Some Useful Investment Formulas

RISK and RATES OF RETURN

Terminology:

Ri = Rate of Return on any security.

RM = Rate of return on the market portfolio

RF = Risk-free Rate

Pi = Probability distributions

1. CALCULATION OF EXPECTED RETURNS and VARIANCE

 Percentage Return: 

A. **Probability Distributions:**



 Covariance: 

B. Historical (***Ex Post***) Observations: 

 Covariance: 

 Coefficient of Variation: 

The Risk and Return for a portfolio:

Expected return on a portfolio is: 

Variance and standard deviation of a portfolio are: 



Minimum Variance portfolio

**Risk and Beta**: The capital asset pricing model (CAPM) shows that the rate of return on a security is linearly related to its beta. That is: 

where the beta is a measure of the volatility of a security’s returns relative to the returns on the market portfolio and(RM -RF) is the market risk premium. That is,



The beta of the portfolio is estimated by the following equation: 

Characteristic (Market) Line: This line is used to estimate the beta coefficient. 

Total Risk = Systematic Risk + Unsystematic Risk: 



**Portfolio Performance Measures:**

**Sharpe Index**



**Treynor Index:**



**Jensen:**



 **STOCKS VALUATION**

**Terminology:**

Dt  = dividend the shareholder expects to receive at the end of year t.

D0 = the most recent dividend which has already been paid (ex-dividend).

P0 = actual market price of the stock today

Pt = expected price at the end of the year t.

 Dt /P0 = expected dividend yield during the coming year t.

(Pt - P0)/P0 = expected capital gains (loss) yield during the coming year t.

g = expected growth rate = RR x ROE

Rs = rate of return on common stock

Dp = dividend on preferred stock

Pp = preferred stock price

Rp = rate of return on preferred stock

**STOCK VALUATION:**

**A. Preferred Stock:** 

**B. Common Stock Valuation**: **Valuation of Different Types of Stocks:**

Case 1: **Zero Growth**: 

Case 2: **Constant Growth Rate: dividends grow at a rate of g forever.**



Case 3: **Super (Differential) Growth**:



The value of PT is calculated as a growing perpetuity.

**C**. The expected rate of return on the stock is the sum of dividend income yield and capital gain (loss) yield.

 

or



**Capital Asset Pricing Model:**

The security Market line (SML) is used to calculate the rate of return on equity of company with no debt in its capital structure (unlevered).



However, with the debt in the capital structure of the company, the rate of return equity is based on the levered beta:

where 

If t=tax rate is zero, then 

**D. Price-Earnings Ratio**:

One frequently used method among financial analysts is based on the P/E ratio. That is,

Price = EPS x P/E

**Valuation Models**



 where

Equity Value =Enterprise Value + cash -debt



# Bond Valuation

Terminology:

Par = face or terminal value

C = Coupon payment, C = Par x CR

CR = Coupon Rate

T =Maturity Date

Rb = Discount rate, Required rate of return, Interest rate.

Pb = Price of a bond

**Forms of Bonds**:

1. Pure Discount Bond: 
2. Level - Coupon Bonds

Or 

3. Consols (Perpetuities):



**Estimation of Yield-to-Maturity:** 

**3. Risk Premium Method:**

Risk Premium method is less used as a stand-alone method. This method is based on adding an explicit premium for risk to the current long-term interest rate, usually the interest rate on government bonds.



**Modified Duration** 

or

**Modified Duration** 

Price change based on duration and modified duration









Percentage price change based on duration and convexity



**OPTION PRICING MODEL:**

**Put-Call Parity Model:** 

Alternatively, the put premium is equal to: 

**Riskless Hedges: A General Case of Black and Scholes Model**

The premium (price) of a Call:



where 

Black-Scholes modified for dividends:





**Financial Ratios**

***Ratio*** ***Method of Computation***

**1. Current (CR)**  Current asset

Current liabilities

Measures short-term liquidity, the ability of a firm to meet needs for cash as they arise.

**2. Quick or acid-test** Current assets - inventory

Current liabilities

Measures short-term liquidity more rigorously than the current ratio by eliminating inventory, usually the least liquid current asset.

**3. Cash flow liquidity**

 Cash + marketable securities + cash flow from operating activities

Current liabilities

Measures short-term liquidity by considering as cash resources (numerator) cash plus cash equivalents plus cash flow from operating activities.

**4. Average collection period (ACP)** Accounts receivable

 Net sales/360

Indicates days required converting receivables into cash.

**5. Accounts receivable turnover**  Net sales

Accounts receivable

Indicates how many times receivables are collected during a year, on average.

**6. Inventory turnover** Cost of goods sold

 Inventories

Measures efficiency of the firm in managing all assets.

**7. Fixed asset turnover (FAT)** Net sales

Net property, plant, and equipment

Measures efficiency of the firm in managing fixed assets.

**8. Total asset turnover (TAT)** Net sales

 Total assets

Measures efficiency of the firm in managing current and fixed assets.

**9. Debt ratio** Total liabilities

Total assets

Shows proportion of all assets that are financed with debt.

**10. Long-term debt to total capitalization** long-term debt

Long-term debt + stockholders' equity

Measures the extent to which long-term debt is used for permanent financing.

**11. Debt to equity (D/E)** Total liabilities

Stockholders' equity

Measures debt relative to equity base.

**12. Times interest earned (TIE)** Operating profit

Interest expense

Measures how many times interest expense is covered by operating earnings.

**13. Fixed charge coverage**  Operating profit + lease payments

Interest expense + lease payments

Measures coverage capability more broadly than times interest earned by including lease payments as a fixed expense.

**14. Cash flow adequacy** Cash flow from operating activities

Average annual long-term debt maturity

Measures how many times average annual payments of long-term debt are covered by operating cash flow.

**15.** **Gross profit margin (GPM)** Gross profit

Net sales

Measures profit generated after consideration of cost of products sold.

**16. Operating profit margin (OPM)** Operating profit before taxes

Net sales

Measures profit generated after consideration of operating expenses.

**17. Net profit margin (NPM)** Net profit

Net sales

Measures profit generated after consideration of all expenses and revenues.

**18. Cash flow margin**  Cash flow from operating activities

Net sales

Measures the ability of the firm to generate cash from sales.

**19. Return on investment (ROI)** Net earnings

Total assets

Measures overall efficiency of the firm in managing assets and generating profits.

**20. Return on equity (ROE)** Net earnings

Stockholders' equity

Measures rate of return on stockholders' (owners') investment.

**21. Cash return on assets** Cash flow from operating activities

Total assets

Measures the return on assets on a cash basis.

 **Basic Earning Power** EBIT

Total assets

**22. Earnings per common share (EPS)** Net earnings

Average common shares outstanding

Shows return to common stock shareholder for each share owned.

**23. Price to earnings (P/E)** Market price of common stock

Earnings per share

Expresses a multiple that the stock market places on a firm's earnings.

**24. Dividend payout ratio (DPR)** Dividends per share

Earnings per share

Shows percentage of earnings paid to shareholders.

**25. Dividend yield (D/P)** Dividends per share

Market price of common stock

Shows the rate earned by shareholders from dividends relative to current price of stock.