

LEVEL I 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.
 - 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 Members and Candidates in the CFA Program.
 - VII (B) Reference to CFA Institute, the CFA Designation, and the CFA Program.

Global Investment Performance Standards (GIPS®)

- **Compliance statement:** "[Insert name of firm] has prepared and presented this report in compliance with the Global Investment Performance Standards (GIPS)." Compliance must be applied on a firm-wide basis.
- **Nine sections:** fundamentals of compliance, input data, calculation methodology, composite construction, disclosures, presentation and reporting, real estate, private equity, and wrap fee/separately managed account portfolios.

QUANTITATIVE METHODS

Time Value of Money Basics

- **Future value (FV):** amount to which investment grows after one or more compounding periods.
- **Future value:** $FV = PV(1 + I/Y)^N$.
- **Present value (PV):** current value of some future cash flow $PV = FV/(1 + I/Y)^N$.
- **Annuities:** series of equal cash flows that occur at evenly spaced intervals over time.
- **Ordinary annuity:** cash flow at end-of-time period.
- **Annuity due:** cash flow at beginning-of-time period.
- **Perpetuities:** annuities with infinite lives.
 $PV_{\text{perpetuity}} = PMT/(\text{discount rate})$.

Required Rate of Return

Components:

1. Real risk-free rate (RFR).
 2. Expected inflation rate premium (IP).
 3. Risk premium.
- $$E(R) = (1 + RFR_{\text{real}})(1 + IP)(1 + RP) - 1$$

Approximation formula for nominal required rate:

$$E(R) \approx RFR + IP + RP$$

Means

Arithmetic mean: sum of all observation values in sample/population, divided by # of observations.

Geometric mean: used when calculating investment returns over multiple periods or to measure compound growth rates.

Geometric mean return:

$$\bar{R}_G = [(1 + R_1) \times \dots \times (1 + R_N)]^{1/N} - 1$$

$$\text{harmonic mean} = \frac{N}{\sum_{i=1}^N \frac{1}{X_i}}$$

Variance and Standard Deviation

Variance: average of squared deviations from mean.

$$\text{population variance} = \sigma^2 = \frac{\sum_{i=1}^N (x_i - \mu)^2}{N}$$

$$\text{sample variance} = s^2 = \frac{\sum_{i=1}^n (x_i - \bar{x})^2}{n - 1}$$

Standard deviation: square root of variance.

Holding Period Return (HPR)

$$R_t = \frac{P_t - P_{t-1} + D_t}{P_{t-1}} \text{ or } \frac{P_t + D_t}{P_{t-1}} - 1$$

Coefficient of Variation

Coefficient of variation (CV): expresses how much dispersion exists relative to mean of a distribution; allows for direct comparison of dispersion across different data sets. CV is calculated by dividing standard deviation of a distribution by the mean or expected value of the distribution:

$$CV = \frac{s}{\bar{x}}$$

Sharpe Ratio

Sharpe ratio: measures excess return per unit of risk.

$$\text{Sharpe ratio} = \frac{\bar{r}_p - r_f}{\sigma_p}$$

$$\text{Roy's safety-first ratio: } \frac{\bar{r}_p - r_{\text{target}}}{\sigma_p}$$

For both ratios, larger is better.

Expected Return/Standard Deviation

Expected return: $E(X) = \sum P(x_i) x_i$

$$E(X) = P(x_1)x_1 + P(x_2)x_2 + \dots + P(x_n)x_n$$

Probabilistic variance:

$$\begin{aligned} \sigma^2(X) &= \sum P(x_i) [x_i - E(X)]^2 \\ &= P(x_1)[x_1 - E(X)]^2 + P(x_2)[x_2 - E(X)]^2 \\ &\quad + \dots + P(x_n)[x_n - E(X)]^2 \end{aligned}$$

Standard deviation: take square root of variance.

Correlation and Covariance

Correlation: covariance divided by product of the two standard deviations.

$$\text{corr}(R_i, R_j) = \frac{\text{COV}(R_i, R_j)}{\sigma(R_i)\sigma(R_j)}$$

Expected return, variance of 2-stock portfolio:

$$E(R_p) = w_A E(R_A) + w_B E(R_B)$$

$$\begin{aligned} \text{var}(R_p) &= w_A^2 \sigma^2(R_A) + w_B^2 \sigma^2(R_B) \\ &\quad + 2w_A w_B \sigma(R_A) \sigma(R_B) \rho(R_A, R_B) \end{aligned}$$

Normal Distributions

Normal distribution is completely described by its mean and variance.

68% of observations fall within $\pm 1\sigma$.

90% fall within $\pm 1.65\sigma$.

95% fall within $\pm 1.96\sigma$.

99% fall within $\pm 2.58\sigma$.

Computing Z-Scores

Z-score: "standardizes" observation from normal distribution; represents # of standard deviations a given observation is from population mean.

$$z = \frac{\text{observation} - \text{population mean}}{\text{standard deviation}} = \frac{x - \mu}{\sigma}$$

Binomial Models

Binomial distribution: assumes a variable can take one of two values (success/failure) or, in the case of a stock, movements (up/down). A binomial model can describe changes in the value of an asset or portfolio; it can be used to compute its expected value over several periods.

Sampling Distribution

Sampling distribution: probability distribution of all possible sample statistics computed from a set of equal-size samples randomly drawn from the same population. The *sampling distribution of the mean* is the distribution of estimates of the mean.

Central Limit Theorem

Central limit theorem: when selecting simple random samples of size n from population with mean μ and finite variance σ^2 , the sampling distribution of sample mean approaches normal probability distribution with mean μ and variance equal to σ^2/n as the sample size becomes large.

