

LEVEL II SCHWESER'S QuickSheet

CRITICAL CONCEPTS FOR THE 2023 CFA® EXAM

QUANTITATIVE METHODS

MULTIPLE REGRESSION

Coefficient of Determination, R^2

$$R^2 = \frac{\text{total variation} - \text{unexplained variation}}{\text{total variation}}$$

$$= \frac{SST - SSE}{SST} = \frac{\text{explained variation}}{\text{total variation}} = \frac{RSS}{SST}$$

$$MSE = \frac{SSE}{n - k - 1}; MSR = \frac{RSS}{k}; R^2 = \frac{RSS}{SST}$$

Adjusted R^2

$$R_a^2 = 1 - \left[\left(\frac{n-1}{n-k-1} \right) \times (1-R^2) \right]$$

Akaike's information criterion (AIC):

$$AIC = n \times \ln\left(\frac{SSE}{n}\right) + 2(k+1)$$

Schwarz's Bayesian information criteria (BIC):

$$BIC = n \times \ln\left(\frac{SSE}{n}\right) + \ln(n) \times (k+1)$$

F-statistic to evaluate nested models:

$$F = \frac{(SSE_R - SSE_U) / q}{(SSE_U) / (n - k - 1)}$$

with q and $(n-k-1)$ degrees of freedom.

F-test statistic to evaluate overall model fit:

$$F = \frac{(RSS_U) / k}{(SSE_U) / (n - k - 1)}$$

Model Misspecification

- Omitting a variable (that should be included).
- Variable should be transformed (for linearity).
- Inappropriate scaling of the variable.
- Incorrectly pooling data (e.g., different regimes).

Regression Analysis—Problems

- **Heteroskedasticity:** Non-constant error variance. Detect with scatter plots or Breusch–Pagan test. Correct with White-corrected standard errors.
- **Autocorrelation:** Correlation among error terms. Detect with Durbin–Watson (DW) test or Breusch–Godfrey (BG) test. Correct using robust (a.k.a. Newey–West corrected) standard errors.
- **Multicollinearity:** High correlation among X s. (F-test significant, t-tests insignificant.) Detect using VIF. Correct by dropping correlated X variables.

Variance inflation factor (VIF) to quantify multicollinearity: $VIF_j = 1 / (1 - R_j^2)$

Cook's distance (D_i) detects influential data points:

$$D_i = \frac{e_i^2}{k \times MSE} \left[\frac{h_{ii}}{(1 - h_{ii})^2} \right]$$

Logistic regression (logit) models:

$$\ln\left(\frac{p}{1-p}\right) = b_0 + b_1X_1 + b_2X_2 + \dots + \epsilon$$

$$\text{odds} = e^{\hat{y}}$$

$$P = \text{odds} / (1 + \text{odds}) = 1 / (1 + e^{-\hat{y}})$$

Likelihood ratio (LR) test for logistic regressions:

$$LR = -2 (\log \text{likelihood restricted model} - \log \text{likelihood unrestricted model})$$

TIME-SERIES ANALYSIS

Linear trend model: $y_t = b_0 + b_1t + \epsilon_t$

Log-linear trend model: $\ln(y_t) = b_0 + b_1t + \epsilon_t$

Covariance stationary: Mean and variance don't change over time. To determine if a time series is covariance stationary, (1) plot data, (2) run an AR model and test correlations, and/or (3) perform Dickey Fuller test.

Unit root: Coefficient on lagged dep. vbl. = 1. Series with unit root is not covariance stationary. First differencing will often eliminate the unit root.

Autoregressive (AR) model: Specified correctly if autocorrelation of residuals not significant.

Mean-reverting level for AR(1):

$$\frac{b_0}{(1 - b_1)}$$

RMSE: Square root of average squared error.

Random Walk Time Series

$$x_t = x_{t-1} + \epsilon_t$$

Seasonality: Indicated by statistically significant lagged error term. Correct by adding lagged term.

ARCH: Detected by estimating:

$$\hat{\epsilon}_t^2 = a_0 + a_1 \hat{\epsilon}_{t-1}^2 + \mu_t$$

Variance of ARCH series:

$$\hat{\sigma}_{t+1}^2 = \hat{a}_0 + \hat{a}_1 \hat{\epsilon}_t^2$$

MACHINE LEARNING

Supervised learning: Algorithm uses labeled training data (inputs and outputs identified) to model relationships.

Unsupervised learning: Algorithm uses unlabeled data to determine the structure of the data.

Deep learning algorithms: Algorithms such as neural networks and reinforced learning learn from their own prediction errors and are used for complex tasks such as image recognition and natural language processing.

BIG DATA PROJECTS

Preparing Data

Normalization: Scales values between 0 and 1.

$$\text{normalized } X_i = \frac{X_i - X_{\min}}{X_{\max} - X_{\min}}$$

Standardization: Centered at 0; scaled as standard deviations from mean.

$$\text{standardized } X_i = \frac{X_i - \mu}{\sigma}$$

Fit of a Machine Learning Algorithm

$$\text{precision (P)} = \frac{\text{true positives}}{(\text{false positives} + \text{true positives})}$$

$$\text{recall (R)} = \frac{\text{true positives}}{(\text{true positives} + \text{false negatives})}$$

$$\text{accuracy} = \frac{(\text{true positives} + \text{true negatives})}{(\text{all positives and negatives})}$$

$$F1 \text{ score} = (2 \times P \times R) / (P + R)$$

Receiver operating characteristic (ROC): Shows tradeoff between false positives and true positives.

Root mean square error (RMSE): Used when the target variable is continuous.

$$RMSE = \sqrt{\frac{\sum_{i=1}^n (\text{predicted}_i - \text{actual}_i)^2}{n}}$$

ECONOMICS

CURRENCY EXCHANGE RATES

Bid-ask spread = ask quote – bid quote

Cross rates with bid-ask spreads:

$$\left(\frac{A}{C}\right)_{\text{bid}} = \left(\frac{A}{B}\right)_{\text{bid}} \times \left(\frac{B}{C}\right)_{\text{bid}}$$

$$\left(\frac{A}{C}\right)_{\text{offer}} = \left(\frac{A}{B}\right)_{\text{offer}} \times \left(\frac{B}{C}\right)_{\text{offer}}$$

Currency arbitrage: “Up the bid and down the ask.”

