Handbook for Formulas

List of formulas for Level 1 CFA® Program
### TIME VALUE OF MONEY

<table>
<thead>
<tr>
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<th>Equation/Formula</th>
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<tbody>
<tr>
<td>1</td>
<td>Nominal interest rate = real risk-free rate + expected inflation rate</td>
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<tr>
<td>2</td>
<td>Required interest rate on security = nominal risk-free rate + default risk premium + liquidity premium + maturity risk premium</td>
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</tbody>
</table>
| 3 | Effective Annual Return (EAR) = \( \text{EAR} = (1 + \text{periodic rate})^m - 1 \)  
   Periodic rate = stated annual rate/m  
   M = number of compounding periods per year |
| 4 | \( \text{FV} = \text{PV}(1 + \frac{I/Y}{N})^N \)  
   \( \frac{\text{PV}}{(1 + \frac{I/Y}{N})^N} \)  
   \( \text{FV} = \text{future value} \)  
   \( \text{PV} = \text{Present value} \)  
   \( I/Y = \text{Rate of return per compounding period} \)  
   \( N = \text{Number of compounding periods} \) |
| 5 | \( \text{PV perpetuity} = \frac{\text{PMT}}{(I/Y)} \)  
   \( \text{PMT} = \text{Fixed periodic cash flow} \) |

### DISCOUNTED CASH FLOW APPLICATION

<table>
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| 6 | \( \text{NPV} = \sum \frac{\text{CF}}{(1 + r)^t} \)  
   \( \text{CF} = \text{Expected cash flow} \)  
   \( r = \text{Discount rate} \) |
| 7 | \( \text{IRR} = \text{CF}_0 + \frac{\text{CF}_1}{(1 + \text{IRR})} + \frac{\text{CF}_2}{(1 + \text{IRR})^2} + \frac{\text{CF}_3}{(1 + \text{IRR})^3} \)  
   \( \text{IRR} = \text{Internal rate of return.} \) |
| 8 | \( \text{HPR} = \frac{\text{Ending Value} - \text{Beginning Value}}{\text{Beginning Value}} \)  
   \( \text{HPR} = \text{Holding period return} \) |
| 9 | \( \text{RBD} = \frac{\text{D/F}}{360/t} \)  
   \( \text{RBD} = \text{Annualised yield on a bank discount basis} \)  
   \( \text{D} = \text{Dollar discount} = \text{purchase price - face value} \)  
   \( \text{F} = \text{Face value} \)  
   \( t = \text{Number of days until maturity} \)  
   360 = Bank convention of number of days in a year |
| 10| \( \text{Effective Annual Yield (EAY)} = (1 + \text{HPY})^{365/t} - 1 \)  
   \( \text{HPY} = \text{Holding period yield} \) |
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</table>
| 11 | RMM = \( \frac{360}{\text{days}^{\times} \text{HPY}} \)  
RMM = Money market yield |
| 12 | Bond equivalent yield = \( \{(1 + \text{effective annual yield})^{\frac{1}{2}} - 1\} \times 2 \) |
| 13 | Geometric Mean = \( \{(1 + R_1)(1 + R_2)\ldots(1 + R_n)\}^{\frac{1}{n}} \)  
Geometric mean return is also known as compound annual rate of return |
| 14 | Harmonic Mean = \( \frac{N}{\sum(1/x)} \) |
| 15 | Position of observation at a given percentile  
\( L_y = (n + 1) \times \frac{y}{100} \) |
| 16 | Range = Maximum Value - Minimum Value |
| 17 | Mean Absolute Deviation (MAD) = \( \frac{(\sum|X_i - \bar{X}|)}{n} \) |
| 18 | Population Variance  
\( \sigma^2 = \frac{(\sum(X_i - \mu)^2)}{N} \) |
| 19 | Standard Deviation  
\( \sigma = \text{square root of variance} \) |
| 20 | Sample Variance  
\( \sigma^2 = \frac{(\sum(X_i - \mu)^2)}{N-1} \) |
| 21 | Chebyshev’s Inequality  
Percentage of observations that lie within \( k \) standard deviations of the mean is at least = \( 1 - \frac{1}{k^2} \) |
| 22 | Coefficient of Variation  
\( CV = \frac{(\text{standard deviation of } x)}{(\text{average value of } x)} \) |
| 23 | Sharpe Ratio = \( \frac{(R_p - R_{FR})}{\sigma_p} \)  
\( R_p = \text{Portfolio Return} \)  
\( R_{FR} = \text{Risk Free Rate} \)  
\( \sigma_p = \text{standard deviation of portfolio return} \) |
| 24 | Sample Skewness (Sk) = \( \frac{(\sum(X_i - \bar{X})^3)}{s^3} \)  
\( s = \text{sample standard deviation} \) |
| 25 | Sample Skewness (Sk) = \( \frac{(\sum(X_i - \bar{X})^4)}{s^4} \) |
| 26 | Excess Kurtosis = Sample Kurtosis - 3 |
## PROBABILITY CONCEPTS

