ETHICAL AND PROFESSIONAL STANDARDS

STANDARDS OF PROFESSIONAL CONDUCT

• Thoroughly read the Standards, along with related guidance and examples.

ASSET MANAGER CODE OF PROFESSIONAL CONDUCT

• Firm-wide, voluntary standards
• No partial claim of compliance
• Compliance statement: “[insert name of firm] claims compliance with the CFA Institute Asset Manager Code of Professional Conduct. This claim has not been verified by CFA Institute.”
• Firms must notify CFA Institute when claiming compliance.
• CFA Institute does not verify manager’s claim of compliance.
• Standards cover:
  • Loyalty to clients
  • Investment process and actions
  • Trading
  • Risk management, compliance, and support
  • Performance and valuation
  • Disclosures

BEHAVIORAL FINANCE

BEHAVIORAL FINANCE PERSPECTIVE

• Prospect theory
• Assigns value to changes in wealth rather than levels of wealth.
• Underweight moderate- and high-probability outcomes.
• Overweight low-probability outcomes.
• Value function is concave above a wealth reference point (risk aversion) and convex below a wealth reference point (risk seeking).
• Value function is steeper for losses than for gains.
• Cognitive limitations
• Bounded rationality: deciding how much will be done to aggregate relevant information and using rules of thumb.
• Satisficing: finding adequate rather than optimal solutions.
• Traditional perspective on portfolio construction assumes that managers can identify an investor’s optimal portfolio from mean-variance efficient portfolios.
• Consumption and savings
• Mental accounting: wealth classified into current income, currently owned assets, PV of future income.
• Framing: source of wealth affects spending/saving decisions (current income has high marginal propensity to consume).
• Self-control: long-term sources unavailable for current spending.
• Behavioral asset pricing models
• Sentiment premium included in required return.
• Bullish (bearish) sentiment risk decreases (increases) required return.
• Behavioral portfolio theory
• Strategic asset allocation depends on the goal assigned to the funding layer.
• Uses bonds to fund critical goals in the domain of gains.
• Uses risky securities to fund aspirational goals in the domain of losses.
• Adaptive markets hypothesis
• Must adapt to survive (bias towards previously successful behavior due to use of heuristics).
• Risk premiums and successful strategies change over time.

BEHAVIORAL BIASES

• Cognitive errors (belief persistence biases)
• Conservatism: overweight initial information and fail to update with new information.
• Confirmation bias: only accept belief-confirming information, disregard contradictory information.
• Representativeness: extrapolate past information into the future (includes base-rate neglect and sample-size neglect).
• Illusion of control: believe that you have more control over events than is actually the case.
• Hindsight bias: only remember information that reinforces existing beliefs.
• Cognitive errors (information-processing biases)
• Anchoring and adjustment: develop initial estimate and subsequently adjust it up/down.
• Mental accounting: treat money differently depending on source/use.
• Framing: make a decision differently depending on how information is presented.
• Availability bias: use heuristics based on how readily information comes to mind.
• Emotional biases
• Loss aversion: strongly prefer avoiding losses to making gains (includes disposition effect, house-money effect and myopic loss aversion).
• Overconfidence: overestimate analytical ability or usefulness of their information (prediction overconfidence and certainty overconfidence).
• Self-attribution bias: self-enhancing and self-protecting biases intensify overconfidence.
• Self-control bias: fail to act in their long-term interests (includes hyperbolic discounting).
• Status quo bias: prefer to do nothing than make a change.
• Endowment bias: value an owned asset more than if you were to buy it.
• Regret aversion: avoid making decisions for fear of being unsuccessful (includes errors of commission and omission).
• Goals-based investing
• Base of pyramid: low-risk assets for obligations/needs.
• Moderate-risk assets for priorities/desires; speculative assets for aspirational goals.
• Behaviorally modified asset allocation
• Greater wealth relative to needs allows greater adaptation to client biases.
• Advisor should moderate cognitive biases with high standard of living risk (SLR).
• Advisor should adapt to emotional biases with a low SLR.

INVESTMENT PROCESSES

• Behavioral biases in portfolio construction
• Inertia and default: decide not to change an asset allocation (status quo bias).
• Naive diversification: exhibit cognitive errors resulting from framing or using heuristics like 1/n diversification.
• Company stock investment: overallocate funds to company stock.
• Overconfidence bias: engage in excessive trading (includes disposition effect).
• Home bias: prefer own country’s assets.
• Mental accounting: portfolio may not be efficient due to goals-based investing as each layer of pyramid is optimized separately.
• Behavioral biases in research and forecasting
• Representativeness: due to excessive structured information.
• Confirmation bias: only accept supporting evidence.
• Gamblers’ fallacy: overweight probability of mean reversion.
• Hot hand fallacy: overweight probability of similar returns.
• Overconfidence, availability, illusion of control, self-attribution and hindsight biases also possible.
• Market behavioral biases
• Momentum effects due to herding, anchoring, availability and hindsight biases.
• Bubbles due to overconfidence, self-attribution, confirmation and hindsight biases.
• Value stocks have outperformed growth stocks; small-cap stocks have outperformed large-cap stocks.

PRIVATE WEALTH MANAGEMENT

INVESTMENT POLICY STATEMENT

Return calculation
• To maintain real value of portfolio, the required real after-tax return is calculated as:

\[
\text{Annual after-tax withdrawal} = \frac{\text{Pre-tax withdrawal}}{(1 – \text{Tax rate on withdrawals})}
\]

• To convert after-tax withdrawal to a pre-tax withdrawal

\[
\text{Pre-tax withdrawal} = \frac{\text{Annual after-tax withdrawal}}{1 – \text{Tax rate on withdrawals}}
\]