Standard Error

Standard error of the sample mean is the standard deviation of distribution of the sample means.

$$\text{known population variance: } \sigma_{\bar{x}} = \frac{\sigma}{\sqrt{n}}$$

$$\text{unknown population variance: } s_{\bar{x}} = \frac{s}{\sqrt{n}}$$

Confidence Intervals

Confidence interval: gives range of values the mean value will be between, with a given probability (say 90% or 95%). With known variance, formula for a confidence interval is:

$$\bar{x} \pm z_{\alpha/2} \frac{\sigma}{\sqrt{n}}$$

$z_{\alpha/2} = 1.645$ for 90% confidence intervals (significance level 10%, 5% in each tail)

$z_{\alpha/2} = 1.960$ for 95% confidence intervals (significance level 5%, 2.5% in each tail)

$z_{\alpha/2} = 2.575$ for 99% confidence intervals (significance level 1%, 0.5% in each tail)

QUANTITATIVE METHODS continued...

Null and Alternative Hypotheses

Null hypothesis (H_0): hypothesis the researcher wants to reject; the hypothesis that is actually tested; the basis for selection of the test statistics.

Alternative hypothesis (H_a): concluded if there is sufficient evidence to reject the null hypothesis.

Difference Between One- and Two-Tailed Tests

One-tailed test: tests whether value is greater than or less than a given number.

Two-tailed test: tests whether value is equal to a given number.

- One-tailed test: $H_0: \mu \leq 0$ versus $H_a: \mu > 0$.
- Two-tailed test: $H_0: \mu = 0$ versus $H_a: \mu \neq 0$.

Type I and Type II Errors

- **Type I error:** rejection of null hypothesis when it is actually true.
- **Type II error:** failure to reject null hypothesis when it is actually false.

Technical Analysis

Reversal patterns: head and shoulders, inverse H&S, double/triple top or bottom.

Continuation patterns: triangles, rectangles, pennants, flags.

Price-based indicators: moving averages, Bollinger bands, momentum oscillators (rate of change, RSI, stochastic, MACD).

Sentiment indicators: opinion polls, put/call ratio, VIX, margin debt, short interest ratio.

Flow of funds indicators: TRIN, margin debt, mutual fund cash position, new equity issuance, secondary offerings.

ECONOMICS

Elasticity

$$\text{Own price elasticity} = \frac{\% \Delta \text{ quantity demanded}}{\% \Delta \text{ price}}$$

If absolute value > 1 , demand is elastic.

If absolute value < 1 , demand is inelastic.

On a straight line demand curve, total revenue is maximized where price elasticity = 1.

$$\text{Income elasticity} = \frac{\% \Delta \text{ quantity demanded}}{\% \Delta \text{ income}}$$

If positive, the good is a normal good.

If negative, the good is an inferior good.

$$\text{Cross price elasticity} = \frac{\% \Delta \text{ quantity demanded}}{\% \Delta \text{ price of related good}}$$

If positive, related good is a substitute.

If negative, related good is a complement.

Types of Auctions

Ascending price (English): Highest bid wins, pays amount bid; all bids known to all bidders.

Sealed bid: Highest bid wins, pays amount bid; bids are unknown to other bidders.

Second price sealed bid (Vickrey): Highest bid wins, pays amount bid by second-high bidder.

Descending price (Dutch): Price declines until all units can be sold; each bidder pays price bid.

Modified Dutch: Price declines until all units can be sold; all bidders pay last bid price.

Revenues and Costs

Total revenue = price $\times$ quantity, summed across all units sold.

Average revenue = total revenue / quantity sold.

Marginal revenue = Δ total revenue / Δ quantity sold.

Total fixed costs are costs that do not vary with output in the short run.

Total variable costs are costs that vary with output.

Total cost = total fixed costs + total variable costs.

Average total cost = total cost / output.

Average fixed cost = total fixed costs / output.

Average variable cost = total variable costs / output.

Marginal cost = Δ total cost / Δ output.

Breakeven and Shutdown

Breakeven: total revenue = total cost.

Operate in short run if $TR < TC$ but $TR > TVC$.

Shut down in short run if $TR < TVC$.

Market Structures

Perfect competition: Many firms with no pricing power; very low or no barriers to entry; homogeneous product.

Monopolistic competition: Many firms; some pricing power; low barriers to entry; differentiated products; large advertising expense.

Oligopoly: Few firms that may have significant pricing power; high barriers to entry; products may be homogeneous or differentiated.

Monopoly: Single firm with significant pricing power; high barriers to entry; advertising used to compete with substitute products.

In all market structures, profit is maximized at the output quantity for which marginal revenue = marginal cost.

Gross Domestic Product

Real GDP = consumption spending + investment + government spending + net exports.

Savings, Investment, Fiscal Balance, and Trade Balance

Fiscal budget deficit ($G - T$) = excess of saving over domestic investment ($S - I$) - trade balance ($X - M$)

Equation of Exchange

$MV = PY$, where M = real money supply, V = velocity of money in transactions, P = price level, and Y = real GDP.

Business Cycle Phases

Expansion; peak; contraction; trough.

Factors Affecting Aggregate Demand

Consumers' wealth; business expectations; consumers' income expectations; capacity utilization; monetary and fiscal policy; exchange rates; global economic growth.

Factors Affecting SR Aggregate Supply

Input prices; labor productivity; expectations for output prices; taxes and subsidies; exchange rates; all factors that affect LR aggregate supply.

Factors Affecting LR Aggregate Supply

Size of labor force; human capital; supply of natural resources; stock of physical capital; level of technology.

Types of Unemployment

Frictional: time lag in matching qualified workers with job openings.

Structural: unemployed workers do not have the skills to match newly created jobs.

Cyclical: economy producing at less than capacity during contraction phase of business cycle.