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| **27** | Multiplication Rule Of Probability,  
\[ P(AB) = P(A/B) \times P(B) \] |
| **28** | Addition Rule Of Probability,  
\[ P(A \text{ or } B) = P(A) + P(B) - P(AB) \] |
| **29** | Total Probability Rule (Used to determine unconditional probability of an event)  
\[ P(A) = P(A/B_1)P(B_1) + P(A/B_2)P(B_2) + \ldots \ldots + P(A/B_N)P(B_N) \] |
| **30** | Expected value of random variable = weighted average of possible outcomes,  
Weights = probabilities that the outcome will occur |
| **31** | Covariance  
\[ \text{Cov}(R_i, R_j) = E\{(R_i - E(R_i))(R_j - E(R_j))\} \]  
\[ \text{Cov}(R_i, R_j) = \text{Corr}(R_i, R_j) \frac{\sigma(R_i) \sigma(R_j)}{\sigma(R_i) \sigma(R_j)} \] |
| **32** | Correlation Coefficient  
\[ \text{Corr}(R_i, R_j) = \frac{E(\{R_i - E(R_i)\}(R_j - E(R_j)))}{\sigma(R_i) \sigma(R_j)} \] |
| **33** | Weight of asset in portfolio,  
\[ w = \text{market value of investment in asset } i / \text{market value of the portfolio} \] |
| **34** | Portfolio Expected Value  
\[ E(R_p) = w_1E(R_1) + w_2E(R_2) + \ldots \ldots + w_nE(R_n) \] |
| **35** | Variance of 2 Asset Portfolio |
| **36** | Variance of 3 Asset Portfolio |
| **37** | Bayes Formula,  
\[ \text{Updated Probability} = \frac{\text{Probability of new information for a given event} / \text{unconditional probability of new event}}{\text{prior probability of event}} \] |
| **38** | Factorial  
\[ n! = n \times (n-1) \times (n-2) \times \ldots \times 1 \]  
0! = 1 |
| **39** | Labelling,  
\[ n! / (n_1)! \times (n_2)! \times \ldots \times (n_n)! \] |
| **40** | Combination,  
\[ n \text{ C}_r = n! / (n-r)!r! \] |
| **41** | Permutation,  
\[ n! / (n-r)! \] |
| **42** | To standardize a normal variable,  
\[ z = \frac{\text{Observation} - \text{Population Mean}}{\text{Standard Deviation}} \] |

## COMMON PROBABILITY DISTRIBUTIONS

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| **42** | To standardize a normal variable,  
\[ z = \frac{\text{Observation} - \text{Population Mean}}{\text{Standard Deviation}} \] |
### Roy’s safety first criteria,
\[ SFR = \frac{([E(R_p) - R_l])}{\sigma_p} \]
**Choose the portfolio with largest SFR**

### Continuously compounded rate of return,
\[ R_{cc} = \ln(1 + HPR) \]

## SAMPLING AND ESTIMATION

### Standard Error of sample Mean,
\[ \sigma_x = \frac{\sigma}{\sqrt{n}} \]
\[ \sigma = \text{Standard deviation of population} \]
\[ n = \text{Size of the sample} \]

### t-distribution to construct a confidence interval,
When variance is unknown,
\[ x = t_{\alpha/2} \frac{s}{\sqrt{n}} \]
When variance is known,
\[ x = t_{\alpha/2} \frac{\sigma}{\sqrt{n}} \]
\[ x = \text{Point estimate of population mean} \]
\[ t_{\alpha/2} = \text{The t-reliability factor} \]
\[ s/\sqrt{n} = \text{Standard error of sample mean} \]

## TEST STATISTIC

### Test Statistic
\[ \frac{\text{(Sample Mean - Hypothesized Mean)}}{\text{(Standard Error of Sample Mean)}} \]

### t-statistic
When population variance is unknown,
\[ T_{n-1} = \frac{(x - \mu)}{(s/\sqrt{n})} \]
When population variance is known,
\[ T_{n-1} = \frac{(x - \mu)}{(\sigma/\sqrt{n})} \]

### Chi-square test
\[ X^2 = \frac{(n-1)s^2}{\sigma^2} \]

### F-distribution test,
\[ F = \frac{s_{12}}{s_{22}} \]

## TECHNICAL ANALYSIS

### Arms Index or Short Term Trading Index,
\[ TRIN = \frac{(\text{Number of advancing Issues / Number of declining issues})}{(\text{Volume of advancing issues / Volume of declining issues})} \]
### DEMAND AND SUPPLY ANALYSIS: INTRODUCTION

