

LEVEL II SCHWESER'S QuickSheet™

CRITICAL CONCEPTS FOR THE 2012 CFA® EXAM

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
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- VII Responsibilities as a CFA Institute Member or CFA Candidate
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QUANTITATIVE METHODS

Simple Linear Regression

Correlation:

$$r_{XY} = \frac{\text{cov}_{XY}}{(s_X)(s_Y)}$$

t-test for r ($n - 2$ df): $t = \frac{r\sqrt{n-2}}{\sqrt{1-r^2}}$

Estimated slope coefficient: $\frac{\text{cov}_{xy}}{\sigma_x^2}$

Estimated intercept: $\hat{b}_0 = \bar{Y} - \hat{b}_1\bar{X}$

Confidence interval for predicted Y-value:

$$\hat{Y} \pm t_c \times \text{SE of forecast}$$

Multiple Regression

$$Y_i = b_0 + (b_1 \times X_{1i}) + (b_2 \times X_{2i}) + (b_3 \times X_{3i}) + \varepsilon_i$$

- Test statistical significance of b ; $H_0: b = 0$.

$$t = \frac{\hat{b}_j}{s_{\hat{b}_j}}, n - k - 1 \text{ df}$$

- Reject if $|t| > \text{critical } t$ or $p\text{-value} < \alpha$.

Confidence Interval: $\hat{b}_j \pm (t_c \times s_{\hat{b}_j})$.

SST = RSS + SSE.

MSR = RSS / k .

MSE = SSE / $(n - k - 1)$.

- Test statistical significance of regression:

$$F = \text{MSR} / \text{MSE} \text{ with } k \text{ and } n - k - 1 \text{ df (1-tail)}.$$

- Standard error of estimate ($\text{SEE} = \sqrt{\text{MSE}}$).
Smaller SEE means better fit.
- Coefficient of determination ($R^2 = \text{RSS} / \text{SST}$).
% of variability of Y explained by X's; higher R^2 means better fit.

Regression Analysis—Problems

- Heteroskedasticity. Non-constant error variance. Detect with Breusch-Pagan test. Correct with White-corrected standard errors.
- Autocorrelation. Correlation among error terms. Detect with Durbin-Watson test; positive autocorrelation if $DW < d$. Correct by adjusting standard errors using Hansen method.
- Multicollinearity. High correlation among Xs. Detect if F-test significant, t-tests insignificant. Correct by dropping X variables.

Model Misspecification

- Omitting a variable.
- Variable should be transformed.
- Incorrectly pooling data.
- Using lagged dependent vbl. as independent vbl.
- Forecasting the past.
- Measuring independent variables with error.

Effects of Misspecification

Regression coefficients are biased and inconsistent, lack of confidence in hypothesis tests of the coefficients or in the model predictions.

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

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

Covariance stationary: mean and var. 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 avg. squared error.

Random Walk Time Series:

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

Seasonality: indicated by statistically significant lagged err. term. Correct by adding lagged term.

ARCH: detected by estimating:

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

Variance of ARCH series:

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

ECONOMICS

One Third Rule

- At given technology level, 1% $\uparrow$ in capital/labor hour $\Rightarrow$ 1/3% $\uparrow$ in real GDP per labor hour.

Classical Growth Theory

- Real GDP growth temporary (real GDP/person $\uparrow$ above subsistence level).
- Population explodes.
- Real GDP/person $\downarrow$ to subsistence level.

Neoclassical Growth Theory

- No technological change $\Rightarrow$ no real GDP growth.
- Technology changes $\Rightarrow$ increased saving and inv. $\Rightarrow$ capital/labor hour $\uparrow$ and real return $\downarrow$.
- Economic growth stops when real return = target return.
- Pop. growth independent of economic growth.

New Growth Theory

- Economic growth continues indefinitely as technology advances.
- $\downarrow$ real rate $\Rightarrow$ incentive to discover new products and methods.
- Discovery $\Rightarrow$ real return $>$ target return.

Foreign Exchange

Direct quotes: if quote is £ per \$ (or USD:GBP), this is a direct quote from the perspective of the pound. Bid-ask spread stated as percent of asking price:

$$\% \text{ spread} = \frac{\text{ask price} - \text{bid price}}{\text{ask price}} (100)$$

Foreign currency is at forward discount (premium) if F is below (above) S , using direct quotes:

$$(\text{fwd prem/disc}) = \left(\frac{\text{fwd rate}}{\text{spot rate}} - 1 \right) \left(\frac{360}{\text{term in days}} \right)$$

Currency appreciates due to:

- Lower relative income growth rate.
- Lower relative inflation rate.
- Higher domestic real interest rate.
- Improved investment climate.