Forward premium = (forward price) – (spot price)

Value of fwd currency contract prior to expiration:

$$V_t = \frac{(FP_t - FP)(\text{contract size})}{\left[1 + R_A \left(\frac{\text{days}}{360}\right)\right]}$$

Covered interest rate parity:

$$F = \frac{\left[1 + R_A \left(\frac{\text{days}}{360}\right)\right] S_0}{\left[1 + R_B \left(\frac{\text{days}}{360}\right)\right]}$$

Uncovered interest rate parity:

$$E(\% \Delta S)_{(A/B)} = R_A - R_B$$

Fisher relation:

$$R_{\text{nominal}} = R_{\text{real}} + E(\text{inflation})$$

International Fisher relation:

$$R_{\text{nominal A}} - R_{\text{nominal B}} = E(\text{inflation}_A) - E(\text{inflation}_B)$$

Relative purchasing power parity: High inflation rates leads to currency depreciation.

$$\% \Delta S_{(A/B)} = \text{inflation}_{(A)} - \text{inflation}_{(B)}$$

where: $\% \Delta S_{(A/B)}$ = change in spot price (A/B)

Profit on FX carry trade = interest differential – change in the spot rate of investment currency

Mundell-Fleming model: Impact of monetary and fiscal policies on interest rates & exchange rates. Under high capital mobility, expansionary monetary policy/restrictive fiscal policy → low interest rates → currency depreciation. Under low capital mobility, expansionary monetary policy/expansionary fiscal policy → current account deficits → currency depreciation.

Dornbusch overshooting model: Restrictive monetary policy → short-term appreciation of currency, then slow depreciation to PPP value.

ECONOMIC GROWTH

Cobb-Douglas production function:

$$Y = TK^\alpha L^{(1-\alpha)}$$

Labor productivity:

$$\text{output per worker } Y/L = T(K/L)^\alpha$$

Growth accounting:

$$\begin{aligned} &\text{growth rate in potential GDP} \\ &= \text{long-term growth rate of technology} \\ &\quad + \alpha (\text{long-term growth rate of capital}) \\ &\quad + (1 - \alpha) (\text{long-term growth rate of labor}) \\ &\text{growth rate in potential GDP} \\ &= \text{long-term growth rate of labor force} \\ &\quad + \text{long-term growth rate in labor productivity} \end{aligned}$$

Classical Growth Theory

- Real GDP/person reverts to subsistence level.

Neoclassical Growth Theory

- Sustainable growth rate is a function of population growth, labor's share of income, and the rate of technological advancement.

ECONOMICS continued...

- Growth rate in labor productivity driven only by improvement in technology.
- Assumes diminishing returns to capital.

$$g^* = \frac{\theta}{(1-\alpha)} \quad G^* = \frac{\theta}{(1-\alpha)} + \Delta L$$

Endogenous Growth Theory

- Investment in capital can have constant returns.
- ↑ in savings rate → permanent ↑ in growth rate.
- R&D expenditures ↑ technological progress.

ECONOMICS OF REGULATION

Classifications of Regulations

- *Statutes*: Laws made by legislative bodies.
- *Administrative regulations*: Issued by government.
- *Judicial law*: Findings of the court.

Classifications of Regulators

- Can be government agencies or independent.
- Independent regulators can be SROs or SRBs. SROs are given government recognition.

Self-Regulation in Financial Markets

- SROs are more prevalent in common-law countries than in civil-law countries.

Economic Rationale for Regulatory Intervention

- *Informational frictions* arise in the presence of information asymmetry.
- *Externalities* deal with provision of public goods.
- *Weak competition* can lead to lack of innovation and higher prices.
- *Social objectives* such as provision of public goods.

Regulatory Interdependencies and Their Effects

- *Regulatory capture theory*: Regulatory body is influenced or controlled by industry being regulated.
- *Regulatory arbitrage*: Exploiting regulatory differences between jurisdictions, or difference between substance and interpretation of a regulation.

Tools of Regulatory Intervention

- Price mechanisms, restricting or requiring certain activities, and provision of public goods or financing of private projects.

Financial market regulations: Seek to protect investors and to ensure stability of financial system.

Securities market regulations: Include disclosure requirements, regulations to mitigate agency conflicts, and regulations to protect small investors.

Prudential supervision: Monitoring institutions to reduce system-wide risks and protect investors.

Anticompetitive Behaviors and Antitrust Laws

- Discriminatory pricing, bundling, exclusive dealing.
- Mergers leading to excessive market share blocked.

Net regulatory burden: Costs to the regulated entities minus the private benefits of regulation.

Sunset clauses: Require a cost-benefit analysis to be revisited before the regulation is renewed.

FINANCIAL STATEMENT ANALYSIS

INTERCORPORATE INVESTMENTS

Accounting for Intercorporate Investments

Investment in financial assets: <20% owned, no significant influence.

- Amortized cost on balance sheet; interest and realized gain/loss on income statement.
- Fair value through OCI at FMV with unrealized gains/losses in equity on B/S; dividends, interest, realized gains/losses on I/S.
- Fair value through profit or loss at FMV; dividends, interest, realized and unrealized gains/losses on I/S.

Investments in associates: 20–50% owned, significant influence. With equity method, pro rata share of the investee's earnings incr. B/S inv. acct., also in I/S. Div. received decrease investment account (div. not in I/S).

Business combinations: >50% owned, control.

Acquisition method required under U.S. GAAP and IFRS. Goodwill not amortized, subject to annual impairment test. All assets, liabilities, revenue, and expenses of subsidiary are combined with parent, excluding intercomp. trans. If <100%, minority interest acct. for share not owned.

Joint venture: 50% shared control. Equity method.

Financial Effect of Choice of Method

Equity, acquisition, & proportionate consolidation:

- All three methods report same net income.
- Assets, liabilities, equity, revenues, and expenses are higher under acquisition compared to the equity method.

IFRS AND U.S. GAAP DIFFERENCES

Fair value accounting, investment in associates:

IFRS – Only for venture capital, mutual funds, etc.

U.S. GAAP – Fair value accounting allowed for all.

- IFRS permits either the “partial goodwill” or “full goodwill” methods to value goodwill and noncontrolling interest. U.S. GAAP requires the full goodwill method.

Goodwill impairment processes:

IFRS – 1 step (recoverable amount vs. carrying value).

U.S. GAAP – 2 steps (identify; measure amount).

Acquisition method contingent asset recognition:

IFRS – Contingent assets are not recognized.

U.S. GAAP – Recognized; recorded at fair value.

Prior service cost:

IFRS – Recognized as an expense in P&L.

U.S. GAAP – Reported in OCI; amortized to P&L.

Actuarial gains/losses:

IFRS – Remeasurements in OCI and not amortized.

U.S. GAAP – OCI, amortized with corridor approach.