Nominal return = Real return + Inflation rate
• If investor wishes to grow portfolio, use TVM worksheet to compute I/Y over investment horizon.
• Risk tolerance
• Above-average ability if longer time horizon or large asset base compared with needs.
• Willingness based on psychological profile.
• Overall tolerance is a combination of ability and willingness.
• Time horizon constraint: length and number of stages.
• Liquidity constraint: ongoing needs, one-time expenditures, emergencies.
• Tax constraint: different rates may apply to different sources of income and capital gains.
• Legal and regulatory constraint: less of a concern for individuals, restricted trading periods may apply to corporate insiders.
• Unique constraint: client-imposed restrictions, e.g. socially responsible investing, client-directed brokerage.
• Psychological profiling
• More risk averse: methodical (thinking), cautious (feeling).
• Less risk averse: individualist (thinking), spontaneous (feeling).
• Strategic asset allocation
• Return: eliminate portfolios that do not meet return objective. May need to convert a pre-tax nominal return to an after-tax real return.

\[
\text{After-tax real return} = \text{Pre-tax nominal return} \times (1 – \text{Tax rate}) – \text{Inflation rate}
\]

Risk: eliminate portfolios that do not meet shortfall or other risk objectives.
• Constraints: eliminate portfolios that do not meet constraints, e.g. cash holding for liquidity.
• Of the remaining portfolios, select portfolio with highest risk-adjusted performance, usually on Sharpe ratio.
TAXES AND PRIVATE WEALTH MANAGEMENT

**Future value factor with accrual taxes**

\[
FV_{\text{tax}} = \left[1 + \frac{rg + \Delta t}{2}ight]^T
\]

**Future value factor when deferring taxes on capital gains** (β is cost basis as a proportion of current market value)

\[
FV_{\text{defer}} = (1 + \frac{rg + \Delta t}{2} - (1 - \beta) + C)
\]

**Future value factor with annual wealth tax**

\[
FV_{\text{wealth}} = \left[1 + \frac{rg + \Delta t}{2}\right]^T
\]

**Effective annual after-tax return after taxes interest, dividends and realized capital gains**

\[
\tau = r - \left(\frac{\tau - \Delta t}{2}\right)
\]

**Effective capital gains tax rate**

\[
\tau_g = \frac{1}{1 + \frac{rg + \Delta t}{2} - \frac{\tau - \Delta t}{2}}
\]

**Future value factor with blended tax regime**

\[
FV_{\text{blend}} = (1 + r)^T - (1 - \frac{\tau - \Delta t}{2})
\]

**Accrual equivalent after-tax return**

\[
V = (1 + \frac{rg + \Delta t}{2})^T
\]

**Accrual equivalent tax rate**

\[
t_{\text{acc}} = \frac{1}{1 + \frac{rg + \Delta t}{2} - \frac{\tau - \Delta t}{2}}
\]

**Measure of tax drag** = Difference between accrual equivalent after-tax return and the actual return of the portfolio.

**Tax-deferred accounts (TDAs): contributions from untaxed ordinary income, tax-free growth during the holding period, taxed at time of withdrawal**

\[
FV_{\text{TD}} = (1 + r)^T - (1 - \frac{\tau - \Delta t}{2})
\]

**Tax-exempt accounts (TEAs): after-tax contributions, tax-free growth during the holding period, no future tax liabilities.**

\[
FV_{\text{TE}} = (1 + r)^T - (1 - \frac{\tau - \Delta t}{2})
\]

**Divestiture of noncore assets:** owner uses proceeds to write covered calls to generate income.

**Use prepaid variable forward (combine hedge and monetization).**

**Objectives:** risk reduction (diversification), monetization, tax optimization, control.

**Considerations:** illiquidity, triggering taxable gains on sale, restrictions on amount and timing of sales, emotional and cognitive biases.

**Monetization strategies**

Monetization by (1) hedging the position, and (2) borrowing against hedged position.

Hedging for monetization strategies can be achieved by: (1) short sale against the box (least expensive); (2) total return equity swap; (3) short forward or futures contract; (4) synthetic short forward (long put and short call).

**Hedging strategies**

Buy puts (protect downside and keep upside while deferring capital gains tax).

Use zero-premium collars (long put and short call with offsetting premiums) to reduce costs vs buying puts.

Use prepaid variable forward (combine hedge and margin loan in same instrument), with number of shares delivered at maturity dependent on share price at maturity.

**Yield enhancement strategies:**

Write covered calls to generate income.

Does not reduce downside risk.

**Tax optimized equity strategies**

Index-tracking separately managed portfolio: designed to outperform benchmark from an investment and tax perspective.

Completeness portfolio: tracks index given concentrated portfolio characteristics and new investments.

**Exchange fund:** investors with concentrated positions contribute these positions in exchange for a share in a diversified fund (non-taxable event).

**Monetization strategies for concentrated private shares**

- Strategic buyers: gain market share and earnings growth.
- Financial buyers: acquire and manage companies using private equity fund.
- Leveraged recapitalization: private equity firms use debt to purchase majority of owner’s stock for cash.
- Management buyout: management borrow money to purchase owner’s stock.
- Divestiture of noncore assets: owner uses proceeds to diversify asset pool.
- Sale or gift to family members.
- Personal line of credit secured by company shares.
- Initial public offering.
- Employee share ownership plan (ESOP) exchange: company buys owner’s shares for ESOP distributions.
- Monetization strategies for real estate
  - Mortgage financing (no tax consequences and can use proceeds to diversify).
  - Donor-advised funds (contribute property now for tax deduction).
  - Sale and leaseback (frees up capital for diversification but sale triggers taxable gain).

**RISK MANAGEMENT FOR INDIVIDUALS**

**Financial capital:** includes all tangible assets including family home.

**Human capital:** PV of future expected labor income (higher income volatility requires higher discount rate).

**Income volatility risk** can be diversified by appropriate financial capital, e.g., if human capital is equity-like, financial capital should contain more bonds.

**Economic (holistic) balance sheet**

- Assets: financial capital, personal property, human capital, pension value.
- Liabilities: total debt, lifetime consumption needs, bequests.
- Net wealth: the difference between total assets and total liabilities.
- Young family has high % of economic assets in human capital. As the household ages, weight of human (financial) capital will decrease (increase).
- **Risks to human and financial capital**
  - Earnings risk: protect against earnings risk related to injury with disability insurance.
  - Premature death (mortality risk): protect with life insurance.
  - Longevity risk: protect with annuities.
  - Property risk: protect with homeowner’s insurance.
  - Liability risk: protect with liability insurance.
  - Health risk: protect with health insurance.
- **Risk management techniques**
  - Adequacy of life insurance
  - Human life value method: estimates the PV of earnings that must be replaced.
  - Needs analysis method: estimates financial needs of dependents.