Unanticipated shift to exp. monetary policy: higher income, accelerated infl., lower real interest rates; leads to currency depr. and financial acct. deficit. Unanticipated shift to exp. fiscal policy: currency appr., current acct. deficit, and financial account surplus.

Purchasing Power Parity

Law of one price: a single, clearly comparable good should have same real price in all countries.

Relative PPP: countries with high inflation rates should see their currencies depreciate.

$$S_0 \left[\frac{1 + I_{\text{counter currency}}}{1 + I_{\text{base currency}}} \right]^t = E(S_t)$$

International Fisher Relation

Assumes real interest rates are equal across borders, so interest differential equals expected inflation diff:

$$\frac{1 + r_b}{1 + r_a} = \frac{1 + E(i_b)}{1 + E(i_a)}$$

$$r_b - r_a \approx E(i_b) - E(i_a)$$

Uncovered Interest Rate Parity

Countries with high nominal interest rates should see their currencies depreciate:

$$S_0 \times \left[\frac{1 + r_{\text{counter currency}}}{1 + r_{\text{base currency}}} \left(\frac{n}{360} \right) \right] = E[S_n]$$

Interest Rate Parity

Countries with high nominal interest rates will have their currencies sell at forward discount to prevent arbitrage.

ECONOMICS continued...

$$\frac{F}{S} = \frac{(1 + r_b)}{(1 + r_s)}$$

Currency Arbitrage

"Up the bid and down the ask."

FINANCIAL STATEMENT ANALYSIS

LIFO/FIFO

As compared to LIFO, FIFO results in:

- Lower COGS.
- Higher taxes.
- Higher net income.
- Higher inventory balances.
- Lower cash flow (more taxes).
- Higher net and gross margins.
- Higher current ratio.
- Lower inventory turnover.
- Lower debt-to-equity.

LIFO to FIFO

To adjust a LIFO firm's financial statements to reflect the FIFO cost flow method:

- Add the LIFO reserve to current assets (ending inventory).
- Subtract the income taxes on the LIFO reserve from current assets (cash).
- Add the LIFO reserve, net of tax, to shareholders' equity.
- Subtract the change in the LIFO reserve from COGS.
- Add the income taxes on the change in the LIFO reserve to income tax expense.

Depreciation Analysis

Average age (in years) = accumulated depreciation / annual depreciation expense.

Average depreciable life = ending gross investment / annual depreciation expense.

Remaining useful life = ending net investment / annual depreciation expense.

Accounting for InterCorp Investments

Investment in Financial Assets: <20% owned, no sig. influence.

- Held-to-maturity at cost on B/S; int. and realized gain/loss on I/S.
- Available-for-sale at FMV with unrealized gains/losses in equity on B/S; dividends, interest, realized gains/losses on I/S.
- Held-for-trading at FMV; dividends, interest, realized and unrealized gains/losses on I/S.
- Designated as fair value-like held for trading.

Investments in Associates: 20–50% owned, sig. 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, liab., rev. & exp. of sub. combined with parent, excluding intercomp. trans. If <100%, minority interest acct. for share not owned.

Joint Venture: 50% shared control. IFRS: Proportionate consol. preferred, similar to regular consol. except only incl. pro-rata share. U.S. GAAP: Equity method.

Financial Effect of Choice of Method

- Equity, acquisition, & proportionate consolidation:
- All three methods report same net income.
- Assets, liabilities, sales are highest under acquisition; lowest under equity method; proportionate consolidation in between.

Differences between IFRS and U.S. GAAP treatment of intercorporate investments include:

- Unrealized FX gains and losses on available-for-sale securities recognized on income statement under IFRS and as other comprehensive income under U.S. GAAP.
- U.S. GAAP categorizes business combinations as mergers, acquisitions, or consolidations. IFRS does not distinguish between types of business combinations.
- IFRS permits either the "partial goodwill" or "full goodwill" methods to value goodwill and noncontrolling interest. U.S. GAAP requires the full goodwill method.
- U.S. GAAP requires equity method for joint ventures. Under IFRS, proportionate consolidation preferred but the equity method is permitted.

Entity is a VIE if any of the following:

- Insufficient at-risk equity investment.
- S/h lack decision-making rights.
- S/h do not absorb losses.
- S/h do not receive residual benefits.

The primary beneficiary consolidates the VIE.

Pension Accounting

- PBO components: current service cost, interest cost, actuarial gains/losses, benefits paid.
- Funded status = plan assets – PBO.
- Pension expense components: current service cost, interest cost, expected return on plan assets, prior (past) service cost, net actuarial gain/loss.
- Aggressive assumptions/low earnings quality: high discount rate, low compensation growth rate, high expected return.

Economic Pension Exp.: if < firm contribution, diff. = ↓ in overall pension oblig. If > firm contribution, diff = borrowing (and reclass from CFO to CFF).

