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AFM

FORMULA BOOK

150+ Formulas
Applicable for May/Nov 2025

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Basics – Time Value of Money

1. Simple Interest

$$SI = P \times r \times t$$

Where,
SI = Simple Interest
P = Principal Amount
r = Rate of Interest
t = Period of investment

2. Compound Amount

$$A = P(1+r/n)^{nt}$$

Where,
A= Compound Amount
r = Rate of Interest
t = Period of investment
n = No. of Compounding in a year

3. Effective Rate of Interest

$$\text{Effective Rate of Interest} = (1+r/n)^{n} - 1$$

4. Present Value & Future Value

$$FV = PV\ (1+r/n)^{nt}$$

$$FV = PV \times FVF$$

$$PV = FV/(1+r/n)^{nt}$$

$$PV = FV \times 1/(1+r/n)^{nt}$$

$$PV = FV \times PVF$$

Where,
PV = Present Value
FV = Future Value
FVF = Future Value Factor
PVF = Present Value Factor

5. Present Value of Annuity

PV of Annuity = Annuity x PVAF

Where, **PVAF** = Present Value Annuity Factor= $\sum$ PVF

6. Perpetuity

$$\text{Value of Perpetuity} = \frac{\text{Periodic CF}}{r}$$

Basics - Ratios

1. Debt Equity Ratio $= \frac{\text{Total Debt}}{\text{Total Shareholders Equity}}$

2. Debt to Capital Ratio $= \frac{\text{Total Debt}}{\text{Debt+Total Shareholders Equity}}$

3. Fixed Interest Coverage Ratio $= \frac{\text{EBIT}}{\text{Interest Payments +Preference Dividend}}$

4. Return on Capital Employed (ROCE) $= \frac{\text{EBIT}(1-\text{tax})}{\text{Total Capital Employed}}$

5. Return on Equity (ROE) $= \frac{\text{PAT}-\text{Pref.Dividend}}{\text{Total Equity Capital}}$

6. COGS = Purchases + Opening Stock − Closing Stock

7. Effective Tax Rate $= \frac{\text{Income Tax Expense}}{\text{PBT}}$

8. Weighted Average Cost of Capital (WACC) = Ke x We + Kd(1 − t) x Wd

9. Dividend Rate $= \frac{\text{Dividend Per Share}}{\text{Face Value}}$ x 100

10. Dividend Yield $= \frac{\text{Dividend Per Share}}{\text{Market Price}}$ x 100

11. Dividend Payout Ratio $= \frac{\text{Dividend Per Share}}{\text{Earnings Per Share}}$ x 100

12. Retention Ratio = 100 - DPR

13. Growth Rate (g) = ROE x Retention Ratio

14. Price Earning Ratio (PE Ratio) $= \frac{\text{Market Price Per Share}}{\text{Earnings Per Share}}$

15. 100 Basis Point = 1%

Chapter 2 Risk Management

1. To Standardize a Normal Variable

$$z = \frac{\text{Observation} - \text{Mean}}{\text{Standard Deviation}} = \frac{x - \mu}{\sigma}$$

2. Value at Risk

$$\mathbf{VaR_{t\ days}} = \text{Z Score x } SD_{t\ days}$$

$$\mathbf{VaR_{t\ days}} = \text{Z Score x } SD_{1\ day} \text{ x } \sqrt{\text{t days}}$$

$$\mathbf{VaR_{t\ days}} = VaR_{1\ day} \text{ x } \sqrt{\text{t days}}$$

3. Standard Deviation

$$\mathbf{SD_{t\ days}} = SD_{1\ day} \text{ x } \sqrt{\text{t days}}$$

4. Portfolio Variance (in Currency)

$$\mathbf{Variance = SDa^2 + SDb^2 + 2 \times SDa \times SDb \times Corr_{ab}}$$

Note – Weights are not required in the formula above if the values are in rupees or any other currency. We use weights when the values are in % in Portfolio Management Chapter.

5. Portfolio VAR

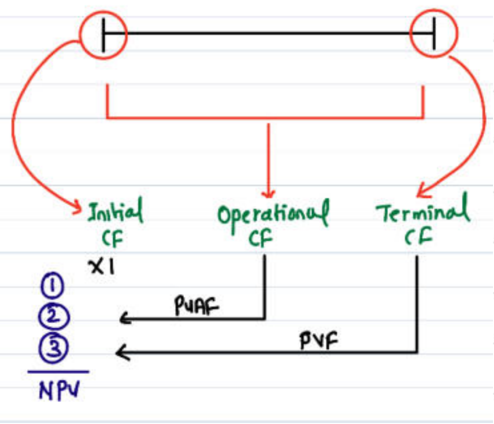
$$\mathbf{VAR_{Portfolio}{}^2 = VAR_A{}^2 + VAR_B{}^2 \times 2VAR_a\ VAR_b Corr_{ab}}$$

