets.
- **Role in portfolio**
  - Global macro can be very useful over a full market cycle in terms of portfolio diversification and alpha generation.

Managed Futures

- Take long and short positions in a variety of derivatives contracts including futures, forwards, options on futures, swaps, and sometimes currencies and commodities.
- **Futures development**
  - Gaining in size (i.e., open interest) and liquidity;
  - Trading sector and industry index futures as well as more exotic contracts. E.g.,futures on weather (e.g., temperature, rainfall) and derivatives contracts on carbon emissions.
- **Strategy implementation**
  - The most common type of managed futures approach is **time-series momentum (TSM) trend following**.
  - A second, less common approach is using **cross-sectional momentum (CSM) strategies.**

Managed Futures

- **Characteristics**
  - Both global macro and managed futures strategies are **highly liquid** but with some crowding aspects and execution slippage in managed futures as AUM have grown rapidly.
  - **Managed futures** managers tend to take a **more systematic approach**, while **global macro managers** are generally **more discretionary** in their application of models and tools.
  - **Managed futures and global macro managers** are somewhat cyclical and at the **more volatile** end of the spectrum of hedge fund strategies (with volatility positively related to the strategy's time horizon). In addition, macro managers can also be early and overly anticipatory in their positioning.
  - **High leverage** is embedded in futures contracts.
- **Role in portfolio**
  - Returns of managed futures strategies typically exhibit **positive right-tail skewness** in periods of market stress, which is very useful for portfolio diversification.

Example

- Considering global macro strategies and managed futures strategies, it would be most accurate to state that:

  A. managed futures strategies use more discretionary approaches.

  B. global macro strategies use more systematic approaches.

  C. both strategies tend to be highly liquid and use high leverage.

Solution: C

Managed futures strategies usually are implemented via systematic approaches, while global macro strategies more often use discretionary approaches. Both strategies typically use high leverage and tend to be highly liquid.

Example

- During periods of market stress:

  A. managed futures and global macro both exhibit right-tail skewness.

  B. managed futures strategies exhibit left-tail skewness.

  C. global macro strategies exhibit left-tail skewness.

Solution: A

Returns of managed futures and global macro strategies both typically exhibit right-tail (positive) skewness during times of market stress. Global macro strategies, however, generally deliver more heterogeneous outcomes.

Specialist Strategies

- **Specialist hedge fund strategies** require highly specialized skill sets for trading in niche markets.
  - <u>Volatility trading;</u>
  - Reinsurance/life settlements.

- **The main risk :** the risks of such strategies are often unique to the particular niche securities being invested in.

Volatility Trading

- Once an esoteric pursuit, **volatility trading** has evolved over recent years to become a recognized investable asset.
  - The goal of relative value volatility arbitrage strategies is to source and buy cheap volatility and sell more expensive volatility while netting out the time decay aspects normally associated with options portfolios.
- **Type of relative value volatility trading**
  - Capturing the volatility spread between same underlying options in different geographical location - **time-zone arbitrage**
  - Involve idiosyncratic, macro-oriented risks - **cross-asset volatility trading**

Volatility Trading

- **Characteristics**
  - Long volatility positioning exhibits positive convexity, which can be particularly useful for hedging purposes.
    - ✓ On the short side, option premium sellers generally extract steadier returns in normal market environments.
  - Liquidity varies across the different instruments used for implementation.
  - The natural convexity of volatility instruments typically means that outsized gains may be earned at times with very little up-front risk.
- **Role in portfolio**
  - A useful source of portfolio return alpha across different geographies and asset classes.

Example

- Considering the correlation between equity volatility and equity market returns, the two measures are most likely to be:

  A. highly positively correlated.

  B. predominantly uncorrelated.

  C. highly negatively correlated.

  Solution: C

  Equity volatility is roughly 80% negatively correlated with equity market returns. Volatility levels rise when equity markets fall. This characteristic makes long volatility strategies useful diversifiers for long equity investments.

Reinsurance/Life Settlements

- Although still somewhat nascent, hedge funds have also entered the world of insurance, reinsurance, life settlements, and catastrophe reinsurance.
  - Although the primary market for insurance has existed for centuries, the secondary market for insurance has grown substantially in the last several decades.
- **Types of insurance contracts sold by insurance providers**
  - Vehicle and home insurance,
  - Life insurance,
  - Catastrophe insurance, which covers damage from such events as floods, hurricanes, or earthquakes

Reinsurance/Life Settlements

- **Strategy implementation**
  - The hedge fund would look for the following policy characteristics:
    - ✓ the surrender value being offered to an insured individual is relatively low;
    - ✓ the ongoing premium payments to keep the policy active are also relatively low;
    - ✓ the probability is relatively high that the designated insured person is indeed likely to die within a certain period of time (i.e., earlier than predicted by standard actuarial methods).
  - On finding the appropriate policy (or, more typically, a pool of policies), the hedge fund manager pays a lump sum (via a broker) to the policyholder(s), who transfers the right to the eventual policy benefit to the hedge fund.
  - Valuation methods for catastrophe insurance may require the hedge fund manager to consider global weather patterns and make forecasts using sophisticated prediction models that involve a wide range of geophysical inputs.

Reinsurance/Life Settlements

- **Characteristics**
  - Life insurance protects the policyholder's dependents in the case of his/her death.
    - ✓ The secondary market for life insurance involves the sale of a life insurance contract to a third party—a life settlement.
  - A hedge fund strategy focusing on life settlements involves analyzing pools of life insurance contracts being offered for sale, typically being sold by a third-party broker who purchased the insurance contracts from the original policyholders.
- **Role in portfolio**
  - <u>A very appealing feature of insurance investments in a portfolio is that the risk inherent in these strategies is almost entirely uncorrelated with market risks and business cycles</u>.
    - ✓ Hedge funds that invest in such assets can add alpha to a portfolio while simultaneously adding return diversification.

Example

- A hedge fund is most likely to purchase a pool of life insurance policies that has high:

  A. surrender value.

  B. ongoing premium payments.

  C. likelihood of the insured person dying soon.

Solution: C

In implementing life settlement strategies, a hedge fund manager looks for policies with the following traits: low surrender value being offered to the insured individual, low ongoing premium payments required of the investor, and high probability that the insured person will die sooner than predicted by actuarial methods.

Multi-Manager Strategies

- The previous sections examined individual hedge fund strategies. In practice, most investors invest in a range of hedge fund strategies.
- **Three main approaches** are used to combine individual hedge fund strategies into a portfolio:
  - Creating one's own mix of managers by investing directly into individual hedge funds running different strategies;
  - Fund-of-funds;
  - Multi-strategy funds.

Fund-of-Funds

- Fund-of-funds (FoF) managers aggregate investors' capital and allocate it to a portfolio of separate, individual hedge funds following different, less correlated strategies.
- **Strategy implementation**
  - First, FoF managers will become acquainted with different hedge fund managers via the use of various databases and introductions at prime broker-sponsored capital introduction events, where hedge fund managers present their perceived opportunity sets and qualifications to potential investors.
  - Next, with both quantitative and qualitative top-down and bottom-up approaches, the formal manager selection process is initiated.
  - Once an individual hedge fund is deemed a true candidate for investment, the fund's Offering Memorandum and Limited Partnership Agreement will be fully reviewed.
  - After a hedge fund is approved and the strategy is included in the FoF portfolio, then the process moves into the ongoing monitoring and review phases.

Fund-of-Funds

- **Characteristics**
  - FoFs are important hedge fund "access vehicles" for smaller high-net-worth investors and smaller institutions.
  - Through their prime brokerage services, commercial banks provide levered capital to FoFs.
  - But FoFs are also designed to provide other attractive features
    - ✓ Even for such institutional investors as endowments, foundations, and pension plans.
  - <u>FoFs offer a potentially more diverse strategy mix but with lower leverage, less operational risk, less transparency and slower tactical reaction time.</u>
- **Role in portfolio**
  - By combining different and ideally less correlated strategies, a FoF portfolio should **provide more diversification, less extreme risk exposures, lower realized volatility, and generally less single manager tail risk** than direct investing in individual hedge fund strategies.

Multi-Manager Strategies

- **Multi-manager strategies**
  - Fund-of-funds
  - <u>Multi-strategy hedge funds</u>
    - ✓ Multi-strategy hedge funds combine multiple hedge fund strategies under the same hedge fund structure.

Multi-Strategy Hedge Funds

- **Characteristics**
  - Full transparency and a better picture of the interactions of the different teams' portfolio risk than FOF manager.
  - Can fully focus on their respective portfolios.
  - Multi-strategy funds have generally outperformed with more variance and occasional large losses often related to **their higher leverage**.
  - Multi-strategy funds offer potentially faster tactical asset allocation and improved fee structure (netting risk handled at strategy level) but with higher manager-specific operational risks.
  - Multi-strategy funds also often impose investor-level or fund-level gates on maximum redemptions allowed per quarter.
  - Multi-strategy funds are somewhat more **prone to left-tail blow-up risk in stress periods.**
  - Better strategy transparency and shorter tactical reaction time make multi-strategy funds overall more resilient.
- **Role in portfolio**
  - The multi-strategy manager can react faster to different real-time market impacts

Example

- Compared to a multi-strategy fund, a fund-of-funds is most likely to offer the investor a more:

  A. effective tactical asset allocation.

  B. attractive fee structure.

  C. diverse strategy mix.

Solution: C

Funds-of-funds generally offer a more diverse strategy mix than do multi-strategy funds. Multi-strategy funds offer quicker tactical asset allocation and generally a better fee structure (<u>for example, netting risk between strategies is often absorbed by the multi-strategy general partner</u>).

Example

- Compared to a multi-strategy fund, a fund-of-funds is most like/y to offer an investor lower:

  A. transparency.

  B. netting risks.

  C. leverage.

Solution: A

Compared to multi-strategy funds, funds-of-funds offer an investor less transparency. For funds-of-funds, netting risk is higher, and funds-of-funds have more variance due to using comparatively high leverage.

Example

- Sushil Wallace is the chief investment officer of a large pension fund. Wallace wants to increase the pension fund's allocation to hedge funds and recently met with three hedge fund managers. These hedge funds focus on the following strategies:

  Hedge Fund A: Specialist—Follows relative value volatility arbitrage

  Hedge Fund B: Multi-Manager—Multi-strategy fund

  Hedge Fund C: Multi-Manager—Fund-of-funds

- After a significant amount of internal discussion, Wallace concludes that the pension fund should invest in either Hedge Fund B or C for the diversification benefits from the different strategies employed. However, after final due diligence is completed, Wallace recommends investing only in Hedge Fund B, noting its many advantages over Hedge Fund C.

Example

- Discuss two advantages of Hedge Fund B relative to Hedge Fund C with respect to investment characteristics.

a. Multi-strategy managers like Hedge Fund B can reallocate capital into different strategy areas more quickly and efficiently than would be possible by a fund-of-funds (FoF) manager like Hedge Fund C. The multi-strategy manager has full transparency and a better picture of the interactions of the different teams' portfolio risks than would ever be possible for FoF managers to achieve. Consequently, the multi-strategy manager can react faster to different real-time market impacts—for example, by rapidly increasing or decreasing leverage within different strategies depending upon the perceived riskiness of available opportunities.

Example

b. The fees paid by investors in a multi-strategy fund can be structured in a number of ways, some of which can be very attractive when compared to the FoFs' added fee layering and netting risk attributes. Conceptually, FoF investors always face netting risk, whereby they are responsible for paying performance fees due to winning underlying funds while suffering return drag from the performance of losing underlying funds. Even if the FoF's overall performance is flat or down, FoF investors must still pay incentive fees due to the managers of winning funds.

Analysis of Hedge Fund Strategies

- **Conditional Factor Risk Model**
- A linear factor model can provide insights into the intrinsic characteristics and risks in a hedge fund investment.
  - $(Return\ on\ HF_i)_t = \alpha_i + \beta_{i,1}(Factor\ 1)_t + \beta_{i,2}(Factor\ 2)_t + \cdots + \beta_{i,K}(Factor\ K)_t + D_t\beta_{i,1}(Factor\ 1)_t + D_t\beta_{i,2}(Factor\ 2)_t + \cdots + D_t\beta_{i,K}(Factor\ K)_t + (error)_{i,t}$
- **where:**
  - α_i=intercept for hedge fund i
  - $\beta_{i,K}$(Factor K)t=exposure during normal periods to risk factor K
  - D_t=dummy variable that equals zero during normal periods, and one during a financial crisis
  - $D_t\beta_{i,K}$(Factor K)$_t$=incremental exposure to risk factor K during financial crisis periods
  - (error)$_{i,t}$=random error with zero mean
- Any **returns not explained by the model's risk factors** would be attributed to 1) omitted risk factors, 2) alpha (i.e., hedge fund manager skill), or 3) randomness (error).

*Conditional Factor Risk Model

- Hasanhodzic and Lo (2007) used the following six factors:
  - 1. Equity risk (SNP500): S&P 500 total return index.
  - 2. Interest rate risk (BOND): Bloomberg Barclays Corporate AA Intermediate Bond Index.
  - 3. Currency risk (USD): U.S. Dollar Index.
  - 4. Commodity risk (CMDTY): Goldman Sachs Commodity Index (GSCI) total return.
  - 5. Credit risk (CREDIT): Spread between Moody's Baa and Aaa corporate bond yields.
  - 6. Volatility risk (VIX): CBOE Volatility Index (VIX).
- A **stepwise regression** process is useful for creating linear conditional factor models that avoid multicollinearity problems, by avoiding the use of highly correlated risk factors.
  - When this stepwise regression process was run by the authors of the original reading, the process resulted in the BOND and CMDTY factors being dropped due to multicollinearity issues. (CREDIT and SNP500 respectively produced higher adjusted R^2.)

Conditional Factor Risk Model

- This left the **following four factors** for measuring risk exposures:
  - 1. Equity risk (SNP500).
  - 2. Currency risk (USD).
  - 3. Credit risk (CREDIT).
  - 4. Volatility risk (VIX).
- These risk factors stem from taking long or short positions in financial instruments that are exposed to these risks.
- Each hedge fund strategy has different exposures to these various risk factors.
  - For example, arbitrage strategies often are generally exposed to credit spread risk and market volatility risk.
  - Event-driven strategies and L/S equity strategies generally have significant exposure to equity (market beta) risk.

Performance Contribution of Hedge Fund Strategies

- **Performance Contribution to a 60/40 Portfolio**
- When the previously mentioned 20% allocation to hedge funds is added to a traditional 60% stock/40% bond investment portfolio, the resulting allocation is 48% stock, 32% bond, and 20% hedge fund.
- **General results**
  - Total portfolio standard deviation decreases.
  - Sharpe ratio increases.
  - Sortino ratio increases.
  - Maximum drawdown decreases in approximately one-third of portfolios.
- **The interpretation of these results** is that hedge fund strategies generally increase risk-adjusted return and provide diversification to a traditional portfolio of stocks and bonds.

Risk-adjusted Measure

- The **Sharpe ratio** is one risk-adjusted measure of performance.
  - The risk measure used to calculate the Sharpe ratio is standard deviation, so both downside and upside standard deviation result in a lower Sharpe ratio.
- The **Sortino ratio** is a similar risk-adjusted measure of performance; however, only downside deviations are considered to reflect risk.
  - Risk is measured as variability below a predefined level of return.
  - Because of the left-tail risk present in many hedge fund strategies, the Sortino ratio is generally seen as a superior measure of the risk-adjusted performance of hedge funds.

Empirical Results: Risk-adjusted Measure

- Allocations to the following strategies was found to be effective in generating superior risk-adjusted performance, based on the comparatively higher Sharpe and Sortino ratios:
  - Systematic futures.
  - Equity market neutral.
  - Global macro.
  - Event-driven hedge fund strategies.
- On the other hand, it was observed that the following fund strategies do not significantly enhance risk-adjusted performance:
  - Fund-of-funds.
  - Multi-strategy.
- Allocating a portion of a stock/bond portfolio to hedge funds **generally reduces risk and increases returns**.

Empirical Results: Risk measure-S.D.

- Perhaps not surprisingly, it was found that the following strategies resulted in the **lowest standard deviations** of returns for the overall portfolio:
  - Dedicated short-biased.
  - Bear market neutral.
- These funds also produced notably **low standard deviations**:
  - Systematic futures.
  - FoF: macro/systematic.
  - Equity market neutral.
- Funds that were found to have **little positive impact on reducing standard deviations** of the overall portfolio include:
  - Event-driven: distressed securities.
  - Relative value: convertible arbitrage.
  - An explanation
    - ✓ **Event-driven:** outcomes are either mild successes or grand failures.
    - ✓ **Relative value:** because their leveraged nature becomes a liability during times of market volatility.

Empirical Results: Risk measure-Drawdown

- **Drawdown** is defined as the peak-to-trough decline for a portfolio, generally quoted as the percentage drop between a peak and the subsequent trough.
- The hedge fund strategies that produced the **smallest maximum drawdowns**:
  - Global macro.
  - Systematic futures.
  - Merger arbitrage.
  - Equity market neutral.
- Strategies **did little to mitigate the traditional portfolio's maximum drawdown**:
  - L/S equity.
  - Event-driven: distressed securities.
  - Relative value: convertible arbitrage.
- Use of the conditional risk model can show that strategies perform relatively well during periods of market crisis because they have minimal exposure to credit risk or equity. Vice Versa.

Example

- Conditional linear factor models used to understand hedge fund risk exposures are most likely to use factors including:

  A. liquidity risk, operational risk, valuation risk, and systemic risk.

  B. interest rate risk, commodity risk, margining risk, and concentration risk.

  C. equity risk, credit risk, currency risk, and volatility risk.

Solution: C

This reading uses a model that incorporates four factors: equity risk, credit risk, currency risk, and volatility risk. (The interest rate risk "BOND" and commodity risk "CMDTY" factors used by Hasanhodzic and Lo were dropped due to multicollinearity issues.)

Example

- Adding a 20% allocation of a hedge fund strategy to a traditional 60%/40% portfolio is most likely to increase the total portfolio's:

  A. standard deviation.

  B. maximum drawdown.

  C. Sortino ratio.

Solution: C

Adding a 20% allocation of a hedge fund strategy to a traditional 60%/40% portfolio usually decreases total portfolio standard deviation while it increases Sharpe and Sortino ratios in the combined portfolios. An allocation to hedge funds often decreases maximum drawdown.

Reading 27

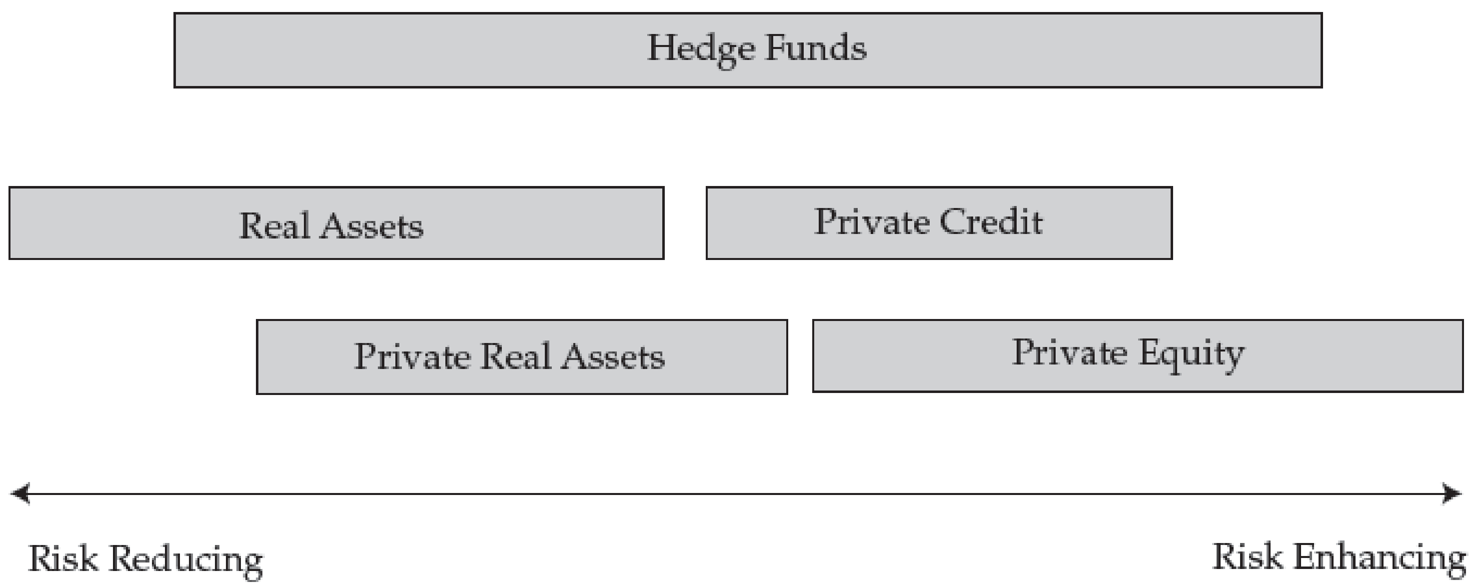
Asset Allocation to Alternative Investments

75-133

1. Roles in Multi-Asset Portfolios - Alternatives

- Overall, the goal of adding alternative investments to a portfolio is most often to improve the portfolio's risk and returns profile.
- Investors may seek alternative investments for **capital growth (top priority), income generation, risk diversification or safety** (preservation of value).

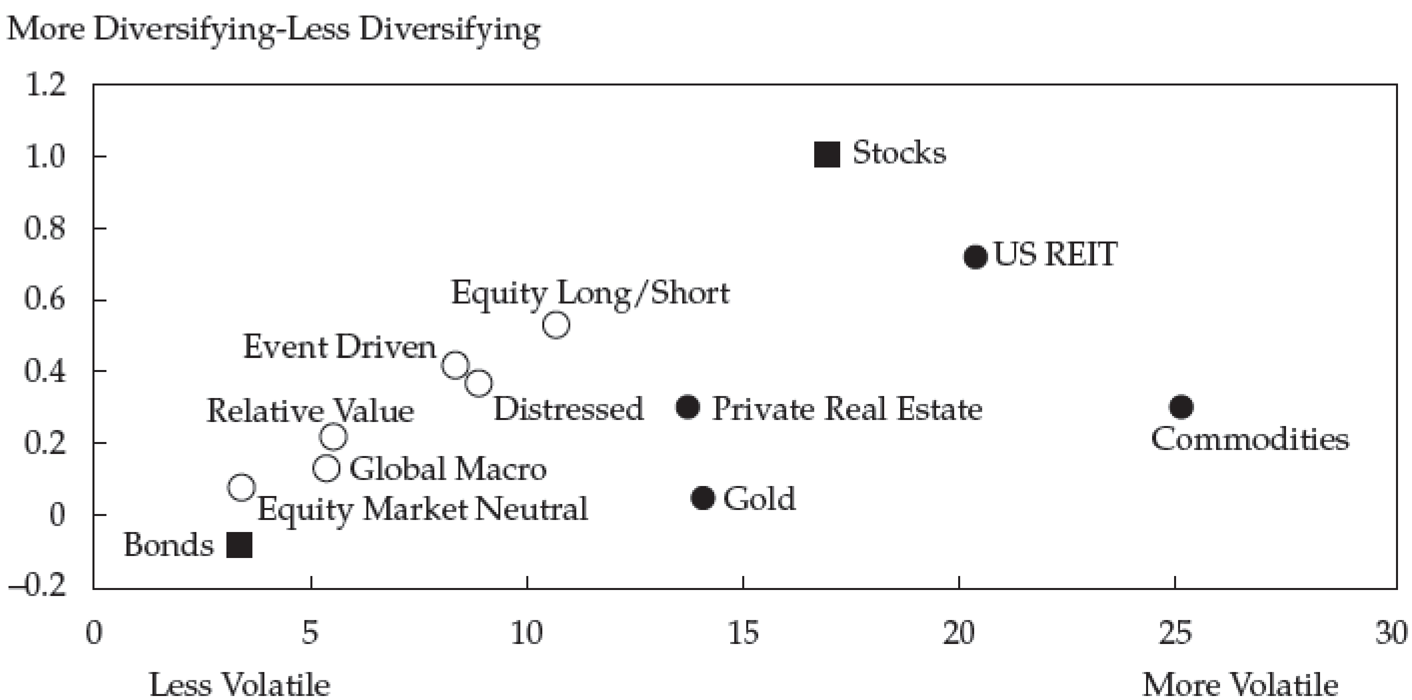
Exhibit 1 Alternative Investments in the Risk/Reward Continuum



1.1 Diversification Potential

- Exhibit 4 illustrates the potential contributions the various alternative strategies might make to a portfolio dominated by equity risk.

Exhibit 4 Diversification Potential of Various Alternative Asset Classes



Sources: Bloomberg and authors' own data and calculations.

1.2 Roles in Multi-Asset Portfolios

- **Private equity.**
  - For a portfolio of public equity securities, an allocation to private equity has limited diversification potential because public and private companies face essentially the same risk factors.
  - Thus, the main function of private equity in the portfolio is to increase expected returns.
- **Hedge funds.**
  - Some hedge fund strategies, such as equity long/short or short bias, may somewhat reduce a portfolio's overall equity beta but are mainly expected to increase returns through their managers' security selection skill.
  - Other hedge fund strategies, such as merger arbitrage or global macro, may be less correlated with traditional asset classes.