Policy Multipliers

$$\text{money multiplier} = \frac{1}{\text{reserve requirement}}$$

$$\text{fiscal multiplier} = \frac{1}{1 - \text{MPC}(1 - t)}$$

where MPC = marginal propensity to consume, t = tax rate.

Expansionary and Contractionary Policy

Monetary policy is expansionary when the policy rate is greater than the neutral interest rate (real trend rate of economic growth + inflation target) and contractionary when the policy rate is less than the neutral interest rate.

Fiscal policy is expansionary when a budget deficit is increasing or surplus is decreasing, and contractionary when a budget deficit is decreasing or surplus is increasing.

Balance of Payments

Current account: merchandise and services; income receipts; unilateral transfers.

Capital account: capital transfers; sales/purchases of nonfinancial assets.

Financial account: government-owned assets abroad; foreign-owned assets in the country.

Regional Trading Agreements

Free trade area: Removes barriers to goods and services trade among members.

Customs union: Members also adopt common trade policies with non-members.

Common market: Members also remove barriers to labor and capital movements among members.

Economic union: Members also establish common institutions and economic policy.

Monetary union: Members also adopt a common currency.

Exchange Rate Quotations

Direct quote: Units of domestic currency per unit of foreign currency.

Indirect quote: Units of foreign currency per unit of domestic currency.

Real Exchange Rate (domestic/foreign)

$$= \text{nominal exchange rate} \times \left(\frac{\text{foreign CPI}}{\text{domestic CPI}} \right)$$

Spot and Forward Exchange Rates

Spot (d/f) < forward (d/f): Foreign currency is at **forward premium** to domestic currency.

Spot (d/f) > forward (d/f): Foreign currency is at **forward discount** to domestic currency.

No-Arbitrage Forward FX Rate

$$\frac{\text{forward } (d/f)}{\text{spot } (d/f)} = \frac{1 + \text{domestic interest rate}}{1 + \text{foreign interest rate}}$$

Exchange Rate Regimes

Formal dollarization: country adopts foreign currency.

Monetary union: members adopt common currency.

Fixed peg: $\pm 1\%$ margin versus foreign currency or basket of currencies.

Target zone: Wider margin than fixed peg.

Crawling peg: Pegged exchange rate adjusted periodically.

Crawling bands: Width of margin increases over time.

Managed floating: Monetary authority acts to influence exchange rate but does not set a target.

Independently floating: Exchange rate is market-determined.

FINANCIAL REPORTING AND ANALYSIS

Revenue Recognition

Two requirements: (1) completion of earnings process and (2) reasonable assurance of payment.

Revenue Recognition Methods

- Percentage-of-completion method.
- Completed contract method.
- Installment sales.
- Cost recovery method.

Unusual or Infrequent Items

- Gains/losses from disposal of a business segment.
- Gains/losses from sale of assets or investments in subsidiaries.

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- Provisions for environmental remediation.
- Impairments, write-offs, write-downs, and restructuring costs.
- Integration expenses associated with businesses recently acquired.

Extraordinary Items (U.S. GAAP only)

Both unusual and infrequent (e.g., losses from expropriation of assets). IFRS does not allow extraordinary items.

Discontinued Operations

To be accounted for as a discontinued operation, a business—assets, operations, investing, financing activities—must be physically/operationally distinct from rest of firm. Income/losses are reported net of tax after net income from continuing operations.

Compute Cash Flows From Operations (CFO)

Direct method: start with cash collections (cash equivalent of sales); cash inputs (cash equivalent of cost of goods sold); cash operating expenses; cash interest expense; cash taxes.

Indirect method: start with net income, subtracting back gains and adding back losses resulting from financing or investment cash flows, adding back all noncash charges, and adding and subtracting asset and liability accounts that result from operations.

Free Cash Flow

Free cash flow (FCF) measures cash available for discretionary purposes. It is equal to operating cash flow less net capital expenditures.

Critical Ratios

Common-size financial statement analysis:

- Common-size *balance sheet* expresses all balance sheet accounts as a percentage of total assets.
- Common-size *income statement* expresses all income statement items as a percentage of sales.
- Common-size cash flow statement expresses each line item as a percentage of total cash inflows (outflows), or as a percentage of net revenue.

Horizontal common-size financial statement analysis: expresses each line item relative to its value in a common base period.

Liquidity ratios:

$$\text{current ratio} = \frac{\text{current assets}}{\text{current liabilities}}$$

$$\text{quick ratio} = \frac{\text{cash} + \text{marketable securities} + \text{receivables}}{\text{current liabilities}}$$

$$\text{cash ratio} = \frac{\text{cash} + \text{marketable securities}}{\text{current liabilities}}$$

$$\text{defensive interval} = \frac{\text{cash} + \text{mkt. sec.} + \text{receivables}}{\text{daily cash expenditures}}$$

Receivables, inventory, payables turnover, and days' supply ratios—all of which are used in the cash conversion cycle:

$$\text{receivables turnover} = \frac{\text{annual sales}}{\text{average receivables}}$$

$$\text{inventory turnover} = \frac{\text{cost of goods sold}}{\text{average inventory}}$$

$$\text{payables turnover ratio} = \frac{\text{purchases}}{\text{average trade payables}}$$

$$\text{days of sales outstanding} = \frac{365}{\text{receivables turnover}}$$

$$\text{days of inventory on hand} = \frac{365}{\text{inventory turnover}}$$

$$\text{number of days of payables} = \frac{365}{\text{payables turnover ratio}}$$

$$\text{cash conversion cycle} = \left(\frac{\text{days of inventory on hand}}{\text{on hand}} \right) + \left(\frac{\text{days of sales outstanding}}{\text{outstanding}} \right) - \left(\frac{\text{number of days of payables}}{\text{of payables}} \right)$$