$$\mathbf{VAR_{Portfolio} = Z\ Score\ x\ SD_{Portfolio}}$$

Chapter 3 Advanced Capital Budgeting

1. Net Present Value

NPV = PV of Cash Inflows – PV of Cash Outflows



2. Expected Cash Flows (Probability)

$$\overline{\mathbf{CF}} = \sum \mathbf{CF_i \, x \, P_i}$$

3. Standard Deviation (σ)

$$\sigma_{CF} = \sqrt{\sum (CF - \overline{CF})^2 P}$$

$$\sigma_{NPV} = \sqrt{\sum (NPV - \overline{NPV})^2 P}$$

4. Coefficient of Variation (Risk per unit of NPV/Profit)

$$CV = \frac{SD(\sigma)}{NPV}$$

Project with Lower CV is better

5. Standard Deviation (Hilliers Model)

$$\sigma_{CF} = \sqrt{\sum \frac{{\sigma_t}^2}{(1+r)^{2t}}}$$

6. Real and Nominal Cash Flows

Nominal Cash Flows = Real Cash Flows x (1+ Inflation Rate)

(1+ NDR) = (1+ RR) x (1+IR)

Where,

NDR = Nominal Discount Rate

RR = Real Rate

IR = Inflation Rate

7. Risk Adjusted Discount Rate

RADR = Rf + (Ko – Rf) x Risk Factor

Where,

Rf= Risk Free Rate

Ko= Cost of Capital of Firm

8. Certainty Equivalent Coefficient

$$\text{CE Coefficient} = \frac{\text{Certain Cash Flows}}{\text{Total Cash Flows}}$$

9. Sensitivity

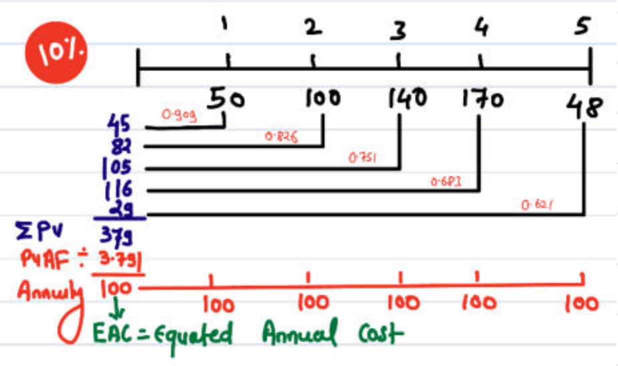
$$\text{Sensitivity} = \frac{\text{Change in Base Value}}{\text{Base Value}} \; x \; 100$$

10. Simulation Analysis

Steps	Description
Step 1	**Model the Project**: Build a model that links NPV with parameters (fixed) and exogenous variables (stochastic, like sales volume or selling price).
Step 2	**Assign Values**: Set values for parameters (e.g., discount rate) and define probability distributions for exogenous variables (e.g., sales volume, prices).
Step 3	**Generate Random Numbers**: Use random numbers to simulate values for the exogenous variables over many trials.
Step 4	**Calculate NPV**: For each trial, compute the NPV based on randomly generated exogenous variable values and fixed parameters.
Step 5	**Analyze Results**: Review the distribution of NPVs from all trials to understand the range of outcomes and associated risks.

11. Equated Annual Cost

$$\text{EAC} = \frac{\text{PV of Cash Flows}}{\text{PVAF}}$$



12. Adjusted Net Present Value

APV= Base Case NPV+PV of Tax Shield on Interest +PV of Interest Subsidies

Chapter 4 Security Analysis

1. **ABI=** $\frac{\text{(No. of Advancing Stocks - No. of Declining Stocks)}}{\text{Total Issues Traded}}$

Where,

ABI = Absolute Breadth Index

Total Issues Traded= Advancing Stocks + Declining Stocks + Stocks Unchanged

2. **Confidence Index=** $\frac{\text{Avg YTM (Best Grade Bonds)}}{\text{Avg YTM (Intermediate Grade Bonds)}}$

3. **RSI =** $\frac{\text{\% Change in Stock Price}}{\text{\% Change in Index}}$

Where **RSI** = Relative Strength Index

4. Arithmetic (Simple) Moving Average (AMA)

$$AMA_{n,t}=\frac{1}{n}\left[P_t+P_{t-1}+...+P_{t-(n-1)}\right]$$

i. e.

$$AMA_{n,t}=\frac{\text{Total of the closing prices in a data}}{\text{number of observation}}$$

5. Exponential (Weighted) Moving Average (EMA)

EMA= [CP x e]+ [Previous EMA x (1-e)]

CP= Current Closing Price,

$e = \text{exponent in decimals} = \frac{2}{n+1}$

6. Run Test Analysis:

Step 1. Total Number of Runs (r)

Step 2. Number of positive price changes (n1)