**INSTITUTIONAL INVESTORS DEFINED BENEFIT PENSION PLAN**

- **Risk tolerance:** greater ability to assume risk if
  - Plan surplus
  - Lower short-term debt and/or higher current profitability
  - Lower correlation of plan asset returns with company profitability
  - No early retirement and lump sum distributions options
  - Greater proportion of active versus retired lives
  - Higher proportion of younger workers
- **Risk objective:** usually related to shortfall risk of achieving funding status.
- **Return objective:** to achieve a return that will fully fund liabilities (inflation-adjusted), given funding constraints.
- **Liquidity:** to meet required benefit payments.
- **Time horizon:** usually long-term and could be multi-stage.
• Tax: investment income and capital gain usually tax-exempt.
• Legal/regulatory: plan trustees have a fiduciary responsibility to beneficiaries under ERISA (US).
• Unique: limited resources for due diligence, ethical constraints.

**FOUNDATIONS**

• Risk tolerance/objective: higher risk tolerance due to noncontractually committed payout.
• Return objective: to cover inflation-adjusted spending goals and overheads not countable toward required spending minimum.

**NON-LIFE INSURANCE COMPANIES**

• Risk tolerance/objective
  • Policyholder reserves use lower-risk assets due to unpredictable operating claims.
  • Maintaining surplus during high-volatility markets reduces ability to accept higher risk.
  • Risk measured against premiums-to-capital and premiums-to-surplus ratios.
• Return objective
  • Investment earnings on surplus assets must be sufficient to offset periodic losses and to maintain policyholder reserves.
  • Larger companies use active management strategies for total return rather than yield or investment income strategies.
• Liquidity: to meet policyholder claims.
• Time horizon: generally shorter duration than life insurance companies.
• Tax: pay corporate tax.
• Legal/regulatory: regulations on eligible investments, risk-based capital (RBC) and asset valuation reserve (AVR) requirements.
• Unique: look for restrictions on illiquid investments.

**ENDOWMENTS**

• Risk tolerance/objective
  • Greater ability to take risk due to infinite time horizon and if adopting spending rules based on smoothed averages of return and previous spending.
• Lower ability to take risk if high donor contributions as a % of total spend.
• Lower ability to take risk if contributing a significant % to a company’s annual spending or if company relies on endowment to cover high fixed costs.
• Return objective: same as for foundations. Annual spend may be calculated in a number of ways.

**LIFE INSURANCE COMPANIES**

• Risk tolerance/objective
  • Liquidity risk: arises from changes in investment portfolio that affects reserves.
  • Interest rate risk: reinvestment risk and valuation risk (due to duration mismatch between assets and liabilities).
• Credit risk: driven by demand for loans and net outflows of deposits.
• Time horizon: duration spread of assets over liabilities constrains time horizon for securities portfolio to an intermediate-term.
• Tax: pay corporate tax.
• Legal/regulatory
  • Large % of securities portfolio in government securities as pledge against reserves.
  • Regulators restrict allocation to common shares and below-investment-grade bonds.
• Risk-based capital requirements.
• Unique: Lending activities may be influenced by community needs and historical banking relationships.

**ECONOMIC ANALYSIS**

**CAPITAL MARKET EXPECTATIONS**

• Expected return on equity from Gordon growth model

\[
E(R) = \frac{D_1}{EK} + g + \frac{g}{r_E - g}
\]

**EQUITY MARKET VALUATION**

• **Cyclically adjusted P/E (CAPE) ratio**
  • 10-year moving average CAPE ratio controls for business cycle effects and is mean reverting.

**RISK PREMIUMS**

• Tax premium (buildup) approach
  • Fixed income buildup model
  • Equity buildup model
  • ICAPM (Singer-Terhaar)

• Expected return

\[
E(R) = \beta \times (R_F - R_P) + \alpha
\]

• Risk premium in a completely segmented market

\[
R_P = \frac{\alpha}{\beta^2}
\]

• Expected return with less than 100% integration and a liquidity risk premium (where \(R_P^*\) is the weighted average of perfectly integrated and completely segmented asset class risk premiums)

\[
E(R) = \beta \times (R_F - R_P^*) + \alpha
\]

• Taylor rule

\[
\frac{\Delta y}{\Delta t} = \left(1 - \phi\right) \frac{\Delta y}{\Delta t}^{\text{past}} + \frac{\phi}{1 - \beta} \left(\frac{y}{d} - y + \text{other terms}\right)
\]

• Exchange rate forecasting
  • Relative PPP: exchange rates offset inflation differentials

\[
\Delta y = \Delta y_{\text{past}} + \beta \left(\Delta y_{\text{past}} - \Delta y_{\text{past}}^{\text{short-term}}\right)
\]

• Relative economic strength: increasing growth attracts portfolio investment capital, increasing short-term demand for domestic currency.
• Capital flows forecasting: higher relative direct and long-term portfolio investment causing currency appreciation.
• Savings-investment imbalance: current account deficits must be met with capital account surplus as foreign investors provide funds to offset domestic savings deficit.

**LEGAL/REGULATORY**

• Legal/Regulatory: UPMIFA (US).
• Unique: types of investments constrained by size or board member sophistication.

**BANKS**

• Risk tolerance/objective
  • Below-average risk tolerance.
• Leverage-adjusted duration gap (LADG) measure overall interest rate exposure.

\[
LADG = -\frac{\text{Duration} \times \text{Mark-to-Market Value}}{\text{Current Market Value}}
\]

• Value at risk (VAR) measures minimum loss expected over a specified time period at a given level of probability.
• Credit risk in the bank’s loan portfolio.
• Return objective: interest income allocation focuses on positive spread over cost of funds, with the remaining allocation focusing on higher total return.
• Liquidity: driven by demand for loans and net outflows of deposits.
• Time horizon: duration spread of assets over liabilities constrains time horizon for securities portfolio to an intermediate-term.
• Tax: pay corporate tax.
• Legal/regulatory
  • Large % of securities portfolio in government securities as pledge against reserves.
  • Regulators restrict allocation to common shares and below-investment-grade bonds.
• Risk-based capital requirements.
• Unique: Lending activities may be influenced by community needs and historical banking relationships.