Total asset, fixed-asset, and working capital turnover ratios:

$$\text{total asset turnover} = \frac{\text{revenue}}{\text{average total net assets}}$$

$$\text{fixed asset turnover} = \frac{\text{revenue}}{\text{average net fixed assets}}$$

$$\text{working capital turnover} = \frac{\text{revenue}}{\text{average working capital}}$$

Gross, operating, and net profit margins:

$$\text{gross profit margin} = \frac{\text{gross profit}}{\text{revenue}}$$

$$\text{operating profit margin} = \frac{\text{operating profit}}{\text{revenue}} = \frac{\text{EBIT}}{\text{net sales}}$$

$$\text{net profit margin} = \frac{\text{net income}}{\text{revenue}}$$

Return on assets (return on total capital (ROTC)):

$$\text{return on assets (total capital)} = \frac{\text{EBIT}}{\text{average total capital}}$$

Debt to equity ratio and total debt ratio:

$$\text{debt-to-equity ratio} = \frac{\text{total debt}}{\text{total equity}}$$

$$\text{total-debt-ratio} = \frac{\text{total debt}}{\text{total assets}}$$

Interest coverage and fixed charge coverage:

$$\text{interest coverage} = \frac{\text{EBIT}}{\text{interest}}$$

$$\text{fixed charge coverage} = \frac{\text{EBIT} + \text{lease payments}}{\text{interest} + \text{lease payments}}$$

Growth rate (g): $g = \text{RR} \times \text{ROE}$

$$\text{retention rate} = 1 - \frac{\text{dividends declared}}{\text{operating income after taxes}}$$

Liquidity ratios indicate company's ability to pay its short-term liabilities.

Operating performance ratios indicate how well management operates the business.

DuPont Analysis

Traditional DuPont equation:

$$\text{return on equity} = \left(\frac{\text{net income}}{\text{sales}} \right) \left(\frac{\text{sales}}{\text{assets}} \right) \left(\frac{\text{assets}}{\text{equity}} \right)$$

You may also see it presented as:

$$\text{return on equity} = \left(\frac{\text{net profit}}{\text{margin}} \right) \left(\frac{\text{asset}}{\text{turnover}} \right) \left(\frac{\text{equity}}{\text{multiplier}} \right)$$

Extended DuPont equation further decomposes net profit margin:

$$\text{ROE} = \left(\frac{\text{net income}}{\text{EBT}} \right) \times \left(\frac{\text{EBT}}{\text{EBIT}} \right) \times \left(\frac{\text{EBIT}}{\text{revenue}} \right) \times \left(\frac{\text{revenue}}{\text{avg. total assets}} \right) \times \left(\frac{\text{avg. total assets}}{\text{avg. equity}} \right)$$

You may also see it presented as:

$$\text{ROE} = \text{tax burden} \times \text{interest burden} \times \text{EBIT margin} \times \text{asset turnover} \times \text{leverage}$$

Inventory Accounting

In periods of rising prices and stable or increasing inventory quantities:

LIFO results in:

Higher COGS
Lower gross profit
Lower inventory
balances

FIFO results in:

Lower COGS
Higher gross profit
Higher inventory
balances

Basic and Diluted EPS

Basic EPS calculation **does not** consider effects of any dilutive securities in computation of EPS:

$$\text{basic EPS} = \frac{\text{net income} - \text{preferred dividends}}{\text{wtd. avg. no. of common shs. outstanding}}$$

$$\text{diluted EPS} = \frac{\text{adj. income avail. for common shares}}{\text{wtd. avg. common shares plus potential common shares outstanding}}$$

Therefore, diluted EPS is:

$$\left[\frac{\text{net income}}{\text{avg. sh.}} - \frac{\text{pfd. div.}}{\text{sh.}} \right] + \frac{\text{convertible preferred dividends}}{\text{sh.}} + \frac{\text{convertible debt interest}}{\text{sh.}} (1 - t) + \left[\frac{\text{wtd. avg. conversion of conv. pfd. sh.'s}}{\text{sh.}} + \frac{\text{sh.'s from conversion of conv. debt}}{\text{sh.}} + \frac{\text{shares issuable from stock options}}{\text{sh.}} \right]$$

Long-Lived Assets Capitalizing vs. Expensing

Capitalizing: lowers income variability and increases near-term profits. Increase assets, equity.
Expensing: opposite effect.

Depreciation

$$\text{Straight-line: } \frac{\text{cost} - \text{residual value}}{\text{useful life}}$$

Double declining balance:

$$\left(\frac{2}{\text{useful life}} \right) (\text{cost} - \text{accum. depreciation})$$

Units of production:

$$\frac{\text{cost} - \text{salvage value}}{\text{useful life in units}} \times \text{output units}$$

Revaluation of Long-Lived Assets

IFRS: revaluation gain recognized in net income only to the extent it reverses previously recognized impairment loss; further gains recognized in equity as revaluation surplus. (For *investment property*, all gains and losses from marking to fair value are recognized as income.)

U.S. GAAP: revaluation is not permitted.

Deferred Taxes

- Created when taxable income (on tax return) $\neq$ pretax income (on financial statements) due to temporary differences.
- *Deferred tax liabilities* are created when taxable income $<$ pretax income. Treat DTL as equity if not expected to reverse.
- *Deferred tax assets* are created when taxable income $>$ pretax income. Must recognize *valuation allowance* if more likely than not that DTA will not be realized.

Long-Term Liabilities

- *Premium bond:* coupon rate $>$ market rate at issuance.
- *Discount bond:* coupon rate $<$ market rate at issuance.
- *Interest expense* equals book value at the beginning of the year multiplied by the market rate of interest at the time the bonds were issued.

Leases

Financial statement/ratio impact of lease accounting from the lessee perspective: capital leases result in:

- *Higher:* assets, liabilities, CFO, debt/equity.