1.3 Roles in Multi-Asset Portfolios

- **Real assets.**
  - Assets such as commodities, farm and timberland, and infrastructure protect against inflation risk.
  - Commodity holdings (futures) can target particular subsets of inflation risk.
    - ✓ For example, energy, food, or building materials.
  - Infrastructure investments require a longer time horizon and their correlation with inflation may be limited.
    - ✓ For example, by utility rate regulations.
- **Commercial real estate.**
  - Real estate investments can hedge inflation risk.
    - ✓ Both rental income and the value of properties owned may increase with inflation.

1.3 Roles in Multi-Asset Portfolios

- **Private credit.**
  - This class of alternative investments include both direct lending and distressed debt.
    - ✓ **Direct lending** is primarily an income-producing investment. For a given range of credit quality, the risk-return profile tends to be similar for direct lending and **publicly traded debt**, except that direct lending has additional risk (and an expected return premium) due to its illiquidity.
    - ✓ Distressed debt has a risk-return profile **more like equity securities**, because factors specific to the issuer have a greater effect on the debt's performance than factors that affect fixed-income investments in general.

2. Diversifying Equity risks

- Are alternative investments or bonds the better choice for diversifying an equity portfolio?
  - The answer may depend on the investor’s investment horizon.

2.1 Diversifying Equity risks: Short Time Horizon

- For a **short investment horizon**, the primary risk facing the investor is **returns volatility**.
- Alternative investments as an asset class appears **lower volatility and correlation**. However, these statistics are likely to **be biased downward** for a number of reasons:
  - **Appraisal-based valuations** of privately held investments result in smoothing of reported returns.
  - Databases of alternative investment returns are subject to sampling biases, such as **survivorship bias and backfill bias**, which result in downside risk being understated in the reported data.
  - Indexes of alternative investment returns reflect some degree of diversification because manager's returns in an index may have low correlations of returns with each other.

2.1 Diversifying Equity risks: Short Time Horizon

- By comparison, bonds as an asset class have had a **lower correlation** with equity returns than alternative investments.
  - In fact, over the 20 years before 2017, their correlation with equity returns has been negative.
  - As a result, an allocation to bonds is likely to reduce the volatility of an equity portfolio's returns more than an equal allocation to alternative investments.

2.2 Diversifying Equity risks: Long Time Horizon

- With a **long time horizon**, however, the primary risk is not returns volatility, but failing to achieve a minimum required rate of return over time.
  - For example, an endowment must earn an average rate of return greater than the sum of inflation and its required annual distributions.
- In this case, **alternative investments can be a better choice for diversification.**
  - Because the expected return on alternative investments is higher than that of bonds, over a long time horizon they reduce the risk of failing to meet the portfolio's return requirements.

3. Investment Opportunity Set

- **Traditional approaches** to defining the investment opportunity set include **classifying asset groups by liquidity** or by **how they perform** over economic cycles.
  - A portfolio manager using **a liquidity-based approach** would
    - ✓ Distinguish between alternative investments that are publicly traded and those that are not publicly traded.
    - ✓ Among alternative investments that are not publicly traded, the manager would further classify them by the length of the time commitment required.

	Fixed Income	Equity	Other Assets
More Liquid	Cash	Public Equity	Commodity Futures
	Gov. Bond	L/S Equity	REITs
	Corp. Bond	Hedge funds	
Less Liquid	Private Credit	Private Equity	Private Real Estate Private Real Assets

3. Investment Opportunity Set

- **Traditional approach**
  - Classify assets by **how they are expected to perform** under different scenarios for **economic growth and inflation**. A manager would <u>distinguish among</u>
    - ✓ asset classes that provide growth in an expanding economy (primarily equities),
    - ✓ asset classes that hedge inflation risk (such as real assets and inflation-linked bonds),
    - ✓ asset classes that hedge against deflation (primarily nominal government bonds).

	Negative/Low Growth	High Growth
Deflation	Non-Indexed Bonds	
Moderate Inflation		Public Equity Private Equity Private Credit
High Inflation	Indexed Bonds Gold	Commodities Real Assets

3. Investment Opportunity Set

- **A risk factor based approach** to defining asset classes involves statistically estimating their sensitivities to risk factors identified by the manager.
  - Economic growth and inflation;
  - Interest rates and credit spreads;
  - Currency values;
  - Liquidity;
  - Capitalization;
  - Value-versus-growth.
- **Characteristics of a risk factor based approach**
  - With respect to alternative investments, a risk factor analysis may show that some alternative investment classes are similar to traditional asset classes in terms of factor sensitivity.
    - ✓ private equity returns ≈ public equity;
    - ✓ private credit ≈ publicly traded high yield bonds.

3. Investment Opportunity Set

Exhibit 14 Factor Sensitivity Estimates across Various Asset Classes

Asset Classes	Equity	Size	Value	Liquidity	Nominal Duration	Inflation	Credit Spread	Currency	R-squared
US Equities	1.0								1.00
Non-US Dev Equities	0.9							0.7	0.86
Emerging Mkt Equities	1.1	0.5						0.5	0.66
Government Bonds					4.8				0.96
Broad Fixed Income					4.2		0.6		0.89
High-Yield Credit					4.1		4.2		0.95
Inflation-Linked Bonds					6.6	7.0			0.82

3. Investment Opportunity Set

Exhibit 14 (Continued)

Asset Classes	Equity	Size	Value	Liquidity	Nominal Duration	Inflation	Credit Spread	Currency	R-squared
Hedge Funds	0.3	0.1					0.6		0.74
HF Macro	0.2	0.2			1.9	3.1	–0.9	0.1	0.28
HF Equity Mkt. Neut.	0.1								0.14
HF Equity Hedged	0.5								0.72
HF Distressed	0.1	0.2					1.8		0.72
Commodities						18.0		0.8	0.36
Public Real Estate	0.9				4.6	0.9			0.38
Private Real Estate	0.2			0.1		2.4			0.20
Buyout & Growth Equities	0.6	0.2	–0.3	0.1					0.70
Venture Capital	0.8	0.6	–1.8	0.2					0.38

3. Investment Opportunity Set

- **Pros and cons of a risk factor based approach**
  - Identifying sources of risk that are common across asset classes is one of the **key advantages of a risk factor based approach**.
    - ✓ This mitigates a limitation of the traditional approaches, which may classify investments into different classes even when they face largely the same risk factors, leading a manager to believe the portfolio is more diversified than it actually is.
  - Another **advantage of a risk-based approach** is that by allowing a manager to analyze multiple dimensions of portfolio risk, this approach is useful for developing an integrated risk management framework.
    - ✓ More useful than the traditional approaches for highlighting the primary drivers of portfolio risk.
  - Managers using a risk factor based approach must be aware that risk factor estimates can be **sensitive to the period** used for analysis.

3. Investment Opportunity Set

- **Traditional approach**
  - **Advantages**
    - ✓ Easy to communicate.
    - ✓ Relevance for liquidity management and operational considerations.
  - **Limitations**
    - ✓ Over-estimation of portfolio diversification.
    - ✓ Obscured primary drivers of risk.
- **Risk-based approach**
  - **Advantages**
    - ✓ Common risk factor identification.
    - ✓ Integrated risk framework.
  - **Limitations**
    - ✓ Sensitivity to the historical look-back period.
    - ✓ Implementation hurdles.

Example

- Which of the following categories of alternative investments would be most appropriate for diversifying a portfolio of public equity?

  A. Private equity and short-bias hedge funds.

  B. Long-short hedge funds and distressed debt.

  C. Commercial real estate and global macro hedge funds.

Solution: C

Alternative investments that can diversify a public equity portfolio include commercial real estate, real assets, and hedge funds that pursue non-equity-oriented strategies. Private equity, distressed debt, and equity-oriented hedge funds are less appropriate because they are affected by many of the same risk factors as public equity.

Example

- For alternative investments as an asset class, appraisal-based valuations and sampling biases are believed to overstate:

  A. returns.

  B. risk measures.

  C. diversification benefits.

Solution: C

Smoothing of returns and sampling biases are believed to understate the correlation of alternative investments with traditional asset classes and therefore overstate their diversification benefits. These data issues are believed to understate risk measures. Their effect on reported returns is not clear.

4. Alternative Investment Considerations

- In addition to the risk, return, and correlation characteristics relevant to the decision to invest in the alternative asset classes, many operational and practical complexities must be considered before finalizing a decision to invest.
  - Properly defining risk characteristics;
  - Establishing return expectations;
  - Selection of the appropriate investment vehicle;
  - Operational liquidity issues;
  - Expense and fee considerations;
  - Tax considerations (applicable for taxable entities);
  - Build vs. Buy.

4.1 Investment Considerations: Risk consideration

- **Risk consideration**
  - Several characteristics of alternative investments limit the usefulness of mean-variance optimization as a tool for determining their appropriate portfolio allocations.
    - ✓ Because of **illiquidity and valuation issues, option-like return patterns**, and the fact that returns from some strategies tend to be low or negative during a drawdown period and high in later years, we **cannot assume returns are normally distributed**.
    - ✓ Additionally, for alternative investments for which committed capital is not immediately invested by the manager, **a portfolio's effective allocation to the asset class might be less than its target.**

4.2 Investment Considerations: Expected return

- **Expected return**
  - Setting return expectations for alternative investments is made more difficult by their short history relative to other asset classes and by the **limited validity of the data** that are available.
    - ✓ A suggested approach to determining an expected return for a particular class of alternative investments is to
      - ◆estimate each of its risk factor exposures,
      - ◆add the expected returns from these exposures to the risk-free rate.

4.3 Investment Vehicles

- **Investment Vehicles**
  - A typical structure for an alternative investment vehicle is a **limited partnership.**
    - ✓ With this structure, the liability of investors in the fund is <u>limited</u> to the amount they have committed.
    - ✓ Often these limited partnerships are registered <u>offshore for tax or reporting reasons</u>.
  - **Investing directly in a limited partnership** is appropriate for **large investors** that have the expertise to evaluate managers and fund strategies.
  - Investing through a **fund-of-funds** may be appropriate for investors that **lack the needed expertise**.
    - ✓ The **benefit** of a fund-of-funds is that it provides access to this asset class to investors who otherwise would not have it.
    - ✓ The **drawback** is that they charge an additional layer of fees above those charged by the underlying limited partnerships.

4.3 Investment Vehicles

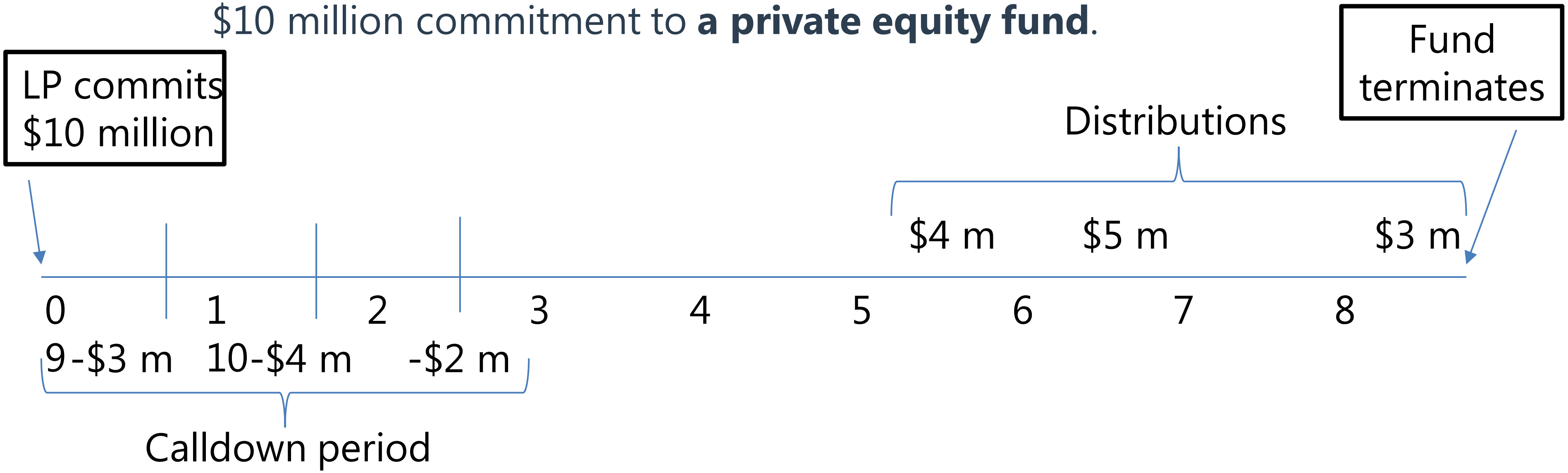
- **Investment Vehicles**
  - Some investors that are large enough to demand favorable investment terms may establish **separately managed accounts (SMAs, funds of one)** through which to access alternative investments.
  - Some **open-ended mutual funds** and "undertakings for collective investment in transferable securities" (**UCITS**) have developed to <u>give smaller investors access to alternative investments</u>.

4.4 Investment Considerations: Liquidity

- **Liquidity Concerns: Liquidity risks associated with investment vehicle**
  - <u>For funds in the private equity, private credit, real estate, and real asset sectors</u>, liquidity provisions are often **more strict** than is typical for hedge funds.
    - ✓ **Subscriptions** are structured in "closes" for new investors, usually over a one-year period.
    - ✓ **Limited partners commit a stated amount of capital**, and the general partner will "call" this capital over an investment period (such as 3 to 5 years) as they identify investment opportunities.
    - ✓ **Redemptions** are typically not available.
    - ✓ Instead, the fund will **distribute capital over its life** (often 10 to 12 years) as it exits its investments.

4.4 Investment Considerations: Liquidity

- **Liquidity Concerns: Drawdown Structure**
  - The following illustrates a time line of cash flows that might occur for a $10 million commitment to **a private equity fund**.



  - Note in the figure that only $9 million of the limited partner’s capital was called. A general partner is not required to call the full amount of committed capital.

4.4 Investment Considerations: Liquidity

- **Liquidity Concerns: Drawdown Structure**
  - **Neither capital calls nor distributions** occur on a predetermined schedule.
    - ✓ Capital may be called (or not) at any time during the calldown period.
    - ✓ Distributions can occur at any point in the fund's life, even during the calldown period.
  - Limited partners must also consider the **opportunity cost** of their committed capital during the calldown period.
    - ✓ On the other hand, investing it in higher return but less liquid investments risks missing a capital call.

4.4 Investment Considerations: Liquidity

- **Liquidity Concerns: liquidity risks associated with the underlying investments**
  - With respect to the liquidity of a fund's holdings, a potential issue is **whether they are consistent with the fund's redemption terms**.
    - ✓ This is mostly a consideration for hedge funds; as noted previously, other types of private investment funds generally do not offer redemptions.
  - **Equity-oriented hedge fund**
    - ✓ Hedge funds **that pursue long-only equity strategies** tend to hold relatively liquid investments that are consistent with offering redemptions monthly or quarterly.

4.4 Investment Considerations: Liquidity

- **Liquidity Concerns: liquidity risks associated with the underlying investments**
  - **Event-driven strategies**
    - ✓ **Frequent redemption periods** may limit a general partner's flexibility to implement strategies with long time horizons or infrequent investment opportunities.
  - **Relative value funds**
    - ✓ For example, Funds that **hold significant portions of illiquid investments**, such as some relative value funds, may restrict redemptions under certain market conditions to <u>avoid having to liquidate these assets during crisis periods</u>.
  - **Leverage** is another important liquidity consideration because creditors have priority of claims over limited partners.
    - ✓ **Margin calls** may force a leveraged fund to sell its most liquid holdings and be left with its less liquid investments, <u>regardless of which holdings the general partner would otherwise prefer to keep</u>

4.5 Investment Considerations: Expenses, Fees

- **Expenses, Fees**
  - Many alternative investments involve **significant** fees and expenses.
    - ✓ For example, the “2 and 20” fee structure of many hedge funds (annual management fee <u>2% of assets under management</u>, incentive fee <u>20% of gains</u>)
  - Funds with calldown structures charge management fees **on the amount of committed capital**, regardless of how much of it has been called down.
    - ✓ <u>This may generate negative returns</u> in the early years of an investment when much of the committed capital is yet to be called.

4.6 Investment Considerations: Taxes

➢ **Taxes**

- Investors must ensure that their investments, and the investment vehicles used to invest, are <u>consistent with their tax situations</u>.
  - ✓ Some fund strategies may result in **short-term taxable income to investors**, or may be subject to **tax withholding.**
  - ✓ Tax-exempt organizations must ensure that income from a fund **will not be considered to be unrelated to** the organization's purpose, and therefore considered taxable.

Example

- A limited partnership structure with a single client is known as:

  A. UCITS.

  B. a fund of one.

  C. a separately managed account.

Solution: B

A fund of one is a limited partnership structure that has only a single client.

Example

- Cash flows from investors into a private equity limited partnership:

  A. are at the discretion of the general partner.

  B. will be 100% invested after three to five years.

  C. are made only on the establishment date of the partnership.

Solution: A

Typically, in private equity limited partnerships, the limited partners commit a fixed amount of capital, which the general partner can call over a number of years as investment opportunities arise. Limited partners are responsible for having cash available to meet capital calls. General partners may call less than 100% of the committed capital.

Example

- Which of the following: terms describes the practice of a hedge fund designating certain of its investment holdings as exempt from the fund's ordinaiy redemption terms?

  A. Gate.

  B. Lock-up.

  C. Side pocket.

Solution: C

Assets that are not subject to a fund’s redemption terms are said to be held in a side pocket. A gate is a maximum amount an investor may redeem at one time. A lock-up is a restriction on redemptions during a period of time.

5. Approaches to Asset Allocation

- A suggested approach to including alternative investments in an asset allocation decision is to do it in two stages:
  - First with only the traditional asset classes;
  - Then also considering alternative investments.
    - ✓ The second process can be assisted by statistical tools such as:
      - Monte Carlo simulation.
      - Mean-variance optimization.
      - Risk factor based optimization.
    - ✓ These approaches can be used individually or in combination.

5. Approaches to Asset Allocation

- **Challenges in modeling the risk and return properties of alternatives**
  - Because asset valuations for many alternative investments are based on **appraisals**, returns data are likely to be artificially smoothed and are often stale.
  - The **distribution of returns** is also known to be **non-normal**, exhibiting skew and excess kurtosis to a greater extent than traditional asset classes.
- **Incorporate non-normality** into analyses.
  - use **empirically observed asset returns** instead of working with the normal distribution
    - ✓ A further limitation is the relatively short history of alternative investments, which may result in **small-sample and time-period biases**.
- One method for **modeling a distribution with fat tails** (positive excess kurtosis) is to define risk and return properties for two or more distinct market environments.
  - For example, a normal period and a high-volatility period.

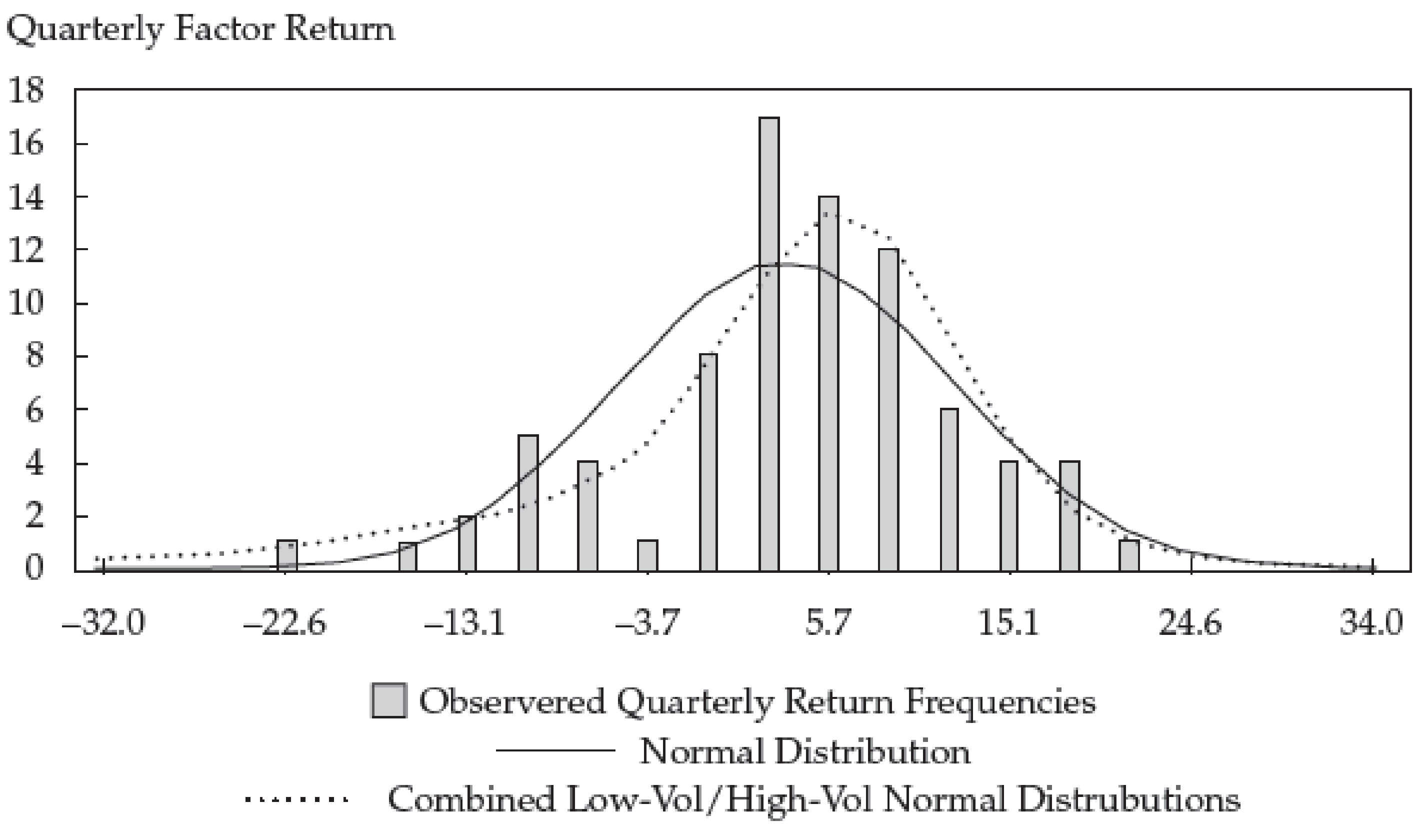
5.1 Monte Carlo simulation

➢ **Monte Carlo simulation**

- First, we discuss how we can simulate risk factor or asset return scenarios that <u>exhibit the skewness and kurtosis</u> commonly seen in alternative investments.
- Second, we <u>illustrate simulation-based risk and return</u> analytics over a long time horizon in a broad asset allocation context.
- **Steps of model construction process**
  - ✓ 1. Decide between asset class <u>returns or risk factors</u> as the variables to be simulated.
  - ✓ <u>2. Establish the quantitative framework</u>, for example by accounting for properties like mean reversion, fat-tailed distributions, or unstable correlations.
  - ✓ 3. If the model is based on risk factors, translate them to asset class returns.
  - ✓ 4. Use the resulting asset class return scenarios to develop meaningful outputs, such as the probability of a shortfall to a portfolio's required or target rate of return.

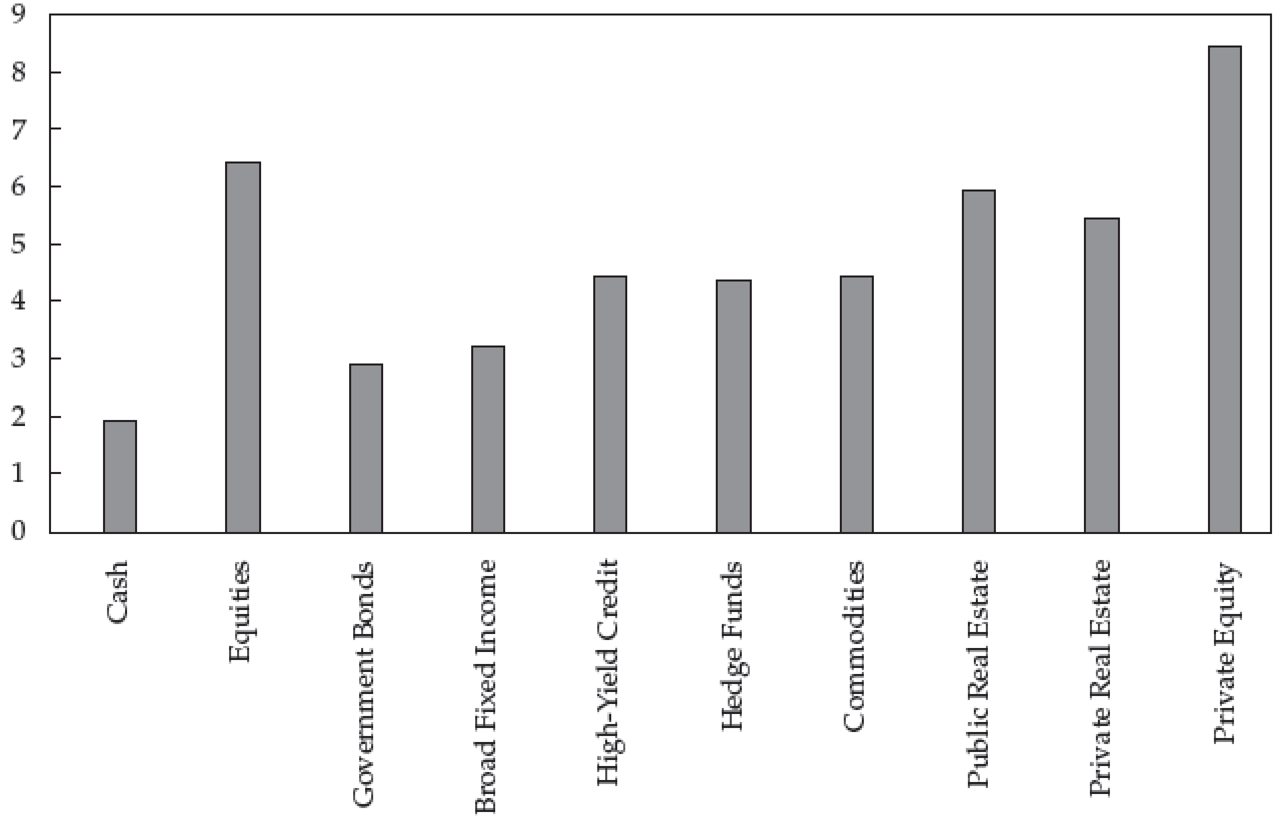
5.1 Monte Carlo simulation

➢ **Simulate Normal and Fat-Tailed Distribution Fit for US Equity Quarterly Returns**



5.1 Monte Carlo simulation

- **Asset Class Expected Returns**
  - The expected returns for the selected asset classes (shown in Exhibit 26), however, are not based on historical average returns but are illustrative, forward-looking estimates.