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| 52   | Demand function for good X,  
\( Q_{dx} = f(P_x, I, P_y, \ldots) \)  
\( P_x = \text{Price of good } X, \ I = \text{Some measure of average income per year}, \ P_y = \text{Prices of related goods} \) |
| 53   | Price Elasticity of Demand = \( \frac{\% \Delta \text{Quantity Demanded}}{\% \Delta \text{Price}} \)  
\( \Delta = \text{change} \) |
| 54   | Cross Price Elasticity = \( \frac{\% \Delta \text{Quantity Demanded}}{\% \Delta \text{Price Of Related Goods}} \)  
\( \Delta = \text{change} \) |
| 55   | Income Elasticity = \( \frac{\% \Delta \text{Quantity Demanded}}{\% \Delta \text{in Income}} \)  
\( \Delta = \text{change} \) |

### DEMAND AND SUPPLY ANALYSIS: THE FIRM

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<tbody>
<tr>
<td>56</td>
<td>Accounting profit = total revenue - total accounting costs</td>
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</table>
| 57   | Economic profit = accounting profit - implicit opportunity costs  
Or  
Economic profit = total revenue - total economic costs |
| 58   | Normal profit,  
Economic profit = accounting profit - normal profit = 0  
Normal profit is the accounting profit that makes economic profit equal to zero |
| 59   | Marginal Cost,  
\( \text{MC} = \text{change in total cost/change in output} \) |

### AGGREGATE OUTPUT, PRICES AND ECONOMIC GROWTH

<table>
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| 60   | Nominal GDP = \( \sum P_i t Q_i t \)  
\( P_i t = \text{Price of good i in year t}, \ Q_i t = \text{Quantity of good I produced in year t} \) |
| 61   | GDP deflator = \( \frac{\text{nominal GDP/value of year t output at year t}}{100} \) |
| 62   | Per Capita Real GDP = GDP/population |
| 63   | GDP by expenditure approach,  
\( \text{GDP} = C + I + G + (X-M) \)  
\( C = \text{Consumption spending}, \ I = \text{Business investment}, \ G = \text{Government purchases}, \ X = \text{Exports}, \ M = \text{Imports} \) |
| 64   | GDP by Income Approach,  
\( \text{GDP} = \text{national income} + \text{capital consumption allowance} + \text{statistical discrepancy} \) |
| 65   | National Income = compensation of employees (wages and benefits)  
+ corporate and government enterprise profits before taxes  
+ Interest Income  
+ Unincorporated business net income (business owner’s income)  
+ rent  
+ indirect business taxes-subsidies |
| 66 | Personal Income = national Income + transfer payments to households - indirect business taxes - corporate income taxes - undistributed corporate profits |
| 67 | Personal disposable income = personal income - personal taxes |
| 68 | Quantity Theory Of Money, \( MV = PY \)  
M = Money Supply,  
V = Velocity of money in transactions,  
P = Price level  
Y = Real GDP |
| 69 | Recessionary Gap or Output Gap = Real GDP - Full Employment GDP |
| 70 | Potential GDP = aggregate hours worked * labour productivity  
In terms of economic growth,  
Growth in potential GDP = growth in labour force + growth in labour productivity |
| 71 | Production Function,  
\( Y = A \cdot f(L,K) \)  
Y = Aggregate economic output,  
L = Size of labour force,  
K = Amount of capital available,  
A = Total factor productivity |
| **UNDERSTANDING BUSINESS CYCLES** |
| 72 | CPI = \((\text{Cost of basket at current prices}/\text{cost of basket at base period prices}) \times 100 \) |
| 73 | Total amount of money that can be created,  
Money created = new deposit/reserve requirement |
| 74 | Money Multiplier = \(1/\text{Reserve Requirement} \) |
| 75 | Fisher Effect,  
\( R_{\text{nom}} = R_{\text{real}} + E(I) + RP \)  
\( R_{\text{nom}} \) = Nominal interest rate,  
\( R_{\text{real}} \) = Real Interest rate  
RP = Risk premium for uncertainty |
| 76 | Neutral Interest Rate = Real trend rate of economic growth + inflation target |
| 77 | Fiscal Multiplier = \(1/\{1-MPC(1-t)\}] \) |
| 78 | Relation between trade deficit, saving and domestic investment,  
Exports - imports = private savings + government savings + domestic investment |
| **CURRENCY EXCHANGE RATES** |
| 79 | Real Exchange Rate = Nominal Exchange Rate \( \frac{d/f}{(\text{CPI foreign})} \times \frac{(\text{CPI domestic})}{(\text{CPI domestic})} \) |
### Interest Rate Parity,

\[
\frac{\text{forward}}{\text{spot}} = \frac{(1+\text{interest rate (domestic)})}{(1+\text{interest rate (foreign)})}
\]