Dividend/interest income and interest expense:

IFRS – Either operating or financing cash flows.

U.S. GAAP – Must classify as operating cash flow.

EMPLOYEE COMPENSATION

Pension Accounting

- *PBO components*: Current service cost, interest cost, actuarial gains/losses, benefits paid.

Balance Sheet

- Funded status = fair value of plan assets – PBO = balance sheet asset (liability) under GAAP and IFRS.

Income Statement

- Total periodic pension cost (under both IFRS and GAAP) = contributions – Δ funded status.
- IFRS and GAAP differ on where the total periodic pension cost (TPPC) is reflected (income statement vs. OCI).
- Under GAAP, periodic pension cost in P&L = service cost + interest cost ± amortization of actuarial (gains) and losses + amortization of past service cost – expected return on plan assets.
- Under IFRS, reported pension expense = service cost + past service cost + net interest expense.
- Under IFRS, discount rate = expected rate of return on plan assets. Net interest expense = discount rate × beginning funded status. If funded status was positive, a net interest income would be recognized.

Total Periodic Pension Cost

TPPC = ending PBO – beginning PBO + benefits paid – actual return on plan assets

TPPC = contributions – (ending funded status – beginning funded status)

Cash Flow Adjustment

If TPPC < firm contribution, difference = Δ in PBO (reclassify difference from CFF to CFO after-tax).

If TPPC > firm contribution, diff = borrowing (reclassify difference from CFO to CFF after-tax).

MULTINATIONAL OPERATIONS

Multinational Operations: Choice of Method

For self-contained sub., functional ≠ presentation currency; use current rate method:

- Assets/liabilities at current rate.
- Common stock at historical rate.
- Income statement at average rate.
- Exposure = shareholders' equity.
- Dividends at rate when paid.

For integrated sub., functional = presentation currency, use temporal method:

- Monetary assets/liabilities at current rate.
- Nonmonetary assets/liabilities at historical rate.
- Sales, SGA at average rate.
- COGS, depreciation at historical rate.
- Exposure = monetary assets – monetary liabilities. Net asset position & depr. foreign currency = loss. Net liab. position & depr. foreign currency = gain.

Original Financial Statements vs. All-Current

- Pure balance sheet and income statement ratios unchanged.
- If LC depreciating (appreciating), translated mixed ratios will be larger (smaller).

Hyperinflation: GAAP vs. IFRS

Hyperinfl. = cumulative inflation > 100% over 3 yrs. GAAP: use temporal method. IFRS: 1st, restate foreign curr. st. for infl. 2nd, translate with current rates. Net purch. power gain/loss reported in income.

ANALYSIS OF FINANCIAL INSTITUTIONS

Financial institutions differ from other companies due to systemic importance and regulated status.

Basel III: Minimum levels of capital and liquidity.

CAMELS: Capital adequacy, Asset quality, Management, Earnings, Liquidity, and Sensitivity.

$$\text{liquidity coverage ratio} = \frac{\text{highly liquid assets}}{\text{expected cash outflows}}$$

$$\text{net stable funding ratio} = \frac{\text{available stable funding}}{\text{required stable funding}}$$

Insurance Company Key Ratios

Underwriting loss ratio

$$= \frac{\text{claims paid} + \Delta \text{ loss reserves}}{\text{net premium earned}}$$

Expense ratio

$$= \frac{\text{underwriting expenses incl. commissions}}{\text{net premium written}}$$

Loss and loss adjustment expense ratio

$$= \frac{\text{loss expense} + \text{loss adjustment expense}}{\text{net premiums earned}}$$

Dividends to policyholders ratio

$$= \frac{\text{dividends to policyholders}}{\text{net premiums earned}}$$

Combined ratio after dividends

$$= \text{combined ratio} + \text{divs to policyholders ratio}$$

Total investment return ratio

$$= \text{total investment income} / \text{invested assets}$$

Life and health insurers' ratios

total benefits paid / (net premiums written and deposits)
commissions + expenses / (net premiums written + deposits)

QUALITY OF FINANCIAL REPORTS

Beneish model: Used to detect earnings manipulation based on eight variables. M-score > -1.78 (i.e., less negative) indicates potential earnings manipulation.

High-quality earnings are:

1. **Sustainable**: Expected to recur in future periods.
2. **Adequate**: To cover the company's cost of capital.

Mean reversion in earnings: Is quicker for accruals-based earnings – especially if accruals are discretionary.

Indicators of Balance Sheet Quality:

Completeness, unbiased measurement, and clarity of presentation.

FINANCIAL STATEMENT ANALYSIS TECHNIQUES

ROE decomposed (extended DuPont equation)

$$\text{ROE} = \frac{\text{Tax Burden}}{\text{EBT}} \times \frac{\text{Interest Burden}}{\text{EBIT}} \times \frac{\text{EBIT Margin}}{\text{revenue}} \times$$

$$\frac{\text{Total Asset Turnover}}{\text{revenue}} \times \frac{\text{Financial Leverage}}{\text{average assets}} \times \frac{\text{average equity}}{\text{average assets}}$$

Accruals Ratio (balance sheet approach)

$$\text{accruals ratio}^{\text{BS}} = \frac{(\text{NOA}_{\text{END}} - \text{NOA}_{\text{BEG}})}{(\text{NOA}_{\text{END}} + \text{NOA}_{\text{BEG}})/2}$$

Accruals Ratio (cash flow statement approach)

$$\text{accruals ratio}^{\text{CF}} = \frac{(\text{NI} - \text{CFO} - \text{CFI})}{(\text{NOA}_{\text{END}} + \text{NOA}_{\text{BEG}})/2}$$

FINANCIAL STATEMENT MODELING

Bottom-up analysis: Starts with study of an individual company or reportable segments of a company.

Top-down analysis: Begins with expectations about the expected growth rate of nominal GDP.

Economies of Scale: As production volume increases, costs fall and operating margins rise.

Porter's Five Forces Analysis

- Firms have less pricing power when **threat of substitute products** is high and switching costs low.
- Companies have less pricing power when the **intensity of industry rivalry** is high.
- Company prospects for earnings growth are lower when the **bargaining power of suppliers** is high.
- Companies have less pricing power when the **bargaining power of customers** is high.
- Firms have more pricing power (and earnings growth) when **threat of new entrants** is low.

Cannibalization factor: Percentage of a new product's sales stolen from an existing product's sales.