- **Lower:** net income (early years), CFF, current ratio, working capital, asset turnover, ROA, ROE.
- **Same:** total cash flow.

Pensions

Defined contribution: employer contribution expensed in period incurred.

Defined benefit: overfunded plan recognized as asset, underfunded plan recognized as liability. Balance sheet value equals funded status of plan under U.S. GAAP but not under IFRS.

Marketable Security Classifications

Held-for-trading: fair value on balance sheet; dividends, interest, realized and unrealized G/L recognized on income statement.

Available-for-sale: fair value on balance sheet; dividends, interest, realized G/L recognized on income statement; unrealized G/L is other comprehensive income.

Held-to-maturity: amortized cost on balance sheet; interest, realized G/L recognized on income statement.

CORPORATE FINANCE**Weighted Average Cost of Capital**

$$WACC = (w_d)[k_d(1-t)] + (w_{ps})(k_{ps}) + (w_{ce})(k_s)$$

Cost of Preferred Stock

$$k_p = \frac{D_{ps}}{P}$$

Cost of Equity Capital

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

Cost of Equity Using CAPM

$$k_e = RFR + \beta(R_{mkt} - RFR)$$

Capital Budgeting

$$NPV = CF_0 + \frac{CF_1}{(1+k)^1} + \frac{CF_2}{(1+k)^2} + \dots + \frac{CF_n}{(1+k)^n}$$

IRR: discount rate that makes NPV equal to zero.

Pure-Play Method Project Beta

Delevered asset beta for comparable company:

$$\beta_{asset} = \beta_{equity} \times \frac{1}{1 + \left((1-t) \frac{D}{E} \right)}$$

Relevered project beta for subject firm:

$$\beta_{project} = \beta_{asset} \times \left[1 + \left((1-t) \frac{D}{E} \right) \right]$$

Measures of Leverage

Total leverage: percent change in net income from a given percent change in sales.

Operating leverage: percent change in EBIT from a given percent change in sales.

Financial leverage: percent change in net income from a given percent change in EBIT.

$$\text{breakeven quantity of sales} = \frac{\text{fixed operating \& financing costs}}{\text{price} - \text{variable costs per unit}}$$

$$\text{operating breakeven quantity of sales} = \frac{\text{fixed operating costs}}{\text{price} - \text{variable costs per unit}}$$

Dividends and Share Repurchases

Cash dividend and share repurchase have same effect on shareholder wealth.

Share repurchase with borrowed funds will increase EPS if cost of debt < earnings yield, decrease EPS if cost of debt > earnings yield.

Share repurchase will increase book value per share if stock price < BVPS, decrease book value per share if stock price > BVPS.

Working Capital Management

Primary sources of liquidity: cash balances, short-term funding, cash flow management of collections and payment.

Secondary sources of liquidity: liquidating assets, negotiating debt agreements, bankruptcy protection.

Cost of trade credit:

$$\left(1 + \frac{\% \text{ discount}}{1 - \% \text{ discount}} \right)^{\frac{365}{\text{days past discount}}} - 1$$

Pro Forma Financial Statements

- Estimate the relations between changes in sales and changes in income statement and balance sheet items.
- Estimate future tax rate, interest rates on debt, lease payments, etc.
- Forecast sales.
- Estimate fixed operating and financial costs.
- Integrate these estimates into pro forma financial statements.

Corporate Governance

Favor shareholder interests: independent board, strong code of ethics, confidential voting.

Harm shareholder interests: management-aligned board, voting restrictions, takeover defenses.

PORTFOLIO MANAGEMENT**Investment Policy Statement**

Investment objectives:

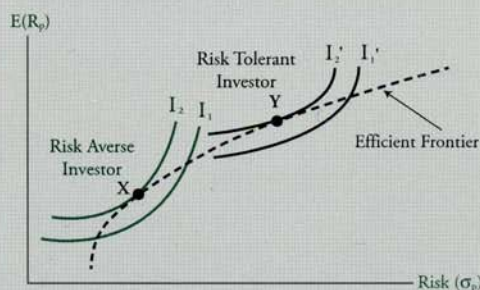
- Return objectives.
- Risk tolerance.

Constraints:

- Liquidity needs.
- Time horizon.
- Tax concerns.
- Legal and regulatory factors.
- Unique needs and preferences.

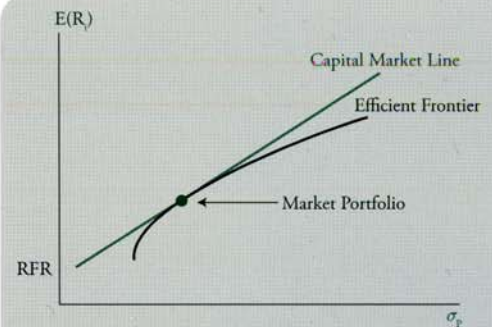
Combining Preferences with the Optimal Set of Portfolios

Markowitz efficient frontier is the set of portfolios that have highest return for given level of risk.