Balance Sheet: GAAP vs. IFRS

GAAP: net asset/liab. = funded status = economic reality. IFRS: net asset/liab. = funded status adj. for unrecognized items.

Underlying Economic Pension Exp.: sum of all chgs. in PBO (except benefits paid) less actual ROA. Also, = chg. in funded status excl. firm's contributions. Service cost = operating expense. Interest and actual ROA repeated as nonop. income.

Multinational Operations: Choice of Method

For self-contained sub, functional ≠ presentation currency; use all-current 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 F/S vs. All-Current

- Pure BS and IS ratios unchanged.
- If LC depreciating, translated mixed ratios will be larger.
- If LC appreciating, translated mixed ratios will be smaller.

Hyperinflation: GAAP vs. IFRS

Hyperinfl. = cumul. infl. > 100% over 3 yrs. GAAP: use temporal method. IFRS: 1st, restate foreign

curr. st. for infl. 2nd, translate with all-current. Net purch. power gain/loss reported in income.

Accrual-Based Income: accrual part less persistent than cash part.

Measures of earnings quality: (↓ = better)

$$\text{Accruals}^{\text{BS}} = \text{NOA}_{\text{END}} - \text{NOA}_{\text{BEG}}$$

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

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

Mean Reversion: occurs faster with larger accrual earnings component.

CORPORATE FINANCE

Capital Budgeting Expansion

- Initial outlay = FCInv + WCInv.
- $\text{CF} = (\text{S} - \text{C} - \text{D})(1 - \text{T}) + \text{D} = (\text{S} - \text{C})(1 - \text{T}) + \text{DT}$.
- $\text{TNOCF} = \text{Sal}_T + \text{NWCFInv} - \text{T}(\text{Sal}_T - \text{B}_T)$.

Capital Budgeting Replacement

- Same as expansion, except current after-tax salvage of old assets reduces initial outlay.
- Incremental depreciation is Δ in depth.

Projects with Unequal Lives

- Least common multiple of lives.
- Equivalent annual annuity (EAA): annuity equal to PV of project CFs.

Effects of Inflation

- Discount nominal (real) cash flows at nominal (real) rate; unexpected changes in inflation affect project profitability; reduces the real tax savings from depreciation; decreases value of fixed payments to bondholders; affects costs and revenues differently.

Capital Rationing

- If +NPV projects > capital, choose combination with highest NPV.

Real Options

- Timing, abandonment, expansion, flexibility, fundamental options.

Economic and Accounting Income

- Econ inc. = AT CF + Δ in project's MV.
- Econ dep. based on Δ in investment's MV.
- Econ inc. calculated before interest expense (cost of cap reflected in discount rate).
- Acc inc. = project rev. – costs.
- Acc. dep. based on original investment cost.
- Interest (financing costs) deducted before calculating accounting income.

Valuation Models

- Econ. profit = NOPAT – \$WACC; discounted at WACC.
- Residual income: = NI – equity charge; discounted at required return on equity.
- Claims valuation separates CFs based on equity claims (discounted at cost of equity) and debt holders (discounted at cost of debt).

MM Prop I (No Taxes): capital structure irrelevant (no taxes, trans., or bankruptcy costs).

MM Prop II (No Taxes): increased use of cheaper debt increases cost of equity, no change in WACC.

MM Proposition I (With Taxes): tax shield adds value, value maximized at 100% debt.

MM Proposition II (With Taxes): tax shield adds value, WACC minimized at 100% debt.

Investor Preference Theories

- MM's dividend irrelevance theory holds that in a no-tax/no-fees world, dividend policy is irrelevant

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CORPORATE FINANCE continued...

because individual investors can create their own homemade dividend.

- Dividend preference theory says investors prefer the certainty of current cash to future capital gains.
- Tax aversion theory states that investors are tax averse to dividends and would prefer companies instead buy back shares.

Effective Tax Rate on Dividends

Double taxation or split rate systems:

$$\text{eff. rate} = \text{corp. rate} + (1 - \text{corp. rate})(\text{indiv. rate})$$

Imputation system: effective tax rate is the shareholder's individual tax rate.

Signaling Effects of Dividend Changes

Initiation: ambiguous signal.

Increase: positive signal.

Decrease: negative signal unless management sees many profitable investment opportunities.

When the stock goes ex-dividend:

$$\Delta P = \frac{D(1 - T_D)}{(1 - T_{CG})}$$

Target Payout Ratio Adjustment Model

If company earnings are expected to increase and the current payout ratio is below the target payout ratio, an investor can estimate future dividends through the following formula:

$$\text{expected dividend} = \left(\frac{\text{previous dividend}}{\text{dividend}} \right) + \left(\frac{\text{expected increase in EPS}}{\text{target payout ratio}} \right) \times \left(\frac{\text{adjustment factor}}{\text{factor}} \right)$$

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.