5.1 Monte Carlo simulation

Simulate Portfolio Risk and Return Estimates

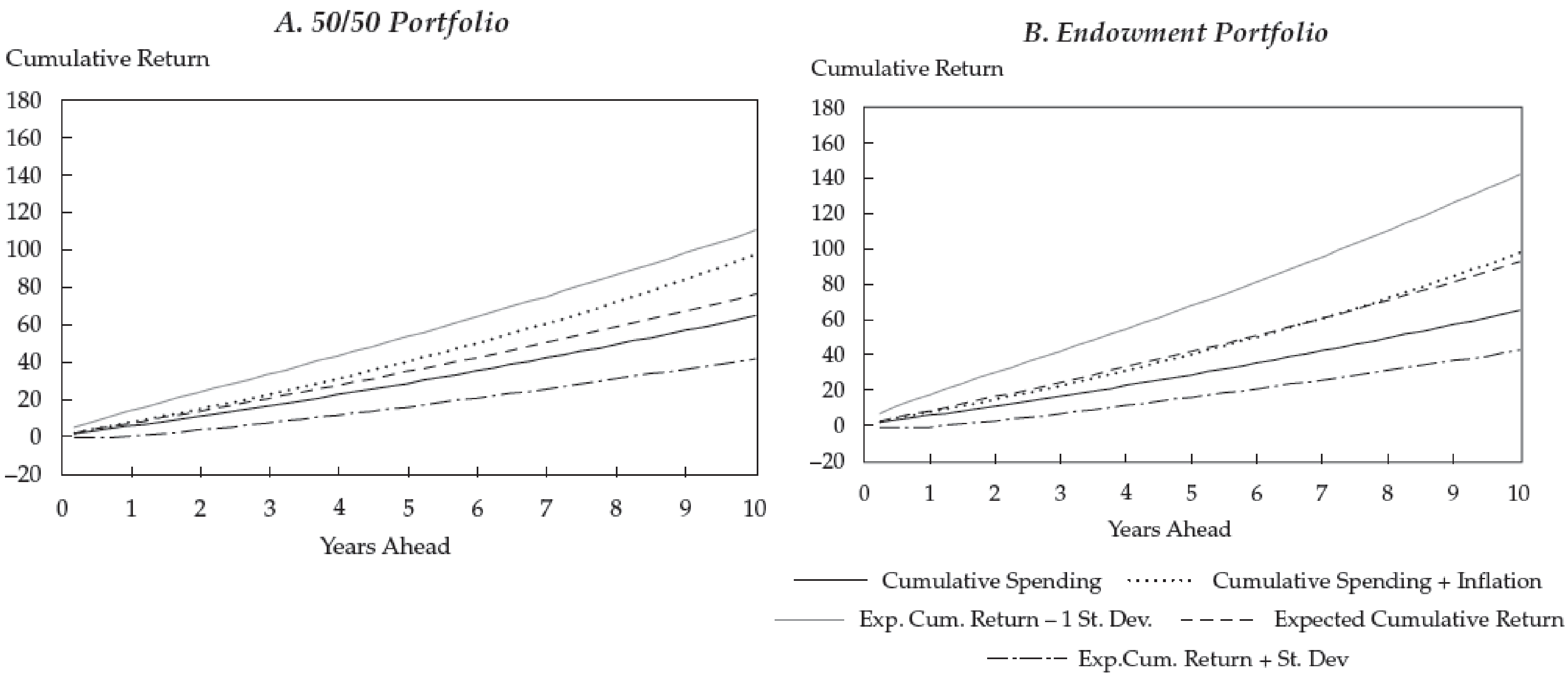
- A portfolio 100% invested in government bonds
- A portfolio allocated 50% to equities and 50% to broad fixed income
- A diversified "endowment portfolio" allocated 40% to global public equities, 15% to fixed income, 20% to broad hedge funds, 15% to private equity, 5% to private real estate, and 5% to commodities

Exhibit 27 Portfolio Risk and Return Estimates

	Government Bond Portfolio	50/50 Portfolio	Endowment Portfolio
Expected Geometric Return over 10 Years	2.3%	5.6%	7.0%
Annual Total Return Volatility	4.2%	6.6%	11.2%
95% VaR over Q/Q (quarter over quarter)	−3.1%	−2.9%	−4.6%
95% VaR over 1 Year	−5.2%	−4.2%	−9.1%
95% CVaR over Q/Q	−4.0%	−3.9%	−6.4%
95% CVaR over 1 Year	−6.9%	−6.6%	−13.1%
99% VaR over Q/Q	−4.5%	−4.6%	−7.5%
99% VaR over 1 Year	−7.9%	−8.1%	−15.6%
99% CVaR over Q/Q	−5.2%	−5.5%	−8.7%
99% CVaR over 1 Year	−9.2%	−10.3%	−18.7%
Worst Drawdown over 10 Years	−19.8%	−22.5%	−36.9%

5.1 Monte Carlo simulation

➢ **Cumulative Total Return Simulated over 10-year Horizon**



5.2 Optimization techniques

- **Optimization techniques**
  - Mean–variance optimization (MVO) typically over-allocates to alternative asset classes, because:
    - ✓ risk is underestimated because of stale or infrequent pricing;
    - ✓ the underlying assumption that returns are normally distributed.
  - Practitioners usually address this bias towards alternatives by **establishing limits on the allocations to alternatives.**
  - Optimization methods that **incorporate downside risk** (mean–CVaR optimization) or **take into account skew** may be used to enhance the asset allocation process.
  - **Limitation**
    - ✓ **Small** changes in the inputs may generate **significant** changes in optimal asset allocations.

5.3 Risk factor based optimization

➢ **Risk factor based optimization**

- Risk factor based optimization is similar to MVO, but instead of modeling asset classes by their return and risk characteristics, the investor **models risk factors and factor return expectations**.
- A risk factor based approach requires the additional step of translating the optimized risk exposures to an asset allocation to achieve them.
  - ✓ For example, both public and private equity provide exposure to economic growth risk
- Risk factor-based model produce more robust asset allocation proposals.
- **Limitations**
  - ✓ Asset classes' return **sensitivity** to some risk factor exposures might not be stable over time.
  - ✓ **Correlations** among risk factors may behave like correlations among asset class returns and increase during periods of financial stress.

6. Liquidity Planning

- A portfolio must be managed in a way that **meets its capital commitments** while still **providing required liquidity**.
- Here we will explore the challenges with private investment liquidity planning with **three primary considerations**:
  - 1 How to achieve and maintain the desired allocation.
  - 2 How to handle capital calls.
  - 3 How to plan for the unexpected.

6. Liquidity Planning

- **Achieve and maintain the desired allocation**
  - Cash flows for a typical private investment partnership are capital calls in the early years and distributions in the later years.
- **A simple model** (estimate the cash flows to and from a fund)
  - Capital Contribution = Rate of Contribution × (Capital Commitment – Paid-in-Capital)
    - ✓ $C_t = C\%_t \times (CC - PIC)$
  - Distributions from a fund can be modeled as percentages of its net asset value.
  - Distributions in period t = percentage to be distributed in period $_t$ × [NAV in period $_{t-1}$ × (1+growth rate)]
    - ✓ $D_t = D\%_t \times [NAV_{t-1} \times (1+g)]$
    - ✓ growth rate = IRR of its investments
    - ✓ $NAV_t = NAV_{t-1} \times (1+g) + C_t - D_t$

6. Liquidity Planning

- **Achieve and maintain the desired allocation**
  - Liquidity forecasting is also important for managing how a portfolio reaches and maintains its target asset allocations.
  - Combined with the cash flow forecasting approach described previously for a particular fund, an investor can project the capital commitments needed over a span of years to reach the target allocation, and forecast the need to reinvest future distributions to maintain the target.

Example

➢ **Liquidity Planning for Private Investments**

The NAV of an investor's share in a private renewable energy fund was €30 million at the end of 2020. All capital has been called. The investor expects a 20% distribution to be paid at the end of 2021. The expected growth rate is 12%. What is the expected NAV at year-end 2022?

➢ **Solution**

- The expected distribution at the end of 2021 is €6.72 million [(€30 million x 1.12) x 20%].
- The NAV at year-end 2021 is therefore 30 x (1+12%) + 0 – 6.72 = 26.88
- The NAV at year-end 2022 = 26.88 x (1+12%) = 30.1056 million

6. Liquidity Planning

- **Managing the capital call**
  - A crucial aspect of liquidity planning is **having cash available to meet capital calls**.
  - A **suggested approach** is to invest it in publicly traded securities that may be viewed as proxies for the private investments to which they are committed.
    - ✓ For example, capital committed to private real estate but not yet called could be invested in publicly traded real estate investment trusts.
- **Preparing for the unexpected**
  - Capital calls, distributions, growth rates, and even fund lifetimes may turn out **significantly different than expected**.
    - ✓ An investor should **stress-test liquidity planning models against unexpected events** such as delayed fund distributions when expected distributions have been earmarked to meet capital calls.

7. Monitoring Programs

- **Overall Investment program monitoring**
  - Its performance should be evaluated in the context of return, risk, income, and safety, rather than simply measured against a benchmark.
  - One reason that measuring against a benchmark or peer group can be misleading is the difficulty of selecting a representative one.
    - ✓ Because many alternative investment strategies depend heavily on active management, any benchmark chosen is unlikely to be directly comparable to a portfolio’s actual investments in the asset class.
    - ✓ In addition, published indexes are often inconsistent with each other in the way they define various alternative investment strategies.

7.1 Performance Evaluation

- **Performance Evaluation**
  - Monitoring of alternative investments can be challenging because their performance reporting can be **infrequent** and come with **significant time lags.**
  - A further complication with private investments is that they often report internal rates of return rather than time-weighted rates of return.
    - ✓ IRR is influenced by the timing of capital calls and distributions, and therefore, may be subject to manipulation.
    - ✓ Investors may prefer to monitor a private fund's multiple on invested capital (MOIC). (MOIC is a private equity measure that divides the current value of the underlying companies plus any distributions received by the total invested capital.)
  - If capital is **returned quickly** (thereby possibly producing extraordinarily high IRRs), the investor may want to put greater emphasis on the **MOIC** measure. Similarly, funds that **return capital more slowly** than expected might want to put greater weight on the **IRR** measure.

7.2 Monitoring the Firm and the Investment Process

- **Monitoring the Firm and the Investment Process**
  - A fund's "**key persons**" are typically specified in its documents.
  - **The manager's interests should be aligned with the investor's interests.**
  - **Style drift:** Because managers have a great deal of discretion over how they invest capital, investors should monitor a fund's holdings over time for signs of style drift.
  - **Risk Management:** Monitoring a fund's risk management framework is important, especially for leveraged strategies.
  - **Client/asset turnover:** An investor should observe the profile of a fund's other investors and judge whether they are likely to remain committed for the long term.

7.2 Monitoring the Firm and the Investment Process

- **Monitoring the Firm and the Investment Process**
  - A large or unexpected increase in **new investors** may make **more capital available to a manager** than he has attractive opportunities to use.
    - ✓ If this leads the manager to pursue lesser opportunities, the performance of the fund as a whole may suffer.
  - A fund should have reliable auditors, custodians, and other third-party **service providers.**
    - ✓ If these relationships change, an investor should understand whether it is for a positive reason (e.g., the fund outgrows the capabilities of a service provider and needs a larger one)
    - ✓ or otherwise (e.g., an auditor quits a relationship because of a manager's actions).

8. Suitability Considerations

- **Investment Horizon**
  - Private equity and private real assets are generally suitable only for investors with long time horizons (15 years or more).
- **Expertise**
  - Alternative investment strategies are largely based on the premise that **skilled managers (large investors)** can create value through **active management.**
    - ✓ Alternative investments may **not** be suitable for investors whose philosophy is grounded in a belief in the price-efficiency of markets.
- **Governance**
  - The investor should have a formal investment policy with <u>clear objectives, put decision-making power in the hands of experts, and have a reliable reporting framework</u>.
- **Transparency**
  - Investors in alternative investments must be comfortable with a lower level of transparency than is generally available with traditional investments.

Example

- Which class of publicly traded securities is most likely to be affected by similar risk factors to those that affect private credit?

  A. REITs.

  B. Equity securities.

  C. High yield bonds.

  Solution: C

  High yield debt may be viewed as a proxy for private debt because they tend to be affected by the same risk factors.

Example

- Alternative investments are most likely to be suitable for a portfolio investor that:

  A. has a strong governance program and insists on transparency.

  B. has a long time horizon and believes financial markets are efficient.

  C. believes active management can generate excess risk-adjusted returns over time.

Solution: C

Allocating to alternative investments is most suitable for investors with long time horizons, strong governance programs, comfort with limited transparency, and a belief that active managers add value.

Example

- When using optimization approaches to determine an allocation to alternative investments, recommended practices least likely include: I
  A. using only unsmoothed historical data as inputs.
  B. modeling normal and high-volatility periods separately.
  C. placing constraints on the allocations to various asset classes.

Solution: A

Because some alternative investments have relatively short histories of returns data, use of historical data alone may introduce time-period and small-sample biases. Unsmoothing is recommended because the data often reflect appraisal-based valuations.

Example

- Compared to an alternative investment partnership's reported internal rate of return, its multiple on invested capital is less affected by:

  A. stale pricing.

  B. timing of capital calls.

  C. appraisal-based valuations.

Solution: B

Multiple on invested capital is less subject to manipulation of cash flow timing by a manager than IRR, but may sill reflect stale pricing and appraisal-based valuations.

It's not an end but just the beginning.

Search for knowledge, read more, sit on your front porch and admire the view without paying attention to your needs.

寻找更多的知识，多读一些书，坐在你家的前廊里，以赞美的眼光去享受眼前的风景，不要带上任何功利的想法。

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Trading, Performance Evaluation, and Manager Selection

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Study Session 3	BEHAVIORAL FINANCE
Study Session 4	CAPITAL MARKET EXPECTATIONS
Study Session 5	ASSET ALLOCATION AND RELATED DECISIONS IN PORTFOLIO MANAGEMENT
Study Session 6	DERIVATIVES AND CURRENCY MANAGEMENT
Study Session 7-8	FIXED-INCOME PORTFOLIO MANAGEMENT (1)&(2)
Study Session 9-10	EQUITY PORTFOLIO MANAGEMENT (1)&(2)
Study Session 11	ALTERNATIVE INVESTMENTS FOR PORTFOLIO MANAGEMENT
Study Session 12-13	PRIVATE WEALTH MANAGEMENT (1)&(2)
Study Session 14	PORTFOLIO MANAGEMENT FOR INSTITUTIONAL INVESTORS
Study Session 15	**TRADING, PERFORMANCE EVALUATION, AND MANAGER SELECTION**
Study Session 16	CASES IN PORTFOLIO MANAGEMENT AND RISK MANAGEMENT

Framework

Trading, Performance Evaluation, and Manager Selection

- **SS15: Trading, Performance Evaluation, and Manager Selection**
  - R34 Trade Strategy and Execution
  - R35 Portfolio Performance Evaluation
  - R36 Investment Manager Selection

Reading 34

Trade Strategy and Execution

Framework

1. Motivations to Trade
2. Trading Strategies and Strategy Selection
   - Trade Strategy Inputs
   - Reference Prices
   - Trade Strategies
3. Trade Execution (Strategy Implementation)
   - Trade Implementation Choices
   - Algorithmic Trading
   - Comparison of Markets
4. Implementation Shortfall
5. Evaluating Trade Execution
6. Trade Governance

1. Motivations to Trade

- Portfolio managers need to trade their portfolio holdings to ensure **alignment** with the fund's underlying **investment strategy and objectives**.
  - Profit seeking
  - Risk management/hedging needs
  - Cash flow needs
  - Corporate actions/index reconstitutions/margin calls

1.1 Profit seeking

- **Profit seeking**
  - The primary added value that most active managers seek to provide is risk-adjusted outperformance relative to their benchmark.
  - **Trade urgency & alpha decay**
    - ✓ **Trade urgency** refers to how quickly (aggressively) or slowly (patiently) the order is executed over the trading time horizon.
    - ✓ **Alpha decay** refers to the erosion or deterioration in short-term alpha once an investment decision is made.
      - Managers following **a short-term alpha-driven strategy** will trade with **greater urgency** to realize alpha before it dissipates (decays).
      - Managers following **a longer-term strategy** will trade with **less urgency** if alpha decay is expected to be slower.
        - Value manager (long-term profit seeking)

1.2 Risk management/hedging needs

- **Risk management/hedging needs**
  - As the market and the risk environment change, portfolios need to be traded or rebalanced to **remain at targeted risk levels or risk exposures**.
    - ✓ Duration match,
    - ✓ Beta management.
  - Portfolio managers may also trade to **hedge risks** when they **do NOT have an investment view** on the specific risk in question.
    - ✓ Currency hedging, CDSs, option strategies.

1.3 Cash flow needs

- **Cash flow needs**
  - This type of trading is often **client driven**, arising from fund inflows (orders, mandates) and outflows (redemptions, liquidations).
  - Cash flow needs may involve high or low trade urgency
    - ✓ **high trade urgency**: collateral/margin calls
    - ✓ **low trade urgency**: longer-term client asset allocation changes
  - To minimize **cash drag** on a portfolio, fund inflows may be **equitized** using futures or ETFs until the next portfolio rebalance or positions in the underlying can be traded.
    - ✓ **Equitization** refers to a strategy of temporarily investing cash using futures or ETFs to gain the desired equity exposure before investing in the underlying securities longer term.
    - ✓ Equitization may be required if large inflows into a portfolio are hindered by lack of liquidity in the underlying securities.

1.4 Others

- **Corporate actions/index reconstitutions/margin calls**
- Trading may be liquidity driven resulting from client activity or index reconstitutions.
    - Trading may also be necessitated by such activity as corporate actions and operational needs.
        - ✓ Dividend/coupon reinvestment, distributions, margin calls, and expiration of derivative contracts
    - For index tracking portfolios, such index changes as additions, deletions, and constituent weight changes are generally traded in the manager's portfolio to reflect benchmark exposure.
    - Margin or collateral calls may drive high levels of trade urgency, given a need for the immediate sale of portfolio holdings.
- In these cases, managers typically trade using end-of-day closing prices because these prices are used for fund and benchmark valuation.

2. Trading Strategies and Strategy Selection

- **Trade Strategy Inputs**
  - Order Characteristics
  - Security Characteristics
  - Market Conditions
  - User-Based Considerations: Trading Cost Risk Aversion
  - Market Impact and Execution Risk
- **Reference Prices**
  - Pre-Trade Benchmarks
  - Intraday Benchmarks
  - Post-Trade Benchmarks
  - Price Target Benchmarks
- **Trade Strategies**
  - Short-Term Alpha Trade
  - Long-Term Alpha Trade
  - Risk Rebalance Trade
  - Client Redemption Trade
  - New Mandate Trade

2.1 Trade Strategy Inputs

- **Order Characteristics**
  - **Side**: the side or trade direction of the order—for example, buy or sell.
    - ✓ If prices are rising, executing a buy order may take longer than executing a sell order, given the presence of more buyers (liquidity demanders) than sellers (liquidity suppliers) in the market.
    - ✓ Trading a list that consists of only buys or only sells will have greater market risk exposure than a list of buys and sells in which the securities have offsetting market risk exposures.
  - **Size**: the total amount or quantity of the security being transacted.
  - **Relative size (% of ADV):** order size as a percentage of the security's average daily volume (ADV).

2.1 Trade Strategy Inputs

- **Security Characteristics**
  - **Security type**: the type of security being traded (underlying, ETF, American depositary receipt, global depositary receipt).
  - **Short-term alpha**: (trading alpha or trade alpha) may arise from an appreciation, a depreciation, or a reversion (i.e., reversal) in security price.
    - ✓ High rates of alpha decay, or alpha loss, require faster, or more accelerated, trading to realize alpha before it is traded on by other market participants.
  - **Price volatility**: the annualized price volatility of the security. The price volatility of a security primarily affects the execution risk of the trade.
    - ✓ **Execution risk** is the risk of an adverse price movement occurring over the trading horizon owing to a change in the fundamental value of the security or because of trading-induced volatility.
    - ✓ Securities with higher levels of price volatility have greater exposure to execution risk than securities with lower price volatility.
  - **Security liquidity**: the liquidity profile of the security (e.g., ADV, bid–ask spread, average trade size).
    - ✓ All else being equal, greater liquidity reduces execution risk and trading costs, such as market impact.

2.1 Trade Strategy Inputs

- **Market Conditions**
  - **Liquidity crises**: deviations from expected liquidity patterns due to periods of crisis.
    - ✓ During market events or crises, the **volatility** and **liquidity** of the market and the security will be critical to consider as conditions result in sudden and significant deviations from normal trade patterns.
    - ✓ During normal market environment, some companies will reach market value, which may result in them being added or removed from the widely used stock index. When this happens, liquidity in their stocks tends to improve or deteriorate as their stocks become broader or narrower.
  - Market volatility and liquidity are **dynamic**. They are also generally **negatively related**, which becomes apparent especially during periods of crisis, when volatility increases and liquidity decreases.

2.1 Trade Strategy Inputs

- **User-Based Considerations: Trading Cost Risk Aversion**
  - A portfolio manager or trader with **a high level of risk aversion** is likely to be
    - ✓ more concerned about **market risk**
    - ✓ tend to trade with greater trade **urgency** to avoid the greater market exposure associated with trading more patiently.

2.1 Trade Strategy Inputs

- **Market Impact and Execution Risk**
  - **Market impact** is the adverse price impact in a security caused from trading an order and can represent one of the largest costs in trading.
    - ✓ To minimize information leakage, portfolio managers may attempt to hide their trading activity by executing orders across different venues and using a mix of order types, such as market and limit orders.
  - **Execution risk** is the adverse price impact resulting from a change in the fundamental value of the security and is often proxied by price volatility.
- **Trader's dilemma.** Trading too fast results in too much market impact, but trading too slow results in too much market risk.
- **The goal in selecting a trading strategy** is to choose the best **price–time trade-off** given current market conditions and the unique characteristics of the order.

2.2 Reference Prices

- **Reference prices**, also referred to as **price benchmarks**, are used in determining trade prices for execution strategy and in calculating **actual trade costs** for post-trade evaluation purposes.
- **Categories of reference prices**
  - Pre-trade benchmarks
  - Intraday benchmarks
  - Post-trade benchmarks
  - Price target benchmarks

2.2 Reference Prices

- **Pre-trade benchmarks**, where the reference price for the benchmark is known before trading begins.
  - **Decision price**
    - ✓ **Quantitative portfolio managers** will often have **records** of their decision price because these prices may be **inputs** into their quantitative models.
  - **Previous close**
    - ✓ A previous close benchmark is often specified by **quantitative portfolio managers** who incorporate the previous close in a quantitative model, portfolio optimizer, or screening model.
    - ✓ The previous close is often used as a proxy for the decision price by **quantitative portfolio managers.**

2.2 Reference Prices

- **Pre-trade benchmarks**, where the reference price for the benchmark is known before trading begins.
  - **Opening price**
    - ✓ This benchmark price is most often specified by portfolio managers who begin trading at the market open and wish to **minimize trading costs**.
    - ✓ The opening price is often used as a proxy for the decision price by **fundamental portfolio managers** who are investing in a security for long-term alpha or growth potential.
    - ✓ The opening price does **not** have associated **overnight risk**, or the risk that prices will **adjust at market open** to incorporate information released after the close of the previous business day.
    - ✓ If the trade is to be executed in the opening auction, then using the opening price as a reference benchmark is not appropriate because the trade itself can influence the reference benchmark.

2.2 Reference Prices

- **Pre-trade benchmarks**, where the reference price for the benchmark is known before trading begins.
  - **Arrival price**.
    - ✓ The arrival price is the price of the security at the time the order is entered into the market for **execution**.
    - ✓ In these cases, the portfolio manager's goal is to transact at or close to **current market prices**.
    - ✓ Portfolio managers who are buying or selling on the basis of **alpha expectations** or a **current market mispricing** will often specify an arrival price benchmark (greater trade urgency).
    - ✓ Portfolio managers looking to minimize trading cost will also use arrival price as benchmark.