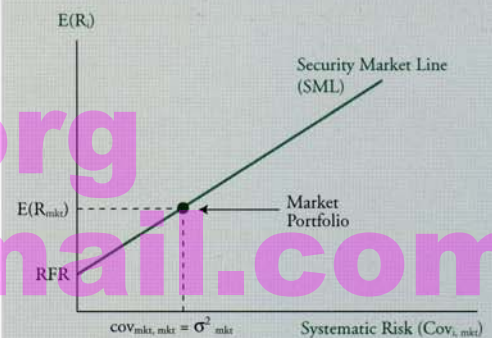
**Security Market Line (SML)**

Investors should only be compensated for risk relative to market. *Unsystematic risk* is diversified away; investors are compensated for *systematic risk*. The equation of the SML is the CAPM, which is a return/systematic risk equilibrium relationship.

total risk = systematic + unsystematic risk



$$CAPM: E(R_i) = RFR + \beta_i [E(R_{mkt}) - RFR]$$

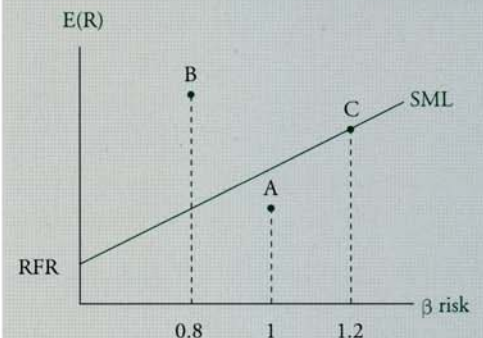
**The SML and Equilibrium**

Identifying mispriced stocks:

Consider three stocks (A, B, C) and SML.

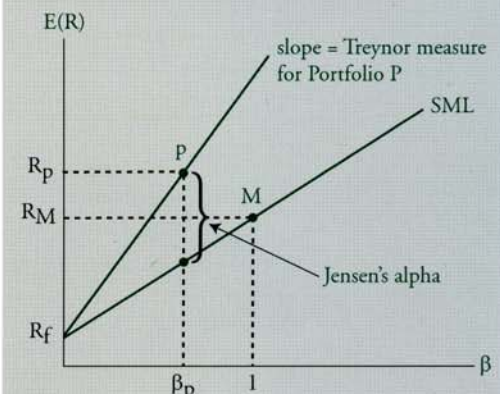
Estimated stock returns should plot on SML.

- A return plot over the line is *underpriced*.
- A return plot under the line is *overpriced*.

**Risk-Adjusted Returns**

Sharpe ratio and **M-squared** measure excess return per unit of *total risk*.

Treynor measure and **Jensen's alpha** measure excess return per unit of *systematic risk*.



SECURITIES MARKETS & EQUITY INVESTMENTS

Well-Functioning Security Markets

- Operational efficiency (lowest possible transactions costs).
- Informational efficiency (prices rapidly adjust to new information).

Margin Purchases

For margin transactions:

- Leverage factor = $1/\text{margin percentage}$.
- Levered return = $\text{HPR} \times \text{leverage factor}$.

Margin Call Price

$$\frac{P_0(1 - \text{initial margin \%})}{1 - \text{maintenance margin \%}}$$

Computing Index Prices

$$\text{Price-weighted Index} = \frac{\sum \text{stock prices}}{\text{adjusted divisor}}$$

Value-weighted Index

$$= \frac{\sum (\text{current prices})(\# \text{ shares})}{\sum (\text{base year prices})(\# \text{ base year shares})} \times \text{base value}$$

Types of Orders

Execution instructions: how to trade; e.g., market orders, limit orders.

Validity instructions: when to execute; e.g., stop orders, day orders, fill-or-kill orders.

Clearing instructions: how to clear and settle; for sell orders, specify short sale or long sale.

Market Structures

Quote-driven markets: investors trade with dealers.

Order-driven markets: buyers and sellers matched by rules.

Brokered markets: brokers find counterparties.

Forms of EMH

- **Weak form.** Current stock prices *fully reflect* available security market info. Volume information/past price do not relate to future direction of security prices. Investor *cannot* achieve excess returns using tech analysis.
- **Semi-strong form.** Security prices instantly adjust to new *public* information. Investor *cannot* achieve excess returns using fundamental analysis.
- **Strong form.** Stock prices *fully reflect all* information from public and private sources. Assumes perfect markets in which all information is cost free and available to everyone at the same time. Even with inside info, investor cannot achieve excess returns.

EQUITY INVESTMENTS

Industry Life Cycle Stages

Embryonic: slow growth, high prices, large investment needed, high risk of failure.

Growth: rapid growth, falling prices, limited competition, increasing profitability.

Shakeout: slower growth, intense competition, declining profitability, cost cutting, weaker firms fail or merge.

Mature: slow growth, consolidation, stable prices, high barriers to entry.

Decline: negative growth, declining prices, consolidation.

Five Competitive Forces

1. Rivalry among existing competitors.
2. Threat of new entrants.
3. Threat of substitute products.
4. Bargaining power of buyers.
5. Bargaining power of suppliers.

One-Period Valuation Model

$$V_0 = \frac{D_1}{(1 + k_c)} + \frac{P_1}{(1 + k_c)}$$

Be sure to use *expected* dividend D_1 in calculation.

Infinite Period Dividend Discount Models

Supernormal growth model (multi-stage) DDM:

$$V_0 = \frac{D_1}{(1 + k_c)} + \dots + \frac{D_n}{(1 + k_c)^n} + \frac{P_n}{(1 + k_c)^n}$$

$$\text{where: } P_n = \frac{D_{n+1}}{(k_c - g_c)}$$

Constant growth model:

$$V_0 = \frac{D_0(1 + g_c)}{k_c - g_c} = \frac{D_1}{k_c - g_c}$$

Critical relationship between k_c and g_c :

- As difference between k_c and g_c *widens*, value of stock *falls*.
- As difference *narrows*, value of stock *rises*.
- Small changes in difference between k_c and g_c cause large changes in stock's value.
- Critical *assumptions* of infinite period DDM:
 - Stock pays dividends; constant growth rate.
 - Constant growth rate, g_c , never changes.
 - k_c must be greater than g_c (or math will not work).