### Accounting Equation, (Balance Sheet)

\[\text{Assets} = \text{liabilities} + \text{equity} + \text{contributed capital} + \text{ending retained earnings}\]

\[\text{Assets} = \text{liabilities} + \text{contributed capital} + \text{beginning retained earnings} + \text{revenue} - \text{expenses} - \text{dividends}\]

### Income statement equation,

\[\text{Net income} = \text{revenues} - \text{expenses}\]

### Straight line depreciation expense

\[\text{Straight line depreciation expense} = \frac{(\text{cost} - \text{residual value})}{\text{useful life}}\]

### Accelerated depreciation- double declining balance method

\[\text{DDB depreciation} = \frac{2}{\text{useful life}}(\text{cost} - \text{accumulated depreciation})\]

### Basic EPS

\[\text{Basic EPS} = \frac{(\text{net income} - \text{preferred dividends})}{(\text{weighted average number of common shares outstanding})}\]

### Diluted EPS

\[\text{Diluted EPS} = \frac{(\text{Adjusted income for common shareholders})}{(\text{weighted average common and potential common shares outstanding})}\]

\[\text{Diluted EPS} = \frac{([\text{Net income} - \text{preferred dividends}] + [\text{convertible preferred dividends}] + [\text{convertible debt interest}(1-\text{tax rate})])}{([\text{Weighted average shares}] + [\text{shares from conversion of converted preferred shares}] + [\text{shares from conversion of debt}] + [\text{shares issuable from stock options}])}\]

### Free Cash flow to firm,

\[\text{FCFF} = \text{NI} + \text{NCC} + \text{Interest}(1-\text{Tax Rate}) - \text{FC Inv} - \text{WC Inv}\]

\[\text{FCFF} = \text{CFO} + \text{Interest}(1-\text{Tax Rate}) - \text{FC Inv}\]

\[\text{NI} = \text{Net income}\]

\[\text{NCC} = \text{Non cash charges}\]

\[\text{FC Inv} = \text{Fixed capital investment}\]

\[\text{WC Inv} = \text{Working Capital Investment}\]

### Free cash flow to equity,

\[\text{FCFE} = \text{CFO} - \text{FC Inv} + \text{net borrowing}\]