Step 3. Number of negative price changes (n2)

Step 4. Mean (μ) $= \frac{2n1\ n2}{n1+n2} + 1$

Step 5. Standard Deviation (σ)$= \sqrt{\frac{2n1n2(2n1n2-n1-n2)}{(n1+n2)^2\ (n1+n2-1)}}$

Step 6. Lower limit: [μ - t (σ)]

Step 7. Upper limit: [μ + t (σ)]

Where, t = value from t table at the confidence level for given degrees of freedom

7. Coefficient of Correlation (r)

$$r_{xy} = \frac{Cov_{xy}}{\sigma_x \sigma_y}$$

Where,

Corr$_{xy}$ = correlation between returns of the stock and returns of the market

σ_x = Standard Deviation of returns of the stock x

σ_y = Standard Deviation of returns of the market index

σ_y^2 = Variance of the market index

Cov_{xy} = Covariance of stock x and y

8. Covariance:

$$Cov_{xy} = \frac{\sum [R_x - \overline{R_x}][R_y - \overline{R_y}]}{N}$$

Where,

COV_{xy} = Covariance between x and y

R_x = Expected or mean return on stock x

R_y = Expected or mean return on stock y

Chapter 5 Security Valuation

Situation	Valuation	Action
AMP > TMP	Shares are Overvalued	Sell
AMP=TMP	Shares are Correctly Valued	Hold
AMP<TMP	Shares are Undervalued	Buy

AMP = Actual Market Price
TMP = Theoretical Market Price/ Fair Value

1. Walters Model

$$P = \frac{D + \frac{r}{K_e}(E-D)}{K_e}$$

Where,

P = TMP = Theoretical Market Price / Fair Value of the shares

D= Dividend Per Share = EPS x Dividend Payout Ratio

r= Return on Equity = EAT for Equity / Equity Shareholders Fund

Ke= Cost of Equity / Required Rate of Return of Shareholder

E= Earnings Per Share = EAT for Equity/ No. of Equity Shares

Situation	Action	Optimum DPR	MP @ Optimum DPR
ROE > Ke	Company should retain all earnings	0%	Highest
ROE<Ke	Company should distribute all earnings	100%	Highest
ROE = Ke	Doesn't Matter	Doesn't Matter	Indifferent

ROE = Return on Equity According to Du Pont Analysis

ROE = Net Profit Margin x Asset Turnover Ratio x Equity Multiplier

$$= \frac{PAT}{Sales} \times \frac{Sales}{Assets} \times \frac{Assets}{Net\ Worth(SC + R\&S)}$$

$$= \frac{PAT}{Net\ Worth\ (SC + R\&S)}$$

2. Dividend Based Model

a. Zero Growth Model: $P = \frac{D}{K_e}$

b. Single Period Holding

$$P_0 = \frac{D_1}{(1+K_e)^1} + \frac{P_1}{(1+K_e)^1}$$

Where,
D_1 = Do(1+g)= **Next** Dividend, **Expected** Dividend, **Proposed** Dividend
P_1 = Market Price of the share at the end of the year
Ke= Cost of Equity / Required Rate of Return of Shareholder

c. Constant/Perpetual/Gordon's Growth Model:

Ke = Shareholders Expectation of returns from the company

= Dividend Yield + Capital Appreciation

= D1/MP + Growth

$$= \frac{D_1}{MP} + G$$

$$MP = \frac{D_1}{Ke - G}$$

$$MP = \left[\frac{D_0(1+g)}{K_e - g}\right]$$

Where,

MP = TMP = Theoretical Market Price / Fair Value of the shares

Do = **Current** Dividend, **Past** Dividend, Dividend **Declared**, Dividend **Paid**

D_1 = Do(1+g)= **Next** Dividend, **Expected** Dividend, **Proposed** Dividend

g = Growth Rate = b x r = Retention Ratio x Return on Investment

Ke = Cost of Equity / Required Rate of Return of Shareholder = Dividend Yield+ Capital Appreciation

d. Constant/Perpetual/Gordon's Declining Model:

$$MP = \left[\frac{D_0(1-g)}{K_e + g}\right]$$

This formula should be used in case dividend is declining at a constant rate perpetually.

e. Two Stage Dividend Growth Model:

$$P_0 = \left[\frac{D_0(1+g_1)}{(1+K_e)^1} + \frac{D_1(1+g_1)}{(1+K_e)^2} + \dots \frac{D_{n-1}(1+g_1)}{(1+K_e)^n}\right] + \frac{P_n}{(1+Ke)^n}$$

Where,

$$P_n = \left[\frac{D_n(1+g_2)}{K_e - g_2}\right]$$

g_1 = First Stage Growth Rate

g_2 = Second Stage / Perpetual / Stable Growth rate

f. H Model:

$$P_0 = \left[\frac{D_0(1+g_n)}{(K_e - g_n)} + \frac{D_0 H_1 (g_c - g_n)}{k_e - g_n}\right]$$