Steps to a sales-based pro forma company model:

1. Estimate revenue growth and future revenue.
2. Estimate COGS.
3. Estimate SG&A.
4. Estimate financing costs.
5. Estimate income tax expense and cash taxes.
6. Model the balance sheet based on income statement items and working capital account estimates.
7. Use historical depreciation and capital expenditures to forecast capital expenditures and net PP&E.
8. Use the pro forma income statement and balance sheet to construct a pro forma cash flow statement.

CORPORATE ISSUERS

DIVIDENDS AND SHARE REPURCHASES

Target Payout Adjustment Model

expected increase in dividends =

$$\left[\left(\text{expected earnings} \times \frac{\text{target payout ratio}}{\text{ratio}} \right) - \text{previous dividend} \right] \times \text{adjustment factor}$$

$$\text{adjustment factor} = 1 / \text{years of adjustment}$$

Dividend Coverage Ratios

dividend coverage ratio = net income / dividends

FCFE coverage ratio = FCFE / (dividends + share repurchases)

Share Repurchases

- Share repurchase is equivalent to cash dividend, assuming equal tax treatment.
- Unexpected share repurchase is good news.
- Rationale for (1) potential tax advantages, (2) share price support/signaling, (3) added flexibility, (4) offsetting dilution from employee stock options, and (5) increasing financial leverage.

ESG CONSIDERATIONS

The board of directors of a company can be structured either as a single-tier board of internal (executive) and external (non-executive) directors, or a two-tiered board where the management board is overseen by a supervisory board.

CEO duality: When the CEO is also the company's chairperson of the board.

ESG-Related Risk Exposures: In fixed-income analysis, ESG considerations are primarily concerned with downside risk. In equity analysis, ESG is considered both in regard to upside opportunities and downside risk.

COST OF CAPITAL: ADVANCED TOPICS

Grinold-Kroner model:

$$\text{ERP} = [\text{DY} + \Delta\text{P}/\text{E} + i + \text{G} + \Delta\text{S}] - r_f$$

Cost of equity based on DDM: cost of equity (r_e) = dividend yield (DY) + capital gains yield (CGY)

Fama-French model: required return of stock = $r_f + \beta_1 \text{ERP} + \beta_2 \text{SMB} + \beta_3 \text{HML}$

Five-factor Fama-French extended model:

required return of stock = $r_f + \beta_1 \text{ERP} + \beta_2 \text{SMB} + \beta_3 \text{HML} + \beta_4 \text{RMW} + \beta_5 \text{CMA}$

Expanded CAPM: required return = $r_f + \beta_{\text{peer}} \times \text{ERP} + \text{SP} + \text{IP} + \text{SCRIP}$

Build-up approach: required return = $r_f + \text{ERP} + \text{SP} + \text{SCRIP}$

CORPORATE RESTRUCTURING

Actions can include **investment** (to increase the size and scope), **divestment** (to decrease size or scope), or **restructuring** (to improve performance).

Investment actions include equity investments, joint ventures, and acquisitions to pursue growth, synergies, or undervalued targets.

Divestment actions, including sales and spin-offs, are made to increase growth or profitability or reduce risk.

Restructuring actions: Cost cutting, balance sheet restructurings, reorganizations. To improve ROIC.

Materiality is defined by both size and fit. **Large actions** are greater than 10% of EV. **Fit** refers to the alignment between the action and expectations.

Valuation methods for corporate restructurings include **comparable company**, **comparable transaction**, and **premium paid** analysis.

EQUITY

EQUITY VALUATION:

Porter's Five Forces of Industry Structure

- Rivalry (intra-industry)
- Threat of new entrants
- Threat of substitutes
- Bargaining power of suppliers
- Bargaining power of buyers

DISCOUNTED DIVIDEND VALUATION

Discounted Cash Flow (DCF) Methods

Use dividend discount models (DDM) when:

- Firm has dividend history.
- Dividend policy is related to earnings.
- Minority shareholder perspective.

Use free cash flow (FCF) models when:

- Firm lacks stable dividend policy.
- Dividend policy not related to earnings.
- FCF is related to profitability.
- Controlling shareholder perspective.
- Use residual income (RI) when:
 - Firm lacks dividend history.
 - Expected FCF is negative.

Gordon Growth Model (GGM)

Assumes perpetual dividend growth rate:

$$V_0 = \frac{D_0(1+g)}{r-g} = \frac{D_1}{r-g}$$

Most appropriate for mature, stable firms.

Limitations are:

- Very sensitive to estimates of r and g .
- Difficult with non-dividend stocks.
- Difficult with unpredictable growth patterns (use multi-stage model).

Present Value of Growth Opportunities

$$V_0 = \frac{E_1}{r} + \text{PVGO}$$

H-Model

$$V_0 = \frac{[D_0 \times (1 + g_L)]}{r - g_L} + \frac{[D_0 \times H \times (g_S - g_L)]}{r - g_L}$$

where: H = half-life (in years) of high-growth period

Sustainable Growth Rate: $b \times \text{ROE}$.

Required Return From Gordon Growth Model:

$$r = (D_1 / P_0) + g$$

FREE CASH FLOW VALUATION

Free Cash Flow to Firm (FCFF)

Assuming depreciation is the only NCC:

- FCFF = NI + Dep + [Int × (1 - tax rate)] - FCInv - WCInv.
- FCFF = [EBIT × (1 - tax rate)] + Dep - FCInv - WCInv.
- FCFF = [EBITDA × (1 - tax rate)] + (Dep × tax rate) - FCInv - WCInv.
- FCFF = CFO + [Int × (1 - tax rate)] - FCInv.

Free Cash Flow to Equity (FCFE)

- FCFE = FCFF - [Int × (1 - tax rate)] + Net borrowing.
- FCFE = NI + Dep - FCInv - WCInv + Net borrowing.
- FCFE = NI - [(1 - DR) × (FCInv - Dep)] - [(1 - DR) × WCInv]. (Used to forecast.)

Single-Stage FCFF/FCFE Models

- For FCFF valuation: $V_0 = \frac{\text{FCFF}_1}{\text{WACC} - g}$
- For FCFE valuation: $V_0 = \frac{\text{FCFE}_1}{r - g}$

2-Stage FCFF/FCFE Models

- Step 1: Calculate FCF in high-growth period.
- Step 2: Use single-stage FCF model for terminal value at end of high-growth period.
- Step 3: Discount interim FCF and terminal value to time zero to find stock value; use WACC for FCFF, r for FCFE.

PRICE AND EV MULTIPLES

Price-to-Earnings (P/E) Ratio

Problems with P/E:

- If earnings < 0, P/E meaningless.
- Volatile, transitory portion of earnings makes interpretation difficult.