\[\text{Net borrowing} = \text{deb ent issued} - \text{debt repaid}\]
|   | 89 Performance Ratio:  
Cash flow to revenue = CFO/Net Revenue  
CFO = Cash flow from operations  
90 Performance Ratio:  
Cash return on asset ratio = CFO/Average total assets  
91 Performance Ratio:  
Cash return on equity ratio = CFO/Average total equity  
92 Performance Ratio:  
Cash to income ratio: CFO/Operating Income  
93 Cash flow per share = (CFO-Preferred Dividends) / (Weighted Average Number Of Common Shares)  
94 Coverage Ratio:  
Debt coverage = CFO / (Total Debt)  
95 Coverage Ratio:  
Interest coverage ratio: (CFO + interest paid + taxes paid) / (interest paid)  
If interest paid is classified as a financing activity under IFRS, no interest adjustment is necessary  
96 Reinvestment Ratio = CFO / (Cash paid for long term assets)  
97 Debt payment Ratio = CFCFO / (Cash long term debt repayment)  
98 Dividend Payment Ratio = CFO / (Dividends paid)  
99 Investing and Financing Ratio = CFO / (Cash outflow from investing and financing activities)  
|   | FINANCIAL ANALYSIS TECHNIQUES  
|   | ACTIVITY RATIOS:  
100 Receivables Turnover = net annual sales /average receivables  
101 Days of sales outstanding = 365 / (Receivables turnover)  
102 Inventory Turnover = (Cost of goods sold) / (Average inventory)  
103 Days of inventory in hand = 365 / (Inventory turnover) |
| 104 | Payables turnover = \( \frac{\text{Purchases}}{\text{Average trade payables}} \) |
| 105 | Number of days of payables = \( \frac{365}{\text{Payable turnover}} \) |
| 106 | Total asset turnover = \( \frac{\text{Revenue}}{\text{Average total assets}} \) |
| 107 | Fixed asset turnover = \( \frac{\text{Revenue}}{\text{Average net fixed assets}} \) |
| 108 | Working capital turnover = \( \frac{\text{Revenue}}{\text{Average working capital}} \) |
| 109 | Current Ratios = \( \frac{\text{(Current Assets)}}{\text{Current Liabilities}} \) |
| 110 | Quick Ratio = \( \frac{\text{(Cash+Marketable Securities+Receivables)}}{\text{(Current Liabilities)}} \) |
| 111 | Cash Ratio = \( \frac{\text{(Cash+Marketable Securities)}}{\text{(Current Liabilities)}} \) |
| 112 | Defensive Interval = \( \frac{\text{(Cash+Marketable Securities+Receivables)}}{\text{(Average Daily Expenditures)}} \) |
| 113 | Cash Conversion Cycle = \( \text{(Days sales outstanding)} + \text{(days on inventory on hand)} - \text{(number of days of payables)} \) |
| 114 | Debt to equity ratio = \( \frac{\text{(Total debt)}}{\text{Total Shareholders Equity}} \) |
| 115 | Debt To Capital = \( \frac{\text{(Total debt)}}{\text{(Total Debt+Total Shareholders Equity)}} \) |
| 116 | Debt To Assets = \( \frac{\text{(Total Debt)}}{\text{(Total Assets)}} \) |
| 117 | Financial Leverage = \( \frac{\text{(Average Total Assets)}}{\text{(Average Total Equity)}} \) |
| 118 | Interest Coverage Ratio = \( \frac{\text{(Earnings Before Interest and taxes)}}{\text{(Interest payments)}} \) |
| 119 | Fixed Charge Coverage = \( \frac{\text{(Earnings Before Interest & Taxes + Lease Payments)}}{\text{(Interest payments + Lease payments)}} \) |
| 120 | Net profit margin = \( \frac{(\text{Net Income})}{\text{Revenue}} \)  
Net income = earnings after taxes but before dividends |
| 121 | Gross Profit Margin = \( \frac{\text{Gross profit}}{\text{Revenue}} \)  
Gross profit = Net Sales - COGS |
| 122 | Operating profit margin = \( \frac{\text{(Operating Income (EBIT))}}{\text{Revenue}} \) |
| 123 | Pretax margin = \( \frac{\text{EBT}}{\text{Revenue}} \) |
| 124 | Return on assets (ROA) = \( \frac{(\text{Net Income})}{\text{(Average Total Assets)}} \) |
| 125 | Operating return on assets = \( \frac{(\text{Operating Income})}{\text{(Average Total Assets)}} \) |
| 126 | Return on Total Capital = \( \frac{\text{EBIT}}{\text{(Average Total Capital)}} \) |
| 127 | Return On Equity = \( \frac{(\text{Net Income})}{\text{(Average Total Equity)}} \)  
Or  
Return On Equity = \( \frac{(\text{Net Income})}{\text{Revenue}} * \frac{\text{Revenue}}{\text{Equity}} \)  
= Net Profit Margin * Equity Turnover  
Return On Equity By Du Pont Equation,  
Return On Equity = \( \frac{(\text{Net Income})}{\text{Sales}} * \frac{\text{(Sales)}}{\text{Assets}} * \frac{\text{(Assets)}}{\text{Equity}} \)  
= Net Profit Margin * Asset Turnover * Leverage Ratio  
ROE By Extended Dupont Equation,  
ROE = \( \frac{(\text{Net Income})}{\text{EBT}} * \frac{\text{EBT}}{\text{Revenue}} * \frac{\text{Revenue}}{\text{(Total Assets)}} * \frac{\text{(Total Assets)}}{\text{(Total Equity)}} \)  
= Tax Burden * Interest Burden * EBIT Margin * Asset turnover * financial leverage |
| 128 | Return on common equity = \( \frac{(\text{Net Income-Preferred Dividends})}{\text{(Average Common Equity)}} \) |
| 129 | Sustainable growth rate = RR*ROE  
RR = Retention rate  
= 1 - dividend payout |
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<tr>
<td>130</td>
<td>Coefficient of variation sales = ( \frac{\text{Standard deviation of operating income}}{\text{Mean sales}} )</td>
</tr>
<tr>
<td>131</td>
<td>CV Operating Income = ( \frac{\text{Standard deviation of operating income}}{\text{Mean operating income}} )</td>
</tr>
<tr>
<td>132</td>
<td>CV Net Income = ( \frac{\text{Standard deviation of net income}}{\text{Mean net income}} )</td>
</tr>
</tbody>
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### INVENTORIES

133 COGS = beginning inventory + purchases - ending inventory

### LONG LIVED ASSETS

134 Depreciation methods,
   i) straight line and ii) ddb covered earlier.
   ii) units of production depreciation = \( \frac{\text{(Original cost-salvage value)}}{\text{(life in output units)}} \times \text{Output units in the period} \)

### INCOME TAXES

135 Effective tax rate = \( \frac{\text{(Income tax expense)}}{\text{(Pretax income)}} \)

136 Income tax expense = taxes payable + \( \Delta \text{DTL-\( \Delta \)DTA} \)

   DTL = Deferred tax liability

   DTA = Deferred tax asset

### CAPITAL BUDGETING

137 Profitability Index (PI) = \( \frac{\text{(PV Of future cash flows)}}{\text{CF0}} \)

\[ = 1 + \frac{\text{NPV}}{\text{CF0}} \]

### COST OF CAPITAL

138 WACC = \( (\text{wd})\text{kd}(1-t)+ (\text{wps})\text{kps}+(\text{wcc})\text{Kcc} \)

   Wd = percentage of debt in capital structure.