Where,

D_0 = The most recent dividend payment

g_c = The initial/current high growth rate

g_n = The terminal growth rate

r = The discount rate

H = The half-life of the transition period

3. Earnings Based Model

a. Gordon's Earning Model

$$P_0 = \frac{EPS_1(1-b)}{Ke - br}$$

b. PE Multiplier

Market Price = EPS x PE Ratio

$$EPS = \frac{PAT - Preference\ Dividend}{No.\ of\ Equity\ Shares}$$

4. Enterprise Value

EV = Market Value of Equity

+ Market Value of Preferred Equity
+ Market Value of Debt
+ Minority Interest
- Cash and Investments

i. Enterprise value to EBITDA Multiple

$$\text{Enterprise Multiple} = \frac{\text{Enterprise Value}}{\text{EBITDA}}$$

ii. Enterprise value to Sales multiple

$$\text{Enterprise Multiple} = \frac{\text{Enterprise Value}}{\text{Sales}}$$

5. Free Cash Flows to Firm (FCFF):

Where,

EBITDA = Earnings Before Interest, Tax and Depreciation & Amortisation

EBIT= Earnings Before Interest & Tax

EAT = Earnings After Tax for Equity Holders

I = Interest , **D** = Depreciation

CAPEX = Capital Expenditure, Inflow = Add, Outflow = Less

ΔWC = Change in Working Capital, Increase = Less, Decrease = Add

Based on EBITDA

FCFF= EBITDA (1-t) + D* tax rate -/+ Capex -/+ ΔNon Cash WC + Short Term Debt Issued

Based on Operating Income or EBIT

FCFF= EBIT (1-t) + D -/+ Capex -/+ Δ Non Cash WC + Short Term Debt Issued

Based on its Net Income (EAT)

FCFF= EAT + I(1-t) + D -/+ Capex -/+ Δ Non Cash WC + Short Term Debt Issued

Based on FCFE

FCFF= FCFE + I (1-t) + Principal Repaid– New Debt + Pref. Dividend

6. Free Cash Flows to Equity (FCFE)

FCFE = EAT + D -/+ Capex -/+ ΔWC+ New Debt- Debt Repayment

Capital Expenditure

Capex = Closing FA + Fixed Asset Sold + Depreciation – Opening FA

7. One Stage, Two Stage and Three Stage Model for the Valuation of the firm

For One Stage Model

Intrinsic Value = Present Value of Stable Period Free Cash Flows to Firm

For Two Stage Model

Intrinsic Value = Present value of Explicit Period Free Cash Flows to Firm + Present Value of Stable Period Free Cash Flows to a Firm,

or

Intrinsic Value = Present Value of Transition Period Free Cash Flows to Firm + Present Value of Stable Period Free Cash Flows to a Firm

For Three Stage Model

Intrinsic Value = Present value of Explicit Period Free Cash Flows to Firm

+ Present Value of Transition Period Free Cash Flows to Firm + Present Value of Stable Period Free Cash Flows to Firm

8. Right Share

Ex-Right Price of shares

$$\text{Ex-Right Price } (P_1) = \frac{nP_0 + n_1 S}{n + n_1}$$

Where,

P_1= Ex Right Price of Share

P_0= Pre – Right Price of Share

n =No. of existing shares before right issue

n_1=No. of new shares issued under right issue

Value of the Right (Right On)

1. Value of right = $\frac{n_1(P_0 - S)}{n + n_1}$

2. Value of right = $P_0 - P_1$

3. Value of right = $\frac{n_1(P_1 - S)}{n}$

Value of the Right (Ex-Right)

1. Value of right = $\frac{(P_0 - S)}{n}$

9. Value Preference Shares

1. Value of the redeemable preference shares

$$\frac{\text{Dividend}_1}{(1+\text{Kp})^1}+\frac{\text{Dividend}_2}{(1+\text{Kp})^2}+\ldots+\frac{(\text{Dividend}_n+\text{Maturity Value})}{(1+\text{Kp})^n}$$

2. Value of the irredeemable preference shares

$$\text{MP}=\frac{\text{Preference Dividend (PD)}}{\text{Required return on Preference Shares (Kp)}}$$

10. Value of bond

$$\text{BV}= \text{I x PVAF}_{\text{YTM, n}} + \text{RV x PVF}_{\text{YTM, n}}$$

Where,

BV = Value of the bond or Theoretical Market Price or Intrinsic Value of the bond [Present value of all the future cash flows]

I = Annual interest payable on the bond

RV = Redemption value of the bond. [May be at par, premium or discount]

n = No. of years left till redemption

YTM = yield to maturity or required rate of return or going rate on new bond with same risk