Dividend Policy Approaches

- Residual dividend: dividends based on earnings less funds retained to finance capital budget.
- Longer-term residual dividend: forecast capital budget, smooth dividend payout.
- Dividend stability: dividend growth aligned with sustainable growth rate.
- Target payout ratio: long-term payout ratio target.

Corporate Governance Objectives

- Mitigate conflicts of interest between (1) managers and shareholders, and (2) directors and shareholders.
- Ensure assets used to benefit investors and stakeholders.

Merger Types: horizontal, vertical, conglomerate.

Merger Motivations: achieve synergies, more rapid growth, incr. mkt. power, gain access to unique capabilities, diversify, mgr. personal benefits, tax benefits, unlock hidden value, achieving intl. goals, and bootstrapping earnings.

Pre-Offer Defense Mechanisms: poison pills and puts, reincorp. in a state w/ restrictive takeover laws, staggered board elections, restrict. voting rights, supermajority voting, fair price amendments, and golden parachutes.

Post-Offer Defense Mechanisms: litigation, greenmail, share repurch, leveraged recap, the

"crown jewel," "Pac man," and "just say no"

defenses, and white knight/white squire.

The Herfindahl-Hirschman Index (HHI): mkt.

power = sum of squared mkt. shares for all industry firms. High or ↑ HHI mean regulators more likely to challenge a merger.

Methods to Determine Target Value

DCF method: target proforma FCF discounted at adj. WACC.

Comparable company analysis: target value from relative valuation metrics on similar firms + takeover premium.

Comparable transaction analysis: target value from takeover transaction; takeover premium included.

Merger Valuations

Combined firm:

$$V_{AT} = V_A + V_T + S - C$$

Takeover premium (to target):

$$\text{Gain}_T = TP = P_T - V_T$$

Synergies (to acquirer):

$$\text{Gain}_A = S - TP = S - (P_T - V_T)$$

Merger Risk & Reward

Cash offer: acquirer assumes risk & receives reward.

Stock offer: some of risks & rewards shift to target. If higher confidence in synergies; acquirer prefers cash & target prefers stock.

Forms of divestitures: equity carve-outs, spin-offs, split-offs, and liquidations.

EQUITY AND ALTERNATIVE INVESTMENTS

Porter's Five Forces/Competitive Strategy

1. Threat of new entrants. ↑ = more pricing pressure, lower industry profits.
2. Threat of substitutes. Is there a price ceiling? More cost effective, more pricing pressure. Buyer propensity to substitute. Switching costs.
3. Bargaining power of buyers = function of bargaining leverage/price sensitivity.
4. Bargaining power of suppliers: determined by differentiation of inputs, presence of sub. inputs, supplier concentration, importance to supplier, threat of forward integration.
5. Rivalry among existing competitors. ↑ rivalry = ↑ risk of destructive price/feature/marketing wars. Function of industry growth, fixed costs, value added, product differences, branding, diversity of competitors, exit barriers.

Key point: Who captures value added?

Strategic Alternatives

- Positioning firm where five forces weakest.
- Project and exploit changes in industry.
- Induce industry changes to play to firm strength.

Industry Analysis

- Industry life cycle: Pioneer → Growth → Mature → Decline.
- External factors: technology, government, social change, demography, foreign influences.

Nominal vs. Real: Distinction Matters

- Inflation distorts reported financial statements: reported profitability and fixed asset turnover are higher; leverage is lower.
- It is better to adjust cash flows than to add CRP to discount rate while valuing emerging market stocks.

Discounted Cash Flow (DCF) Methods

Use dividend discount models (DDM) when:

- Firm has dividend history.
- Dividend policy 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:

$$V_0 = \frac{D_1}{r - g}$$

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

$$V_0 = \frac{E}{r} + PVGO$$

2-Stage Growth Model

Step 1: Calculate dividends in high-growth period.

Step 2: Use GGM for terminal value at end of high-growth period.

Step 3: Discount interim dividends and terminal value to time zero to find stock value.

H-Model

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

$$H = \frac{t}{2}$$

Solving for Required Return

For Gordon (or stable growth) model, solving for return yields:

$$r = \frac{D_1}{P_0} + g$$

Free Cash Flow to Firm (FCFF)

Assuming DEP is 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 to Earnings (P/E) Ratio

Problems with P/E:

- If earnings < 0, P/E meaningless.

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EQUITY AND ALTERNATIVE INVESTMENTS continued...

- Volatile, transitory portion of earnings makes interpretation difficult.
- Management discretion over accounting choices affects reported earnings.

Justified P/E

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

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

Normalization Methods

- Historical average EPS.
- Average ROE.

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 in valuing mature, cyclical, and start-up firms.