- Management discretion over accounting choices affects reported earnings.

Justified P/E

$$\text{justified leading P/E} = \frac{P_0}{E_1} = \frac{1-b}{r-g}$$

$$\text{justified trailing P/E} = \frac{P_0}{E_0} = \frac{(1-b)(1+g)}{r-g}$$

Justified Dividend Yield

$$\frac{D_0}{P_0} = \frac{r-g}{1+g}$$

Normalization Methods

- Historical average EPS.
- Average ROE.

PEG ratio: P/E multiple to earnings growth:

$$\text{PEG ratio} = \frac{P/E}{g}$$

Price-to-Book (P/B) Ratio

Advantages:

- BV almost always > 0.
- BV more stable than EPS.
- Measures NAV of financial institutions.

Disadvantages:

- Size differences cause misleading comparisons.
- Influenced by accounting choices.
- BV ≠ MV due to inflation/technology.

$$\text{justified P/B} = \frac{\text{ROE} - g}{r - g}$$

Price-to-Sales (P/S) Ratio

Advantages:

- Meaningful even for distressed firms.
- Sales revenue not easily manipulated.
- Not as volatile as P/E ratios.
- Useful for mature, cyclical, and start-up firms.

Disadvantages:

- High sales ≠ imply high profits and cash flows.
- Does not capture cost structure differences.
- Revenue recognition practices still distort sales.

$$\text{justified P/S} = \frac{PM_0 \times (1-b)(1+g)}{r-g}$$

DuPont Model

$$ROE = \left[\frac{\text{net income}}{\text{sales}} \right] \times \left[\frac{\text{sales}}{\text{total assets}} \right] \times \left[\frac{\text{total assets}}{\text{equity}} \right]$$

Price-to-Cash Flow Ratios

Advantages:

- Cash flow harder to manipulate than EPS.
- More stable than P/E.
- Mitigates earnings quality concerns.

Disadvantages:

- Difficult to estimate true CFO.
- FCFE better but more volatile.

Method of Comparables

- Firm multiple > benchmark implies overvalued.
- Firm multiple < benchmark implies undervalued.
- Fundamentals that affect multiple should be similar between firm and benchmark.

RESIDUAL INCOME VALUATION

Residual Income Models

- RI = $E_t - (r \times B_{t-1}) = (ROE - r) \times B_{t-1}$
- Single-stage RI model:

$$V_0 = B_0 + \left[\frac{(ROE - r) \times B_0}{r - g} \right]$$

- Multistage RI valuation: $V_0 = B_0 + (\text{PV of interim high-growth RI}) + (\text{PV of continuing RI})$

Economic Value Added®

- EVA = NOPAT - \$WACC; NOPAT = EBIT(1 - t).

PRIVATE COMPANY VALUATION

Private Equity Valuation

$$DLOC = 1 - \left[\frac{1}{1 + \text{control premium}} \right]$$

Total discount = $1 - [(1 - DLOC)(1 - DLOM)]$.
The DLOM varies with the following:

- An impending IPO or firm sale ↓ DLOM.
- The payment of dividends ↓ DLOM.
- Earlier, higher payments ↓ DLOM.
- Restrictions on selling stock ↑ DLOM.
- A greater pool of buyers ↓ DLOM.
- Greater risk and value uncertainty ↑ DLOM.

FIXED INCOME

TERM STRUCTURE OF INTEREST RATES

Price of a T-period zero-coupon bond:

$$P_T = \frac{1}{(1 + S_T)^T}$$

Forward price of zero-coupon bond:

$$F_{(j,k)} = \frac{1}{[1 + f(j,k)]^k}$$

Forward pricing model:

$$F_{(j,k)} = \frac{P_{(j+k)}}{P_j}$$

Forward rate model:

$$[1 + f(j,k)]^k = [1 + S_{(j+k)}]^{(j+k)} / (1 + S_j)^j$$

“Rolling down the yield curve”: Holding bonds with maturity > investment horizon, with upward-sloping yield curve.

Swap spread = swap rate_t - treasury yield_t

Z-spread: When added to yield curve, makes PV of a bond's cash flows = bond's market price.

TED spread

$$= (3\text{-month MRR rate}) - (3\text{-month T-bill rate})$$

MRR-OIS spread

$$= \text{MRR rate} - \text{“overnight indexed swap” rate}$$

Term Structure of Interest Rates

Traditional theories:

- Unbiased (pure) expectations theory.
- Local expectations theory.
- Liquidity preference theory.
- Segmented markets theory.
- Preferred habitat theory.

Managing yield curve shape risk:

$$\Delta P/P \approx -D_L \Delta x_L - D_S \Delta x_S - D_C \Delta x_C$$

(L = level, S = steepness, C = curvature)

Yield volatility: Long-term ← uncertainty regarding the real economy and inflation.

Short term ← uncertainty re: monetary policy.

Long-term yield volatility is generally lower than volatility in short-term yields.

ARBITRAGE-FREE VALUATION

Modern term structure models:

- Cox-Ingersoll-Ross: $dr = a(b-r)dt + \sigma \sqrt{r} dz$
- Vasicek model: $dr = a(b-r)dt + \sigma dz$
- Ho-Lee model: $dr_t = \theta_t dt + \sigma dz_t$
- Kalotay-Williams-Fabozzi (KWF) model: $d \ln(r_t) = \theta_t dt + \sigma dz_t$

BONDS WITH EMBEDDED OPTIONS

Value of option embedded in a bond:

$$V_{\text{call}} = V_{\text{straight bond}} - V_{\text{callable bond}}$$

$$V_{\text{put}} = V_{\text{putable bond}} - V_{\text{straight bond}}$$

When interest rate volatility increases:

$$V_{\text{call option}} \uparrow, V_{\text{put option}} \uparrow, V_{\text{callable bond}} \downarrow, V_{\text{putable bond}} \uparrow$$

Upward-sloping yield curve: Results in lower call value and higher put value.

When binomial tree assumed volatility increases:

- Computed OAS of a callable bond decreases.
- Computed OAS of a puttable bond increases.

$$\text{effective duration} = \frac{BV_{-\Delta y} - BV_{+\Delta y}}{2 \times BV_0 \times \Delta y}$$

$$\text{effective convexity} = \frac{BV_{-\Delta y} + BV_{+\Delta y} - (2 \times BV_0)}{BV_0 \times \Delta y^2}$$

Effective duration:

- ED (callable bond) ≤ ED (straight bond).
- ED (puttable bond) ≤ ED (straight bond).
- ED (zero-coupon) ≈ maturity of the bond.
- ED fixed-rate bond < maturity of the bond.
- ED of floater ≈ time (years) to next reset.