Earnings Multiplier Model

$$\frac{P_0}{E_1} = \frac{D_1/E_1}{k - g} = \frac{\text{payout ratio}}{k - g}$$

Price Multiples

$$\text{leading P/E} = \frac{\text{price per share}}{\text{forecast EPS next 12 mo.}}$$

$$\text{trailing P/E} = \frac{\text{price per share}}{\text{EPS previous 12 mo.}}$$

$$P/B = \frac{\text{price per share}}{\text{book value per share}}$$

$$P/S = \frac{\text{price per share}}{\text{sales per share}}$$

$$P/CF = \frac{\text{price per share}}{\text{cash flow per share}}$$

DEBT INVESTMENTS

Basic Features of Bond Structures

- **Indenture.** Agreement containing the terms under which money is borrowed.
- **Term to maturity.** Length of time until loan contract or agreement expires.
- **Par value.** Amount borrower promises to pay on or before *maturity* date of the issue.
- **Coupon rate.** When multiplied by par value, gives amount of interest to be paid per period.
- **Zero-coupon bonds.** No-interest bonds; are sold at a deep discount from their par values.

Repayment/Prepayment Provisions

- **Bullet bonds.** Lump sum at maturity pays entire principal.
- **Serial bonds.** Pay off principal through series of payments over time.
- **Amortizing securities.** Periodic *principal and interest* payments.
- **Sinking fund provisions.** Provide for bond retirement through predefined principal payments over life of the issue.
- **Call provisions.** Issuer has right (but not obligation) to *retire all or part of issue prior to maturity*. Issuer owns option to call the bonds away from investor.

- **Refunding provisions.** Nonrefundable bonds prohibit premature retirement of an issue from proceeds of a lower coupon bond. Bonds that carry these provisions can be freely callable but nonrefundable.

Basics of Floating Rate Bonds

- These securities pay variable rate of interest.
- Common procedure for setting coupon rates on floating-rate bonds starts with *reference rate*; then adds/subtracts a stated *margin*.

Interest Rate Risk

Key point: there is an *inverse relationship* between interest rates and bond prices.

How bond's features affect interest rate risk:

- Longer maturity bonds. Higher interest rate risk (all else same).
- Smaller coupon bonds. Higher interest rate risk (all else same).
- If market interest rates are high, price volatility will be lower than if market interest rates are low.

Floating rate securities have very low levels of price volatility in relation to interest rate changes.

- If coupon rate > required market yield $\Rightarrow$ bond price > par value: *premium bond*.
- If coupon rate < required market yield $\Rightarrow$ bond price < par value: *discount bond*.
- If coupon rate = required market yield $\Rightarrow$ bond price = par value: *par bond*.

Reinvestment Risk

If interest rates decline, investors are forced to reinvest at lower yields.

Bonds with high coupons have greater risk. Greatest risk is with callable bonds, where all/part of principal can be repaid in low interest rate environment.

Credit Risk

- **Default risk.** Issuer might not make payments.
- **Credit spread risk.** Difference in bond's yield from yield on risk-free security. All else equal, the riskier the bond, the higher the spread.
- **Downgrade risk.** Bond may be reclassified as riskier security by a major rating agency.

Basic Bond Pricing

To value a *semi-annual pay bond* using a financial calculator:

$$FV = \text{par}, PMT = \frac{\text{coupon}}{2}$$

$$N = (\# \text{ years} \times 2), I/Y = \frac{\text{yield}}{2}$$

There are *two* equivalent ways to price a bond:

- Discount at constant rate applied to all cash flows (YTM) to find all future cash flows' PV.
- Treat each cash flow as a single zero-coupon bond and find PV of each "zero" using appropriate spot rates for each cash flow.

Prices *must be the same* to prevent arbitrage.

Accrued Interest and Clean Prices

Bond price without accrued interest is *clean price*.

Full price includes accrued interest.

$$\text{full price} = \text{clean price} + \text{accrued interest}$$

Yield Calculations

$$\text{current yield} = \frac{\text{annual coupon payment}}{\text{bond price}}$$

Annual Equivalent Yield

Converting a bond-equivalent yield (BEY) to an equivalent annual yield (EAY) or vice versa:

$$\text{BEY of an annual pay bond} = 2[(1 + \text{YTM}_{\text{annual pay bond}})^{1/2} - 1]$$

$$\text{annual equivalent yield} = \left(1 + \frac{\text{BEY}}{2}\right)^2 - 1$$

continued on next page...

DEBT INVESTMENTS continued...

Spot Rates

To derive a bond's value using spot rates, discount the individual cash flows at appropriate rate for each flow's time horizon; sum PV of the cash flows to get bond's current value. This value is the arbitrage-free value.

Duration and Convexity

- Duration** is the slope of a bond's price-yield function. It is steeper at low interest rates, flatter at high interest rates. So, duration (interest rate sensitivity) is high at low rates and low at higher rates. This holds for non-callable bonds.
- Convexity** is a measure of degree of curvature or convexity in the price/yield relationship. Convexity accounts for amount of error in estimated price (based on duration).

A callable bond is likely to be called as yields fall, so no one will pay a price higher than the call price. The price won't rise significantly as yield falls and you'll see negative convexity at work—as yields fall, prices rise at a decreasing rate. For a positively convex bond, as yields fall, prices rise at an increasing rate.

$$\text{effective duration (D)} = \frac{V_- - V_+}{2V_0(\Delta y)}$$

Convexity measures curvature of the price-yield function.

$$\% \Delta \text{price} = [-\text{duration}(\Delta y) + \text{convexity}(\Delta y)^2] \times 100$$

Note: Δy is in decimal form.

Term Structure Theories

- Expectations hypothesis.** Yield curve shape reflects investor expectations about future behavior of short-term interest rates. Forward rates computed using today's spot rates are best guess of future interest rates.
- Liquidity preference theory.** Investors prefer greater liquidity; will demand premium (higher yields to invest in longer-term issues).
- Market segmentation theory.** Market for debt securities is segmented on basis of investor maturity preferences. Each segment's interest rate level is determined by supply/demand.