2.2 Reference Prices

- **Intraday benchmarks**, where the reference price for the benchmark is computed on the basis of market prices that occur during the trading period.
- Managers **without views on short-term price movements** who wish to participate in volumes **over the execution horizon** typically use an intraday benchmark, such as VWAP or TWAP.

2.2 Reference Prices

- **Volume-weighted average price (VWAP)**
  - The VWAP benchmark price is **the volume-weighted average price of all trades executed over the day or the trading horizon**.
  - Portfolio managers may specify the VWAP benchmark when they wish to participate with volume patterns over the day.
  - Portfolio managers who are rebalancing their portfolios over the day and have both buy and sell orders may select the VWAP as a price benchmark.
  - Portfolio managers who are rebalancing and using cash from sell orders to purchase buy orders will also often select an intraday benchmark, such as VWAP. Doing so allows the portfolio managers to structure their executions over time to ensure cash received from sell orders is sufficient to fund remaining buy orders.
    - ✓ Doing so allows the portfolio managers to structure their executions over time to ensure cash received from sell orders is sufficient to fund remaining buy orders.

2.2 Reference Prices

- **Intraday benchmark**
  - **Time-weighted average price (TWAP)**
    - ✓ An **equal-weighted average price** of all trades executed over the day.
    - ✓ Portfolio managers may choose TWAP when they wish to **exclude potential trade outliers.**
      - Trade outliers may be caused by trading a large buy order at the day's low or a large sell order at the day's high.
      - If market participants are not able to fully participate in these trades, then TWAP may be a more appropriate choice.
    - ✓ The TWAP benchmark is used by portfolio managers and traders to evaluate fair and reasonable trading prices in market environments with **high volume uncertainty** and for securities that are **subject to spikes in trading volume** throughout the day.

2.2 Reference Prices

- **Post-trade benchmarks**, where the reference price for the benchmark is established <u>after trading is completed</u>.
  - **Closing price**.
    - ✓ Portfolio managers for funds **valued at the closing price** on the day or who wish to **minimize tracking error** to an underlying benchmark price, such as index funds, often select a post-trade reference price, such as the official closing price.
    - ✓ **Advantage**: minimizes potential tracking error.
    - ✓ **Disadvantage**: not known until after trading is completed.

2.2 Reference Prices

- **Price target benchmarks**, where the reference price for the benchmark is specified as a price to meet or beat (transact more favorably).
  - Portfolio managers **seeking short-term alpha** may select an alternative benchmark known as a price target benchmark.
  - In this case, a portfolio manager would like to transact in a security—believed to be undervalued or overvalued—at a **more favorable price**.

2.3 Trade Strategies

- The **primary goal** of a trading strategy is to **balance the expected costs, risks, and alpha** associated with trading the order in a manner consistent with the portfolio manager's trading objectives, risk aversion, and other known constraints. Trading strategies involving equities, fixed income, currency, and derivatives are explained as follows:
    - **Short-term alpha**: short-term alpha-driven equity trade (high trade urgency).
    - **Long-term alpha**: long-term alpha-driven fixed-income trade (low trade urgency).
    - **Risk rebalance**: buy/sell basket trade to rebalance a fund's risk exposure.
    - **Cash flow driven**: client redemption trade to raise proceeds.
    - **New Mandate Trade**: cash equitization (derivatives) trade to invest a new client mandate.

3. Trade Execution (Strategy Implementation)

- **Trade Implementation Choices**
- **Algorithmic Trading**
  - Execution Algorithm Classifications
    - ✓ Scheduled (POV, VWAP, TWAP)
    - ✓ Liquidity seeking
    - ✓ Arrival price
    - ✓ Dark strategies/liquidity aggregators
    - ✓ Smart order routers
- **Comparison of Markets**
  - Equities
  - Fixed Income
  - Exchange-Traded Derivatives
  - Over-the-Counter Derivatives
  - Spot Foreign Exchange (Currency)

3.1 Trade Implementation Choices

- A variety of implementation choices are available based on the **specific order**, **market**, and **trade strategy** involved.
- The **higher-touch approaches** involve greater degrees of human interaction for order completion.
  - In **principal trades**, the executing broker assumes all or part of the risk related to trading the order, pricing it into her quoted spread.
  - In **agency trades**, the broker is engaged to find the other side of the trade but acts as an agent only, and risk for trading the order remains with the buy-side portfolio manager or trader.
  - Trading **in large blocks of securities** requires a higher-touch approach.
    - ✓ A variation of quote-driven markets often used to trade less liquid securities is a **request for quote (RFQ)**.

3.1 Trade Implementation Choices

- For **straightforward trades in liquid securities**, low-touch automated execution strategies are often preferred.
  - Alternative trading systems (ATS) *multilateral trading facilities (MTF)* Non-exchange trading venues that bring together buyers and sellers to find transaction counterparties.
  - Direct market access (DMA) gives all market participants a way to interact directly with the order book of an exchange, usually through a broker's exchange connectivity.
  - Dark pools.

3.2 Algorithmic Trading

- **Algorithmic trading** is the computerized execution of the investment decision following a specified set of trading instructions.
- Trading algorithms are primarily used for **two purposes**—trade execution and profit generation.
  - **Execution algorithms**. An execution algorithm is tasked with transacting an investment decision made by the portfolio manager.
    - ✓ The manager determines what to buy or sell on the basis of his investment style and investment objective and then enters the order into the algorithm.
  - **Profit-seeking algorithms**. A profit-seeking algorithm will determine what to buy and sell and then implement those decisions in the market as efficiently as possible.
    - ✓ Profit-seeking algorithms are used by electronic market makers, quantitative funds, and high-frequency traders.

3.2.1 Execution Algorithm

- **Scheduled (POV,** VWAP, TWAP**)**
  - Scheduled algorithms are **appropriate** for orders in which portfolio managers or traders do **not** have expectations of adverse price movement during the trade horizon.
  - **POV** (percentage of volume) algorithms (also known as participation algorithms) send orders following a volume participation schedule.
    - ✓ **Advantage**
      - They will automatically take advantage of increased liquidity conditions by trading more shares when there is ample market liquidity and will not trade in times of illiquidity.
    - ✓ **Disadvantage**
      - may incur **higher trading costs** by continuing to buy as prices move higher and to sell as prices move lower.
      - **may not complete** the order within the time period specified.

3.2.1 Execution Algorithm

- **Scheduled (**POV, **VWAP,** TWAP**)**
  - VWAP and TWAP algorithms release orders to the market following a time-specified schedule, trading a predetermined number of shares within the specified time interval.
    - ✓ **VWAP algorithms** slice the order into smaller amounts to send to the market following a time slicing schedule based on historical intraday **volume profiles**.
    - ✓ These algorithms typically trade a **higher percentage** of the order at the **open and close** and a smaller percentage of the order during midday. Because of this, the VWAP curve is said to resemble a **U-shaped curve.**
    - ✓ Following a fixed schedule as VWAP algorithms do may not be optimal for illiquid stocks because such algorithms may **not complete** the order in cases where volumes are low.

3.2.1 Execution Algorithm

- **Scheduled (**POV, VWAP, **TWAP)**
  - **TWAP algorithms** slice the order into smaller amounts to send to the market following an **equal-weighted time schedule**.
    - ✓ An **advantage** of a time slicing strategy is that it **ensures** the specified number of shares are executed within the specified time period.
    - ✓ For example, trade 5000 shares between 10:00 a.m. and 1:00 p.m.
    - ✓ A **disadvantage** of a time slicing strategy is that it will force the trades even in times of insufficient liquidity and will **not take** advantage of increased liquidity conditions when available.

3.2.1 Execution Algorithm

- **Scheduled**
  - Scheduled algorithms are **appropriate** for orders in which portfolio managers or traders do **not** have expectations of adverse price movement during the trade horizon.
  - These algorithms are also used by portfolio managers and traders who have greater risk tolerance for longer execution time periods and are more concerned with minimizing market impact.
  - Scheduled algorithms are often appropriate when the order size is relatively small (e.g., no more than 5%–10% of expected volume)
  - the security is relatively liquid, or the orders are part of a risk-balanced basket and trading all orders at a similar pace will maintain the risk balance.

3.2.2 Execution Algorithm

- **Liquidity seeking**
  - **Liquidity-seeking algorithms**, also referred to as opportunistic algorithms, take advantage of market liquidity across multiple venues by **trading faster** when liquidity exists at a favorable price.
    - ✓ " liquidity sweeping" or "sweeping the book", dark pools
  - Liquidity-seeking algorithms are **appropriate** for large orders that the portfolio manager or trader would like to **execute quickly without** having a **substantial impact** on the security price.

3.2.3 Execution Algorithm

- **Arrival price**
  - **Arrival price algorithms** seek to **trade close to current market prices** at the time the order is received for execution.
  - Arrival price algorithms will trade more aggressively at the beginning of trading to execute more shares nearer to the arrival price, known as a **front-loaded strategy**.
    - ✓ time schedule based or volume participation based
  - Arrival price algorithms are **used for** orders in which the portfolio manager or trader believes **prices are likely to move unfavorably during the trade horizon**.

Example

- **A portfolio manager has identified a stock with attractive long-term growth potential and would like to place an order of moderate size, relative to the stock's average traded volume. The stock is very liquid and has attractive short-term alpha potential. The portfolio manager expects short-term buying pressure by other market participants into the market close, ahead of the company's earnings call scheduled later in the day.**
  - Explain when the following algorithms are used: (a) arrival price, (b) dark aggregator, and (c) SOR.
  - Discuss which of the three algorithms is most suited to trading this order.

Example

- **Solution**
  - Arrival price algorithms are used for relatively liquid securities and when the order is not expected to have a significant market impact. Arrival price algorithms are also used when portfolio managers and traders have higher levels of risk aversion and wish to trade more aggressively at an accelerated pace to reduce the execution risk associated with trading over longer time horizons.
  - Dark aggregator algorithms are appropriate for trading securities that are relatively illiquid or that have relatively wide bid–ask spreads or for relatively large order sizes in which trading in the open market is expected to have a significant price impact. Additionally, they are used by portfolio managers and traders who are concerned with information leakage that may occur when posting limit orders in lit venues. Given their higher risk of unfilled executions, these algorithms are also used when the order does not need to be filled in its entirety

Example

- Smart order routing systems are used to electronically send small orders into the market. Based on prevailing market conditions, SORs will determine which trade destinations have the highest probability of executing for limit orders and which trading venues have the best market prices for market orders and will route orders accordingly. SORs continuously monitor market conditions in real time in both lit and dark markets.
- An arrival price algorithm would be most appropriate for trading this order because the portfolio manager has adverse price expectations. In this case, the portfolio manager wants to trade more aggressively to capture alpha ahead of less favorable prices expected later in the day. By trading the order more quickly, the portfolio manager can execute at more favorable prices ahead of the adverse price movement and the less favorable prices expected from other participants' buying pressure into the close, in line with his trade urgency.

3.2.4 Execution Algorithm

- **Dark strategies/liquidity aggregators**
  - **Dark aggregator algorithms** execute shares away from "lit" markets, these algorithms execute in opaque, or less transparent, trade venues, such as dark pools.
  - Dark aggregator algorithms are **used** in trading when portfolio managers and traders are concerned with **information leakage** that may occur from posting limit orders in **lit venues** with pre- and post-trade transparency.
  - These algorithms are **appropriate** for:
    - ✓ order size is large relative to the market to make significant market impact
    - ✓ trading securities that are relatively illiquid or have relatively wide bid–ask spreads
    - ✓ does not need to execute the order in its entirety

3.2.5 Execution Algorithm

- **Smart order routers (SORs)**
  - The SOR will determine the destination with the **highest probability of executing** the limit order and the venue with the **best market price**.
  - SORs **continuously monitor** market conditions in real time in both lit and dark markets.
  - SORs are used for orders that are sufficiently small that they will not have a large market impact if sent as marketable orders
  - SORs are also best used for orders that require immediate execution because of imminent price movement, high portfolio manager or trader risk aversion, or abnormally high risk levels.
  - Using SORs for marketable orders is also appropriate in cases where the market moves quickly,
    - ✓ **Market orders**. SORs are used for orders that are sufficiently small that they will not have a large market impact if sent as marketable orders.
    - ✓ **Limit orders.** SORs are also used for orders that are small enough that posting the order as a limit order will not leak information to the market and move prices.

3.3 Comparison of Markets

- **Equities**
  - Equities are generally **traded on exchanges and dark pools**.
    - ✓ **Exchanges** are known as lit markets (as opposed to dark markets) because they provide pre-trade transparency—namely, limit orders that reflect trader intentions for trade side (buy or sell), price, and size.
    - ✓ **Dark pools** provide anonymity because no pre-trade transparency exists.
  - **Trade implementation choices.** Equities are the **most technologically advanced market**.
    - ✓ **Large, urgent trades**, particularly in less liquid small-cap stocks, are generally executed as **high-touch broker risk trades**, where the broker acts as dealer and counterparty.
    - ✓ **Large, non-urgent trades** may be executed using trading algorithms (particularly for more liquid large-cap stocks) or, for less liquid securities, a high-touch agency approach.
    - ✓ For **small trades** in liquid securities, most buy-side traders use electronic trading.

3.3 Comparison of Markets

- **Fixed income**
  - Fixed-income securities are generally traded **not** on exchanges but in a bilateral, dealer-centric market structure where **dealers** make markets in the securities. (relatively **illiquid, off-the-run** bonds).
  - **Trade implementation choices**
    - ✓ There is **limited algorithmic trading** in bond markets, except for on-the-run (most recently issued) US Treasuries
    - ✓ For other fixed-income instruments, **high-touch trading** persists, particularly for larger trades and less liquid securities.
      - **Small trades and large, urgent trades** are usually implemented through broker risk trades (via RFQs), (principal trades).
      - **Large, non-urgent trades** are generally implemented using a high-touch approach, (agency trades instead of).

3.3 Comparison of Markets

- **Exchange-traded derivatives (options and futures)**
  - Most of the trading volume in exchange-traded derivatives is concentrated in **futures**.
  - **Trade implementation choices**
    - ✓ **Electronic trading** is pervasive, and **algorithmic trading** is growing.
    - ✓ **Large, urgent trades** "sweep the book" where market depth is relatively good.
      - In these cases, trades are executed against the most aggressive limit orders on the other trade side first and then against decreasingly aggressive limit orders until the entire order has been filled.
    - ✓ **Large, non-urgent trades** are generally implemented electronically through **trading algorithms**.
    - ✓ Buy-side traders generally use **direct market access**, particularly for **small trades**.

3.3 Comparison of Markets

- **Off-exchange (OTC) derivatives**
  - OTC derivative markets have historically been **opaque**, with little public data about prices, trade sizes, and structure details.
  - **Large, urgent trades** are generally implemented as broker risk trades, where risk is transferred to a broker who takes the contract into his inventory.
  - **Large, non-urgent trades** are generally implemented using a high-touch agency trade, where the broker attempts to match buyers and sellers directly.
- **Spot Foreign Exchange (Currency)**
  - For large, urgent trades, RFQs are generally submitted to multiple dealers competing for a trade.
  - Large, non-urgent trades are mostly executed using algorithms (such as TWAP) or a high-touch agency approach.
  - Small trades are usually implemented using DMA.

Summary

- **Trade implement choice**
  - High-touch
    - ✓ Principal: Large, urgent
    - ✓ Agency: Large, non-urgent
  - Automated Execution
    - ✓ ATS/MTF: Non-exchange
    - ✓ DMA: Buy-side, small trade, exchange-traded derivatives, non-urgent(原版书）, Urgent
    - ✓ Dark pool: large relative, illiquidity, do not need to execute all orders, non-urgent, information leakage
    - ✓ Scheduled(POV, VWAP, TWAP): not concerned about adverse price movement, non-urgent, greater risk-tolerance, relatively small, relatively liquidity

Summary

- Automated Execution
  - ✓ Liquidity seeking: execute quickly without substantial impact
  - ✓ Arrival price: more aggressively trading, 担心adverse movement, urgent, high-level of risk averse, relatively liquidity, relatively small or medium
  - ✓ SORs: 同时监控lit & dark, sufficiently small;

4. Trade Evaluation

- **Trade Cost Measurement**
  - Implementation Shortfall
  - Expanded Implementation Shortfall
- **Evaluating Trade Execution**
  - Arrival price
  - VWAP
  - TWAP
  - Market on Close
  - Market-adjusted Cost
  - Added Value

4.1 Implementation Shortfall

- The **implementation shortfall** measure is the standard for measuring the **total cost** of the trade. IS compares a portfolio's **actual return** with its **paper return** (where transactions are based on decision price).
  - The paper return shows the **hypothetical return** that the fund would have received if the manager were able to transact **all shares at the desired decision price** and **without any associated costs or fees** (with no friction).
  - **IS = Paper return – Actual return**

4.1 Implementation Shortfall

- **Paper return =** $(\boldsymbol{P_n} - \boldsymbol{P_d})(\boldsymbol{S}) = (\boldsymbol{S})(\boldsymbol{P_n}) - (\boldsymbol{S})(\boldsymbol{P_d})$
  - S represents the total order shares
    - ✓ S > 0 indicates a buy order
    - ✓ S < 0 indicates a sell order
  - P_d represents the price at the time of the investment decision
  - P_n represents the current price
- **Actual return =** $(\sum \mathrm{s}_j)(\boldsymbol{P_n}) - \sum \mathrm{s}_j\, \mathrm{p}_j - \boldsymbol{Fees}$
  - s_j and p_j represent the number of shares executed and the transaction price of the *j*th trade
  - $\sum \mathrm{s}_j$ represents the total number of shares of the order that were executed in the market
  - "Fees" includes all costs paid by the fund to complete the order

4.1 Implementation Shortfall

- This IS formulation decomposes the total cost of the trade into three categories: **execution cost (Delay cost, Trading cost), opportunity cost, and fixed fees**.
  - **Execution cost** occurs from the buying and/or selling pressure of the order, which often causes buy orders to become **more expensive** and sell orders to **decrease in value**, thus causing the fund to incur **higher costs** and **lower realized returns**.
    - ✓ Wagner (1991) further expanded the IS measure to **decompose** the execution cost component into **a delay-related cost** component and **a trading-related cost** component.
    - ✓ **Delay cost** arises when the order is **not submitted** to the market in a **timely** manner and the asset experiences **adverse price movement**, making it more expensive to transact.

4.1 Implementation Shortfall

- **Opportunity cost** corresponds to the **unexecuted shares** of the order. It is the cost associated with **not** being able to transact the **entire order** at the manager's decision price and is due to **adverse price movement** over the trading period.
- The **fixed fees** component includes **all explicit fees**, such as commissions, exchange fees, and taxes.

➢ **IS formulation**

- **IS = Execution cost + Opportunity cost + Fees**

➢ **Expanded Implementation Shortfall**

- **Expanded IS = Delay cost + Trading cost + Opportunity cost + Fees**

4.1 Implementation Shortfall

- **IS =** $\underbrace{\sum s_j\,p_j - \sum s_j\,P_d}_{\text{Execution cost}} + \underbrace{\left(\boldsymbol{S} - \sum s_j\right)(\boldsymbol{P_n} - \boldsymbol{P_d})}_{\text{Opportunity cost}} + \boldsymbol{Fees}$

- **Expanded IS =**

$$\underbrace{\underbrace{\left(\sum s_j\right)P_0 - \left(\sum s_j\right)P_d}_{\text{Delay cost}} + \underbrace{\sum s_j\,p_j - \left(\sum s_j\right)P_0}_{\text{Trading cost}}}_{\text{Execution cost}} + \underbrace{\left(\boldsymbol{S} - \sum s_j\right)(\boldsymbol{P_n} - \boldsymbol{P_d})}_{\text{Opportunity cost}} + \boldsymbol{Fees}$$

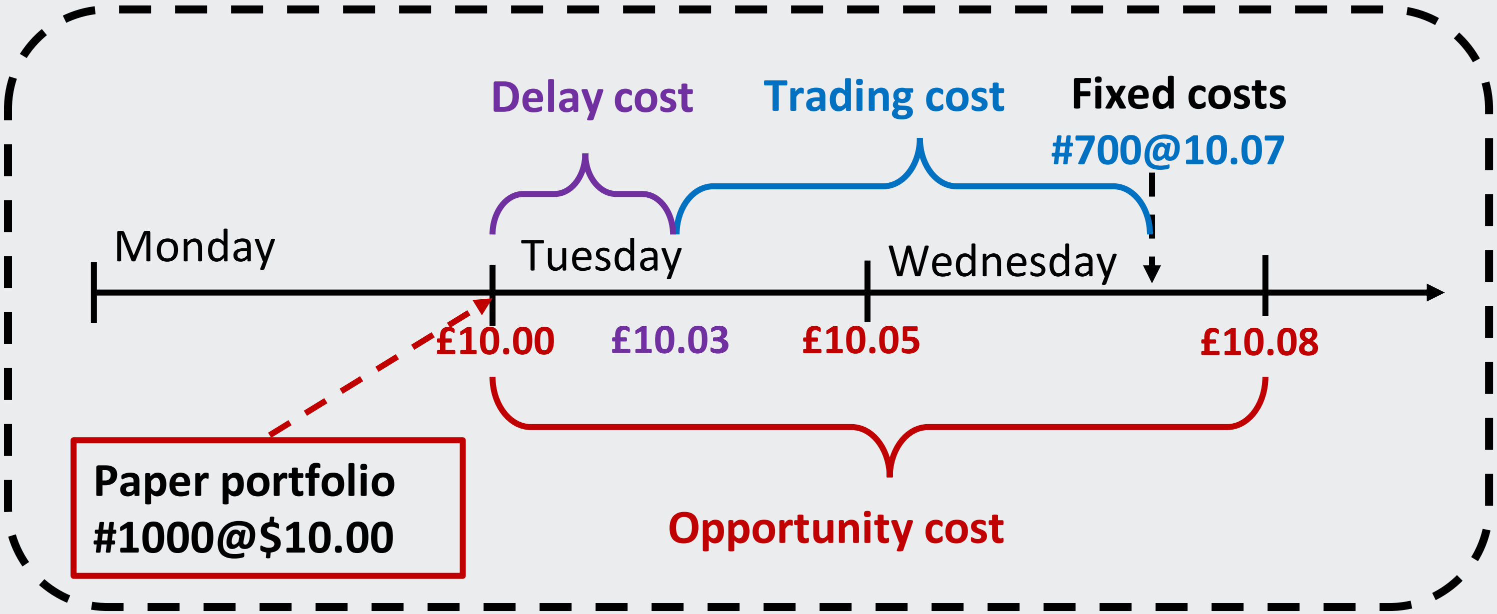
P_0 represents the arrival price

4.1 Example

- On Monday, the shares of Impulse Robotics close at £10.00 per share.
- On Tuesday, before trading begins, a portfolio manager decides to buy Impulse Robotics. An order goes to the trading desk to buy 1,000 shares of Impulse Robotics at £9.98 per share or better, good for one day. The **benchmark price** is Monday's close at £10.00 per share. No part of the limit order is filled on Tuesday, and the order expires. The closing price on Tuesday rises to £10.05.
  - Additional: The buy-side trading desk releases the order to the market 30 minutes after receiving it, when the price is £10.03.
- On Wednesday, the trading desk again tries to buy Impulse Robotics by entering a new limit order to buy 1,000 shares at £10.07 per share or better, good for one day. During the day, 700 shares are bought at £10.07 per share. Commissions and fees for this trade are £14. Shares for Impulse Robotics close at £10.08 per share on Wednesday.
- No further attempt to buy Impulse Robotics is made, and the remaining 300 shares of the 1,000 shares the portfolio manager initially specified are canceled.

Example

- **Solution:**
- We can break this IS down further, as follows:



- **Delay cost**, which reflects the adverse price movement associated with not submitting the order to the market in a timely manner and is based on the amount of shares executed in the order: (700 × £10.03) – (700 × £10.00) = £7,021 – £7,000 = £21.

Example

- **Trading cost**, which reflects the execution price paid on shares executed: (700 × £10.07) – (700 × £10.03) = £7,049 – £7,021 = £28.
- **Opportunity cost**, which is based on the amount of shares left unexecuted and reflects the cost associated with not being able to execute all shares at the decision price: (1,000 shares – 700 shares) × (£10.08 – £10.00) = £24.
- **Fixed fees**, which are equal to total explicit fees paid: £14.
- Therefore, expanded implementation shortfall (£) = £21 + £28 + £24 + £14 = £87.
- The expanded IS provides further insight into the causes of trade costs. The delay cost is £21, which accounts for 24.1% (£21/£87) of the total IS cost, whereas the opportunity cost of £24 accounts for 27.6% (£24/£87) of the total IS cost. Quite often, <u>delay cost and opportunity cost account for the greatest quantity of cost during implementation</u>. These costs can often be eliminated with proper transaction cost management techniques.

4.1 Implementation Shortfall

- **Improving Execution Performance**
  - **Delay costs** can be **reduced** by having **a process** in place that provides traders with **broker performance metrics**.
    - ✓ In theory, the delay cost component should have an expected value of zero.
  - Portfolio managers can use IS to help determine **appropriate order size** for the market within the portfolio manager's price range and to **minimize the opportunity cost** of the order.
    - ✓ Opportunity cost is not mean zero and often represents a cost to the fund. This is due to two reasons:
      - adverse price movement
      - illiquidity.