One-sided durations: Callables have lower down-duration; puttables have lower up-duration.

Value of a capped floater

$$= \text{straight floater value} - \text{embedded cap value}$$

Value of a floored floater

$$= \text{straight floater value} + \text{embedded floor value}$$

Minimum value of convertible bond

$$= \text{greater of conversion value or straight value}$$

Conversion value of convertible bond

$$= \text{market price of stock} \times \text{conversion ratio}$$

Market conversion price

$$= \frac{\text{market price of convertible bond}}{\text{conversion ratio}}$$

Market conversion premium per share

$$= \text{market conversion price} - \text{stock's market price}$$

Market conversion premium ratio

$$= \frac{\text{market conversion premium per share}}{\text{market price of common stock}}$$

Premium over straight value

$$= \left(\frac{\text{market price of convertible bond}}{\text{straight value}} \right) - 1$$

Callable and puttable convertible bond value

$$= \text{straight value of bond} + \text{value of call option on stock} - \text{value of call option on bond} + \text{value of put option on bond}$$

CREDIT ANALYSIS MODELS

Expected exposure: Amount a risky bond investor stands to lose before any recovery is factored in.

Loss given default = loss severity × exposure

Probability of default: Likelihood in a given year.

Credit valuation adjustment (CVA): Sum of the present values of expected losses for each period.

Credit score/rating: Ordinal rank; higher = better.

Return from bond credit rating migration: Δ%P

$$= -(\text{modified duration of bond}) \times (\Delta \text{spread})$$

Structural models of corporate credit risk:

- value of risky debt = value of risk-free debt - value of put option on the company's assets
- equity ≈ European call on company assets

Reduced-form models: Do not explain why default occurs, but statistically model when default occurs.

Credit spread on a risky bond = YTM of risky bond - YTM of benchmark

CREDIT DEFAULT SWAPS

Credit default swap (CDS): Upon credit event, protection buyer compensated by protection seller.

Index CDS: Multiple borrowers, equally weighted.

Default: Occurrence of a credit event.

Common credit events in CDS agreements:

Bankruptcy, failure to pay, restructuring.
CDS spread: Higher for a higher probability of default and for a higher loss given default.

Hazard rate = conditional probability of default.

$$\text{expected loss} = (\text{hazard rate})_t \times (\text{loss given default})_t$$

Upfront CDS payment (by protection buyer)

$$= \text{PV}(\text{protection leg}) - \text{PV}(\text{premium leg})$$

$$\approx (\text{CDS spread} - \text{CDS coupon}) \times \text{duration} \times \text{NP}$$

continued on next page...

Change in value for a CDS after inception

≈ chg in spread × duration × notional principal

DERIVATIVES**FORWARD COMMITMENTS****Forward contract price (cost-of-carry model):**

$$FP = S_0 \times (1 + R_f)^T \quad S_0 = \frac{FP}{(1 + R_f)^T}$$

Price of equity forward with discrete dividends:

$$FP(\text{on an equity security}) = (S_0 - PVD) \times (1 + R_f)^T$$

Value of forward on dividend-paying stock:

$$V_f(\text{long position}) = [S_t - PVD_t] -$$

$$\left[\frac{FP}{(1 + R_f)^{T-t}} \right]$$

Forward: equity index (continuous dividend):

$$FP(\text{on an equity index}) = S_0 \times e^{(R_f - \delta) \times T}$$

$$= (S_0 \times e^{-\delta \times T}) \times e^{R_f \times T}$$

where:

R_f^c = continuously compounded risk-free rate

δ^c = continuously compounded dividend yield

Forward price on a coupon-paying bond:

$$FP(\text{on a fixed-income security})$$

$$= (S_0 - PVC) \times (1 + R_f)^T$$

$$= S_0 \times (1 + R_f)^T - FVC$$

Value of a forward on a coupon-paying bond:

$$V_f(\text{long}) = [S_t - PVC_t] - \left[\frac{FP}{(1 + R_f)^{T-t}} \right]$$

Price of a bond futures contract:

$$FP = [(full\ price)(1 + R_f)^T - AI_T - FVC]$$

$$full\ price = \text{quoted spot price} + AI_0$$

Quoted bond futures price:

QFP = forward price/conversion factor

$$= [(full\ price)(1 + R_f)^T - AI_T - FVC] \left(\frac{1}{CF} \right)$$

Forward rate agreement: The “price” of a 2 × 3 FRA is the implied 30-day forward rate in 60 days.

Swap fixed rate:

$$C = \frac{1 - Z_4}{Z_1 + Z_2 + Z_3 + Z_4}$$

where: $Z_n = 1/(1 + R_n) = \text{price of zero-coupon } \1 bond

Value of interest rate swap to fixed payer

$$= \Sigma Z \times (SFR_{New} - SFR_{Old}) \times \frac{\text{days}}{360} \times \text{notional}$$

VALUATION OF CONTINGENT CLAIMS**Binomial stock tree probabilities:**

$$\pi_U = \text{probability of up move} = \frac{1 + R_f - D}{U - D}$$

$$\pi_D = \text{probability of a down move} = (1 - \pi_U)$$

Put-call parity:

$$S_0 + P_0 = C_0 + PV(X)$$

synthetic call = put + stock – riskless discount bond

synthetic put = call – stock + riskless discount bond

Put-call parity when the stock pays dividends:

$$P_0 + S_0 e^{-\delta T} = C_0 + e^{-rT} X$$

Dynamic delta hedging:

$$\# \text{ of short call options} = \frac{\# \text{ shares hedged}}{\text{delta of call option}}$$

$$\# \text{ of long put options} = - \frac{\# \text{ shares hedged}}{\text{delta of put option}}$$

Change in option value:

$$\Delta C \approx \text{call delta} \times \Delta S + \frac{1}{2} \text{ gamma} \times \Delta S^2$$

$$\Delta P \approx \text{put delta} \times \Delta S + \frac{1}{2} \text{ gamma} \times \Delta S^2$$

Option value using arbitrage-free pricing:

$$C_0 = hS_0 + \frac{(-hS^+ + C^+)}{(1 + R_f)} = hS_0 + \frac{(-hS^- + C^-)}{(1 + R_f)}$$

$$P_0 = hS_0 + \frac{(-hS^- + P^-)}{(1 + R_f)} = hS_0 + \frac{(-hS^+ + P^+)}{(1 + R_f)}$$