**TIME PERIODS**

\[
\Delta = t \times \Delta t
\]
ASSET ALLOCATION

ASSET ALLOCATION APPROACHES

- Asset-only: does not explicitly model liabilities
- Liability-relative (liability-driven investing): aims at an asset allocation that can pay off liabilities when they come due.
- Goals-based investing: specifies sub-portfolios aligned with a specific goal (sum of all sub-portfolio asset allocations results in an overall strategic asset allocation).

PRINCIPLES OF ASSET ALLOCATION

- Mean variance optimization (MVO): Produces an efficient frontier based on returns, standard deviation of returns and pairwise correlations.
- Find optimal asset allocation mix that maximizes client’s utility.

- MVO limitations
  - Asset allocations are highly sensitive to small changes in input variables.
  - Asset allocations can be highly concentrated.
  - Only focuses on mean and variance of returns.
  - Sources of risk may not be well diversified.
  - Asset-only strategy.
  - Single-period framework and ignores trading/ rebalancing costs and taxes.
  - Does not address evolving asset allocation strategies, path-dependent decisions, non-normal distributions.
  - Approaches to improve quality of MVO asset allocation
    - Use reverse optimization to compute implied returns and improve quality of inputs, e.g. Black-Litterman model
    - Adding constraints to incorporate short-selling and other real-world restrictions into optimization.
    - Resampled MVO technique combining MVO and Monte Carlo approaches to seek the most efficient and consistent optimization.
    - Monte Carlo simulation and scenario analysis
      - Used in a multi-period framework to improve single-period MVO.
      - Provides a realistic picture of distribution of potential future outcomes.
      - Can incorporate trading/rebalancing costs and taxes.
      - Can model non-normal distributions, serial and cross-sectional correlations, evolving asset allocations, path-dependent decisions, non-traditional investments, human capital.
  - Risk budget
    - Identifies total amount of risk and allocates risk to different asset classes.
  - Asset allocation is optimal when ratio of excess return to MCTR is the same for all assets.

LIABILITY-RELATIVE ASSET ALLOCATION APPROACHES

- Simplex Optimization
  - Linear constraints
  - All assets of risk
  - Any timing costs
  - Simplex
  - Increased complexity
  - Linear or nonlinear constraints
  - Any assets of risk
  - Any timing costs
  - Increased complexity
  - Timed constraints on risk
  - All assets of risk
  - Any timing costs
  - Increased complexity

- Goal-based asset allocations
  - Creation of differentiated portfolio modules based on capital market expectations.
  - Identifying clients’ goals and matching the goals to appropriate sub-portfolios and modules.

ASSET ALLOCATION WITH REAL-WORLD CONSTRAINTS

- Constraints on asset allocation due to:
  - Asset size: more acute issue for individual rather than institutional investors.
  - Liquidity: liquidity needs of asset owner and liquidity characteristics of specific assets.
  - Time horizon: asset allocation decisions evolve with changes in time horizon, human capital, utility function, financial market conditions, characteristics of liability and the asset owner’s priorities.
  - Regulatory: financial markets and regulatory entities often impose additional constraints.
  - Taxes
    - Place less tax-efficient assets in tax-advantaged accounts to achieve after-tax portfolio optimization.

\[ r_{\text{portfolio}} = (1 - t_p) (r_{\text{MVO}} - t_t) \]

- Rebalancing range for a taxable portfolio \( r_{\text{MVO}} \) can be wider than those of an otherwise identical tax-exempt portfolio \( r_{\text{exempt}} \).

\[ R_{\text{asset}} = W \times \text{asset growth factor}(1 + 1) \]

- Revision to asset an allocation
  - Changes in goals
  - Changes in constraints
  - Changes in investment beliefs

- Tactical asset allocation (TAA) approaches
  - Discretionary TAA: uses market timing skills to avoid or hedge negative returns in down markets and enhance positive returns in up markets.
  - Systematic TAA: uses signals to capture asset-class/ level return anomalies that have been empirically demonstrated as producing abnormal returns.

- Behavioral biases in asset allocation
  - Loss aversion: mitigate by framing risk in terms of shortfall probability or funding high-priority goals with low-risk assets.
  - Illusion of control: mitigate by using the global market portfolio as a starting point and using a formal asset allocation process based on long-term return and risk forecasts, optimization constraints anchored around asset class weights in the global market portfolio, and strict policy ranges.
  - Mental accounting: goal-based investing incorporates this bias directly into the asset allocation solution by aligning each goal with a discrete sub-portfolio.
  - Recency or representativeness bias: mitigate by using a formal asset allocation policy with prespecified allowable ranges.
  - Framing bias: mitigate by presenting the possible asset allocation choices with multiple perspectives on the risk-reward tradeoff.
  - Familiarity or availability bias: mitigate by using the global market portfolio as the starting point in asset allocation and carefully evaluating any potential deviations.

CURRENCY MANAGEMENT

- Domestic return on global asset (where exchange rate is expressed as \( \frac{\text{domestic currency}}{\text{foreign currency}} \))

\[ r_{\text{portfolio}} = (1 + r_{\text{foreign currency}}) \times (1 + r_{\text{domestic currency}}) - 1 \]

- Portfolio return in domestic currency terms

\[ r_{\text{portfolio}} = (1 + r_{\text{foreign currency}}) \times (1 + r_{\text{domestic currency}}) - 1 \]

- Variance of the domestic return

\[ \sigma^2 = (1 + r_{\text{foreign currency}}) \times (1 + r_{\text{domestic currency}}) - 1 \]

- Factors favouring more currency hedging
  - Significant short-term objectives, e.g. income/liquidity requirements.
  - Global fixed-income investments.
  - Markets with high currency or asset volatility.
  - High risk aversion.
  - Doubt about value of currency return potential.
  - Lower possibility of regret if the hedge is not profitable.
  - Low costs of hedging.