Disadvantages:

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

$$\text{justified P/S} = \frac{\text{PM}_0 \times (1-b)(1+g)}{r-g}$$

DuPont Model

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

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 Models

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

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

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

Economic Value Added®

- $\text{EVA} = \text{NOPAT} - \$\text{WACC}$; $\text{NOPAT} = \text{EBIT}(1 - \tau)$.
- Real Estate (RE) Investment Analysis.
- $\text{CFAT} = \text{NOI} - \text{debt service} - \text{taxes payable}$.
- $\text{ERAT} = \text{net selling price} - \text{mortgage balance} - \text{taxes}$.

- *Recaptured depreciation*: depr. taken in anticipation of ↓ in asset's value that did not materialize.

Types of Real Estate Investments

Raw land: passive and illiquid; for speculators and developers.

Apartments and office buildings: active, moderately liquid; tax-shelters for high-income investors.

Warehouses: passive, moderately liquid; for passive investors and those seeking tax shelter.

Shopping centers: moderately active, low-liquidity; for wealthy investors.

Hotels and motels: active, moderately liquid; for those seeking tax shelter.

Income Property Analysis: Cap Rate

Market extraction:

$$R_0(\text{ME}) = \frac{\text{NOI}}{\text{MV}}$$

Use when income data is available.

Valuing Income Properties

Direct income capitalization technique:

$$\text{MV}_0 = \frac{\text{NOI}_1}{r - g} = \frac{\text{NOI}_1}{R}$$

Gross income multiplier technique:

$$\text{MV} = \text{gross income} \times \text{income multiplier}$$

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

Private Equity Valuation

$$\text{DLOC} = 1 - \left[\frac{1}{1 + \text{Control Premium}} \right]$$

The DLOC and DLOM are applied multiplicatively using: total discount = $1 - [(1 - \text{DLOC})(1 - \text{DLOM})]$.

The DLOM varies with the following.

- An impending IPO or firm sale would decrease the DLOM.
- The payment of dividends would decrease the DLOM.
- Earlier, higher payments (i.e., lower duration) would decrease the DLOM.
- Contractual restrictions on selling stock would increase the DLOM.
- A greater pool of buyers would decrease the DLOM.
- Greater risk and value uncertainty would increase the DLOM.

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

Private Equity

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, primary 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 mkt sales; MBO; liquidation.

Performance Measurement: gross IRR = return from portfolio companies. Net IRR = relevant for LP, net of fees & carried interest.

Performance Statistics:

- $\text{PIC} = \% \text{ capital utilized by GP}$; cumul. sum of capital called down.
- $\text{Mgmt. fee} = \% \text{ of PIC}$.
- $\text{Carried interest} = \% \text{ carried int} \times (\text{change in NAV before distrib.})$.

- NAV before distrib. = prior yr. NAV after distrib. + cap. called down – mgmt. fees + op. result.
- NAV after distrib. = NAV before distrib. – carried int. – distrib.
- $\text{DPI mult.} = (\text{cumul. distrib.}) / \text{PIC} = \text{LP's realized return}$.
- $\text{RVPI mult.} = (\text{NAV after distrib.}) / \text{PIC} = \text{LP's unrealized return}$.
- $\text{TVPI mult.} = \text{DPI mult.} + \text{RVPI mult.}$.

NPV VC & IRR methods: calculate pre-money val., post-money val. ownership fraction, & price per share. NPV methods starts with POST, IRR with exp. future wealth.

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

Hedge Funds

Differ from mutual funds: use more leverage, have lower regulation and liquidity. Biases in index performance: selection bias, backfill bias, and survivorship bias. Hedge fund return distribution is not normal—characterized by negative skewness and high kurtosis (both undesirable for investors). Standard deviation as a measure of risk is flawed. Factor-based replication strategies aim to separate beta return from alpha return. Replication strategies may be pursued to avoid high fees, if alpha is not delivered, or to overcome illiquidity of funds and poor transparency. Funds of funds add a second layer of fees but deliver average returns. Diversification does, however, make funds of funds less risky as compared to single manager funds.

FIXED INCOME

Credit Analysis

High-yield debt

- Issuer has senior, short-term, floating bank debt.
- Analyze corporate structure, debt structure.

Asset-backed debt

- Quality of collateral.
- Servicer quality.
- Cash flow stress and payment structure.
- Legal structure.

Municipal bonds

- Tax-backed municipal bond analysis involves: issuer's debt structure, budgetary policy, local tax and intergovernmental revenue availability, and issuer's socioeconomic environment.
- Municipal bond credit analysis: limits of the basic security, flow of funds structure, rate covenants, and additional bonds tests.

Sovereign debt

- Local vs. foreign currency rating.
- Economic risk: ability to pay.
- Political risk: willingness to pay.