Bond's Value with semi-annual interest rate

$$\text{BV}=\frac{\text{I}}{2}\text{ x PVAF}_{\frac{\text{YTM}}{2}, 2n} + \text{RV x PVF}_{\frac{\text{YTM}}{2}, 2n}$$

11. Current Yield

$$\text{Current Yield}=\frac{\text{Interest}}{\text{Market price}}\text{ x 100}$$

12. Yield to Maturity (YTM)

1. Average Method

$$YTM = \frac{C + \frac{(RV-MV)}{n}}{\frac{(RV+MV)}{2}}$$

Where,

C = Coupon Payment Per Annum

RV = Redemption Value

MV = Current Market Value

n = No. of years left till maturity

2. Discounted Cash Flow Method (IRR Method)

$$BV = I \times PVAF_{YTM,\, n} + RV \times PVF_{YTM,\, n}$$

Where,

BV = Value of the bond or Theoretical Market Price or Intrinsic Value of the bond [Present value of all the future cash flows]

I = Annual interest payable on the bond

RV = Redemption value of the bond. [May be at par, premium or discount]

n = No. of years left till redemption

YTM = yield to maturity or required rate of return or going rate on new bond with same risk

3. Yield to Call / Put

$$YTM = \frac{C + \frac{(CV-MV)}{Cn}}{\frac{(CV+MV)}{2}}$$

Where,

C = Coupon Payment Per Annum

CV = Call Value , **PV** = Put Value

MV = Current Market Value

Cn= No. of years left till Call , **Pn** = No. of Years Left till Put

13. Duration of Bond

1. Macaulay's Duration of bond

$$\text{Mac D} = \sum \text{Weight x Year}$$

Where,

Weight = Weight of a Present Value of cash flows in Total Present Value

Alternative 1

$$\text{Mac D} = \frac{\sum \text{PV x Yr}}{\sum \text{PV}}$$

Alternative 2

$$\text{Mac D} = \frac{1+\text{YTM}}{\text{YTM}} - \frac{(1+\text{YTM})+t\,(c-\text{YTM})}{c\,[(1+\text{YTM})^{t}-1]+\text{YTM}}$$

Where,

c= coupon rate, **t**= Time to maturity, **YTM** = yield to maturity

Alternative 3

$$\text{MacD} = \frac{\sum \frac{t^{*}c}{(1+i)^{t}} + \frac{n^{*}M}{(1+i)^{n}}}{P}$$

Normality is what weak people call living. I call it death.

Where,

n= no. of cash flows, **c**= coupon rate, **t**= Time to maturity,

i= Required yield, **M**= Maturity Value, **P**= Bond Price

Points to Note

1. Longer the Maturity , higher will be the duration (Duration is positively related to maturity
2. Higher the coupon rate & YTM, lower will be the duration (Duration is negatively related to coupon rate and YTM)
3. Duration will always be smaller than the maturity of coupon paying bond
4. Duration of Zero Coupon Bond will be equal to its maturity.
5. Duration Gap = Macaulay Duration – Investment Horizon
6. Duration of Perpetual Bond = (1+YTM)/YTM

2. Modified Duration (%) or Volatility of the Bond

$$\text{Volatility or Mod D} = \frac{\text{Macaulay's Duration}}{\left(1+\frac{YTM}{n}\right)}$$

Where, **n** = no. of compounding in a year

14. Convexity

$$\text{Convexity}=\frac{PV_{+}+PV_{-}-2PV_{0}}{2PV_{0}\ x\ (\Delta Yield)^{2}}$$

$$\%\Delta PV \approx (-AnnModDur\ x\ \Delta Yield)+[Convexity\ x\ (\Delta Yield)^{2}]$$

Where,

PV_+=Bonds price when yield increases

PV_-=Bonds price when yield decreases

PV_0=Initial Bond Price at given yield
ΔYield= Change in Yield
AnnModDur=Annual Modified Duration

15. Bond Immunization

Portfolio of Bond is said to be perfectly immunized if

Investors Horizon = Duration of the Portfolio

PV of Assets = PV of Liabilities

Also, Duration of Portfolio = Weighted average of the duration of individual assets in the portfolio

16. Convertible Bonds

1. Conversion Ratio:

The number of shares each convertible bond converts into. It may be expressed per bond.

2. Conversion Value:

Conversion Value=Market price per share x Conversion ratio

3. Conversion Premium:

The amount by which the price of a convertible security exceeds the current market value of the common stock into which it may be converted.

CP = Market price of Convertible Bond – Conversion Value

CP = MP – CV

4. Conversion Premium Ratio:

Ratio which shows at what premium the convertible bond is trading in the market.

$$\text{Conversion Premium Ratio}=\left(\frac{MV}{CV}-1\right)\times 100$$

5. Straight Value of the Bond:

It is the price where the bond would trade if it were not convertible to stock. Its then is equivalent to non-convertible bond.

6. Minimum Value of the Convertible Bond:

A convertible bond should at the lowest trade at the higher of either the conversion value or straight value.