   Wps = percentage of preferred stock in the capital structure.

   Wcc = percentage of common stock in the capital structure

139 After tax cost of debt = \( \text{kd}(1-t) \)

140 Cost of preferred stock \( (k_{ps}) \)

\[ K_{ps} = \frac{D_{ps}}{p} \]
### Capital asset pricing model (CAPM)

\[ K_{ce} = RFR + \beta [E(Rm) - RFR] \]

- **Kce**: Cost of equity capital
- **RFR**: Risk free rate
- **E(Rm)**: Expected return on market.

### Dividend discount model

\[
P_0 = \frac{D_1}{(k-g)}
\]

- **D1**: Next year dividend.
- **k**: Required rate of return on common equity.
- **g**: Firm’s expected constant growth rate.

### Bond yield plus risk premium approach

\[ K_{be} = \text{bond yield} + \text{risk premium} \]

### Asset Beta

\[ B_{Asset} = \beta_{Equity} \left( \frac{1}{1+D/E} \right) \]

- **D/E**: Comparable company’s debt to equity ratio

### Project Beta

\[ B_{Project} = B_{Asset} \left( 1 + (1-t) \frac{D}{E} \right) \]

### Revised CAPM using country risk premium

\[ K_{be} = R_f + \beta [E(R_m)' - RFR + CRP] \]

- **CRP**: Country risk premium

#### Break Points

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<tr>
<td>(Amount Of Capital at which the components cost of capital changes)</td>
<td>( \frac{(Amount \text{ Of Capital at which the components cost of capital changes})}{(weight \text{ of the he component in the capital structure))} )</td>
</tr>
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### MEASURES OF LEVERAGE

#### Degree of operating leverage,
\[
\text{DOL} = \frac{\text{(Percentage change in EBIT)}}{\text{(Percentage change in sales)}}
\]

#### DOL for a particular level of units,
\[
\text{DOL} = \frac{Q(P-V)}{(Q(P-V)-F)} = \frac{(S-TVC)}{(S-TVC-F)}
\]

- \(Q\) = Quantity of units sold
- \(P\) = Price per unit
- \(V\) = Variable cost per unit
- \(F\) = Fixed costs
- \(S\) = Sales
- \(TVC\) = Total variable costs

#### Degree of financial leverage,
\[
\text{DFL} = \frac{\text{(Percentage change in EPS)}}{\text{(Percentage change in EBIT)}}
\]

#### DFL for a particular level of operating units,
\[
\text{DFL} = \frac{\text{EBIT}}{(\text{EBIT-Interest})}
\]

#### Degree Of Total Leverage
\[
\text{DTL} = \text{DOL} + \text{DFL}
\]
\[
\text{DTL} = \frac{\text{(% change in EBIT)}}{\text{(% change in Sales)}} * \frac{\text{(% change in EPS)}}{\text{(% change in EBIT)}} = \frac{\text{(% change in EPS)}}{\text{(% Change in Sales)}}
\]
\[
\text{DTL} = \frac{Q(P-V)}{(Q(P-V)-F-I)} = \frac{(S-TVC)}{(S-TVC-F-I)}
\]

#### Breakeven Quantity Of Sales,
\[
\text{QBE} = \frac{(\text{Fixed perating costs} + \text{Fixed financing costs})}{(\text{Price-Variable cost per unit})}
\]

### DIVIDENDS AND SHARE REPURCHASE BASICS

#### Eps after buyback
\[
\text{Eps after buyback} = \frac{\text{(Total earnings-After tax cost of funds)}}{\text{(Shares outstanding after buyback)}}
\]

### WORKING CAPITAL MANAGEMENT

#### Cost of trade credit
\[
\text{Cost of trade credit} = (1 + \frac{\text{(%discount)}}{\text{(1-%discount)}}) \cdot \frac{365}{\text{days past discount}} - 1
\]
### PORTFOLIO RISK AND RETURN: PART II