- Hedging strategies
  - Passive hedging: manager protects portfolio with full hedging.
  - Discretionary hedging: manager reduces risk with hedging but has discretion to make currency bets for return enhancement.
  - Active currency management: manager seeks alpha by making currency bets.
  - Currency overlap: currency management outsourced to specialists.

- Active currency management
  - Economic fundamentals: real exchange rate will eventually converge to fair market values, with short-term increases in the domestic currency due to (1) increase in domestic currency’s real purchasing power, (2) higher domestic interest rates, (3) higher expected foreign inflation, and (4) higher foreign risk premiums.
  - Technical analysis: based on belief that historical currency patterns will repeat over time and those repetitions are predictable.
  - Carry trade: borrow in lower interest rate (or forward premium) currencies and invest in higher interest rate (or forward discount) currencies, based on assumption that uncovered interest rate parity does not hold.
  - Roll yield: positive when trading the forward rate bias (buying base currency at forward discount or selling base currency at forward premium); negative when trading against the forward rate bias (selling base currency at forward discount or buying base currency at forward premium).

- Volatility trade: long (short) straddle or strangle if volatility expected to increase (decrease).

- Currency management tools

- Forward Contracts: Over-the-counter hedging
  - Basis from mark-to-market

- Option Contracts:
  - OTM options
    - Cheaper than ATM
  - Risk reversals
    - Write options to earn premiums
  - Exotic Options:
    - Put-call spreads
      - Write options to earn premiums
    - Scalpel strikes
    - Knock-out features
      - Reduced downside/hedging exposure
    - Digital options
      - Extreme payoff strategies

- Minimum variance hedge ratio for a cross-hedge

- Obtained from a regression of change in value of underlying asset in domestic currency terms against change in value of the hedging security.

- Beta (slope coefficient) of the regression equation is the optimal hedge ratio.

- Basis risk occurs due to imperfect correlation between currency price movement and hedging instrument.
MARKET INDEXES

- Market cap weighted index: weight of each security is its market capitalization value as a % of total index market cap.
- Advantages: broad acceptance; requires less rebalancing as index remains properly weighted after a price change.
- Disadvantages: overly influenced by overpriced securities; price movements overly concentrated in a few large companies.
- Price weighted index: weight of each security is proportional to its price (represents portfolio holding one share of each security). 
- Advantages: simple; long track record.
- Disadvantages: not relevant to most strategies; influenced by highest priced securities; must be rebalanced after stock splits.
- Equal weighted index: all securities are held in equal weights at rebalancing (represents portfolio holding an equal $ amount of each security).
- Advantages: more diversified away from highest-priced companies.
- Disadvantages: must be rebalanced frequently to maintain weighting; price movements of smaller companies may be overrepresented.
- Fundamental weighted index: uses accounting data or other valuation metrics to weight the securities.
- Advantages: better representation of economic importance.
- Disadvantages: rely on creator’s subjective judgment; restrictive valuation screens may result in less diversification; investability constraints of smaller companies; not transparent because of proprietary valuation weightings.

LIABILITY-DRIVEN STRATEGIES

- Immunization: reduces or eliminates the risks to liability funding arising from interest rate volatility over the planning horizon.
- Immunizing a single liability
  - Market value of assets is greater than or equal to PV of liability
  - Macaulay duration of assets matches liability’s due date
  - Convexity of asset portfolio is minimized.
- Portfolio needs rebalancing as time passes.
- Risk: non-parallel shifts in yield curve (risk is reduced by minimizing convexity).
- Cash flow matching for multiple liabilities
- Portfolio has cash flows matching the amount and timing of liabilities.
- Duration matching for multiple liabilities
  - Market value of assets is greater than or equal to the market value of liabilities.
  - Asset basis point value (BPV) equals the liability BPV.
  - Dispersion of cash flows and convexity of assets are greater than those of the liabilities.
- Derivatives overlay
  - Uses bond futures contracts to immunize liabilities.
- Contingent immunization
  - Active management if surplus (assets less liabilities) is above a designated threshold.
  - If the surplus falls below threshold, revert to a pure immunization strategy.
- Use gains on actively managed funds to reduce cost of meeting liabilities.
- Horizon matching: cash flow matching for short-term liabilities (~ 5 years), duration matching for long-term liabilities.
- Interest rate swap overlay to reduce duration gap
  - Future BPV = \( \frac{BPV_{act}}{BPV_{T}} \times Future BPV \)
  - Risks when managing portfolio against a liability structure: model risk, spread risk, counterparty credit risk.

INDEX-BASED STRATEGIES

- Total return mandates
  - Pure indexing (full replication): match benchmark weights and risk factors by owning all bonds in the index with the same weighting.
  - Enhanced indexing: sampling approach to match primary risk factors; slight mismatches with benchmark weights to achieve a higher return compared to full replication.
  - Active management: aggressive mismatches with benchmark weights and primary risk factors to achieve outperformance.
- Laddered bond portfolio
  - Maturities and par values spread evenly along the yield curve.
  - Protection from yield curve shifts and twists by balancing the position between cash flow reinvestment and market price volatility.
- Suit to stable, upwardly sloped yield curve environment.
- Higher convexity and liquidity.