Example

- A portfolio manager decides to buy 100,000 shares of RLK at 9:00 a.m., when the price is $30.00. He sets a limit price of $30.50 for the order. The buy-side trader does not release the order to the market for execution until 10:30 a.m., when the price is $30.10. The fund is charged a commission of $0.02/share and no other fees. At the end of the day, 80,000 shares are executed and RLK closes at $30.65. Order and execution details are summarized as follows:

Order	
Stock Ticker	RLK
Side	Buy
Shares	100,000
Limit Price	$30.50

Trades	**Execution Price**	**Shares Executed**
Trade 1	$30.20	30,000
Trade 2	$30.30	20,000
Trade 3	$30.40	20,000
Trade 4	$30.50	10,000
Total		80,000

Example

a. Calculate execution cost.
b. Calculate opportunity cost.
c. Calculate fixed fees.
d. Calculate implementation shortfall in basis points.
e. Discuss how opportunity cost could be minimized for the trade.
f. Calculate delay cost.
g. Calculate trading cost.
h. Show expanded implementation shortfall in basis points.
i. Discuss how delay cost could be minimized for the trade.

Example

Solution:

a. **Execution cost** is calculated as the difference between the costs of the real portfolio and the paper portfolio. It reflects the execution price(s) paid for the amount of shares in the order that were actually filled, or executed.

Execution cost can be calculated as follows:

Execution cost

$=(30{,}000\times\$30.20+20{,}000\times\$30.30+20{,}000\times\$30.40+10{,}000\times\$30.50)-80{,}000\times\$30.00$

$=\$2{,}425{,}000-\$2{,}400{,}000$

$=\$25{,}000$

b. **Opportunity cost** is based on the amount of shares left unexecuted in the order and reflects the cost of not being able to execute all shares at the decision price. Opportunity cost can be calculated as follows:

$$\text{Opportunity cost} = (100{,}000 - 80{,}000)(\$30.65 - \$30.00) = \$13{,}000$$

Example

Solution:

c. **Fixed fees** are equal to total explicit fees paid and can be calculated as follows:

Fees = 80,000 × \$0.02 = \$1,600

d. **Implementation shortfall** can be calculated as follows:

Implementation shortfall (\$) = \$25,000+\$13,000+\$1,600

= \$39,600

The implementation shortfall is expressed in basis points as follows:

$$\text{Implementation shortfall (bps)}$$

$$= \frac{\text{Implementation shortfall (\$)}}{(\text{Total shares})(\text{P}_\text{d})} \times 10{,}000 \text{ bps}$$

$$= 132 \text{ bps}$$

Example

Solution:

e. **Minimizing opportunity cost**: Based on the decomposition of IS, the portfolio manager incurred an opportunity cost of \$13,000 on 20,000 shares. The opportunity cost could be lowered by reducing order quantity to a size that can be absorbed into the market at the portfolio manager's price target or better. In this example, opportunity cost represented 32.8% (\$13,000/\$39,600) of the total IS cost. If the portfolio manager had known this in advance, he could have reduced the size of the order to 80,000 shares and invested the extra \$600,000 (20,000 shares × \$30.00/share = \$600,000) in his second most attractive investment opportunity.

f. **Delay cost** can be calculated as follows:

Delay cost=80,000×\$30.10−80,000×\$30.00=\$8,000

Example

Solution:

g. **Trading cost** can be calculated as follows:

Trading cost

$$=(30{,}000\times\$30.20+20{,}000\times\$30.30+20{,}000\times\$30.40+10{,}000\times\$30.50)-80{,}000\times\$30.10$$

$$=\$2{,}425{,}000-\$2{,}408{,}000$$

$$=\$17{,}000$$

h. **Expanded implementation shortfall** can be calculated as follows:

Expanded IS = Delay cost + Trading cost + Opportunity cost + Fees

= \$8,000 + \$17,000 + \$13,000 + \$1,600 = 39,600

The delay cost is \$8,000, which accounts for 20.2% (\$8,000/\$39,600) of the total IS cost, whereas the opportunity cost of \$13,000 accounts for 32.8% (\$13,000/\$39,600) of the total IS cost.

Example

Solution:

i. **Minimizing delay cost**: The delay cost of $8,000 accounts for a sizable portion (20.2%) of the total IS cost and could be minimized by having a process in place that provides the buy-side trader with broker performance metrics. This would allow the trader to quickly identify the best broker and/or algorithm to execute the order given its characteristics and current market conditions, thereby minimizing the time between order receipt and market execution.

4.2 Evaluating Trade Execution

- Trade evaluation measures the **execution quality** of the trade and the performance of the trader, broker, and/or algorithm used.
- Various techniques measure trade cost execution using different benchmarks (**pre-trade, intraday, and post-trade**).
- Trade cost analysis enables investors to better <u>manage trading costs</u> and understand where trading activities can be improved through the use of appropriate trading partners and venues.
- Trade cost calculations are expressed such that a **positive value** indicates **underperformance** and represents underperformance compared with the benchmark. **A negative value** indicates a savings and is a **better performance** compared with the benchmark.

4.2 Evaluating Trade Execution

- **Cost in total dollars ($)**

$$Cost\ (\$) = Side \times (\overline{P} - P^*) \times Shares$$

- **Cost in dollars per share ($/share)**

$$Cost\ (\$/share) = Side \times (\overline{P} - P^*)$$

- **Cost in basis points (bps)**

$$Cost\ (bps) = Side \times \frac{(\overline{P} - P^*)}{P^*} \times 10{,}000\ bps$$

- Side: +1 Buy order ; -1 Sell order
- $\overline{P}$ = Average execution price of order
- P^*= Reference price
- Shares = Shares executed

4.2 Evaluating Trade Execution

- **Arrival Price**
  - The arrival price benchmark measures the difference between the **market price** (P_0) at the time the order was released to the market and the **actual transaction price** for the fund.
  - This benchmark is used to measure the **trade cost of the order** incurred while the order was being executed in the market.

$$\text{Arrival cost (bps)} = Side \times \frac{(\overline{P} - P_0)}{P_0} \times 10^4\ bps$$

4.2 Evaluating Trade Execution

VWAP

- Portfolio managers use the VWAP benchmark as a measure of whether they received **fair** and **reasonable prices** over the trading period.
- Since the VWAP comprises all market activity over the day, all buying and selling pressure of all other market participants, and market noise, it provides managers with a reasonable indication of the **fair cost** for market participants over the day.

$$\text{VWAP cost (bps)} = Side \times \frac{(\bar{P} - VWAP)}{VWAP} \times 10^4\ bps$$

4.2 Evaluating Trade Execution

- **TWAP**
  - The TWAP benchmark is an **alternative measure** to determine whether the fund achieved **fair** and **reasonable prices** over the trading period and is used when managers wish to **exclude** potential trade price **outliers**.

$$\text{TWAP cost (bps)} = Side \times \frac{(\overline{P} - TWAP)}{TWAP} \times 10^4 \; bps$$

4.2 Evaluating Trade Execution

- **Market on Close**
  - The closing benchmark, also referred to as an **MOC** benchmark, is used primarily by **index managers** and **mutual funds** that wish to achieve the closing price on the day and compare their actual transaction prices with the closing price.
    - ✓ Doing so ensures that the benchmark cost measure will be **consistent** with the **valuation of the fund**.
    - ✓ The closing price benchmark is also the benchmark that is **consistent** with the **tracking error calculation**.

$$\text{Close (bps)} = Side \times \frac{(\overline{P} - Close)}{Close} \times 10^4\ bps$$

4.2 Evaluating Trade Execution

- **Market-Adjusted Cost**
  - The market-adjusted cost is a performance metric used by managers and traders to help **separate** the **trading cost** due to trading the order from the **general market movement** in the security price.
  - The market-adjusted cost is calculated by subtracting the market cost due to market movement adjusted for order side from the total arrival cost of the trade.

Market-adjusted cost (bps)=Arrival cost (bps) – β × Index cost (bps)

Where,

β represents the stock's beta to the underlying index

Index cost (bps) $= Side \times \frac{(Index\ VWAP - Index\ arrival\ price)}{Index\ arrival\ price} \times 10^4\ bps$

Example

- A portfolio manager executes a sell order at an average price of \$29.50. The arrival price at the time the order was entered into the market was \$30.00. The selected index price at the time of order entry was \$500, and market index VWAP over the trade horizon was \$495. The stock has a beta to the index of 1.25.

1. Calculate arrival cost.
2. Calculate index cost.
3. Calculate market-adjusted cost.

Example

Solutions:

1. Calculate arrival cost.

$$\text{Cost (bps)} = \text{Side} \times \frac{(\overline{P} - P_0)}{P_0} \times 10{,}000 \text{ bps}$$

$$= -1 \times \frac{\$29.5 - \$30.00}{\$30.00} \times 10{,}000 \text{ bps}$$

$$= 166.7 \text{ bps}$$

- In this example, the arrival cost is calculated to be +166.7 bps, indicating that the order underperformed the arrival price.
- Although this is true, much of the adverse prices were likely due to market movement rather than inferior performance from the broker or algorithm.
- This sell order was executed in a falling market, which resulted in an arrival cost of 166.7 bps for the investor.

Example

Solution:

2. Calculate index cost.

$$\text{Cost (bps)} = \text{Side} \times \frac{(Index\ VWAP - Index\ arrival\ price)}{Index\ arrival\ price} \times 10{,}000\ \text{bps}$$

$$= -1 \times \frac{\$495 - \$500}{\$500} \times 10{,}000\ \text{bps}$$

$$= 100\ \text{bps}$$

3. Calculate market-adjusted cost.

Market-adjusted cost (bps) = Arrival cost (bps) – $\beta \times$ Index cost (bps)

= 166.7 bps – 1.25 $\times$ 100 bps

= 166.7 bps – 125 bps

= 41.7 bps

However, an estimated 125 bps of this cost was due to market movement, which would have occurred even if the order had not traded in the market. Thus, the market-adjusted cost for this order is 41.7 bps.

4.2 Evaluating Trade Execution

- **Added Value**
  - Another methodology used by investors to evaluate trading performance is to compare the **arrival cost** of the order with the **estimated pre-trade cost**.
  - This metric helps fund managers understand the **value added** by their broker and/or execution algorithms during the execution of the order.
  - **Added value (bps) = Arrival cost (bps) – Est. pre-trade cost (bps)**

Example

- Consider the following facts. A portfolio manager executes a buy order at an average price of $\overline{P}$ = \$50.35. The arrival price at the time the order was entered into the market was P_0 = \$50.00. Prior to trading, the buy-side trader performs pre-trade analysis of the order and finds that the expected cost of the trade is 60 bps, based on information available prior to trading. The pre-trade adjustment is calculated as follows:

- Solutions：
  - Arrival cost (bps) = $Side \times \frac{(\overline{P}-P_0)}{P_0} \times 10^4\ bps$

    $= +1 \times \frac{(50.35-50)}{50} \times 10^4\ bps$=70bps
  - Added value = Arrival cost - Est. pre-trade cost

    =70-60=10bps
  - The pre-trade adjusted cost in this example is 10 bps, indicating that the fund underperformed pre-trade expectations by 10 bps.

5. Trade Governance

- Major regulators mandate that asset managers have in place **a trade policy document** that clearly and comprehensively articulates a firm's **trading policies** and **escalation procedures**.
- The objective of a trade policy is to ensure the asset manager's execution and order-handling procedures are **in line with their fiduciary duty** owed to clients for **best execution**.
- A **trade policy document** needs to incorporate the following **key aspects**:
  - Meaning of best execution;
  - Factors determining the optimal order execution approach;
  - Handling trading errors;
  - Listing of eligible brokers and execution venues;
  - A process to monitor execution arrangements.

5. Trade Governance

- **Meaning of Best Order Execution within the Relevant Regulatory Framework**
  - execution price
  - trading costs
  - speed of execution
  - likelihood of execution and settlement
  - order size
  - nature of the trade
  - Rather than simply trying to obtain the best price at the lowest possible trading cost, best execution involves identifying the most appropriate **trade-off** between these aspects.

5. Trade Governance

- **Factors Used to Determine the Optimal Order Execution Approach**
  - Urgency of an order
  - Characteristics of the securities traded
  - Characteristics of the execution venues used
  - Investment strategy objectives
  - Rationale for a trade

5. Trade Governance

- **List of Eligible Brokers and Execution Venues**
  - Quality of service
  - Financial stability
  - Reputation
  - Settlement capabilities
  - Speed of execution
  - Cost competitiveness
  - Willingness to commit capital

5. Trade Governance

- **Process Used to Monitor Execution Arrangements**
  - **Checkpoints** for trade execution monitoring include the following:
    - ✓ Trade submission
    - ✓ What was the execution quality of a trade relative to its benchmark?
    - ✓ Is there an appropriate balance between trading costs and opportunity costs?
    - ✓ Could better execution have been achieved using a different trading strategy, different intermediaries, or different trading venues?
  - **Trading records** and the evaluation of those records
    - ✓ Address client concerns
    - ✓ Address regulator concerns
    - ✓ Assist in improving execution quality
    - ✓ Monitor the parties involved in trading/order execution
  - These policies and procedures should be outlined in a comprehensive document and **reviewed regularly** (for example, quarterly) and when the need arises.

Reading 35

Portfolio Performance Evaluation

Framework

1. The Components of Performance Evaluation
2. Performance Attribution
   - Approaches to Return Attribution
   - Risk Attribution
   - Return Attribution Analysis at Multiple Levels
3. Benchmarking Investments and Managers
4. Performance Appraisal

1. The Components of Performance Evaluation

- Performance evaluation includes **three primary components**, each corresponding to a specific question we need to answer to evaluate a portfolio's performance:
  - **Performance measurement** provides an overall indication of the portfolio's performance, typically relative to a benchmark.
    - ✓ what was the portfolio's performance?
  - **Performance attribution** builds on performance measurement to explain how the performance was achieved.
    - ✓ how was the performance achieved?
  - **Performance appraisal** leverages both returns and attribution to infer the quality of the investment process.
    - ✓ was the performance achieved through manager skill or luck?

2. Performance Attribution

- **Returns-based attribution**
  - Uses only the total portfolio returns over a period to identify the components of the investment process that have generated the returns.
  - Returns-based attribution is the **easiest method** to implement, but because it does **not** use the underlying holdings, it is the **least accurate** of the three approaches and the most vulnerable to data manipulation.
  - One might use **returns-based attribution** to evaluate hedge funds, because it can be **difficult to obtain the underlying holdings** of hedge funds.

2. Performance Attribution

- **Holdings-based** attribution uses the holdings over time to evaluate the decisions that contributed to the returns.
  - The accuracy of holdings-based attribution improves when using data with shorter time intervals (monthly, weekly, or daily).
  - Because holdings-based attribution **fails** to capture the impact of any transactions made during the measurement period, it may not reconcile to the actual portfolio return.
    - ✓ The residual caused by ignoring transactions might be described as a **timing or trading effect**.
  - **Holdings-based analysis** is **most appropriate** for investment strategies with **little turnover** (e.g., passive strategies).

2. Performance Attribution

- **Transactions-based** attribution uses both holdings and transactions to fully explain the performance over the evaluation period.
  - For transaction-based attribution, both the weights and returns reflect all transactions during the period, including transaction costs.
  - Transaction-based attribution is the **most accurate** type of attribution analysis but also the **most difficult and time-consuming** to implement.
  - To obtain meaningful results, the underlying data **must** be **complete**, **accurate**, and **reconciled from period to period**.

3.1 Approaches to Return Attribution

- **Return attribution** is a set of techniques used to identify the sources of excess return of a portfolio against its benchmark, quantifying the consequences of active investment decisions.
  - **Arithmetic attribution** approaches
    - ✓ Arithmetic difference = R – B.
      - R=portfolio return
      - B=benchmark return
    - ✓ Arithmetic approaches are straightforward for <u>a single period</u>.
    - ✓ However, when combining multiple periods, the sub-period attribution effects will **not** sum to the excess return.
  - **Geometric attribution** approaches extend the arithmetic approaches by attributing the geometric excess return (G), as defined below:

$$G = \frac{1+R}{1+B} - 1 = \frac{R-B}{1+B}$$

    - ✓ In a geometric attribution approach, the attribution effects will compound (multiply) together to total the geometric excess return.
    - ✓ Works across <u>multiple periods</u>.

3.1 Return Attribution

- **Equity**
  - The Brinson Model
  - Factor-Based Return Attribution (Carhart four-factor model)
- **Fixed Income**
  - Exposure decomposition—duration based
  - Yield curve decomposition—duration based
  - Yield curve decomposition—full repricing based

3.1.1 Equity Return Attribution: Brinson Model

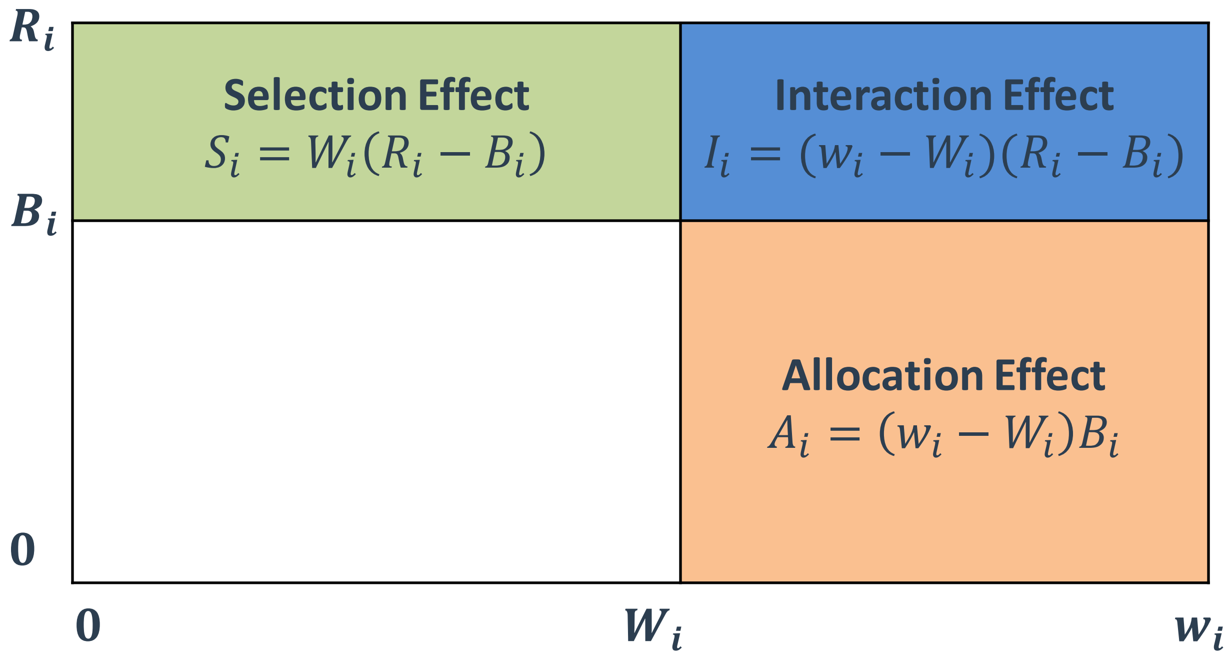
➢ **The Brinson Model**

$$\text{Portfolio return R} = \sum_{i=1}^{i=n} w_i R_i \qquad \text{Benchmark return B} = \sum_{i=1}^{i=n} W_i B_i$$

- Where
  - ✓ w_i= weight of the ith sector in the portfolio
  - ✓ R_i = return of the portfolio assets in the ith sector
  - ✓ W_i = weight of the ith sector in the benchmark
  - ✓ B_i = return of the benchmark in the ith sector
  - ✓ n = number of sectors or securities

3.1.1 Equity Return Attribution: Brinson Model

- **The Brinson Model**



3.1.1 Equity Return Attribution: Brinson Model

➢ **The Brinson Model**

- The **allocation effect** refers to the value the portfolio manager adds (or subtracts) by having portfolio **sector weights** that are different from the benchmark sector weights.

$$A_i = (w_i - W_i)B_i$$

- **Total allocation effect**

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

3.1.1 Equity Return Attribution: Brinson Model

- **The Brinson Model**
  - **Security selection** refers to the value the portfolio manager adds by holding **individual securities** or **instruments** within the sector in different-from-benchmark weights.

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

  - **Total selection effect**

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

3.1.1 Equity Return Attribution: Brinson Model

- **The Brinson Model**
  - The **interaction effect** is the effect resulting from the **interaction** of the allocation and selection decisions combined.

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

  - **Total interaction effect**

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

Example: The Brinson Model

- **Interpreting the Results of a Brinson Attribution**
  - Use the table above to answer the following questions.

Brinson Attribution Analysis Results Table

Region	Portfolio Return	Benchmark Return	Portfolio Weight	Benchmark Weight	Allocation	Selection	Inter-action	Total
Americas	2.80%	1.20%	30%	30%	0.00%	0.48%	0.00%	0.48%
APAC	–1.50%	–0.50%	20%	30%	0.05%	–0.30%	0.10%	–0.15%
EMEA	0.70%	1.50%	50%	40%	0.15%	–0.32%	–0.08%	–0.25%
Total	**0.89%**	**0.81%**	**100%**	**100%**	**0.20%**	**–0.14%**	**0.02%**	**0.08%**

Example: The Brinson Model

- 1 Why is the contribution to selection for Europe, the Middle East, and Africa (EMEA) negative?
  A. The total benchmark return is less than the total portfolio return.
  B. The manager selected securities in EMEA that underperformed the benchmark.
  C. The manager underweighted an outperforming sector.
- 2 Why is the contribution to allocation for Asia Pacific (APAC) equal to +5 bps?
  A. The benchmark weight and the portfolio weight are equal.
  B. The manager has an overweight position in an overperforming region.
  C. The manager has an underweight position in an underperforming region.

Example: The Brinson Model

- 3 Which of the following conclusions from the above attribution analysis is most correct?
  A. The manager’s security selection decisions were better in the Americas than in APAC.
  B. The manager’s security selection decisions were better in EMEA than in APAC.
  C. The manager’s allocation decisions were better in APAC than in EMEA.
- 4 Which of the following conclusions from the above attribution analysis is most correct?
  A. Overall, the manager made better allocation decisions than selection decisions.
  B. Overall, the manager made better selection decisions than allocation decisions.
  C. Contribution from interaction was most noticeable in the Americas.

Example: The Brinson Model

- **Solution to 1:**

  B is correct. The manager selected securities that underperformed the benchmark, with a portfolio return for EMEA of 0.7% versus a benchmark return for EMEA of 1.5%.

- **Solution to 2:**

  C is correct. The manager is underweight in APAC, 20% versus a benchmark weight of 30%. The APAC portion of the portfolio underperformed, with a −0.50% benchmark return versus the total benchmark return of 0.81%.

Example: The Brinson Model

- **Solution to 3:**

  A is correct. As reflected in the contribution to selection, the manager's security selection decisions were better in the Americas (0.48%) than in APAC (–0.30%).

- **Solution to 4:**

  A is correct. Overall, the manager made better allocation decisions (0.20%) than selection decisions (–0.14%).

3.1.2 Equity Return Attribution: Factor-Based

- **Factor-Based Return Attribution (Carhart four-factor model)**

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

- where
  - ✓ R_p= the return on the portfolio
  - ✓ R_f= risk-free rate of return
  - ✓ a_p = “alpha” or return in excess of that expected given the portfolio’s level of systematic risk (assuming the four factors capture all systematic risk)
  - ✓ b_p = the sensitivity of the portfolio to the given factor

3.1.2 Equity Return Attribution: Factor-Based

- **Carhart four-factor model**
  - ✓ **RMRF** = the return on a value-weighted equity index in excess of the one-month T-bill rate
  - ✓ **SMB** = small minus big, a **size (market-capitalization) factor** (SMB is the average return on three small-cap portfolios minus the average return on three large-cap portfolios)
  - ✓ **HML** = high minus low, a **value factor** (HML is the average return on two high-book-to-market portfolios minus the average return on two low-book-to-market portfolios)
  - ✓ **WML** = winners minus losers, a **momentum factor** (WML is the return on a portfolio of the past year's winners minus the return on a portfolio of the past year's losers)
  - ✓ E_p = an **error term** that represents the portion of the return to the portfolio, p, not explained by the model

Example: Carhart four-factor model

- For example, using the Carhart factor model, we calculate the following results for a hypothetical manager.

	Factor Sensitivity				Contribution to Active Return	
	Portfolio	Benchmark	Difference	Factor Return	Absolute	Proportion of Total
Factor	**(1)**	**(2)**	**(3)**	**(4)**	**(3) × (4)**	**Active**
RMRF	0.95	1.00	–0.05	5.52%	–0.28%	–13.30%
SMB	–1.05	–1.00	–0.05	–3.35%	0.17%	8.10%
HML	0.40	0.00	0.40	5.10%	2.04%	98.40%
WML	0.05	0.03	0.02	9.63%	0.19%	9.30%
			A. Factor tilts return =		2.12%	102.40%
			B. Security selection =		–0.05%	–2.40%
			C. Active return (A + B) =		2.07%	100.00%

Example: Carhart four-factor model

- Let's first look at the analysis of the benchmark (column 2). The sensitivity to RMRF of 1 indicates that the assigned benchmark has average market risk, consistent with it being a broad-based index. The benchmark's negative sensitivity to SMB indicates a large-cap orientation. Assuming, of course, that the benchmark is a good fit for the manager's stated strategy, we can describe the approach as large cap without a value/growth bias (HML is zero) or a momentum bias (WML is close to zero).