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<th>Formula/Equation</th>
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<td>155</td>
<td>Expected return when one asset is invested in risky asset and one asset in risk free asset: $E(R_p) = W_A E(R_A) + w_B E(R_B)$, $W_B = 1 - W_A$</td>
</tr>
<tr>
<td>156</td>
<td>Capital market line equation: $E(R_p) = R_f + \frac{(E(R_m) - R_f)}{(\sigma_m)} \sigma_p$</td>
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<tr>
<td>157</td>
<td>Total Risk = systematic risk + unsystematic risk</td>
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<td>158</td>
<td>General form of multifactor model: $E(R_i) - R_f = \beta_{i1}E(Factor\ 1) + \beta_{i2}E(Factor\ 2) + \ldots \ldots + \beta_{ik}E(Factor\ k)$</td>
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<tr>
<td>159</td>
<td>Equation of SML: $E(R_i) = R_f + \frac{(E(R_m) - R_f)}{(\text{Variance of Market})} \text{(Cov}_i\text{,mkt)}$</td>
</tr>
<tr>
<td>160</td>
<td>$M\ Square = \frac{(R_p - R_f)}{(\text{Std Dev of m})} - (R_m - R_f)$</td>
</tr>
<tr>
<td>161</td>
<td>Treynor Measure: $\text{Jenson's\ Alpha = } \alpha_p = R_p - (R_f + \beta_p(R_m - R_f))$</td>
</tr>
<tr>
<td>162</td>
<td>Margin call price = $P_0 \frac{((1\text{-initial margin}))}{((1\text{-maintenance margin})}$</td>
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### SECURITY MARKET INDICES

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<td>164</td>
<td>Compounded Returns: $R_p = (1 + R1)(1 + R2)(1 + R3) \ldots \ldots (1 + R_k) - 1$ $K =$ last sub period</td>
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<tr>
<td>165</td>
<td>Price weighted Index = $\frac{\text{(Sum of stock prices)}}{\text{(Number of stocks in index adjusted for splits})}$</td>
</tr>
<tr>
<td>166</td>
<td>Market weighted Index, $\text{Current\ index\ value = } \frac{\text{(Current\ total\ market\ value\ of\ index\ stocks)}}{\text{(Base\ year\ total\ market\ value\ of\ index\ stocks})} \times \text{Base\ year\ index\ value}$</td>
</tr>
<tr>
<td>167</td>
<td>Equal weighting index, $\text{New\ index\ value = Initial\ index\ value \times (1 + \text{Change\ in\ index})}$</td>
</tr>
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</table>
| 168 | Dividend discount model,  
One year holding period:  
\[ V_0 = \frac{D_t}{(1 + ke)} + \frac{(\text{Year End Price})}{(1 + ke)} \]  
\[ V_0 = \text{Current stock value} \]  
\[ D_t = \text{Dividend at time } t \]  
\[ ke = \text{Required rate of return} \]  
\[ \text{Two year holding period DDM,} \]  
\[ \text{Value} = \frac{D_1}{(1 + ke)} + \frac{D_2}{(1 + ke)^2} + \frac{P_2}{(1 + ke)^2} \]  
\[ \text{Multi-stage dividend discount model:} \]  
\[ \text{Value} = \frac{D_1/ (1 + ke)}{1} + \frac{D_2/ (1 + ke)^2}{1} + \frac{D_n/ (1 + ke)^n}{1} + \frac{P_n}{1} \]  
\[ P_n = \frac{(D_n + 1)}{(ke-gc)} \] |
|---|---|
| 169 | Free cash to equity,  
FCFE = net income + depreciation-increase in working capital-fixed capital investment-debt principal repayments + new debt issues  
FCFE = CFO-FC investment + net borrowing  
CFO = Cash flow from operations. |
| 170 | Preferred stock value = \[ \frac{D_p}{kp} \]  
\[ D_p = \text{Fixed dividend} \]  
\[ Kp = \text{Required rate of return} \] |
| 171 | Enterprise Value (EV)  
EV = market value of common and preferred stock + market value of debt –cash and short term investment |
| 172 | Trailing P/E = \[ \frac{(\text{Market price per share})}{(\text{EPS over previous 12 months})} \] |
| 173 | Leading P/E = \[ \frac{(\text{Market price per share})}{(\text{Forecast EPS over next 12 months})} \] |
| 174 | P/B Ratio = \[ \frac{(\text{Market value of equity})}{(\text{Book value of equity})} = \frac{(\text{Market price per share})}{(\text{Book value per share})} \]  
Book value of equity = common shareholders equity = (total assets- total liabilities)-preferred stock |
INTRODUCTION TO FIXED INCOME VALUATION

175 P/S Ratio = \frac{(\text{Market value of equity})}{(\text{Total sales})}

176 P/CF Ratio = \frac{(\text{Market value of equity})}{(\text{Cash flow})}

UNDERSTANDING FIXED INCOME RISK AND RETURN

177 Price of annual coupon bond,
\[
\text{Price} = \frac{\text{Coupon}}{(1+\text{YTM})} + \frac{\text{Coupon}}{(1+\text{YTM})^2} + \ldots + \frac{\text{Principal + Coupon}}{(1+\text{YTM})^n}
\]