Hedge ratio:

$$\text{Calls: } h = \frac{C^+ - C^-}{S^+ - S^-} \quad \text{Puts: } h = \frac{P^+ - P^-}{S^+ - S^-}$$

Black–Scholes–Merton option valuation model:

$$C_0 = S_0 e^{-\delta T} N(d_1) - e^{-rT} X N(d_2)$$

$$P_0 = e^{-rT} X N(-d_2) - S_0 e^{-\delta T} N(-d_1)$$

where:

δ = continuously compounded dividend yield

$$d_1 = \frac{\ln(S/X) + (r - \delta + \sigma^2/2)T}{\sigma \sqrt{T}}$$

$$d_2 = d_1 - \sigma \sqrt{T}$$

$S_0 e^{-\delta T}$ = stock price, less PV of dividends

ALTERNATIVE INVESTMENTS**REAL ESTATE INVESTMENTS****Value of property using direct capitalization:**

rental income if fully occupied

+ other income

= potential gross income

= vacancy and collection loss

= effective gross income

= operating expense

= net operating income

$$\text{cap rate} = \frac{NOI_1}{\text{comparable sales price}}$$

$$\text{value} = V_0 = \frac{NOI_1}{\text{cap rate}} \text{ or } V_0 = \frac{\text{stabilized NOI}}{\text{cap rate}}$$

$$\text{gross income multiplier} = \frac{\text{sales price}}{\text{gross income}}$$

Debt service coverage ratio:

$$DSCR = \frac{\text{first-year NOI}}{\text{debt service}}$$

Loan-to-value (LTV) ratio:

$$LTV = \frac{\text{loan amount}}{\text{appraisal value}}$$

$$\text{equity dividend rate} = \frac{\text{first-year cash flow}}{\text{equity}}$$

NAV approach to REIT share valuation:

estimated cash NOI

÷ assumed cap rate

= estimated value of operating real estate

+ cash & accounts receivable

= debt and other liabilities

= net asset value

= shares outstanding

= NAV/share

Price-to-FFO approach to REIT share valuation:

funds from operations (FFO)

÷ shares outstanding

= FFO/share

× sector average P/FFO multiple

= NAV/share

Price-to-AFFO approach to REIT share valuation:

funds from operations (FFO)

– non-cash rents

– recurring maintenance-type capital expenditures

= AFFO

÷ shares outstanding

= AFFO/share

× property subsector average P/AFFO multiple

= NAV/share

Discounted cash flow REIT share valuation:

value of a REIT share

= PV(dividends for years 1 through n)

+ PV(terminal value at the end of year n)

PRIVATE EQUITY INVESTMENTS

Sources of value creation: Reengineer firm, favorable debt financing; superior alignment of interests between management and PE ownership.

Valuation issues (VC firms relative to buyouts): DCF not as common; equity, not debt, financing.

Key drivers of equity return:

Buyout: ↑ of multiple at exit, ↓ in debt.

VC: Pre-money valuation, the investment, and subsequent equity dilution.

Components of performance (LBO): Earnings growth, ↑ of multiple at exit, ↓ in debt.

Exit routes (in order of exit value, high to low): IPOs secondary market sales; MBO; liquidation.

Performance measurement: Gross IRR = return from portfolio companies. Net IRR = relevant for LP; net of fees & carried interest.

Performance statistics:

- PIC = % capital utilized by GP; cumulative sum of capital called down.
- Management fee: % of PIC.
- Carried interest: % carried interest × (change in NAV before distribution).
- NAV before distrib. = prior yr. NAV after distrib. + cap. called down – mgmt. fees + op. result.
- NAV after distributions = NAV before distributions – carried interest – distributions.
- DPI multiple = (cumulative distributions) / PIC = LP's realized return.
- RVPI multiple = (NAV after distributions) / PIC = LP's unrealized return.
- TVPI mult. = DPI mult. + RVPI mult.

Assessing risk: (1) adjust discount rate for prob of failure; (2) use scenario analysis for term.

COMMODITIES AND DERIVATIVES

Contango: futures prices > spot prices

Backwardation: futures prices < spot prices

Term Structure of Commodity Futures

1. **Insurance theory:** Contract buyers compensated for providing protection to commodity producers. Implies backwardation is normal.
2. **Hedging pressure hypothesis:** Like insurance theory, but includes both long hedgers (→ contango) and short hedgers (→ backwardation).
3. **Theory of storage:** Spot and futures prices related through storage costs and convenience yield.

Total return on fully collateralized long futures

= collateral return + price return + roll return

Roll return: Positive in backwardation because long-dated contracts are cheaper than expiring contracts.

$$\text{roll return} = \frac{\left(\text{price of expiring} \right) - \left(\text{price of new} \right)}{\text{price of expiring futures contract}}$$

PORTFOLIO MANAGEMENT

EXCHANGE-TRADED FUNDS

Creation/redemption of ETFs: Authorized participants (APs) create additional shares by delivering the creation basket to the ETF manager. Redemption is by tendering ETF shares and receiving a redemption basket.

ETF spreads: Positively related to cost of creation/redemption, spread on the underlying securities, risk-premium for carrying trades until close of trade, and APs' normal profit margin. Negatively related to probability of completing an offsetting trade on the secondary market.

ETF premium (discount) % =
 $(\text{ETF price} - \text{NAV per share}) / \text{NAV per share}$

USING MULTIFACTOR MODELS

Arbitrage Pricing Theory

$$E(R_p) = R_f + \beta_{p1}(\lambda_1) + \beta_{p2}(\lambda_2) + \dots + \beta_{pk}(\lambda_k)$$

Expected return = risk-free rate
 + $\sum(\text{factor sensitivity}) \times (\text{factor risk premium})$

Multifactor model return attribution:

$$\text{factor return} = \sum_{i=1}^k (\beta_{pi} - \beta_{bi}) \times (\lambda_i)$$

Active return
 = factor return + security selection return
Active risk squared
 = active factor risk + active specific risk

$$\text{Active specific risk} = \sum_{i=1}^n (w_{pi} - w_{bi})^2 \sigma_{ei}^2$$

MEASURING AND MANAGING MARKET RISK

Value at risk (VaR): Estimate of minimum loss with a given probability over a specified period, expressed as \$ amount or % of portfolio value.
 5% annual \$VaR = (mean annual return - 1.65 \times annual standard deviation) \times portfolio value

Conditional VaR (CVaR): The expected loss given that the loss exceeds the VaR.

Incremental VaR (IVaR): The change in VaR from a specific change in the size of a portfolio position.