YIELD CURVE STRATEGIES

- Stable yield curve strategies
  - Buy and hold: choose parts of curve where yield changes will not affect return or purchase longer-duration/higher-yield securities.
  - Rollover: rolling the yield curve when yield curve is upward-sloping.
  - Selling convexity: sell lower-yielding higher-convexity bonds if expecting low interest rate volatility.
  - Carry trade: buy longer-maturity, higher-yielding securities and finance them with shorter-maturity, lower-yielding securities.
  - Changing yield curve strategies
  - Duration management: shorten (lengthen) duration if expect yield increases (decreases).
  - Buying convexity: with falling yields, portfolios with greater convexity will increase more in value than portfolios with less convexity; with rising yields, portfolios with greater convexity will decrease less.
  - Bullet and barbell strategies

FIXED INCOME PORTFOLIO MANAGEMENT

INTRODUCTION

- Fixed-income returns model
- Expected return decomposition
  - E(R) = Yield income
  - Roll down return
  - E(A.Price due to yields and spreads)
  - E(Credit losses)
  - E(Currency gains and losses)

- Yield income equals current yield assuming no reinvestment income

- Current yield = Annual coupon payment / Bond price
- Roll down return: value change as bond approaches maturity (pull to par)

- Expected price change due to change in yield or spread
  - E(ΔP) = (1 + (1 + YTM) / T) \times \Delta YTM \times \left(1 - \frac{1}{(1 + YTM)^T}\right)
- Expected credit losses
  - E(Credit losses) = E(Defaults rate) \times E(Rate of default)
- Effect of leverage on portfolio return
  - \( N = \frac{\text{Portfolio return}}{\text{Portfolio equity}} \)
  - \( \Delta N = \frac{\Delta \text{Portfolio return}}{\text{Portfolio equity}} = \frac{\text{Notional value}}{\text{Margin}} \times \Delta \text{Margin} \)
  - Leverage

- Use leverage to increase duration
  - \( \Delta \text{PVBP} = \Delta \text{BPV} \times \text{Duration} \times \text{Beta} \)

- Use interest rate swaps: receive-fixed, pay-floating swaps increase duration; paid-fixed, receive-floating swaps reduce duration.

- Convexity management methods
  - Shift bonds in portfolio (difficult with large portfolios).
  - Buying callable bonds and MBS (equivalent to selling convexity).
  - Portfolio positioning strategy
  - Parallel upward shift: bonds with forward implied yield change greater than forecast yield change will enjoy higher return as they roll down the yield curve (upward sloping).
  - Parallel yield change of uncertain direction: increase convexity by using barbell strategy.

- Using butterflies: long the wings (barbell) and short the body (bullet) if flattening curve, volatile interest rates, buying convexity or pay parallel yield curve increase; short the wings and long the body if steepening curve, stable interest rates or selling convexity.

- Using options: sell convexity bonds (30-year maturity) and purchase call options to outperform in both rising and falling rate scenarios.

CREDIT STRATEGIES

- Risk considerations
  - High yield bonds: credit risk (includes default risk and loss severity).
  - Investment grade bonds: interest rate risk, credit migration risk, spread risk.
• Spread duration (measure of spread risk): percentage increase in bond price for a 1% decrease in spread.
• Credit spread measures
• G-spread: bond’s yield to maturity less interpolated yield of correct maturity benchmark bond.
• I-spread: uses swap rates rather government bond yields.
• Z-spread: spread added to each yield-curve point so that PV of bond’s cash flows equals price.
• Option-adjusted spread (OAS) for bonds with embedded options: spread added to one-period forward rates that sets arbitrage-free value equal to price
• Excess return and expected excess return on credit securities

\[ \text{EEXR} = (x - y) - (x_{\text{hyp}} - y_{\text{hyp}}) \]

• Bottom-up approach to credit strategy (security selection): for two issuers with similar credit risks, purchase bond with greater spread to benchmark rate.
• Top-down approach to credit strategy: macro approach to determine and overweight sectors with better relative value.
• Managing liquidity risk
• Cash
• Liquid, non-benchmark bonds (higher incremental return vs cash).
• Credit default swaps index derivatives (more liquid than credit markets).
• ETPs (liquid but unpredictable price movements in volatile markets).
• Tail risk
• Assess tail risk by modelling unusual return patterns and using scenario analysis (historical and hypothetical).
• Manage tail risk using (1) diversification strategies and (2) hedges using options and credit default swaps.
• Advantages of using structured financial securities such as ABSs, MBS, CDOs and covered bonds
• Higher returns vs other types of bonds.
• Improved portfolio diversification.
• Different exposures to investment grade and high yield bonds.

EQUITY PORTFOLIO MANAGEMENT

• Approaches to managing equity portfolios
• Passive management: try to match benchmark performance.
• Active management: seek to outperform benchmark by buying outperforming stocks and selling underperforming stocks.
• Semiactive management (enhanced indexing): seek to outperform benchmark with limited tracking risk (highest information ratio).
• Approaches to constructing an indexed portfolio
• Full replication: minimal tracking risk but high costs.
• Stratified sampling: retains basic characteristics of index without costs associated with buying all the stocks.
• Optimization: seeks to match portfolio’s risk exposures (including covariances) to those of the index but can be misspecified if historical risk relationships change over time.
• Value style investing: low P/E, contrarian, high yield.
• Growth style investing: consistent growth, earnings momentum.
• Market-oriented (blend or core style) investors: market-oriented with a value bias, market-oriented with a growth bias, growth at a reasonable price, style rotators.
• Market cap approach: small-cap, mid-cap, large-cap investors.
• Investment style analysis
• Holdings-based: analyses characteristics of individual security holdings.

ALTERNATIVE INVESTMENTS

• Common features of alternative investments
• Relative illiquidity
• Diversifying potential
• High due diligence costs
• Difficult performance appraisal
• Informationally less efficient markets
• Real estate
• Direct investment: ownership in residences, commercial real estate, agricultural land.
• Indirect investment: real estate companies, REITs, ETNs, mutual funds, CREFs, infrastructure funds.
• Benchmarks: NCREIF (sample of commercial properties), NAREIT.
• Private equity
• Direct private equity investment is structured as convertible preferred stock: provides priority for dividends and liquidation claims over common shares; buyout or acquisition of the common equity will trigger conversion of convertible prefs into common shares.
• Indirect investment primarily through private equity funds (venture capital and buyout funds).
• Formative-stage investment: seed, start-up, first stage capital.
• Expansion-stage investment: second stage, third stage, pre-IP0 (mezzanine) capital.
• Buyout funds seek to add value by: restructuring operations and improving management; purchasing companies at a discount to intrinsic value; capturing gains from debt restructuring.
• Compensation to fund manager of private equity fund consists of management fee plus incentive fee (carried interest).
• Benchmarks: RJ/CRB, S&P GSCI, DJ-AIGCI and S&P CI are indices based on futures prices.
• Hedge funds
• Broad range of strategies
• Compensation structure consists of management fee plus incentive fee and may include high-water mark and hurdle rate.
• Differences in hedge fund indices due to: selection criteria, style classification, weighting scheme, rebalancing scheme, investmentability, survivorship bias, backfill bias.
• Hedge fund performance appraisal measures
• Sharpe ratio (inappropriate with illiquid holdings and when returns are asymmetrical/skewed or serially correlated).
• Sortino ratio