Example: Carhart four-factor model

- Based on the factor sensitivities shown in column 1 (positive sensitivity to HML of 0.40) and the differences relative to the benchmark shown in column 3, we can see that the manager likely had a value tilt but was otherwise relatively neutral to the benchmark. We would expect the portfolio to hold more value-oriented stocks than the benchmark, and we would want to evaluate the contribution of this tilt.
- Positive active exposure to the HML factor—the bet on value stocks—contributed 204 bps to the realized active return, about 98% of the 207 bps of total realized active return. The manager's minor active exposures to small stocks and momentum also contributed positively to return, whereas the active exposure to RMRF was a drag on performance. However, because the magnitudes of the exposures to RMRF, SMB, and WML were relatively small, the effects of those bets were minor compared with the value tilt (HML).

3.1.3 Fixed-Income Return Attribution

- Fixed-income portfolios are driven by very different sources of risk, requiring attribution approaches that attribute returns to decisions made with respect to credit risk and positioning along the yield curve.
  - **Exposure decomposition—duration based**
  - **Yield curve decomposition—duration based**
  - **Yield curve decomposition—full repricing based**
- All three approaches can be applied to single-currency and multi-currency portfolios.

3.1.3 Fixed-Income Return Attribution

- **Exposure decomposition—duration based**
  - Exposure decomposition is a **top-down attribution approach,** including **portfolio duration bets, yield curve positioning or sector bets**, each relative to the benchmark.
    - ✓ **Exposure decomposition** relates to the decomposition of portfolio risk exposures by means of grouping a portfolio's component bonds by specified characteristics.
    - ✓ **Duration based** relates to the typical use of duration to represent interest rate exposure decisions.
  - Exposure decomposition using duration segments portfolios by their market value weight and assigns securities to duration buckets (i.e., exposure to different ranges of duration) based on the security's maturity. (similar to Brinson model)
  - The exposure decomposition approach is used primarily for <u>marketing and client reports</u>.

Exposure Decomposition

Bucket	Duration
Short	Less than or equal to 5
Mid	Greater than 5 and less than or equal to 10
Long	Greater than 10

Exhibit 4 Sample Exposure Decomposition: Relative Positions of Portfolio and Benchmark

	Portfolio Weights				Portfolio Duration				Portfolio Contribution to Duration			
	Short	Mid	Long	Total	Short	Mid	Long	Total	Short	Mid	Long	Total
Government	10.00%	10.00%	20.00%	40.00%	4.42	7.47	10.21	8.08	0.44	0.75	2.04	3.23
Corporate	10.00%	20.00%	30.00%	60.00%	4.40	7.40	10.06	8.23	0.44	1.48	3.02	4.94
Total	20.00%	30.00%	50.00%	100.00%	4.41	7.42	10.12	8.17	0.88	2.23	5.06	8.17

	Benchmark Weights				Benchmark Duration				Benchmark Contribution to Duration			
	Short	Mid	Long	Total	Short	Mid	Long	Total	Short	Mid	Long	Total
Government	20.00%	20.00%	15.00%	55.00%	4.42	7.47	10.21	7.11	0.88	1.49	1.53	3.91
Corporate	15.00%	15.00%	15.00%	45.00%	4.40	7.40	10.06	7.29	0.66	1.11	1.51	3.28
Total	35.00%	35.00%	30.00%	100.00%	4.41	7.44	10.14	7.19	1.54	2.60	3.04	7.19

Sample Exposure Decomposition

	Portfolio Weights				Portfolio Returns				Portfolio Contribution to Return			
	Short	Mid	Long	Total	Short	Mid	Long	Total	Short	Mid	Long	Total
Government	10.00%	10.00%	20.00%	40.00%	–3.48%	–5.16%	–4.38%	–4.35%	–0.35%	–0.52%	–0.88%	–1.74%
Corporate	10.00%	20.00%	30.00%	60.00%	–4.33%	–6.14%	–5.42%	–5.48%	–0.43%	–1.23%	–1.63%	–3.29%
Total	20.00%	30.00%	50.00%	100.00%	–3.91%	–5.81%	–5.00%	–5.03%	–0.78%	–1.74%	–2.50%	–5.03%

	Benchmark Weights				Benchmark Returns				Benchmark Contribution to Return			
	Short	Mid	Long	Total	Short	Mid	Long	Total	Short	Mid	Long	Total
Government	20.00%	20.00%	15.00%	55.00%	–3.48%	–5.16%	–4.38%	–4.34%	–0.70%	–1.03%	–0.66%	–2.39%
Corporate	15.00%	15.00%	15.00%	45.00%	–4.33%	–6.14%	–5.86%	–5.44%	–0.65%	–0.92%	–0.88%	–2.45%
Total	35.00%	35.00%	30.00%	100.00%	–3.84%	–5.58%	–5.12%	–4.83%	–1.35%	–1.95%	–1.54%	–4.83%

Sample Exposure Decomposition

- From Exhibit 4, we can make the following inferences regarding the manager's investment decisions:
  - With a higher duration than the benchmark (8.17 compared with 7.19 for the benchmark), the manager likely expected the rates to fall and took a bullish position on long-term bonds (interest rates) by increasing exposure to the long end of the interest rate curve (e.g., investing 50% of the portfolio in the longest-duration bucket versus 30% for the benchmark).
  - Based on the overweight in the corporate sector (60% versus the 45% benchmark weight), the manager likely expected credit spreads to narrow. Notice that this bet increases the 4.94 contribution to duration of the corporate sector in the portfolio compared with the 3.28 contribution to duration for the benchmark. This allocation makes the portfolio more exposed to market yield fluctuations in the corporate sector.
  - The total portfolio return is –5.03%, relative to a total benchmark return of –4.83%, showing an underperformance of –0.20% over the period.

Sample Exposure Decomposition

Exhibit 5 Sample Exposure Decomposition: Attribution Results							
Duration Bucket	**Sector**	**Duration Effect**	**Curve Effect**	**Total Interest Rate Allocation**	**Sector Allocation**	**Bond Selection**	**Total**
Short	Government					0.00%	0.00%
	Corporate				0.04%	0.00%	0.04%
	Total	*0.04%*	*0.12%*	*0.52%*	*0.04%*	*0.00%*	***0.56%***
Mid	Government					0.00%	0.00%
	Corporate				–0.05%	0.00%	–0.05%
	Total	*0.23%*	*0.03%*	*0.26%*	*–0.05%*	*0.00%*	***0.21%***
Long	Government					0.00%	0.00%
	Corporate				–0.22%	0.13%	–0.09%
	Total	*–1.25%*	*0.37%*	*–0.88%*	*–0.22%*	*0.13%*	***–0.97%***
Total		***–0.62%***	***0.52%***	***–0.10%***	***–0.23%***	***0.13%***	***–0.20%***

Sample Exposure Decomposition

- Using the results from Exhibit 5, we can draw the following conclusions about the investment decisions made by this manager:
  - The portfolio underperformed its benchmark by 20 bps.
  - 62 bps were lost by taking a long-duration position during a period when yields increased (benchmark returns were negative in each duration bucket).
  - 52 bps were gained as a result of changes in the shape of the yield curve. Given the manager's overweighting in the long-duration bucket, we can infer that the yield curve flattened.
  - 23 bps were lost because the manager overweighted the corporate sector during a period when credit spreads widened (the benchmark corporate returns in each duration bucket were less than the government returns in those same duration buckets).
  - 13 bps were added through bond selection.

3.1.3 Fixed-Income Return Attribution

➢ **Yield curve decomposition—duration based**

- The duration-based yield curve decomposition approach to fixed-income attribution can be either executed as a **top-down approach** or built **bottom-up** from the security level.
- This approach is applied to both the portfolio and the benchmark to identify contributions to total return from changes in the yield to maturity (YTM).

$$\% \text{ Total return} = \% \text{ Income return} + \% \text{ Price return}$$

where $\% \text{ Price return} \approx -\text{Duration} \times \text{Change in YTM}$

- Yield curve decomposition approach require **more data points** to calculate the separate absolute attribution analyses for the portfolio and the benchmark.
- Yield curve decomposition approach is typically used when preparing reports for analysts and portfolio managers.

3.1.3 Fixed-Income Return Attribution

- **Yield curve decomposition—full repricing based**
  - Instead of estimating price changes from changes in duration and yields to maturity, bonds can be repriced from zero-coupon curves (spot rates).
  - This **bottom-up security-level repricing** can then be translated into a contribution to a security's return and aggregated for portfolios, benchmarks, and active management.
  - This full repricing attribution approach provides **more precise** pricing and allows for a broader range of instrument types and yield changes.
  - This approach is **complex** nature can make it **more difficult** and **costly** (more data-intensive) to administer operationally and can make the results more difficult to understand.
  - The full repricing approach is used primarily for <u>fixed-income professionals</u>.

Sample Yield-Curve Decomposition

Exhibit 6 Yield Curve Decomposition—Duration Based: Active Return Contribution

Bond	Yield	Roll	Shift	Slope	Curva-ture	Spread	Specific	Residual	Total
Gov't. 5% 30 June 21	–0.19%	–0.04%	0.43%	0.01%	0.15%	0.00%	0.00%	–0.01%	0.35%
Gov't. 7% 30 June 26	–0.22%	–0.03%	0.71%	0.04%	0.04%	0.00%	0.00%	–0.03%	0.52%
Gov't. 6% 30 June 31	0.12%	0.01%	–0.48%	0.05%	0.09%	0.00%	0.00%	–0.01%	–0.22%
Corp. 5% 30 June 21	–0.11%	–0.02%	0.21%	0.05%	0.05%	0.04%	0.02%	–0.02%	0.22%
Corp. 7% 30 June 26	0.12%	0.01%	–0.35%	–0.02%	–0.02%	–0.07%	0.00%	0.02%	–0.31%
Corp. (B) 6% 30 June 31	–0.39%	–0.03%	1.41%	–0.26%	–0.11%	0.30%	0.00%	–0.04%	0.88%
Corp. (P) 6% 30 June 31	0.78%	0.06%	–2.82%	0.52%	0.33%	–0.60%	0.15%	–0.05%	–1.63%
Total	0.11%	–0.04%	–0.89%	0.39%	0.53%	–0.33%	0.17%	–0.14%	–0.20%
	Time:	*0.08%*	*Curve Movement:*		*0.03%*				

Note: There may be minor differences due to rounding in this table.

Sample Yield-Curve Decomposition

- Using the data from Exhibits 4 and 6, we can infer the following about the portfolio investment process over this period:
  - **Yield:** The portfolio overweighted corporate bonds and longer-term maturities relative to the benchmark (from Exhibit 4), which generally offer higher yield than government bonds and short-term maturities. This decision contributed 11 bps to the excess return (from Exhibit 6).
  - **Roll:** The portfolio overweighted longer maturities (from Exhibit 4). Because of the shape of the yield curve, bonds with longer maturities generally sit on a flatter part of the yield curve, where the roll return is limited. The overweighting of the longer maturities reduced the portfolio roll return by 4 bps.
  - **Shift:** The portfolio overall duration of 8.17 is greater than the benchmark duration of 7.19 (from Exhibit 4), which, given the increase in yield of +1%, reduced the portfolio return by 89 bps.

Sample Yield-Curve Decomposition

- *Slope*: The slope flattening caused the long-term yields to increase less than yields on shorter terms to maturity. The overweight at the long end of the curve contributed 39 bps to the excess return.
- *Curvature*: The reshaping of the yield curve resulted in a larger yield increase at the five-year maturity point. The manager underweighted that part of the yield curve. This decision contributed 53 bps to the excess return.
- *Spread*: The manager overweighted the corporate sector, which resulted in a 33 bps reduction in return because corporate spreads widened.
- *Specific spread*: Looking at the bond-specific spreads in Exhibit 6, the corporate 5% 30 June 2021 bond added 2 bps of selection return and the corporate (P) 6% 30 June 2031 bond added 15 bps of selection return. These decisions added a total of 17 bps to active return.
- *Residual*: A residual of –0.14% is unaccounted for because duration and convexity can only estimate the percentage price variation. It is not an accurate measure of the true price variation. The residual becomes more important during large yield moves, which is the case here, with a +1% yield shift.

Example

- Which decision had the most positive effect on the overall performance of the portfolio?

  A Taking a long-duration position

  B Security selection of bond issues

  C Overweighting the long end of the yield curve

- **Solution to 1:**
  - C is correct: 52 bps were gained by overweighting the long end of the yield curve during a period when the slope of the yield curve flattened.

Example

- Explain the contribution of the long-duration bucket to overall portfolio performance.
  - The long-duration bucket cost the portfolio 97 bps of relative return.
  - From Exhibit 5, the curve and selection effects were positive (37 bps and 13 bps, respectively) whereas the duration and sector allocation effects were negative (–125 bps and –22 bps, respectively). The negative duration effect indicates that the manager took a longer-than-benchmark-duration position in the long-duration bucket, a decision that hurt performance because interest rates rose. The positive curve effect implies that the manager’s specific positioning along the long end of the yield curve benefited from changes in the shape of the yield curve.
  - The duration and curve effects accounted for the majority of the manager’s underperformance relative to the benchmark. In the long-duration bucket, the manager overweighted corporate bonds relative to the benchmark. This decision penalized returns because credit spreads widened, which can be inferred from the weaker performance of the long-duration corporate segment of the benchmark (–5.42%) relative to the long-duration government segment (–4.38%).
  - The positive selection effect of 13 bps implies that the manager’s specific bond selections added to return.

3.2 Risk Attribution

- Risk attribution identifies the sources of risk in the investment process.
  - For absolute mandates, it identifies the sources of **portfolio volatility**.
  - For benchmark-relative mandates, it identifies the sources of **tracking risk**.
- Risk attribution should reflect the investment decision-making process.
- In all cases, risk attribution explains only where risk was introduced into the portfolio. It needs to be combined with return attribution to understand the full impact of those decisions.

3.2 Risk Attribution

<table>
<tr><th colspan="3">Selecting the Appropriate Risk Attribution Approach</th></tr>
<tr><th rowspan="2">Investment Decision-Making Process</th><th colspan="2">Type of Attribution Analysis</th></tr>
<tr><th>Relative (vs. Benchmark)</th><th>Absolute</th></tr>
<tr><td>Bottom up</td><td>Position’s marginal contribution to tracking risk</td><td>Position’s marginal contribution to total risk</td></tr>
<tr><td>Top down</td><td>Attribute tracking risk to relative allocation and selection decisions</td><td rowspan="2">Factor’s marginal contribution to total risk and specific risk</td></tr>
<tr><td>Factor based</td><td>Factor’s marginal contribution to tracking risk and active specific risk</td></tr>
</table>

Example: Risk Attribution

- Manager A is a market-neutral manager following a systematic investment approach, scoring each security on a proprietary set of risk factors. He seeks to maximize the portfolio score on the basis of the factor characteristics of individual securities. He has a hurdle rate of T-bills plus 5%. Which risk attribution approach is most appropriate to evaluate Manager A?
  A. Marginal contribution to total risk
  B. Marginal contribution to tracking risk
  C. Factor's marginal contributions to total risk and specific risk

- **Solution: A.**
  Manager A is a bottom-up manager with an absolute return target.
  B is incorrect because tracking risk is not relevant to an absolute return mandate.
  C is incorrect because, as a market-neutral manager, Manager A is not seeking to take different-from-market exposures.

Example: Risk Attribution

- Manager B has a strong fundamental process based on a comprehensive understanding of the business model and competitive advantages of each firm. He also uses sophisticated models to make explicit three-year forecasts of the growth of free cash flow to determine the attractiveness of each security's current valuation. His objective is to outperform the MSCI World ex-US Index by 200 bps. Which risk attribution approach is most appropriate to evaluate Manager B?
  A. Marginal contribution to total risk
  B. Marginal contribution to tracking risk
  C. Factor's marginal contribution to total risk and specific risk

- **Solution: B.**
  Manager B is a bottom-up manager with a relative return target.
  A and C are incorrect because they are best suited to absolute return mandates.

Example: Risk Attribution

- Manager C specializes in timing sector exposure and generally avoids idiosyncratic risks within sectors. Using technical analyses and econometric methodologies, she produces several types of forecasts. The manager uses this information to determine appropriate sector weights. The risk contribution from any single sector is limited to 30% of total portfolio risk. She hedges aggregate market risk and seeks to earn T-bills plus 300 bps.
- Which risk attribution approach is most appropriate to evaluate Manager C?

  A. Marginal contribution to total risk

  B. Marginal contribution to tracking risk

  C. Factor's marginal contributions to total risk and specific risk
- **Solution:**

  C is correct. Manager C is a top-down manager with an absolute return target. A factor-based attribution is best suited to evaluate the effectiveness of the manager's sector decisions and hedging of market risk.

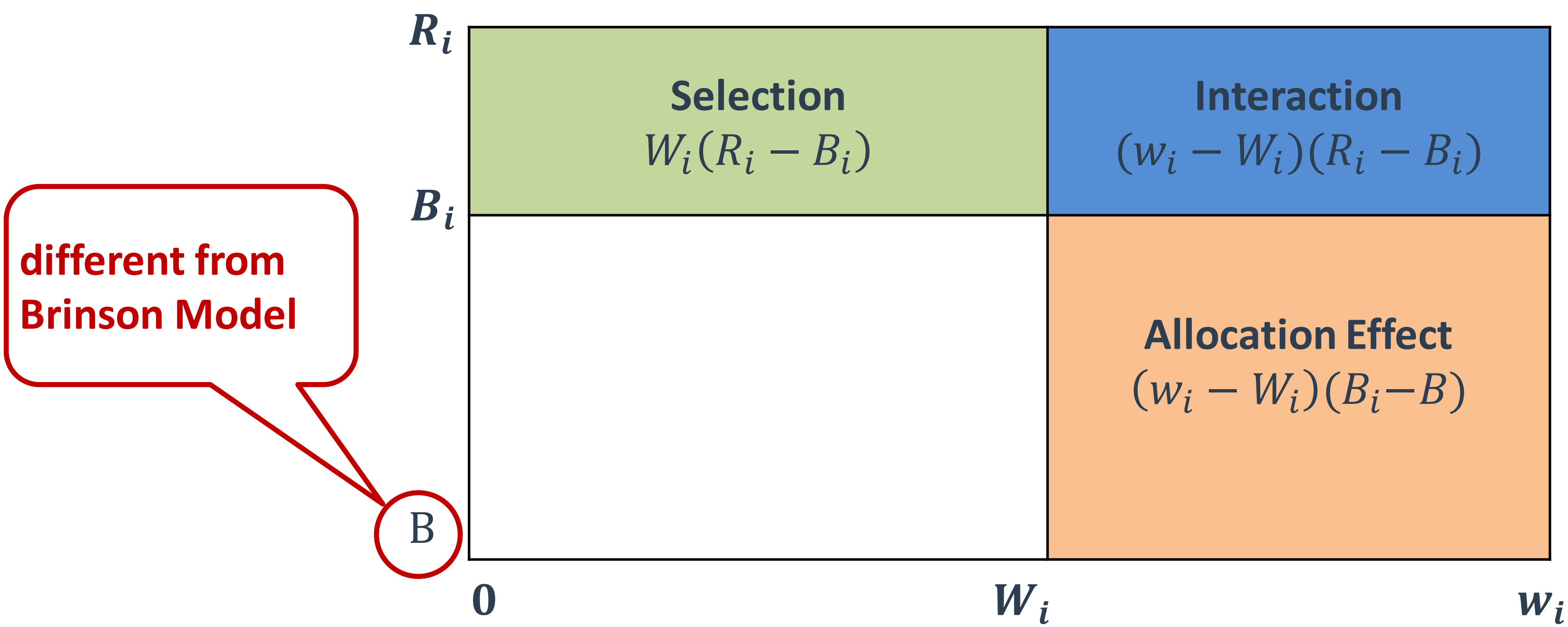
3.3 Return Attribution at Multiple Levels

- The sponsor might also select multiple portfolio managers to manage against specific mandates within a given asset class.
  - The attribution analysis that we use to determine the impact of these **fund sponsor** decisions is sometimes called **macro attribution**.
    - ✓ The first decision might be to allocate a certain weight to asset classes— the **strategic asset allocation**.
  - The attribution of the **individual portfolio manager** decisions is sometimes called **micro attribution**.
    - ✓ Investment managers will decide on any **tactical deviations** from the strategic asset allocation.

3.3 Return Attribution at Multiple Levels

Macro Attribution & Micro Attribution

- Allocation =$(w_i - W_i)(B_i - B)$
- Selection + Interaction =$W_i(R_i - B_i)+(w_i - W_i)(R_i - B_i)$



3.3 Return Attribution at Multiple Levels

➢ **Macro Attribution——An example**

Exhibit 8 Performance of Value and Growth Equity Managers

	Fund Weight	Fund Return	Benchmark Weight	Benchmark Return
Total	**100%**	**0.95**	**100%**	**–0.03**
Value Portfolio Manager	78%	0.99	75%	0.32
Small-cap value equities	20%	2.39	25%	1.52
Large-cap value equities	58%	0.51	50%	–0.28
Growth Portfolio Manager	22%	0.82	25%	–1.08
Large-cap growth equities	22%	0.82	25%	–1.08

➢ Assume our hypothetical fund sponsor has the following total equity benchmark:

- 50% large-cap value equities
- 25% small-cap value equities
- 25% large-cap growth equities

3.3 Return Attribution at Multiple Levels

- **Macro Attribution——An example**
- Allocation = (78% – 75%)[0.32 – (–0.03)] = 0.01
  - The fund sponsor overweighted value equities (78% – 75%).
  - Value equities outperformed the fund's aggregate benchmark [0.32 – (–0.03)].
  - The decision to overweight value equities added to portfolio return.
- Selection + Interaction = [(75%)(0.99 – 0.32)] + [(78% – 75%)(0.99 – 0.32)] = 0.52

Exhibit 9 Macro Attribution

Return Attribution (Plan Sponsor Level)	Selection + Interaction	Allocation	Total
Total	0.94	0.04	0.98
Value Portfolio Manager	**0.52**	**0.01**	**0.53**
Growth Portfolio Manager	**0.42**	**0.03**	**0.45**

3.3 Return Attribution at Multiple Levels

- **Micro Attribution——An example**
  - Using the same return data, we now move to the next level of the investment decision-making process and will evaluate the portfolio managers' decisions.
    - ✓ Allocation = $(wi - Wi)(Bi - B)$
    - ✓ Selection + Interaction = $Wi(Ri - Bi) + (wi - Wi)(Ri - Bi)$
  - We calculate the attribution effects for the small-cap value equities:
    - ✓ Allocation = (20% – 25%)[1.52 – (–0.03)] = –0.08
    - ✓ Selection + Interaction = [(25%)(2.39 – 1.52)] + [(20% – 25%)(2.39 – 1.52)] = 0.17

4. Benchmarking Investments and Managers

- An **investment benchmark** is typically a collection of securities that represents the pool of assets available to the portfolio manager.
  - A benchmark should reflect the **investment process** and the **constraints** that govern the construction of the portfolio.
- Benchmarks help analysts measure the **effectiveness** of a manager's decisions to depart from benchmark weights.
- **Types of benchmarks**
  - **Asset-based benchmarks**
  - **Liability-based benchmarks**
    - ✓ Focus on the cash flows that the asset must generate.
    - ✓ Liability-based benchmarks are most often used when the assets are required to <u>pay a specific future liability</u> (e.g., as in a defined benefit pension plan).

4.1 Evaluating Benchmark Quality

- The portfolio return (P) is a result of the market index return (M), a style return (S), and the active management return (A).

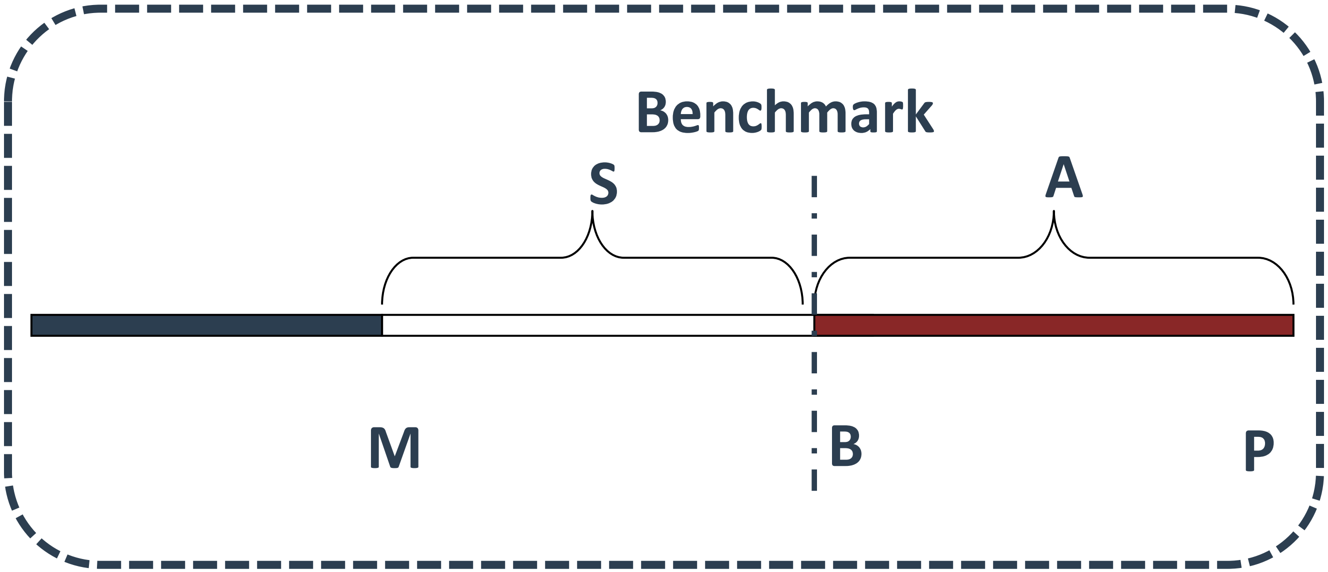
$$P = M + S + A$$

where:

- P: a portfolio's return
- B: appropriate benchmark return
- M: market index return
- S: style return
- A: active management return
- E = (P – M): difference between the portfolio and the broad market index

- If the manager's portfolio is **a broad market index** where S = 0 and A = 0, then the portfolio earns the broad market return: P = M.
- If the benchmark is a broad market index, then S is assumed to be zero and the prediction is that the manager earns the market return and a return to active management: P = M + A.