7. Downside Risk:

Downside risk is the % premium over the straight value of the bond.

$$DR\,(\%)=\left(\frac{MP}{SV}-1\right)\times 100$$

8. Conversion Parity Price or Market Conversion Price:

Price at which the investor will neither gain nor lose on buying the bond and exercising it.

$$CPP=\frac{MP}{N}$$

9. Favourable Income Differential Per Share

It represents extra income earned in Bond over dividend income in shares.

FID= Interest from Bond—(Dividend from Equity x CR)

10. Premium Payback Period:

It represents the time in which we recover premium paid (to purchase the Convertible Bond) using extra income of interest.

$$PPP = \frac{\text{Conversion Premium}}{\text{Favourable Income Differential}}$$

17. Money Market Instruments

1. Dirty Price & Clean Price

Dirty Price = Clean Price + Accrued Interest

2. Discount Rate

$$\text{Discount Rate} = \frac{\text{Face Value - Issue Price}}{\text{Face Value}} \times \frac{360}{\text{maturity in days}} \times 100$$

3. Discount Yield

$$\text{Discount Yield} = \frac{\text{Face Value - Issue Price}}{\text{Issue Price}} \times \frac{360}{\text{maturity in days}} \times 100$$

4. Haircut and Initial Margin

The term haircut is most commonly used when referencing the percentage difference between an asset's market value and the amount that can be used as collateral for a loan. There is a difference between these values because market prices change over time, which the lender needs to accommodate for.

For example, if a person needs a $10,000 loan and wants to use their $10,000 stock portfolio as collateral, the bank is likely to recognize the $10,000 portfolio as worth only $5,000 in collateral. The $5,000 or 50% reduction in the asset's value, for collateral purposes, is called the haircut.

5. Holding Period Return

$$HPR = \frac{\text{Ending Value} - \text{Beginning Value}}{\text{Beginning Value}}$$

6. Annualised Yield on Bank Discount Basis

$$RBD = \frac{\text{Purchase Price} - \text{Face Value}}{\text{Face Value}} \text{ x } \frac{360}{t}$$

Where, **t**= Number of days until maturity

7. Effective Annual Yield

$$EAY = (1 + HPR)^{365/t} - 1$$

8. Money Market Yield

$$MMY = \frac{360}{\text{Days}} \text{ x HPR}$$

Chapter 6 Portfolio Management

1. Return based on Dividend & Capital Appreciation

$$R=\frac{D+CA}{II}$$

Where,

D = Dividend , **CA** = Capital Appreciation, **II** = Initial Investment

2. Expected Return

$$\bar{R}=\sum_{i=1}^{n} R_i P_i$$

Where,

Ri = Return of the possible observation

Pi = Probability of happening of the possible observation

3. Portfolio Return

$$R_p=\sum_{i=1}^{n} \bar{R}_i W_i$$

$$R_p=W_1R_1+W_2R_2+\ldots W_nR_n$$

Where,

Ri = Return of the individual security

Wi = Weight of each security in the portfolio.

4. Return of security under CAPM

$$R_i=R_f+\beta_i(R_m-R_f)$$

$$R_p=R_f+\beta_p(R_m-R_f)$$

Where,

Ri = Required Return by the shareholder

Rp = Return of the Portfolio

Rf = Risk Free Rate of Return

Rm = Market Return

Bi = Beta of the Security

5. The Arbitrage Pricing Theory Model

Stocks/Portfolios Returns according to APT will be

$$R_i = R_f + \beta_1\lambda_1 + \beta_2\lambda_2 + \beta_3\lambda_3 + \cdots \beta_n\lambda_n$$

Where,

Ri = Required Return by the shareholder

$\boldsymbol{\lambda_1, \lambda_2, \lambda_3}$ are average risk premium for each of the factors in the model

$\boldsymbol{\beta_1, \beta_2, \beta_3}$ are betas of the security for each of the factors

6. Single index model

The single index model equation is:

$$R_i= \alpha_i+ \beta_i R_m+\epsilon_i$$

Where,

$\mathbf{R_i}$=expected return on security i

$\boldsymbol{\alpha_i}$=alpha coefficient or intercept of the straight line

$\boldsymbol{\beta_i}$=beta coefficient or slope of the line

$\mathbf{R_m}$=the rate of return on market index

ϵ_i=unsystematic risk of the security

7. Total Risk = Systematic Risk + Unsystematic Risk

8. Risk of Single Security

a. Without probability

$$\sigma = \sqrt{\frac{\sum (R - \overline{R})^2}{N}}$$

N = Number of observations

b. With probability

$$\sigma = \sqrt{\sum_{i=1}^{n} [(R - \overline{R})^2 p}$$

p = probability of i^{th} return

9. Risk of Portfolio of 2 securities/assets

$$\sigma_p^2 = w_a^2\sigma_a^2 + w_b^2\sigma_b^2 + 2w_a w_b (r_{ab}\sigma_a\sigma_b)$$