Theories of the Term Structure

Pure (unbiased) expectations. Forward rates (F) function of expected future spot rates $E(S)$.

- If up sloping, ST spot rates rise.
- If down sloping, ST rate spot rates fall.
- If flat, ST spot rates constant.

Liquidity theory: F rates reflect expectations of $E(S)$ plus liquidity premium.

Preferred Habitat Theory: Imbalance between fund supply/demand at maturity range induces lenders to shift from preferred habitats to one with opposite imbalance.

Key Rate Duration

- $\% \Delta \text{value from } 100 \text{ bps } \Delta \text{ in key rate}$.
- Have several key rates (5-yr, 10-yr).
- Estimate effect of non-parallel yield curve shift on bond portfolio value.

FIXED INCOME continued...

Valuing Option Free Bonds

To value option free bond with the binomial tree, start at end and discount back through the tree (backwards induction method).

Value 2-year, option-free bond:

Step 1: Find the time one up-node value:

$$\text{nodal value}_{1,U} = \frac{1}{2} \left(\frac{\text{nodal value}_{2,UU}}{1+i_{1,U}} + \frac{\text{nodal value}_{2,UD}}{1+i_{1,U}} \right)$$

Step 2: Find time one down-node value.

Step 3: Find time zero value:

$$\text{nodal value}_0 = \frac{1}{2} \left(\frac{\text{nodal value}_{1,U}}{1+i_0} + \frac{\text{nodal value}_{1,D}}{1+i_0} \right)$$

Value Bond with Embedded Option

For bonds with embedded options, assess whether option will be exercised at each node. New Step 3 is:

Step 3: (callable bond). Find time 0 value assuming year 1 down-node calculated value > than call price:

$$\text{nodal value}_0 = \frac{1}{2} \left(\frac{\text{nodal value}_{1,U}}{1+i_0} + \frac{\text{call value}}{1+i_0} \right)$$

Call = noncallable bond – callable bond

Put = puttable bond – nonputtable bond

Option Adjusted Spread

- “Option-removed spread.”
- Compensation for liquidity and credit risk relative to benchmark.
- Spread that forces model price = market price.
- OAS + option cost = Z-spread.

Relative Valuation Analysis

If benchmark is Treasuries or higher-rated bond sector:

- Bond is undervalued if OAS > required OAS.
- Bond is overvalued if OAS < required OAS.

If benchmark is issuer-specific:

- Bond is undervalued if OAS > 0.
- Bond is overvalued if OAS < 0.

Convertible Bonds

- Conversion value = stock price × conversion ratio.
- Minimum value = max (straight value, conversion value).
- Market conversion premium = conversion price – market price.
- Callable convertible bond = straight bond + call on stock – call on bond.

MBS Prepayment Risk

Prepayment Speed Factors

- Spread of current vs. original mortgage rates.
- Mortgage rate path (refinancing burnout).
- Housing turnover.
- Loan seasoning and property location.

Contraction risk occurs as rates fall, prepayments rise, average life falls.

Extension risk occurs as rates rise, prepayments fall (slow), average life rises.

CMO Prepayment Risk

- PAC I tranches: low contraction and extension risk (due to PAC collar).
- PAC II tranches: somewhat higher contraction and extension risk.
- Support tranches: higher contraction and extension risk.
- IO strips: value positively related to interest rates at low current rates.
- PO strips: negative convexity at low rates, high interest rate sensitivity.

Commercial MBS

- Non-recourse, so focus on property credit risk.

- Loan-level call protection: prepayment lockout; defeasance; prepayment penalty; yield maintenance charge.
- Pool-level call protection: senior and subordinated tranches.

ABS Credit Enhancement

- External: corporate guarantees, letters of credit, bond insurance.
- Internal: reserve funds, overcollateralization, senior/sub structure.

ABS Prepayment Risk

- Closed-end HEL: prepayments also affected by borrower credit traits.
- Manufactured housing loan: low prepayment risk; small balances, high depreciation, low borrower credit ratings.
- Auto loan: low prepayment risk; small balances, high depreciation.
- Student loan: prepayments from default, loan consolidation.
- Credit card receivable: low prepayment risk; lockout period, no prepayment on credit cards.

Collateralized Debt Obligation (CDO)

- Structure: senior tranche(s), mezzanine tranches, equity tranche.
- Arbitrage-driven cash CDO: use interest rate swap.
- Cash flow CDO: actively managed, no short-term trading.
- Synthetic CDO: bondholders take on economic risks of assets but not legal ownership of them; link contingent payments to reference asset (e.g., a bond index).
- Advantages of synthetic CDO: no funding, shorter ramp-up period, acquire exposure more cheaply through credit-default swap.