DERIVATIVES

Futures vs. Forwards

- Forward contract:** one party agrees to buy, (counterparty sells) a physical asset/security at specific price on specific future date. If asset's future price increases, buyer (at the older, lower price) has a gain and seller has a loss.
- Futures contract:** standardized, exchange-traded forward contract. Different from forwards in that futures trade in active secondary market, are regulated, backed by clearinghouse, and require daily settlement of gains/losses.

Arbitrage

- Law of one price:** two assets with identical cash flows in the future, regardless of future events, should have the same price. If A and B have identical future payoffs, and A is priced lower than B, buy A and sell B.
- Second type of arbitrage:** two assets with uncertain returns can be combined in a portfolio that will have a certain payoff. If a portfolio of A and B has a certain payoff, the portfolio should yield the risk-free rate.

Forward Contracts

- Long must pay a certain amount at specific future date to short, who will deliver the underlying asset.

- A cash settlement forward contract does not require actual delivery of the underlying asset, but a cash payment to the party disadvantaged by the difference between market price of the asset and contract price at settlement date.
- Early termination can be achieved by entering into a new forward contract with the opposite position, at the then-current expected future price. This will fix the amount of payment to be made/received at settlement date.

Forward Rate Agreements (FRA)

Can be viewed as a forward contract to borrow/lend money at a certain rate at some future date.

Formula for payment to the long at settlement is:

$$\left(\frac{\text{notional}}{\text{principal}} \right) \times \frac{(\text{floating rate} - \text{forward rate}) \left(\frac{\text{days}}{360} \right)}{1 + (\text{floating rate}) \left(\frac{\text{days}}{360} \right)}$$

Futures vs. Forwards

Forwards	Futures
Private contracts	Exchange-traded
Unique contracts	Standardized contracts
Default risk	Guaranteed by clearinghouse
Little or no regulation	Regulated

American vs. European Options

American options let the owner exercise the option any time before or at expiration. **European options** can be exercised *only* at expiration. Value of the American option will equal/exceed value of the European option.

Lower and Upper Bounds for Options

Option	Minimum Value	Maximum Value
European call (c)	$c_t \geq \text{Max} \left[0, S_t - \frac{X}{(1 + \text{RFR})^t} \right]$	S_t
American call (C)	$C_t \geq \text{Max} \left[0, S_t - \frac{X}{(1 + \text{RFR})^t} \right]$	S_t
European put (p)	$p_t \geq \text{Max} \left[0, \frac{X}{(1 + \text{RFR})^t} - S_t \right]$	$\frac{X}{(1 + \text{RFR})^t}$
American put (P)	$P_t \geq \text{Max} [0, X - S_t]$	X

Note: t = time to expiration.

Put-Call Parity

Put-call parity holds that portfolios with identical payoffs must sell for the same price to prevent arbitrage. The put-call parity relationship:

$$C + \frac{X}{(1 + \text{RFR})^t} = S + P$$

Each security in the put-call parity relationship can be expressed as:

$$S = C + \frac{X}{(1 + \text{RFR})^t} - P \quad C = S + P - \frac{X}{(1 + \text{RFR})^t}$$

$$P = C + \frac{X}{(1 + \text{RFR})^t} - S \quad \frac{X}{(1 + \text{RFR})^t} = S + P - C$$

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- Buyer of a call option—long position.

- Writer (seller) of a call option—short position.

- Buyer of a put option—long position.

- Writer (seller) of a put option—short position.

intrinsic value of a call option = $\text{Max}[0, S - X]$

intrinsic value of a put option = $\text{Max}[0, X - S]$

ALTERNATIVE INVESTMENTS

Exchange-Traded Funds (ETFs)

Special type of fund that invests in a portfolio of stocks or bonds; designed to mimic performance of a specified index.

Advantages of ETFs

- Efficient method of diversification.
- Trade similar to traditional equity investments.
- Some ETFs patterned after indexes with active futures/option market; better risk management.
- Exact composition is known at all times.
- Typically, very efficient operating expense ratios; no loads to purchase or redeem shares.
- Decreased capital gains tax liability.

Disadvantages of ETFs

- Some countries have fewer indexes than the U.S. for ETFs to track (results in mid- or low-cap stocks not being well represented).
- Ability to trade intraday may not be significant to investors with longer time horizons.
- ETFs with low trading volume may have large bid-ask spreads.
- Larger investors may choose to directly invest in an index portfolio, resulting in lower expenses/lower tax consequences.

Valuation of Real Estate Investments

- Valuation methods:** cost method, sales comparison method, and income method.
- Income method uses a discounted cash flow model similar to that for a perpetuity:

$$\text{value} = \frac{\text{NOI}}{\text{market cap rate}}$$

- Net operating income (NOI)** equals gross operating income less estimated vacancy, collections, and other operating expenses, (including property taxes, but excluding income taxes). NOI does not include depreciation or financing costs.

Hedge Funds—Risks

- Illiquidity.**
- Potential for mispricing.** Investments in esoteric, infrequently traded securities may lead to difficulty determining true value.
- Counterparty credit risk.**
- Settlement errors.** Risk of counterparty failure to deliver security as agreed on settlement day.
- Short covering.** Risk that managers who short sell as a strategy will have to cover their shorts and repurchase securities at price higher than where they originally sold.
- Margin calls.** Can result in forced selling of assets, possibly at a loss, on an already highly leveraged position.

Investing in Commodities

Contango: futures price > spot price.

Backwardation: futures price < spot price.

Sources of investment return:

- Collateral yield:** return on T-bills posted as margin.
- Price return:** due to change in spot price.
- Roll yield:** positive for backwardation, negative for contango.