\[ \text{Sortino ratio} = \frac{(\text{Annualized rate of return} - \text{Minimum acceptable return})}{\text{Downside deviation}} \]

• Gain-to-loss ratio

\[ \text{Gain-to-loss ratio} = \frac{(\text{Number months with positive returns} - \text{Number months with negative returns})}{\text{Average up-month return} - \text{Average down-month return}} \]

• Distressed securities
• Hedge fund structure or private equity fund structure.
• Risks: event risk, market liquidity risk, market risk, J-factor risk (past judicial precedents on bankruptcy proceedings).

RISK MANAGEMENT

• Financial risks: market, credit, liquidity, asset price, exchange rate, interest rate.
• Non-financial risks: operational, model, settlement (Herstaat), regulatory, legal/contract, tax, accounting, sovereign/political.
• VaR
• Minimum amount we expect to lose in a given reporting period with a given level of probability.
• Analytical (variance-covariance) method: assumes normality in asset return distributions.

\[ \text{Minimum VaR} = \sqrt{\text{portfolio variance}} = \sqrt{\text{portfolio variance}} \]

• Historical method: VaR estimates based on historical realizations of past returns.
• Monte Carlo method: uses a probability distribution for each variable to randomly generate portfolio returns and to compute VaR based on the simulated returns.
• Limitations: can be difficult to estimate; considers only downside risk; may be based on invalid distributional assumptions.
• Stress testing as a complement to VaR
• Used to identify unusual conditions that would lead to losses in excess of a threshold.
• Can be based on stylized scenarios (historical or hypothetical), stressing models, maximum loss optimization and worst-case scenario analysis.
• Credit risk
• Current credit risk (jump-to-default): risk of ongoing or pending default in the immediate future.
• Potential credit risk: risk of possible default in the future.
Credit VaR: minimum expected loss due to a negative credit event with a given probability during a period of time.

Forwards: counterparty with positive value has credit risk.

Interest rate and equity swaps: potential credit risk is highest during the middle of swap’s life.

Currency swap: potential credit risk is highest between the middle and end of swap’s life.

Options: option buyers hold credit risk.

Managing risk: apply effective risk governance model; use ERM system; use risk budgeting; reduce or transfer risk.

Performance evaluation

Sharp ratio

Risk-adjusted return on capital (RAROC)

Return over maximum drawdown (RoMAD)

Sortino ratio

Interest rate options

Buy interest rate call option to protect a future borrowing against interest rate increases.

Interest rate call option payoff = principal × max(0, (Underlying rate at expiration − Exercise rate))/N

Buy interest rate put option to protect a future lending (or investing) transaction against interest rate declines.

Interest rate put option payoff = principal × max(0, Exercise rate − Underlying rate at expiration)/N

Cap: series of interest rate call options.

Floor: series of interest rate put options.

Interest rate collar to protect a future borrowing: buy interest rate cap and sell interest rate floor.

Option Greeks

Option delta: positive for long call; negative for long put.

Option gamma: greatest for options that are at-the-money and close to expiration.

Option vega: greatest for options that are at-the-money and close to expiration.

Duration of interest rate swaps

Duration (Pay fixed and receive floating interest rate swap) = Duration (Floating-rate bond) − Duration (Fixed-rate bond)

Use pay floating and receive fixed interest rate swap to increase duration of bond portfolio.

Use pay fixed and receive floating interest rate swap to reduce duration of bond portfolio.

Duration management using an interest rate swap

Npr = N × vol of index futures/N × vol of notional futures

Uses of currency swap

Convert loan in one currency into a loan in another currency.

Convert foreign cash receipts into domestic currency.

Uses of equity swap

Diversify a concentrated portfolio.

Achieve international diversification.

Change asset allocation between stocks and bonds.

Swaptions

Payer swap: holder has right to enter interest rate swap as fixed-rate payer (in-the-money when interest rates go up).

Receiver swap: holder has right to enter interest rate as fixed-rate receiver (in-the-money when interest rates go down).

RISK MANAGEMENT APPLICATION OF DERIVATIVES

FORWARD AND FUTURES

Managing equity market risk and changing equity asset allocation by beta adjustment

\[ N' = \frac{N}{{\left[ \frac{(1 + \beta \times \text{Index of Risk})}{\beta} \right]}} \]

where \( N' \) is the number of the new portfolio, \( N \) is the number of the old portfolio, \( \beta \) is the index correlation coefficient, \( b' \) is the futures contract price multiplier, \( b \) is the stock index futures price, and \( N' \) is an integer representing the number of long stock index futures contracts to convert a cash position in an equity position or the number of short stock index futures contracts to convert an existing equity position into a cash position.

Changing bond asset allocation

**OPTIONS**

**Strategy**

**Construction using European options**

**Motivation**

Covered call

Own underlying share and sell call on share.

Earn premium to cushion losses.

Protective put

Own underlying share and buy put on share.

Downside protection with upside potential.

**Bull spread**

Buy call at lower strike and sell call at higher strike (can use puts instead of calls).

Speculation on stock price increase in a range.

**Bear spread**

Buy call at higher strike and sell call at lower strike (can use puts instead of calls).

Speculation on stock price decrease in a range.

**Butterfly spread**

Buy call at lower strike, buy call at higher strike, sell two calls at strike halfway between strikes of long calls (can use puts instead of calls).