MBS/ABS Spread Analysis

- Plain-vanilla corporate: use Z-spread.
- Callable corporate: use OAS (binomial model).
- MBS: use OAS (Monte Carlo model).
- Credit card/auto ABS: use Z-spread.
- High-quality home equity ABS: use OAS.

DERIVATIVES

Forwards: No Arbitrage Pricing

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

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

Equity Forward

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

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

Forward on Fixed Income Securities

$$FP(\text{fixed income}) = (S_0 - PVC) \times (1 + R_f)^T$$

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

Forward Rate Agreement (FRA)

- FRA is forward contract on interest rate; long wins when rates increase, loses when rates decrease.
- FRA price is implied forward interest rate for period beginning when FRA expires to underlying loan maturity.
- FRA value at maturity is interest savings at maturity of loan discounted back to FRA expiration at current LIBOR.

- FRA value prior to maturity is interest savings estimated by implied forward rate discounted back to valuation date at current LIBOR.

Currency Forward (Interest Rate Parity)

$$FP(\text{currency}) = S_0 \times \frac{(1 + R_{DC})^T}{(1 + R_{FC})^T}$$

F and S in DC/FC

$$V_{\text{long}} = \left[\frac{S_t}{(1 + R_{FC})^{T-t}} \right] - \left[\frac{FP}{(1 + R_{DC})^{T-t}} \right]$$

Futures Price

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

- Futures > forward when rates and asset values positively correlated.
- Futures < forward when rates and asset values negatively correlated.

Futures Arbitrage

Cash and carry: borrow, buy spot, sell futures today; deliver asset, repay loan at end.

Reverse cash and carry: short spot, invest, buy futures today; collect loan, buy asset under futures contract, deliver to cover short sale.

Costs and Non-Monetary Benefits

- Holding costs increase futures price; non-monetary benefits reduce futures price.
- Backwardation: futures price < spot price.
- Contango: futures price > spot price.
- Normal backwardation: futures price < expected spot price.
- Normal contango: futures price > expected spot price.

Treasury Bond Futures

$$FP = [\text{bond price} \times (1 + R_f)^T - FVC] \times \frac{1}{CF}$$

Equity Futures

$$FP(\text{stock}) = S_0 \times (1 + R_f)^T - FVD$$

$$FP(\text{index}) = S_0 \times e^{(R-\delta)T}$$

Eurodollar Futures

- Priced as discount yield; LIBOR-based deposits priced as add-on yield ⇒ deposit value not perfectly hedged by Eurodollar contract.
- Can't price Eurodollar futures using no-arb. framework.

Put-Call Parity

call + RF bond = put + underlying

$$C_0 + \frac{X}{(1+r)^T} = P_0 + S_0$$

Caps and Floors

- Cap = portfolio of calls on LIBOR.
- Floor = portfolio of puts on LIBOR.
- Collar = buy cap and sell floor, or sell cap and buy floor.

Binomial Option Pricing Model

Step 1: Calculate option payoffs at end in all states.

Step 2: Calculate expected value using probabilities.

$$\pi_{\text{up}} = \frac{1 + R - D}{U - D}$$

Step 3: Discount to today at risk-free rate.

BSM Assumptions & Limitations

- Assumptions: price of underlying follows lognormal distribution; (continuous) risk-free rate constant and known; σ of underlying asset constant and known; frictionless markets; underlying asset has no CF; European options.

DERIVATIVES continued...

- Limitations: not useful for pricing options on bond prices/interest rates; σ must be estimated; σ not constant over time; frictionless markets assumption not realistic.

Effect of Each Variable on a Call Option

- Asset price: positively related.
- Volatility of asset price: positively related.
- Risk-free rate: positively related.
- Time to expiration: value $\rightarrow$ \$0 as call $\rightarrow$ maturity.
- Exercise price: negatively related.

Delta

Estimates the change in value of option for a one-unit change in stock price.

- Call delta between 0 and 1; increases as stock price increases.
- Call delta close to 0 for far out-of-the-money calls; close to 1 for far in-the-money calls.
- Put delta between -1 and 0; increases from -1 to 0 as stock price increases.
- Put delta = call delta - 1 (all else equal).
- Delta close to 0 for far out-of-the-money puts; close to -1 for far in-the-money puts.

Delta Neutral Hedging

$$\# \text{ calls for delta hedge} = \frac{\# \text{ shares of stock}}{\text{delta of call option}}$$

Delta-neutral position only holds for very small changes in value of underlying stock.

Delta-neutral portfolio must be frequently (continuously) rebalanced to maintain hedge; called a dynamic hedge.

Gamma

Measures rate of change in delta as underlying stock price changes; largest when option is at-the-money.

Currency Swaps

Parties swap payments in two currencies at fixed or floating rates.

Interest Rate Swaps

Plain vanilla interest rate swap: trading fixed interest rate payments for floating rate payments.