Marginal VaR (MVaR): Change in VaR for a small change in a portfolio position. Used as an estimate of the position's contribution to overall VaR.

Variance for $W_A\%$ fund A + $W_B\%$ fund B

$$\sigma_{\text{Portfolio}}^2 = W_A^2 \sigma_A^2 + W_B^2 \sigma_B^2 + 2W_A W_B \text{Cov}_{AB}$$

Annualized standard deviation

$$= \sqrt{250} \times (\text{daily standard deviation})$$

% change in value vs. change in YTM

$$= -\text{duration} (\Delta Y) + \frac{1}{2} \text{convexity} (\Delta Y)^2$$

for Macaulay duration, replace ΔY by $\Delta Y / (1 + Y)$

BACKTESTING AND SIMULATION

Problems in a backtest of an investment strategy:

- **Survivorship Bias:** Using data that only includes entities that have persisted until today.
- **Look-ahead Bias:** Using information that was unavailable at the time of the investment decision.
- **Data Snooping:** Model is chosen by backtesting performance (i.e. large t-stat or small p-value).

Cross-validation: Model is first fitted using training data, and then its performance is assessed (often over several rounds) using separate testing data.

Scenario Analysis: Investigates a strategy's performance and risk under different structural regimes (e.g., recession versus nonrecession, or high volatility versus low volatility).

Stress Testing: Examines performance under the worst combinations of events and scenarios.

Historical Simulation: Observations are randomly chosen from the historical dataset.

Monte Carlo Simulation: Statistical distribution is specified and calibrated using historical return data.

Bootstrapping: Random samples are drawn *with* replacement. Useful when the number of simulations needed is large relative to the size of dataset.

Sensitivity Analysis: Overcomes the shortcomings of a traditional Monte Carlo simulation by taking into account fat tails and negative skewness.

ECONOMICS AND INVESTMENT MARKETS

$$\text{Inter-temporal rate of substitution} = m_t = \frac{u_t}{u_0}$$

$$= \frac{\text{marginal utility of consuming 1 unit in the future}}{\text{marginal utility of current consumption of 1 unit}}$$

$$\text{Real risk-free rate of return} = R = \frac{1 - P_0}{P_0} = \left[\frac{1}{E(m_t)} \right] - 1$$

Default-free, inflation-indexed, zero coupon:

$$\text{bond price} = P_0 = \frac{E(P_1)}{(1 + R)} + \text{cov}(P_1, m_1)$$

Nominal short-term interest rate (r)
 = real risk-free rate (R) + expected inflation (π)

Nominal long-term interest rate = $R + \pi + \theta$
 where θ = risk premium for inflation uncertainty

Break-even inflation rate (BEI)
 = $\text{yield}_{\text{non-inflation indexed bond}} - \text{yield}_{\text{inflation indexed bond}}$

BEI for longer maturity bonds
 = expected inflation (π) + infl. risk premium (θ)

Credit risky bonds required return = $R + \pi + \theta + \gamma$
 where γ = risk premium (spread) for credit risk

Discount rate for equity = $R + \pi + \theta + \gamma + \kappa$
 λ = equity risk premium = $\gamma + \kappa$
 γ = risk premium for equity vs. risky debt

Discount rate for commercial real estate
 = $R + \pi + \theta + \gamma + \kappa + \phi$
 κ = terminal value risk, ϕ = illiquidity premium

ACTIVE PORTFOLIO MANAGEMENT

Active return = portfolio return - benchmark return

$$R_A = R_p - R_B$$

$$\text{Portfolio return} = R_p = \sum_{i=1}^n w_{pi} R_i$$

$$\text{Benchmark return} = R_B = \sum_{i=1}^n w_{Bi} R_i$$

Information ratio

$$= \frac{R_p - R_B}{\sigma_{(R_p - R_B)}} = \frac{R_A}{\sigma_A} = \frac{\text{active return}}{\text{active risk}}$$

$$\text{Portfolio Sharpe ratio} = SR_p = \frac{R_p - R_f}{\text{STD}(R_p)}$$

Optimal level of active risk:

$$\text{Sharpe ratio} = \sqrt{SR_B^2 + IR_p^2}$$

$$\text{total portfolio risk: } \sigma_p^2 = \sigma_B^2 + \sigma_A^2$$

$$\text{Information ratio: IR} = TC \times IC \times \sqrt{BR}$$

$$\text{Expected active return: } E(R_A) = IR \times \sigma_A$$

"Full" fundamental law of active management:

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

Sharpe-ratio-maximizing aggressiveness level:

$$\text{STD}(R_A) = \frac{IR}{SR_B} \text{STD}(R_B)$$

TRADING COSTS AND ELECTRONIC MARKETS

Per share spread transaction cost = (side) \times
 (transaction price - midquote price)

Effective spread = $2 \times$ (per share spread transaction cost)

VWAP transaction cost for sell orders = trade size \times (benchmark VWAP benchmark - trade VWAP)

VWAP transaction cost for buy orders = trade size \times (trade VWAP benchmark - benchmark VWAP)

Implementation shortfall: Difference in value between a hypothetical "paper" portfolio and the actual portfolio.

Electronic markets enable: Hidden orders, leapfrogging, flickering quotes, electronic arbitrage machine learning.

Abusive trading practices include front running and market manipulation.

Market manipulation: Trading for price impact, rumormongering, wash trading, spoofing, bluffing, gunning the market, and squeezing/cornering.

ETHICAL AND PROFESSIONAL STANDARDS

I Professionalism

- I (A) Knowledge of the Law
- I (B) Independence and Objectivity
- I (C) Misrepresentation
- I (D) Misconduct

II Integrity of Capital Markets

- II (A) Material Nonpublic Information
- II (B) Market Manipulation

III Duties to Clients

- III (A) Loyalty, Prudence, and Care
- III (B) Fair Dealing
- III (C) Suitability
- III (D) Performance Presentation
- III (E) Preservation of Confidentiality

IV Duties to Employers

- IV (A) Loyalty
- IV (B) Additional Compensation Arrangements
- IV (C) Responsibilities of Supervisors

V Investment Analysis, Recommendations, and Action

- V (A) Diligence and Reasonable Basis
- V (B) Communication with Clients and Prospective Clients
- V (C) Record Retention

VI Conflicts of Interest

- VI (A) Disclosure of Conflicts
- VI (B) Priority of Transactions
- VI (C) Referral Fees

VII Responsibilities as a CFA Institute Member or CFA Candidate

- VII (A) Conduct as Participants in CFA Institute Programs
- VII (B) Reference to CFA Institute, the CFA Designation, and the CFA Program

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