Bets on low volatility.

**Collar**

Buy stock, buy put and sell call. (zero-cost collar if call and put premiums are the same)

Downside protection and with limited upside.

**Straddle**

Buy call and put with same strike.

Both on high volatility.

**Strap**

Buy two calls and one put with same strike.

Bets on high volatility (stock price more likely).

**Strip**

Buy one call and two puts with same strike.

Bets on high volatility (stock price fall more likely).

**Strangle**

Buy call and put, put has different exercise price.

Bets on high volatility.

**Box spread**

Buy bull call spread and bear put spread.

Replicate risk-free return or make arbitrage profit.

**EXECUTION OF PORTFOLIO DECISIONS**

**Effective spread**

\[ \text{Effective spread} = 2 \times \left( \frac{\text{Execution price} - \text{(Bid price + Ask price)}}{2} \right) \]

Market quality

LIquidity: resilience, quote depth, narrow bid-ask spreads.

Transparency: pre-trade and post-trade

Assured completion: trade completion is guaranteed.

Execution costs

Explicit: commissions, exchange fees, duties and taxes.

Implicit: bid-ask spread, market impact, missed trade opportunity cost, delay (or slippage) costs.

Volume-weighted average price (SWAP)

Advantages: easy to compute/understand; useful for comparing smaller trades in nontrending markets.

Disadvantages: does not include costs of delayed/cancelled trades; misleading for large trades; can be gambled by delaying trades; not sensitive to trade size or market conditions.

Implementation shortfall (IS)

Is the return difference between the return on a notional portfolio and the actual portfolio’s return, expressed as a % of the investment in the notional portfolio.

Explicit costs (for purchases)

Realized profit/loss (for purchases)

 Unrealized profit/loss or missed trade opportunity cost (for purchases)

**Types of traders**

**Trading tactics**

**TRADING, MONITORING AND REBALANCING**

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 Unrealized profit/loss or missed trade opportunity cost (for purchases)

**Types of traders**

**Trading tactics**
minimize execution costs by front-loading executions into the early part of the trading day.
- Opportunistic strategies: involve passive holdings and opportunistically seizing liquidity.

**MONITORING AND REBALANCING**
- Rebalancing disciplines
  - Calendar rebalancing: simple but unrelated to market behavior.
  - Percentage-of-portfolio (or interval) rebalancing: provides tighter control and triggers rebalancing related to market performance.
  - Calendar and percentage-of-portfolio: rebalancing occurs at calendar intervals only if corridors have been exceeded (lower monitoring and rebalancing costs).
  - Equal probability rebalancing: corridors are based on a common multiple of asset class standard deviation; does not address transaction costs or correlations.
- Tactical rebalancing: less frequent rebalancing during trending markets; more frequent rebalancing during reversals.
- Optimal corridor width of asset class

<table>
<thead>
<tr>
<th>Factor</th>
<th>Effect</th>
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<tbody>
<tr>
<td>Higher transaction costs</td>
<td>Wider corridor</td>
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<tr>
<td>Higher risk tolerance</td>
<td>Wider corridor</td>
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<tr>
<td>Higher correlation with rest of portfolio</td>
<td>Wider corridor</td>
</tr>
<tr>
<td>Higher volatility of asset class</td>
<td>Narrower corridor</td>
</tr>
<tr>
<td>Higher volatility of remaining portfolio</td>
<td>Narrower corridor</td>
</tr>
</tbody>
</table>

- Rebalancing strategies

**PERFORMANCE EVALUATION**
- Characteristics of a valid benchmark: unambiguous, investable, measurable, appropriate, reflective of current investment opinions, specified in advance, acknowledged.
- Types of benchmarks: absolute return, manager universe, broad market index, investment style index, factor-model-based, return-based, custom security-based.
- High quality benchmark: low systematic bias; minimal tracking error; similar risk exposure to portfolio; significant overlap of holdings with portfolio; low turnover; positive active positions.
- Macro attribution (fund sponsor level)
  - Net contributions
  - Risk-free rate
  - Asset categories
  - Benchmarks
  - Investment managers
  - Allocation effects
  - Micro attribution (investment manager level)
  - Explains three components of value-added return (difference between the returns on the portfolio and the benchmark).

\[
\sigma_{\text{portfolio}} = \sigma_{\text{market}} + \sigma_{\text{manager}} + \sigma_{\text{error}}
\]

- First term is pure sector allocation effect.
- Second term is allocation/selection interaction effect.
- Third term is stock selection effect.
- Fixed income micro attribution
  - Decomposes total return of a fixed-income portfolio into two groups of components: effect of external interest environment (out of manager’s control) and contribution of the investment manager.
- Effect of external interest environment: return on the default-free benchmark, assuming no change in forward rates; return due to changes in forward rates.
- Contribution of the investment manager: return from interest rate management; return from sector/quality management; return from selection of specific securities; return from trading activities.

- Risk-adjusted performance measures
  - Ex post alpha
    \[
    \alpha = \rho \cdot \beta - \frac{\sigma_x}{\sigma_m}
    \]
  - Treynor measure
    \[
    \frac{R_t - R_f}{\beta}
    \]
  - Sharpe ratio
    \[
    R_s = \frac{R_t - R_f}{\sigma}
    \]
  - M^2
    \[
    M^2 = \frac{R_t - R_f}{\sigma^2}
    \]

- Ex post alpha and Treynor measure provide the same conclusion on manager performance as they are based on systematic risk.
- Sharpe ratio and M^2 provide the same conclusion on manager performance as they are based on total risk.
- Information ratio
  \[
  I_R = \frac{R_t - R_f}{\sigma_x}
  \]

- Manager continuation policies
  - Type I error: keeping (or not hiring) managers who do not have investment skills.
  - Type II error: firing (or not hiring) managers who do have investment skills.

**GLOBAL INVESTMENT PERFORMANCE STANDARDS**
- Focus on required disclosures, and presentation and reporting requirements and recommendations of GIPS.
- Be able to identify and correct errors in a performance presentation that claims to be GIPS compliant.

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