4.1 Evaluating Benchmark Quality



- A good benchmark should not reflect these systematic biases, where the correlation between A and S should not be statistically different from zero. $\boldsymbol{\rho(A, S) = 0}$
- A good benchmark will have a statistically significant positive correlation coefficient between S and E. $\boldsymbol{\rho(S, E) > 0}$
  - We define the difference between the portfolio and the broad market index as E = (P – M).

Example: Decomposition of Portfolio Return

- A US large-cap value portfolio run by Anderson Investment Management returned 18.9% during the first three quarters of 2019. During the same time period, a US large-cap value index had a return of 21.7% and a broad US equity index returned 25.2%.

  A. Calculate the return due to style.

  B. Calculate the return due to active management.

  C. Using your answers to A and B, discuss Anderson's performance relative to the benchmark and relative to the market.

Example: Decomposition of Portfolio Return

- **Solution to:**

  A. The return due to style is the difference between the benchmark and the market index, or S = (B − M) = (21.7% − 25.2%) = −3.5%.

  B. The return due to active management is the difference between the portfolio and the benchmark, or A = (P − B) = (18.9% − 21.7%) = −2.8%.

  C. Anderson's underperformance relative to the broad US equity index is partly a function of style and partly a function of the manager's weak performance within the style. Given that the US large-cap value index underperformed the US market index by 3.5%, we can infer that large-cap value was out of favor during the period measured. Provided the US large-cap value index is an appropriate benchmark for Anderson, the manager's underperformance bears further investigation. The client would want to understand the specific drivers of the underperformance and relate those decisions to the manager's stated investment process.

4.2 Properties of a Valid Benchmark

- **Specified in advance**. The benchmark must be constructed prior to the evaluation period so that the manager is not judged against benchmarks created after the fact.
- **Appropriate**. The benchmark must be consistent with the manager's investment style or area of expertise.
- **Measurable**. It must be possible to measure the benchmark's return on a reasonably frequent and timely basis.
- **Unambiguous**. The individual securities and their weights in a benchmark should be clearly identifiable.
- **Reflective of current investment opinions**. The manager should be familiar with the securities that constitute the benchmark and their factor exposures.
- **Accountable**. The manager should accept ownership of the benchmark and its securities and be willing to be held accountable to the benchmark.
- **Investable**. It must be possible to replicate and hold the benchmark to earn its return (at least gross of expenses).

4.3 Asset-Based Benchmarks

- **Asset-based benchmarks** contain a collection of assets to compare against the portfolio's assets.
  - absolute (including target) return benchmarks,
  - broad market indexes,
  - style indexes,
  - factor-model-based benchmarks,
  - returns-based (Sharpe style analysis) benchmarks,
  - manager universes (peer groups), and
  - custom security-based (strategy) benchmarks.

4.3 Asset-Based Benchmarks

- An **absolute return benchmark** is a minimum target return that the manager is expected to beat.
  - **Advantage**
    - ✓ Simple and straightforward benchmark.
  - **Disadvantage**
    - ✓ Absolute return objective is <u>not an investable benchmark</u>.
  - e.g., 9% , the Euro Interbank Offered Rate + 4%

4.3 Asset-Based Benchmarks

- **Broad market indexes** are measures of broad asset class performance.
  - **Advantages**
    - ✓ Well recognized, easy to understand by clients, and widely available.
    - ✓ <u>Unambiguous</u>, generally <u>investable</u>, <u>measurable</u>, and may be specified in advance.
    - ✓ Appropriate to use if it reflects the current investment process of the manager.
  - **Disadvantage**
    - ✓ Manager's style may <u>deviate</u> from the style reflected in the index (e.g., it is not appropriate to use the S&P 500 for a small-capitalization U.S. growth stock manager).
    - ✓ Market indexes have also been more <u>narrowly defined</u> to represent investment styles within asset classes, resulting in style indexes.

4.3 Asset-Based Benchmarks

- **Style indexes**. An **investment style** is a natural grouping of investment disciplines that has some predictive power in explaining the future dispersion of returns across portfolios.
  - **Advantages**
    - ✓ They are widely available, widely understood by clients, and widely accepted.
    - ✓ If the index <u>reflects the manager's style</u> and it is <u>investable</u>, it is an appropriate benchmark.
  - **Disadvantages**
    - ✓ Some style indexes can contain weightings in certain securities and sectors that may be larger than considered prudent.
    - ✓ <u>Differing definitions</u> of investment style can produce quite different benchmark returns, making them inappropriate benchmarks.

4.3 Asset-Based Benchmarks

- **Factor-model-based benchmarks** can be constructed to more closely capture the investment decision-making process.
  - Building a factor model identifies the relative explanatory powers of each factor in the portfolio return.
  - $R_p = a_p + b_1 F_1 + b_2 F_2 + \cdots + b_k F_k + \epsilon_p$

    where:

    ✓ R_p = the portfolio's periodic return

    ✓ a_p = the "zero-factor" term, which is the expected portfolio return if all factor sensitivities are zero

    ✓ b_k = the sensitivity of portfolio returns to the factor return

    ✓ F_k = systematic factors responsible for asset returns

    ✓ ϵ_p= residual return due to nonsystematic factors

4.3 Asset-Based Benchmarks

- **Factor-model-based benchmarks**
  - **Advantages**
    - ✓ It is useful in performance evaluation.
    - ✓ It provides managers and sponsors with insight into the manager's style by capturing factor exposures that affect an account's performance.
  - **Disadvantages**
    - ✓ Focusing on factor exposures is <u>not intuitive</u> to all managers or sponsors.
    - ✓ The data and modeling are <u>not always available</u> and may be <u>expensive</u> to obtain.
    - ✓ It may be <u>ambiguous</u> because different factor 'models can produce different outputs, leading to misspecification.

4.3 Asset-Based Benchmarks

- **Returns-based benchmarks** (Sharpe style analysis) are like factor-model-based benchmarks in that portfolio returns are related to a set of factors that explain portfolio returns.
  - With returns-based benchmarks, however, the factors are the returns for **various style indexes** (e.g., small-cap value, small-cap growth, large-cap value, and large-cap growth).
  - To create a returns-based benchmark using Sharpe style analysis, we use an optimization procedure to force the portfolio's sensitivities (analogous to the b_k's in factor-model-based benchmarks) to be **non-negative** and **sum to 1**.

4.3 Asset-Based Benchmarks

- **Returns-based benchmarks**
  - **Advantages**
    - ✓ Generally easy to use and intuitive.
    - ✓ Meets the criteria of a valid benchmark.
    - ✓ Useful where the only information available is account returns.
  - **Disadvantages**
    - ✓ The style indexes may <u>not reflect</u> what the manager owns or what the manager or client would be willing to own.
    - ✓ Enough monthly returns would be needed to establish a statistically reliable pattern of style exposures.
    - ✓ Will not work when applied to managers who <u>change style</u>.

4.3 Asset-Based Benchmarks

- A **manager universe**, or **manager peer group**, is a broad group of managers with similar investment disciplines.
  - Managers are typically expected to beat the universe's **median return**.
  - Some managers may have **tilts** or **constraints** that create an investment product very different from that of the median manager.
  - **Advantage**
    - ✓ It is measurable.
  - **Disadvantages**
    - ✓ Manager universes are subject to "survivor bias," as underperforming managers often go out of business and their performance results are then removed from the universe history.
    - ✓ Fund sponsors who choose to employ: manager universes must rely on the compiler's representations that the universe has been accurately compiled.
    - ✓ They cannot be identified or specified in advance, so it is not investable; thus, it's not an acceptable benchmark.

4.3 Asset-Based Benchmarks

- **Custom security-based benchmarks** are built to more precisely reflect the investment discipline of an investment manager.
  - Custom security-based benchmarks are also referred to as **strategy benchmarks** because they should reflect the manager's strategy.
  - These benchmarks are **costly** to calculate and maintain.
  - **Advantage**
    - ✓ Meets all the required benchmark properties and all the benchmark validity criteria.
    - ✓ Allows continual monitoring of investment processes.
    - ✓ Allows fund sponsors to effectively allocate risk across investment management teams.
  - **Disadvantages**
    - ✓ It can be <u>expensive</u> to construct and maintain.
    - ✓ <u>A lack of transparency</u> by the manager (e.g., hedge funds) can make it impossible to construct such a benchmark.

4.4 Benchmarking Alternative Investments

- Alternative investments are difficult to benchmark because they are typically less liquid, have fewer available market benchmarks, and often lack transparency.
  - Benchmarking Hedge Fund Investments
  - Benchmarking Real Estate Investments
  - Benchmarking Private Equity
  - Benchmarking Commodity Investments
  - Benchmarking Managed Derivatives
  - Benchmarking Distressed Securities

4.4 Benchmarking Hedge Fund Investments

- Hedge funds may have an unlimited investment universe, vary substantially from one to another, and can vary their asset allocations over time.
  - A manager's use of style, leverage, short positions, and derivatives may change over time.
  - Hedge funds also typically lack transparency, are difficult to monitor, and are often illiquid.
- Hedge fund peer universes are subject to a number of **limitations**:
  - The risk and return characteristics of a strategy peer group is **unlikely** to be representative of the approach taken by a single fund.
  - Hedge fund peer groups suffer from **survivorship** and **backfill bias**.
  - Hedge fund performance data are often **self-reported** and typically not confirmed by the index provider

4.4 Benchmarking Real Estate Investments

- The following are some **limitations** of the available real estate benchmarks:
  - The benchmarks are based on a subset of the real estate opportunity set and, therefore, are not fully representative of the asset class.
  - Index performance is likely to be highly correlated with the returns of the largest fund data contributors.
  - Benchmark returns are based on manager-reported performance and may be inherently biased.
  - Benchmarks weighted by fund or asset value may place a disproportionate emphasis on the most expensive cities and asset types.
  - Valuations of the underlying properties are typically based on appraisals because there are few transactions to measure.
  - Some benchmark returns are unlevered, whereas others contain varying degrees of leverage based on the structure used by the investor that contributed the data.
  - Real estate indexes do not reflect the high transaction costs, limited transparency, and lack of liquidity that drive performance for actual real estate investments.

4.4 Benchmarking Private Equity

- There are several **limitations** to be aware of when comparing returns among managers:
  - The valuation methodology used by the managers may differ.
  - A fund's IRR can be meaningfully influenced by an early loss or an early win in the portfolio.
  - The data are from a specific point in time, and the companies in a fund can be at different stages of development.

4.4 Benchmarking Commodity Investments

- Commodity benchmarks tend to use indexes based on the performance of **futures-based** commodity investments.
- Benchmarking of commodity investments presents similar **challenges** to other alternatives, including:
  - the use of derivatives to represent actual commodity assets,
  - varying degrees of leverage among funds, and
  - the discretionary weighting of exposures within the index.

4.4 Benchmarking Managed Derivatives

- Because market indexes do **not** exist for managed derivatives, the benchmarks are typically specific to a single investment strategy.
- Other derivative benchmarks are based on peer groups.
  - These indexes suffer from the known limitations of peer group–based benchmarks, including **stale pricing** and **survivorship** and **backfill bias.**

4.4 Benchmarking Distressed Securities

- Distressed securities are illiquid and almost non-marketable at the time of purchase, making it very difficult to find suitable benchmarks.
- Typically, it takes a relatively long time for investment strategies of distressed Securities to play out; thus, valuing the holdings may be a challenge.
  - It is difficult to estimate the true market values of distressed securities, and **stale pricing** is almost inevitable.
- One possible strategy is to use market indexes, such as the Barclay Distressed Securities Index.
  - Because this index is constructed from multiple strategies, however, it is difficult to discern whether the index is suitable for a given investment approach.
  - In addition, because the valuations for the member funds are calculated at random intervals, it doesn't necessarily correct for the valuation issues noted previously.

4.4 Importance of Choosing the Correct Benchmark

- The phrase garbage in, garbage out is appropriate to use regarding the impact of benchmark misspecification on attribution and appraisal analysis.
- Benchmark misspecification creates subsequent incorrect performance measurement and invalidates the attribution and appraisal analyses.
- Sometimes, benchmarks are chosen for the wrong reasons. Underperforming managers have been known to change benchmarks to improve their measured excess return, which is both inappropriate and unethical.
- Using a broad market index typically misses the manager’s style.

5. Performance Appraisal

- The **Sharpe ratio** measures the additional return for bearing risk above the risk-free rate, stated per unit of return volatility. In performance appraisal, this additional return is often referred to as **excess return**.

$$\mathrm{S_A} = \frac{\overline{\mathrm{R}}_{\mathrm{A}} - \overline{\mathrm{r}}_f}{\hat{\sigma}_{\mathrm{A}}}$$

  - One **weakness** of the Sharpe ratio is that the use of standard deviation as a measure of risk assumes investors are indifferent between upside and downside volatility.

- The **Treynor ratio** measures the **excess return per unit of systematic risk**.

$$\mathrm{T_A} = \frac{\overline{R}_A - \overline{r}_f}{\hat{\beta}_{\mathrm{A}}}$$

  - Because of its reliance on beta (only considers **systematic risk**), the Treynor ratio shows how a fund has performed in relation not to its own volatility but to the volatility it would bring to a well-diversified portfolio.

Performance Appraisal

- The **information ratio (IR)** is a simple measure that allows the evaluator to assess performance relative to the benchmark, scaled by risk.

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

  - The implicit assumption is that the chosen benchmark is well matched to the risk of the investment strategy.
    - ✓ The information ratio (IR) is used to measure a portfolio's performance against the benchmark but accounting for differences in risk.

5.1 Performance Appraisal

- The **appraisal ratio (AR)** is a returns-based measure. It is the annualized alpha (**Jensen's alpha**) divided by the annualized residual risk (**unsystematic risk**). The appraisal ratio measures the reward of active management relative to the risk of active management.

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

Where,

σ_ε equals the standard deviation of ε_t.

- The alpha and the residual risk are computed from a **factor regression**.
- The appraisal ratio is also referred to as the **Treynor–Black ratio** or the **Treynor–Black appraisal ratio**.

5.1 Performance Appraisal

➢ The **Sortino ratio** is a modification of the Sharpe ratio that penalizes only those returns that are lower than a user-specified return.

$$\mathrm{SR_D} = \frac{\mathrm{E}(r_p) - r_T}{\sigma_D} \qquad \widehat{\mathrm{SR}}_\mathrm{D} = \frac{\bar{r}_p - \bar{r}_T}{\hat{\sigma}_D} \qquad \sigma_\mathrm{D} = \left[\frac{\sum_{\mathrm{t=1}}^{\mathrm{N}} \min(r_t - r_T, 0)^2}{N}\right]^{1/2}$$

where r_T is the minimum acceptable return (MAR), which is sometimes referred to as a target rate of return.

- The Sortino ratio uses a measure of **downside risk** known as target semi-standard deviation or target semideviation.
- The Sortino ratio penalizes managers only for **"harmful" volatility** and is a measure of **return per unit of downside risk**.
- Sortino ratio offers the ability to accurately assess performance when return distributions are **not symmetrical**.
- Essentially, the Sortino ratio **penalizes** a manager when portfolio return is <u>lower than the MAR</u>; it is most relevant when one of the investor's primary objectives is <u>capital preservation</u>.
- **Cross-sectional comparisons** of Sortino ratios are difficult to make applicable to every investor, because the <u>MAR is investor-specific</u>.

Example: Performance Appraisal Measures

1. Portfolio B delivered 10.0% annual returns on average over the past 60 months. Its average annual volatility as measured by standard deviation was 14.0%, and its downside volatility as measured by target semi-standard deviation was 8.0%. Assuming the target rate of return is 3.0% per year, the Sortino ratio of portfolio B is closest to:
   A. 0.66.
   B. 0.77.
   C. 0.88.

➢ **Solution to 1:**

C is correct.

$$\widehat{\mathrm{SR}}_{\mathrm{D}} = \frac{\bar{r}_p - \bar{r}_T}{\hat{\sigma}_D} = \frac{0.10 - 0.03}{0.08} = 0.88$$

Example: Performance Appraisal Measures

2. Why might a practitioner use the Sortino ratio, rather than the Sharpe ratio, to indicate performance?
   A. He is measuring option writing.
   B. The return distributions are not symmetrical.
   C. The investor's primary objective is capital preservation.
   D. All of the above

➢ **Solution to 2:**

D is correct, because the Sortino ratio is more relevant when return distributions are not symmetrical, as with option writing. The Sortino ratio is also preferable when one of the primary objectives is capital preservation.

Example: Performance Appraisal Measures

3. Portfolio Y delivered an average annualized return of 9.0% over the past 60 months. The annualized standard deviation over this same time period was 20.0%. The market index returned 8.0% per year on average over the same time period, with an annualized standard deviation of 12.0%. Portfolio Y has an estimated beta of 1.40 versus the market index. Assuming the risk-free rate is 3.0% per year, the appraisal ratio is closest to:

   A. –0.8492.

   B. –0.0922.

   C. –0.0481.

Example: Performance Appraisal Measures

- **Solution to 3:**

  B is correct. Jensen's alpha is –1.0%: α_p = 9.0% – [3.0% + 1.40(8.0% – 3.0%)] = –1.0% = –0.01. Non-systematic risk is 0.011776:

  $\sigma_{\varepsilon_p}{}^2 = 0.20^2 - 1.40^2(0.12^2) = 0.011776$. The appraisal ratio is approximately –0.0922:

$$\widehat{\mathrm{AR}} = \frac{-0.01}{\sqrt{0.011776}} = -0.0922$$

Example: Performance Appraisal Measures

4. The appraisal ratio is the ratio of the portfolio's alpha to the standard deviation of its:
   A. total risk.
   B. systematic risk.
   C. non-systematic risk.

➢ **Solution to 4:**

C is correct. The appraisal ratio is the ratio of the portfolio's alpha to the standard deviation of the portfolio's non-systematic risk. Essentially, this ratio allows an investor to evaluate whether excess returns warrant the additional non-systematic risk in actively managed portfolios.

Example: Performance Appraisal Measures

5. Portfolio C delivered an average annualized return of 11.0%, with an annualized standard deviation of 14.0% based on the past 60 months of data. The market index returned 12.0% per year over the same time period, with an annualized standard deviation of 16.0%. A market model regression estimates beta of 0.90 for Portfolio C, with an R^2 of 0.64. Assuming the risk-free rate is 3.0% per year, the appraisal ratio is closest to:
   A. –0.1701.
   B. –0.1304.
   C. –0.0119.

Example: Performance Appraisal Measures

- **Solution to 5:**

  C is correct. Jensen's alpha is –0.10%: α_p = 11.0% – [3.0% + 0.90(12.0% – 3.0%)] = –0.10% = –0.001. Non-systematic risk is 0.007056: ${\sigma_{\varepsilon_p}}^2 =$ $(1 - 0.64)0.14^2$ = 0.007056. The appraisal ratio is approximately –0.0119:

$$\widehat{\mathrm{AR}} = \frac{-0.001}{\sqrt{0.007056}} = -0.0119$$

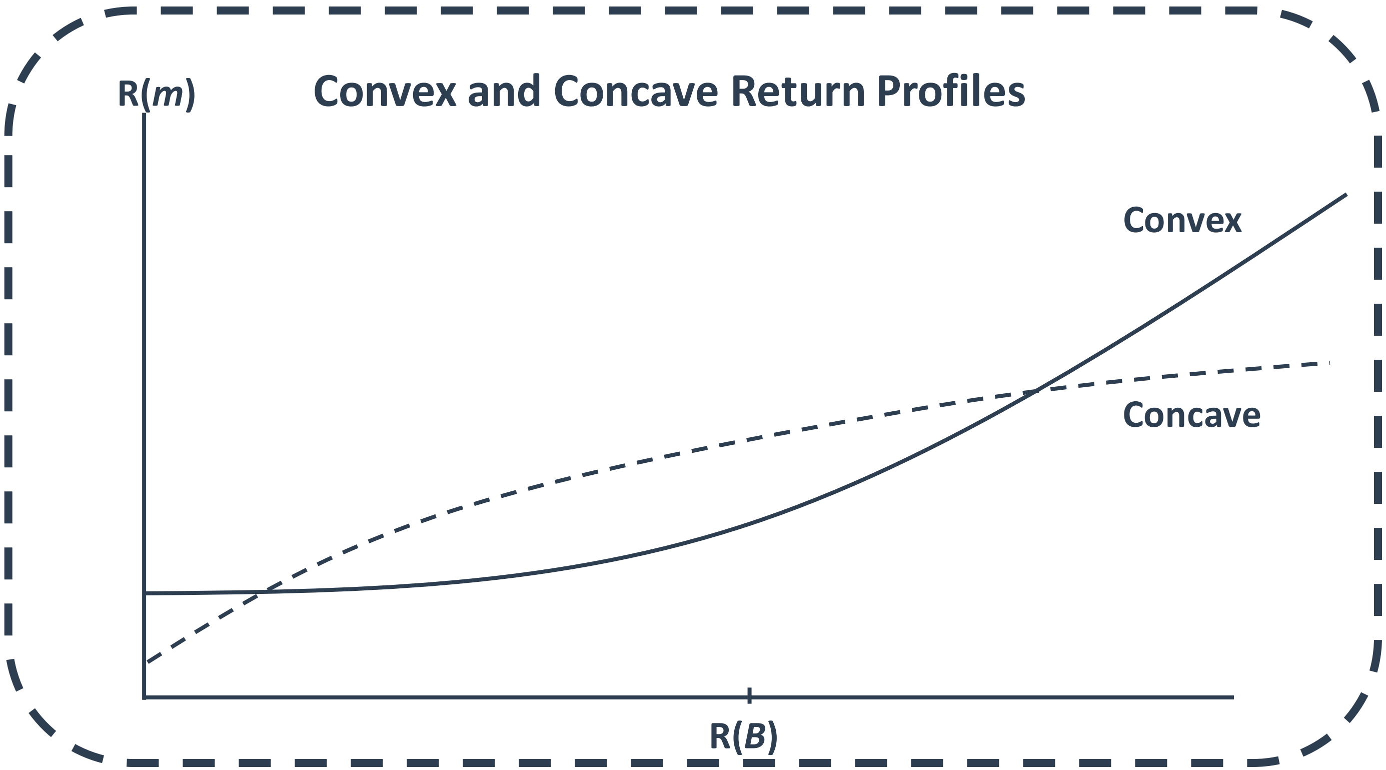
5.1 Performance Appraisal

- **Capture ratios**
  - The upside/downside capture, or simply the **capture ratio (CR)**,

    CR(mB,t) = UC(m,B,t)/DC(m,B,t)
  - The **upside capture ratio** UC(m,B,t) = R(m,t)/R(B,t) if R(B,t) ≥ 0
    - ✓ UC>100%, outperform the market.
  - The **downside capture ratio**(DC), DC(m,B,t) = R(m,t)/R(B,t) if R(B,t) < 0
    - ✓ DC<100%, outperform the market.

  where
    - ✓ R(m,t) = return of manager *m* for time *t*
    - ✓ R(B,t) = return of benchmark *B* for time *t*
  - It **measures the asymmetry of return** (e.g. convexity, gamma).
    - ✓ A **capture ratio greater than 1** indicates **positive asymmetry**, or a **convex** return profile;
    - ✓ A **capture ratio less than 1** indicates **negative asymmetry**, or a **concave** return profile.`

5.1 Performance Appraisal



5.1 Performance Appraisal

- **Drawdown** is measured as the cumulative peak-to-trough loss during a continuous period.
- **Drawdown duration is** the total time from the start of the drawdown until the cumulative drawdown recovers to zero, which can be segmented into the drawdown phase (start to trough) and the recovery phase (trough-to-zero cumulative return).

$$Maximum\ DD(m,t) = \min\left(\frac{V(m,t) - V(m,t*)}{V(m,t*)}, 0\right)$$

where

V(m,t) = portfolio value of manager *m* at time *t*

V(m,t*) = peak portfolio value of manager *m*

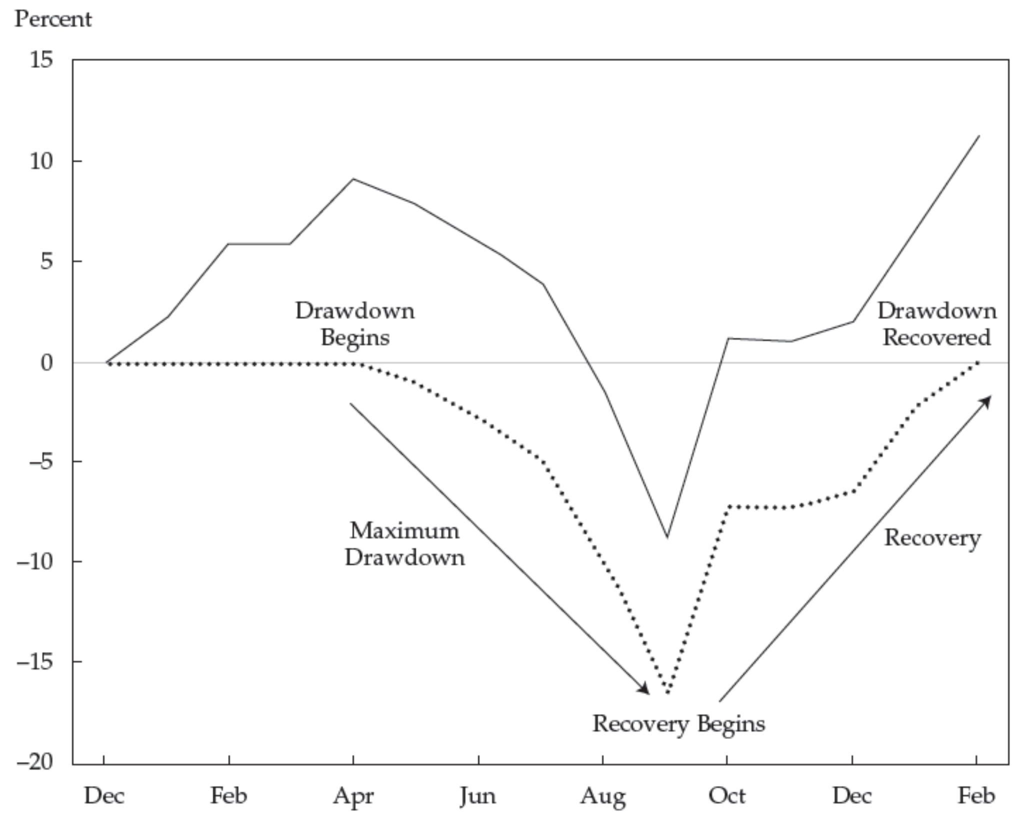
$t > t^*$

Example: Drawdown

Month	R(m)	Cumulative R(m)	Drawdown	Cumulative Drawdown	Comments
January 2011	2.37%	2.37%		0.00%	
February 2011	3.43%	5.88%		0.00%	
March 2011	0.04%	5.92%		0.00%	
April 2011	2.96%	9.06%		0.00%	
May 2011	−1.13%	7.83%	−1.13%	−1.13%	Drawdown begins
June 2011	−1.67%	6.03%	−1.67%	−2.78%	
July 2011	−2.03%	3.87%	−2.03%	−4.75%	
August 2011	−5.43%	−1.77%	−5.43%	−9.93%	
September 2011	−7.03%	−8.67%	−7.03%	−16.26%	Maximum drawdown
October 2011	10.93%	1.31%		−7.11%	Recovery begins
November 2011	−0.22%	1.09%	−0.22%	−7.31%	
December 2011	1.02%	2.12%		−6.36%	
January 2012	4.48%	6.69%		−2.17%	
February 2012	4.32%	11.30%		0.00%	Recovery begins

Example: Drawdown

- Consider the return on the S&P 500 Index from January 2011 to February 2012. The drawdown is 0% until May 2011, when the return is –1.13% and the drawdown continues to grow, reaching a maximum of –16.26% in September 2011. The strong returns from October 2011 to February 2012 reverse the drawdown. The total duration of the drawdown was 10 months, with a 5-month recovery period.