Where,

σ_p^2=portfolio variance,

w_a=proportion of funds invested in first security,

w_b=proportion of funds invested in second security,

σ_a=Standard deviation of first security

σ_b=Standard deviation of second security

r_{ab}=correlation coefficient between the returns of the two securites

Note: Above formula can be shortened when value of r is is 1, -1 or 0 as follows

a. When r =1 [Perfectly Positively Correlated]

$$\sigma_p = w_a\sigma_a + w_b\sigma_b$$

This is the point where risk cannot be reduced using diversification i.e. by creating a portfolio

b. When r =-1 [Perfectly Negatively Correlated]

$$\sigma_p = w_a\sigma_a - w_b\sigma_b$$

This is the point where risk can be reduced to minimum using diversification i.e. by creating a portfolio

c. When r =0 [Uncorrelated]

$$\sigma_p{}^2 = \sqrt{(w_a\sigma_a)^2 + (w_b\sigma_b)^2}$$

10. Risk of Portfolio of 3 securities/assets

$$\boldsymbol{\sigma_p^2 = (a+b+c)^2}$$

$$\boldsymbol{\sigma_p^2} = w_a^2\sigma_a^2 + w_b^2\sigma_b^2 + w_c^2\sigma_c^2 + 2w_aw_b(r_{ab}\sigma_a\sigma_b) + 2w_bw_c(r_{bc}\sigma_b\sigma_c) + 2w_cw_a(r_{ca}\sigma_c\sigma_a)$$

$$\sigma_p^2 = \sum_{i=1}^{n}\sum_{i=1}^{n} w_iw_m\,\sigma_i\sigma_m r_{im}$$

$$\sigma_p^2 = \sum_{i=1}^{n}\sum_{i=1}^{n} w_iw_m\,Cov_{im}$$

Where,

$\boldsymbol{\sigma_p^2}$=portfolio variance,

$\boldsymbol{w_i}$=proportion of funds invested in first security,

$\boldsymbol{w_m}$=proportion of funds invested in second security,

$\boldsymbol{Cov_{im}}$=covariance between the pair of securities a and b

n = Total number of securities in the portfolio

11. Single Index Model

a. Security Variance (σ_i^2)

$$\sigma_i^2 = \beta_i^2 \sigma_m^2 + \epsilon_i^2$$

Where,

$\boldsymbol{\sigma^2}$ = total variance

$\boldsymbol{\beta_i^2 \sigma_m^2}$ = systematic variance

$\sigma_{\epsilon i}^2$ = unsystematic variance

b. Portfolio variance (σ_p^2)

$$\sigma_p^2 = \left[\beta_p^2 \sigma_m^2\right] + \left[\sum (W_i \epsilon_i)^2\right]$$

12. Beta

i. Regression Analysis

$$\beta_x = \frac{\sum XY - n\bar{X}\bar{Y}}{\sum Y^2 - n\bar{Y}^2}$$

Where,

$\boldsymbol{\beta_x}$=Beta of the stock x

X=Return(%)from the stock,

Y=Return(%) from the market

$\boldsymbol{\bar{X}}$=Expected or Mean value of returns from stock

$\boldsymbol{\bar{Y}}$=Expected or Mean value of returns from market

n=number of observation

ii. Correlation Analysis

$$\beta_x = \frac{Corr_{xy}\sigma_x\sigma_y}{\sigma_y^2} \text{ or } \frac{Corr_{xy}\sigma_x}{\sigma_y} \text{ or } \frac{Cov_{xy}}{\sigma_y{}^2}$$

Where,

β_x=beta of the stock x

$Corr_{xy}$=Correlation between returns of the stock and returns of the market

σ_x=standard deviation of returns of the stock x

σ_y=standard deviation of returns of the market index

σ_y^2=variance of the market index

Cov_{xy}=Covariance of stock x and y

9. Covariance:

$$Cov_{xy} = \frac{\sum [R_x - \overline{R_x}][R_y - \overline{R_y}]}{N}$$

Or

$$Cov_{xy} = \beta_x \beta_y \sigma_m{}^2$$

Where,

COV_{xy} = Covariance between x and y

R_x = Expected or mean return on stock x

R_y = Expected or mean return on stock y

β_x = Beta of the stock x

β_y = Beta of the stock y

$\sigma_m{}^2$ = Variance of Market/Index

10. Coefficient of Correlation (r)

$$r_{xy} = \frac{Cov_{xy}}{\sigma_x \sigma_y}$$

$$Cov_{xy} = \sigma_x \sigma_y r_{xy}$$

Where,

$Corr_{xy}$ = correlation between returns of the stock and returns of the market

σ_x = Standard Deviation of returns of the stock x

σ_y = Standard Deviation of returns of the market index

σ_y^2 = Variance of the market index

Cov_{xy} = Covariance of stock x and y

11. Coefficient of Determination = r^2

iii. Portfolio Beta

$$\beta_p = \sum W_i \beta_i$$

Where,

β_p=Portfolio Beta

β_i=Beta of the each asset in the portfolio

W_i=weight of each asset in the portfolio

13. Geared & Ungeared Beta

a. Ungeared Company

$$\beta_{Asset} = \beta_{Equity}$$

b. Geared Company

$$\beta_{Asset} = \beta_{Equity} \times W_{Equity} + \beta_{Debt} \times W_{Debt}$$