Equity Swaps

Return on stock, portfolio, or stock index is paid each period by one party in return for a fixed payment. Return can be capital appreciation or total return including dividends on the stock or portfolio.

Swap Pricing and Valuation

- Swap rate is set so PV of floating rate payments = PV of fixed rate payments; swap value is zero to both parties:

$$C_N = \frac{1 - Z_N}{Z_1 + Z_2 + \dots + Z_N}$$

Z_n = PV of \$1 on nth date

- Value to fixed-pay side = PV of floating - PV of fixed; value increases when rates increase.
- Value to floating-pay side = PV of fixed - PV of floating; value increases when rates decrease.

Credit Derivatives

Credit default swap: compensates buyer when credit event occurs on referenced bond/loan. Pricing depends on credit risk of reference obligation, not interest rate risk.

Strategies: basis, curve, index, options, capital structure, and correlation trades.

PORTFOLIO MANAGEMENT

CAL: eff. front. with R_F becomes straight line.

$$E(R_C) = R_F + \left[\frac{E(R_T) - R_F}{\sigma_T} \right] \sigma_C$$

CML

$$E(R_C) = R_F + \left[\frac{E(R_M) - R_F}{\sigma_M} \right] \sigma_C$$

Market price of risk = Sharpe ratio of mkt. port.
= slope of CML = mkt. risk premium per unit of market risk.

CAPM: $E(R_i) = R_F + \beta_i [E(R_M) - R_F]$

$$\beta_i = \frac{\text{Cov}_{iM}}{\sigma_M^2} = \frac{\rho_{iM} \sigma_i \sigma_M}{\sigma_M^2} = \rho_{iM} \left(\frac{\sigma_i}{\sigma_M} \right)$$

Market Model: $R_i = a_i + b_i R_M + \varepsilon_i$

Multifactor Model: extension of a 1-factor mkt. model. 3 types: macroeconomic factor, fundamental factor, and statistical factor.

APT: $E(R_p) = R_F + b_{p(1)} + b_{p(2)} + \dots + b_{p(k)}$

Active return: $(R_p - R_b)$

Information Ratio

$$IR = \frac{\bar{R}_p - \bar{R}_B}{\sigma(R_p - R_B)}$$

Factor Portfolio: has sensitivity of one to particular factor and zero to all other factors.

Tracking Portfolio: port with specific set of factor sensitivities.

Foreign Currency Risk Premium (FCRP)

Expected foreign currency appreciation less interest rate differential:

$$FCRP = E(\% \Delta S) - (r_{DC} - r_{FC}), S \text{ in DC/FC}$$

International CAPM

DC return = FC interest rate + FC appreciation = DC interest rate + FCRP

$$E(R) = R_F + (\beta_G \times MRP_G) + (\gamma_1 \times FCRP_1) + (\gamma_2 \times FCRP_2)$$

$$\gamma = \gamma(LC) + 1$$

Currency Exposure

- Exporters are hurt and importers are helped by domestic currency appreciation.
- Traditional model predicts domestic currency depreciation will improve competitiveness and increase equity prices (negative currency exposure).
- Money demand model predicts positive currency exposure: decreased LR economic activity causes currency depreciation and lower equity prices.

Treynor Black Model

1. Develop cap. mkt. expectations for passively managed mkt. index port. (M).
2. ID ltd. # of mispriced securities (large +/- alphas).
3. Determine weighting (w) across mispriced securities to form actively managed port. (A).
Weight (w) large for high α , low unsyst. risk.
4. Determine w to A & M to form optimal portfolio P, using Sharpe ratio (P has highest Sharpe ratio):

$$\frac{E(R_P) - R_F}{\sigma_P}$$

5. Determine the appropriate allocation to R_F & P that satisfies investor risk aversion.

Portfolio Management Planning Process

- Analyze risk and return objectives.
- Analyze constraints: liquidity, time horizon, legal and regulatory, taxes, unique circumstances.
- Develop IPS: client description, purpose, duties, objectives and constraints, performance review schedule, modification policy, rebalancing guidelines.
- Determine investment strategy: passive, active, semi-active.
- Select strategic asset allocation: asset class. weightings based on capital market expectations.
- Investor time horizons can be short-term, long-term, or multistage. Longer time horizons indicate a greater ability to take risk and influence the appropriate asset allocation by allowing the investor to invest in longer-term, less liquid, higher-risk securities.
- The investment professional who manages client portfolios well meets both standards of competence and standards of conduct. It is important to recognize that the portfolio manager, who is an expert in the field with presumably more knowledge of investment principles than the client, is in a position of trust and so must meet the highest standards of ethical conduct in order to truly serve clients. The appropriate standard of conduct is embodied by the CFA Institute Code and Standards.

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