Example

- The maximum drawdown and drawdown duration in Exhibit 1 indicate that:

  A. the portfolio recovered quickly from its maximum loss.

  B. over the 10-year period, the average maximum loss was –24.00%.

  C. a significant loss once persisted for four months before the portfolio began to recover.

Exhibit 1	10-Year Trailing Risk-Adjusted Performance
Average annual return	8.20%
Minimum acceptable return (MAR)	5.00%
Sharpe ratio	0.95
Sortino ratio	0.87
Upside capture	0.66
Downside capture	0.50
Maximum drawdown	–24.00%
Drawdown duration	4 months

Reading 36

Investment Manager Selection

170-207

Framework

1. Manager Selection Process
2. Type I and Type II Errors in Manager Selection
3. Quantitative Elements of Manager Search and Selection
   - Style Analysis
   - Capture Ratios and Drawdowns
4. Qualitative Elements of Manager Due Diligence
   - Investment Philosophy
   - Investment Personnel
   - Investment Decision-Making Process
   - Operational Due Diligence

171-207

Manager Selection Process

- **Due diligence** is the analysis and investigation in support of an investment decision, action, or recommendation.
  - Due diligence on investment managers must emphasize the sources and reasons behind the actual returns generated in the past.
- The manager search and selection process has three broad components: the **universe**, a **quantitative analysis** of the manager's performance track record, and a **qualitative analysis** of the manager's investment process.
  - Manager Universe
  - Quantitative Analysis
  - Qualitative Analysis

1. Manager Selection Process

➢ **Manager Universe**

- The manager selection process begins by **defining the universe of feasible managers**, those managers that potentially satisfy the identified portfolio need.
- The manager universe consists of only those managers who are **suitable** for the portfolio in terms of the objectives and constraints of the **IPS**, invest in the relevant **style** (e.g., value, growth, mixed) desired by the client, and will manage the portfolio with the appropriate balance between **active** versus **passive** approaches.
- The IPS and the reason for the manager search largely determine the universe of managers considered and the benchmark against which they are compared.
  - ✓ The benchmark can be determined using one or more of: <u>third-party categorization</u>, <u>returns-based style analysis</u>, <u>holdings-based style analysis</u>, and <u>manager experience</u>.

2. Type I and Type II Errors

- **Hypothesis**
  - H_0: the manager adds no value.
  - H_a: the manager adds positive value.
- **Type I**: Hiring or retaining a manager who subsequently underperforms expectations. (worry more)
- **Type II**: Not hiring or firing a manager who subsequently outperforms, or performs in line with, expectations.

Type I and Type II Errors

		Realization	
		Below expectations (no skill)	At or above expectations (skill)
Decision	Hire/Retain	Type I	Correct
	Not Hire/Fire	Correct	Type II

2. Type I and Type II Errors

- The cost of errors is driven by the size, shape, mean, and dispersion of the return distributions of the skilled and unskilled managers within the universe.
  - The **smaller the difference** in sample size and distribution mean and the wider the dispersion of the distributions, the **smaller the expected cost** of the Type I or Type II error.
  - The extent to which markets are mean-reverting also has a bearing on the cost of Type I and Type II errors.
    - ✓ If performance is mean reverting, firing a poor performer (or hiring a strong performer) only to see a reversion in performance results is a Type I error.
    - ✓ A Type II error would be not trimming strong performers and avoiding hiring managers with weaker short-term track records, which can be costly.

Example: Type I and Type II Errors

- The difference in expected cost between Type I and Type II errors is most likely:
  A. higher the smaller the perceived difference between the distribution of skilled and unskilled managers.
  B. lower the smaller the perceived difference between the distribution of skilled and unskilled managers.
  C. the expected cost difference of Type I and Type II error is zero, because they reflect different aspects of the same issue.

Example: Type I and Type II Errors

- **Solution to 3:**

  B is correct. The less distinct the distribution of skilled managers from unskilled managers, the lower the opportunity cost of retaining and cost of hiring an unskilled manager. That is, the smaller the perceived difference between the distribution of skilled and unskilled managers, the lower the cost and incentive to fire a manager.

3. Quantitative Elements of Manager Selection

- **Style Analysis**
  - Returns-based style analysis (RBSA)
  - Holdings-based style analysis (HBSA)
- **Capture Ratios and Drawdowns in Manager Evaluation**
  - upside capture ratio (UC)
  - downside capture ratio (DC)
  - capture ratio (CR)
  - maximum drawdown
  - drawdown duration

3.1 Style Analysis

- **Style Analysis**
  - A manager's <u>self-reported</u> risk exposures are the <u>starting point</u> in style analysis.
  - The results of the **returns-based style analysis** (RBSA) and the **holdings-based style analysis** (HBSA) should be consistent with the manager's philosophy and the investment process.
  - Style analysis is most useful with strategies that hold <u>publicly-traded</u> securities where pricing is frequent.
  - To be useful, style analysis must be:
    - ✓ **Meaningful:** The risks reported must represent the important sources of performance return and risk.
    - ✓ **Accurate:** The reported values must reflect the manager's actual risk exposures.
    - ✓ **Consistent:** The methodology must allow for comparison over time and across multiple managers.
    - ✓ **Timely:** The report must be available in a timely manner so that it is useful for making informed investment decisions.

3.1 Style Analysis

Holdings-based style analysis		
Portfolio Characteristics for GF Active Equity Strategy Based on **Current-Period Data**		
	Active Equity	**Benchmark**
Number of stocks	50	1,000
Market value	\$180 billion	\$4,400 billion
Weighted average market capitalization	\$4.0 billion	\$4.1 billion
Dividend yield	3.00%	2.00%
Price/Earnings	8×	12×

Returns-based style analysis			
Return Correlations between GF's Active Equity Approach and Benchmarks Based on 36 Months of **Historical Data**			
	Value	**Blend**	**Growth**
Coefficient of determination	0.39	0.45	0.65

3.1 Style Analysis

- **Returns-based style analysis (RBSA)**
  - Returns-based style analysis is a **top-down approach** that involves estimating the risk exposures from an actual return series for a given period.
  - Although RBSA adds the additional analytical step of estimating the risk factors, the analysis is straightforward and typically does **not** require a large amount of additional, or difficult to acquire, data.
  - It can be estimated even for <u>complicated strategies</u> and is <u>comparable</u> across managers and through time.
  - The **disadvantage** is that RBSA is an **imprecise** tool, attributing performance to a **static portfolio** during the period that might not reflect the current or future portfolio exposures.
  - Furthermore, the portfolio being analyzed might **not** reflect the current or future portfolio exposures.
    - ✓ If the portfolio contains <u>illiquid securities</u>, **stale prices** may understate the risk exposure of the strategy.

3.1 Style Analysis

➢ **Holdings-based style analysis (HBSA)**

- Holdings-based style analysis is a **bottom-up approach** that estimates the risk exposures from the actual securities held in the portfolio at a point in time.
- HBSA allows for the estimation of **current risk factors** and should identify all important drivers of return and risk factors, be comparable across managers and through time, and provide an **accurate** view of the manager's risk exposures.
- The **disadvantages** are the additional computational effort, dependence on the **degree of transparency** provided by the manager, and the possibility that accuracy may be compromised by stale pricing and window dressing.
- HBSA uses a point in time analysis format that may **not** be useful in projecting into the future or if the portfolio has high turnover.

3.2 Capture Ratio and Drawdown

- **Capture Ratio**
  - When betas are increasing (decreasing), momentum-driven strategies should have higher (lower) UC than value-driven strategies.
  - A low-beta (high-beta) strategy will have lower (higher) UC and DC. Therefore, CRs can be used to confirm the investment strategy.
- **Drawdowns** are useful for identifying poor or poorly executed investment strategies, weak internal controls, and operational problems. Significant or extended drawdowns could cause a manager to utilize self-preservationist tactics that could harm the investors.

4. Qualitative Elements of Manager Due Diligence

- The **goal of manager due diligence** is to <u>weigh the potential risks</u> that may arise from entering into an investment management relationship and entrusting assets to a firm.
  - Investment Philosophy
  - Investment Personnel
  - Investment Decision-Making Process
    - ✓ Signal Creation (Idea Generation)
    - ✓ Signal Capture (Idea Implementation)
    - ✓ Portfolio Construction
    - ✓ Monitoring the Portfolio
  - Operational Due Diligence
    - ✓ Firm
    - ✓ Investment Vehicle
    - ✓ Evaluation of the Investment's Terms

4.1 Investment Philosophy

- The investment philosophy is the **foundation** of the investment process.
- The philosophy outlines the set of **assumptions** about the factors that drive performance and the manager's beliefs about their ability to successfully exploit these sources of return.
  - The investment manager should have a **clear and concise** investment philosophy.
  - The investment process has to be **consistent and appropriate** for the philosophy, and the investment personnel need to possess sufficient expertise and experience to effectively execute the investment process.

4.1 Investment Philosophy

- **Passive strategies** seek to capture return through exposure to systematic risk premiums, such as equity risk, duration risk, or credit risk.
- In contrast, **active strategies** take the position that markets are inefficient and can allow for those inefficiencies to be exploited when market prices of securities deviate from their intrinsic values. There are two broad types of inefficiencies to be considered: behavioral and structural.
  - **Behavioral inefficiencies** are mispricings caused by <u>other investors and their behavioral biases</u> (e.g., trend-following). The mispricings are very <u>short-term</u> in nature.
  - **Structural inefficiencies** occur because of <u>laws and regulations</u>, which can make them <u>long-term</u> in nature.

Example: Investment Philosophy

- 1 Which of the following is not an important consideration when evaluating a manager’s investment philosophy?
  - A. What are the compensation arrangements of key employees?
  - B. Are the investment philosophy assumptions credible and consistent?
  - C. Can the manager clearly and consistently articulate their investment philosophy?

- **Solution to 1:**

  A is correct. Employee compensation is a legal and compliance issue considered as part of operational due diligence.

Example: Investment Philosophy

- 2 Generally speaking, inefficiencies can be categorized as:

  A. large and small.

  B. internal and external.

  C. structural and behavioral.

- **Solution to 2:**

  C is correct. Behavioral inefficiencies are created by the actions of other participants in the market. These inefficiencies are temporary, lasting long enough for the manager to identify and exploit them before the market price and perceived intrinsic value converge. Structural inefficiencies are created by external or internal rules and regulations. These inefficiencies can be long lived and assume a continuation of the rules and regulations rather than a convergence.

4.2 Investment Personnel

- An investment process can only be as good as the people who create and implement it, and even the best process can be compromised by poor execution by the people involved.
  - Does the investment team have **sufficient expertise** and **experience** to effectively execute the investment process?
  - Does the investment team have **sufficient depth** to effectively execute the investment process?
  - What is the level of **key person risk**?
  - What kinds of **agreements** (e.g., non-compete) and **incentives** (ownership, bonus, pay) exist to retain and attract key employees to join and stay at the firm?
  - What has been the **turnover** of firm personnel?

4.3 Investment Decision-Making Process

- **Signal Creation (Idea Generation)**
  - An investment signal is a **data point** or **fact** that can be observed early enough to implement as an investment position.
    - ✓ **Unique**: To effectively exploit inefficiencies, investment strategies must utilize unique information to have an informational advantage over other market participants.
    - ✓ **Timely**: The unique information must be obtained and used on a very timely basis as it is frequently the case that the window of opportunity to exploit is very short.
    - ✓ **Interpreted differently**: The investment manager must have superior cognitive or interpretive skills with regards to utilizing the information.

4.3 Investment Decision-Making Process

- **Signal Capture (Idea Implementation)**
  - Here the investment idea is transformed into an investment position (i.e., signal capture).
  - Two **key concerns** include the repeatability of process and its congruence with the investment philosophy plus the determination and approval of the investment position.

4.3 Investment Decision-Making Process

- **Portfolio Construction**
  - The third element is portfolio construction; how investment positions are implemented within the portfolio.
  - This element begins to capture the manager's risk management methodology.
  - It is also important that portfolio construction is consistent with the investment philosophy and process as well as the expertise of the investment personnel.
  - A related issue is the allocation of long and short positions—they may be paired or determined separately.
  - Assets under management (AUM) will likely increase over time, therefore, the underlying positions may need to be adjusted (e.g., liquidity constraints) to allow for greater AUM.

4.3 Investment Decision-Making Process

- **Portfolio Construction**
  - **Stop losses** are orders to sell a security once it reaches a certain price and can be an important risk management tool.
    - ✓ Hard stop losses: positions are automatically sold when the loss threshold is reached.
    - ✓ Soft stop losses: positions are evaluated when the loss threshold is reached.
  - With liquidity, it should be determined whether the manager is a net supplier or demander of liquidity.

4.3 Investment Decision-Making Process

- **Monitoring the Portfolio**
  - The investment decision-making process is a **feedback loop** that consists of ongoing monitoring of the portfolio in light of new information and analysis.
  - This monitoring includes an assessment of both external and internal considerations.
    - ✓ **External considerations** include the economic and financial market environments.
    - ✓ **Internal considerations** include the portfolio's performance, risk profile, and construction.

4.4 Operational Due Diligence

- Performance appraisal assumes that reported returns are accurate and fully reflect the manager’s risk profile. Unfortunately, as we have seen, this assumption is not always true.
- Operational due diligence analyzes the integrity of the business and seeks to understand and evaluate these risks by examining and evaluating the firm’s policies and procedures.
  - Firm
  - Investment Vehicle
  - Evaluation of the Investment’s Terms

4.4.1 Firm

- An investment management firm must operate as a successful business to ensure sustainability.
- A firm that is independently owned may have greater autonomy and flexibility than a firm owned by a larger organization, but it may have a higher cost structure and lack financial support during market events, raising potential business risks.
- Last, and by no means least important, are legal and compliance issues. It is critical that the firm's interests are aligned with those of the investor.

4.4.2 Investment Vehicle

- There are two broad options for implementing investment strategies: **individual separate accounts** and **pooled (or commingled) vehicles**.
  - **Separate accounts** offer additional control, customization, tax efficiency, reporting, and transparency advantages, but these come at a higher cost.
  - In a **pooled or commingled vehicle**, the money from multiple investors is held as a single portfolio and managed without potential customization for any investor.
    - ✓ Such vehicles include open-end funds, closed-end funds, exchange-traded funds, exchange-traded notes, and hedge funds.

4.4.2 Investment Vehicle

- The **advantages of SMA** vehicles include the following:
  - **Ownership**: In an SMA, the investor owns the individual securities directly.
  - **Customization**: SMAs allow the investor to potentially express individual constraints or preferences within the portfolio.
  - **Tax efficiency**: SMAs offer potentially improved tax efficiency because the investor pays taxes only on the capital gains realized and allows the implementation of tax-efficient investing and trading strategies.
  - **Transparency**: SMAs offer real-time, position-level detail to the investor, providing complete transparency and accurate attribution to the investor.

4.4.2 Investment Vehicle

- If the SMA is customized, additional investment due diligence may be required to account for differences in security selection or portfolio construction.

  Disadvantages include:

  - **Cost**: Separate accounts represent an additional operational burden on the manager, which translates into potentially higher costs for the investor.
  - **Tracking risk**: Customization of the strategy creates tracking risk relative to the benchmark, which can confuse attribution because performance will reflect investor constraints rather than manager decisions.
  - **Investor behavior**: Transparency, combined with control and customization, allows for potential micromanagement by the investor—that is, the investor attempting to manage the portfolio.

Example: Pooled Investments and SMA

- Which of the following are advantages of separately managed accounts compared with pooled investments?
  A. Typically lower cost
  B. Potential management of the portfolio by the investor
  C. Ability to take close account of individual client constraints or preferences
- **Solution:**

  C is correct. With SMAs, the investor owns the individual securities directly and can potentially express individual constraints or preferences within the portfolio. In particular, SMAs offer potentially improved tax efficiency because the investor pays taxes only on the capital gains realized and allows the implementation of tax-efficient investing and trading strategies.

4.4.3 Evaluation of the Investment's Terms

- **Liquidity**
  - **Liquidity** is defined as the timeliness with which a security or asset can be sold at or near the current price.
    - ✓ The most liquid vehicles are **closed-end funds and ETFs**.
    - ✓ **Limited partnerships**
    - ✓ **Private equity and venture capital funds** provide the least liquidity.
    - ✓ An SMA's liquidity will depend on the <u>liquidity of the securities held</u>.
  - Limited liquidity <u>**reduce the investor's flexibility**</u> to adjust portfolio allocations in light of changing market conditions or investor circumstances.
  - On the other hand, limited liquidity allows the funds to take long-term views and hold less liquid securities with <u>**reduced risk of having to divest assets at inopportune times in response to redemption requests**</u>.

4.4.3 Evaluation of the Investment's Terms

- **Management Fees**
  - Fee structures can influence which managers will be willing to accept a particular investment mandate.
    - ✓ **Assets under management fees**, also called *ad valorem fees* (from the Latin for "according to value"), result from applying stated percentage rates to assets under management.
    - ✓ **Performance-based fees** are determined by portfolio returns and are designed to reward managers with a share of return for their skill in creating value.

4.4.3 Evaluation of the Investment's Terms

- There are three **basic forms** of performance-based fees:
  - A **symmetrical** structure in which the manager is fully exposed to both the downside and upside
    - ✓ **Computed fee = Base + Sharing of performance**
  - A bonus structure in which the manager is not fully exposed to the downside but is fully exposed to the upside
    - ✓ **Computed fee = max (Base, Base plus sharing of positive performance)**
  - A bonus structure in which the manager is not fully exposed to either the downside or the upside
    - ✓ **Computed fee = max (Base, Base plus sharing of performance, to a limit)**
- Fee structures must be designed carefully to <u>avoid favoring one party over the other</u>.

Sample Performance-Based Fee Schedule

- A simple performance-based fee, specifies a base fee below which the computed fee can never fall. In this case, the manager is protected against sharing for performance below 25 bps. To make the result symmetrical around the commonplace 50 bps fee, the manager does not share in active performance beyond 2.75%.

Panel A. Sample Fee Structure

Standard fee	0.50%
Base fee	0.25%
Sharing*	20%
Breakeven active return	1.50%
Maximum annual fee	0.75%

Panel B. Numerical Examples for Annual Periods

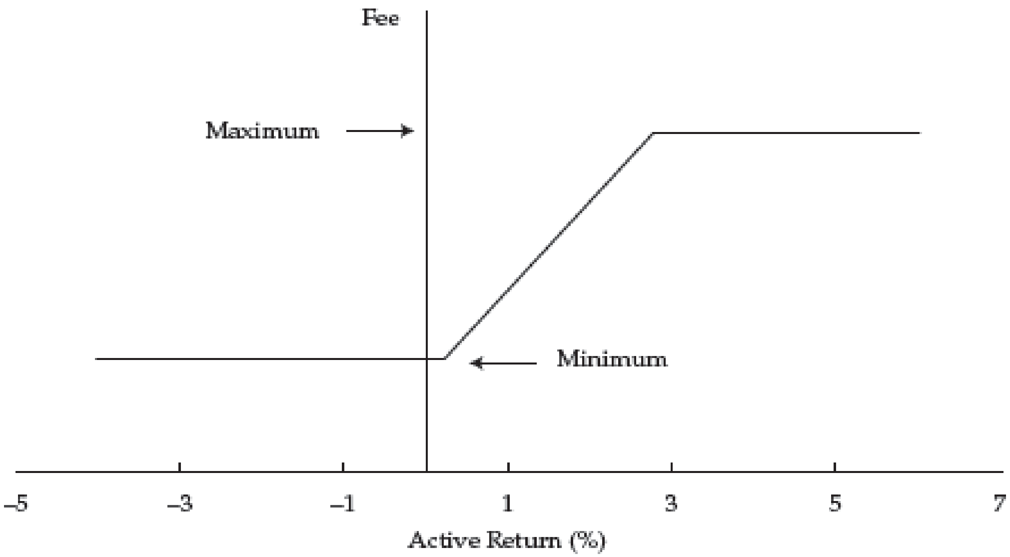
	Active Return				
	≤ 0.25%	**1.00%**	**1.50%**	**2.00%**	**≥ 2.75%**
Billed fee	0.25%	0.40%	0.50%	0.60%	0.75%
Net active return	≤ 0.00%	0.60%	1.00%	1.40%	≥ 2.00%

* On active return, beyond base fee.

Call Option

- **Bonus-style fees** are the close equivalent of a manager's **call option** on a share of active return, for which the base fee is the strike price.
  - The graph illustrates three fee components: a 25 bps base fee, plus a long call option on active return with a strike price equal to the minimum (base) fee, minus another (less valuable) call option with a strike price equal to the maximum fee.

Payoff Line of Sample Performance-Based Fee Schedule



205-207

Sample Performance-Based Fee Schedule

- Based on the details in Panel A and the summary calculations in Panel B, the fee is a bonus with limited upside (maximum billed fee) and downside (minimum billed fee) exposures. There is symmetry within the active return range of 0.25% and 2.75% and centered around a breakeven active return of 1.50%. In calculating the breakeven return, we have the following:

  $(1.50\% - 0.25\%) \times 20\% = 0.25\%$ performance fee
- Adding the performance fee to the base fee of 0.25% results in a total billed fee of 0.50%, which is the same as the standard fee of 0.50%.
- At an active return of 0.25% or less, the performance fee is zero (the non-negativity constraint frequently encountered in practice prevents the performance fee from being negative).
- In that case, the billed fee is simply the base fee of 0.25%. At an active return of 2.75% or more, the performance fee is maximized at 0.50%, and so the billed fee is a maximum of 0.75%.

It’s not the end but just beginning.

By training your thoughts to concentrate on the bright side of things, you are more likely to have the incentive to follow through on your goals. You are less likely to be held back by negative ideas that might limit your performance.

试着训练自己的思想朝好的一面看，这样你就会汲取实现目标的动力，而不会因为消极沉沦停滞不前。