\text{YTM} = \text{Yield to maturity}

Price of semi-annual coupon bond,
\[
\text{Price} = \left(1 + \frac{\text{YTM}}{2}\right) \left(1 + \frac{\text{YTM}}{2}\right)^2 + \ldots + \left(1 + \frac{\text{YTM}}{2}\right)^n 2
\]

178 Full Price = Flat price + Accrued interest

179 Current Yield = \frac{(\text{Annual cash coupon payment})}{(\text{Bond price})}

180 Relation between forward rates and spot rates,
\[(1 + s_2) = (1 + S^1)(1 + 1y1y)\]

181 Option Value = \text{z spread} – OAS

182 Modified duration,
For annual pay bond:
\text{Modified duration} = \text{Macaulay duration}/ (1+\text{YTM})

For semi-annual bond,
\text{ModDursemi} = \text{MacDur}/(1+\text{YTM}/2)
\text{V}_- = \text{price increase}
\text{V}_+ = \text{price decrease}
\text{V}_0 = \text{current price}
\text{Approximate modified duration} = \frac{(\text{V}_- - \text{V}_+)}{2\text{V}_0\Delta\text{YTM}}

183 Approximate % change in bond price = -\text{ModDur} \times \Delta\text{YTM}

184 Effective duration = \frac{(\text{V}_- - \text{V}_+)}{2\text{V}_0\Delta\text{Curve}}
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| 185  | Portfolio duration = $W_1D_1 + W_2D_2 + \ldots + W_nD_n$  
|      | $W =$ Weight = Full price/total value  
|      | $D =$ Duration on bond |
| 186  | Money duration = annual modified duration * full price of bond position  
|      | Money Duration per 100 units of par value = annual modified duration * full price per 100 of par value |
| 187  | Price value of a basis point (PVBP) = Average of decrease in value of bond when YTM increases and increase in value of bond when YTM decreases |
| 188  | Approximate Convexity = $V - V_+ -2V_o / (\Delta \text{curve})^2 Vo$ |
| 189  | % change in Bond Price (when duration and convexity are given)  
|      | $%\Delta \text{Bond Value} = -\text{duration} \,(\Delta \text{spread}) + 1/2 \text{convexity} \,(\Delta \text{spread})^2$ |
| 190  | Duration Gap = Macaulay duration - Investment horizon |
| 191  | Return impact (% change in bond price)  
|      | For small spread changes,  
|      | Return impact = -Modified duration * $\Delta \text{Spread}$  
|      | For larger spread changes,  
|      | Return impact = -Modified duration * $\Delta \text{Spread} + 1/2 \text{convexity} \,(\Delta \text{spread})^2$ |
| 192  | Yield spread = liquidity premium + credit spread |
| 193  | Payment to the long at settlement,  
|      | $\left( \frac{\text{(floating-forward)}}{360} \right) \left( \frac{\text{days}}{360} \right)$  
|      | (notional principal)  
|      | $1 + \left( \frac{\text{(floating)}}{360} \right) \left( \frac{\text{days}}{360} \right)$  
|      | Days = number of days in the loan term |
| 194  | Intrinsic value of call option,  
|      | $C = \max [0,S-X]$  
|      | $C =$ Intrinsic Value of Call option  
|      | $S =$ Spot price  
|      | $X =$ Strike price |
| 195  | Intrinsic value of a put option,  
|      | $P = \max [0,X-S]$  
<p>|      | $P =$ intrinsic value of put |</p>
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<tr>
<td>196</td>
<td>Option value = intrinsic value + time value</td>
</tr>
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</table>
| 197  | Put-call parity:  
\[ C + X/(1+RFR)^t = S + P \]  
C = Call  
P = Put  
S = Stock  
X = Present value |
| 198  | Put call parity with assets cashflows,  
\[ C + X/(1+RFR)^t = (S_0 - PVcf) + P \] |
| 199  | Plain vanilla interest rate swap,  
\[ (\text{Net fixed rate payment})^t = (\text{Swap rate} - \text{LIBOR}_t - 1) \times \frac{(\text{Number of days})}{360} \times \text{notional principal} \] |
For more details call to ICFL Team

<table>
<thead>
<tr>
<th>Region</th>
<th>Phone Numbers</th>
</tr>
</thead>
<tbody>
<tr>
<td>West</td>
<td>+91 8588816146 +91 7838352716</td>
</tr>
<tr>
<td>North</td>
<td>+91 9999560943 +91 7838352716</td>
</tr>
<tr>
<td>South</td>
<td>+91 9739830119 +91 7838352716</td>
</tr>
<tr>
<td>East</td>
<td>+91 9999346802 +91 7838352716</td>
</tr>
</tbody>
</table>

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SMS ‘EDU CFA’ to 5676766

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