$$\beta_{Equity} = \beta_{Asset} [1+D/E(1-tax)]$$

$$\beta_{Geared} = \beta_{Ungeared} [1+D/E(1-tax)]$$

$$\beta_{Levered} = \beta_{Unlevered} [1+D/E(1-tax)]$$

14. Portfolio Alpha

$$\alpha_p = \sum_{i=1}^{N} w_i \alpha_i$$

Value of Beta	Interpretation	Example
β < 0	Asset generally moves in the opposite direction as compared to the index	Gold, which often moves opposite to the movements of the stock market
β = 0	Movement of the asset is uncorrelated with the movement of the benchmark	Fixed-yield asset, whose growth is unrelated to the movement of the stock market
0 < β < 1	Movement of the asset is generally in the	Stable, "staple" stock such as a company that

	same direction as, but less than the movement of the benchmark	makes soap. Moves in the same direction as the market at large, but less susceptible to day-to-day fluctuation.
β = 1	Movement of the asset is generally in the same direction as, and about the same amount as the movement of the benchmark	A representative stock or a stock that is a strong contributor to the index itself.
β > 1	Movement of the asset is generally in the same direction as, but more than the movement of the benchmark	Volatile stock, such as a tech stock, or stocks which are very strongly influenced by day-to-day market news.

15. Three market Lines:

1. Capital Market Line

$$R_i = R_f + \frac{\sigma_i}{\sigma_m}(R_m - R_f)$$

σ_i=Standard deviation of the security

σ_m=Standard deviation of the market

2. Security market line

$$R_i = R_f + \beta_i(R_m - R_f)$$

SML is the graphical representation of Capital Asset Pricing Model

3. Security Characteristic Line

$$R_i = \alpha_i + \beta_i R_m$$

Where,

$\mathbf{R_i}$=expected return on security i

$\boldsymbol{\alpha_i}$=alpha

$\boldsymbol{\beta_i R_m}$=component of return due to market movement

16. Optimum Portfolio Theory

1. Find out the "excess return to beta" ratio for each stock under consideration using Treynor ratio.
2. Rank them from the highest to the lowest.
3. Proceed to calculate C_i for all the stocks/portfolios according to the ranked order using the following formula:

$$C_i = \frac{\sigma_m^2 \sum_{i=1}^{N} \frac{(R_i - R_f)\beta_i}{\sigma_{ei}^2}}{1 + \sigma_m^2 \sum_{i=1}^{N} \frac{\beta_i^2}{\sigma_{ei}^2}}$$

Where,

$\boldsymbol{\sigma_m^2}$=Variance of the market index

$\boldsymbol{\sigma_{ei}^2}$=Vriance of the stock's movement that is not associated with the movement of market index i.e stock's unsystematic risk.

4. Determine the relative Z_i investment of each stock in the selected portfolio

$$Z_i = \frac{\beta_i}{\sigma_{ei}^2}\left(\frac{R_i - R_f}{\beta_i} - C^*\right)$$

5. Find out the weight of X_i each stock in the selected portfolio

$$X_i = \frac{Z_i}{\sum_{j=1}^{N} Z_i}$$

17. Portfolio Evaluation Measures

a. Sharpe Ratio

$$\frac{R_i - R_f}{\sigma_i}$$

b. Treynor Ratio

$$\frac{R_i - R_f}{\beta_i}$$

c. Jensen's Alpha

Actual Return-Required return [CAPM return]

18. Equation of Line

$$Y = mX + b$$

$$W(Y) = m\,W(X) + b$$

Where,

m = slope and **b** = intercept are constant

W(Y) and **W(X)** are the weights of security Y and X for minimum variance portfolio

19. Minimum Variance Portfolio

$$W_A = \frac{\sigma_B^2 - Cov_{A,B}}{\sigma_A^2 + \sigma_B^2 - 2Cov_{A,B}}$$

$$W_B = 1 - W_A$$

Where,

W_A=Weight of security A in minimum variance portfolio

W_B=Weight of security B in minimum variance portfolio

20. Constant Proportion Portfolio Insurance Policy

Equity Value = Multiplier x [Portfolio Value - Floor Value]

21. The covariance of returns between securities i and j

$$Cov_{ij} = \beta_i \beta_j \sigma_m^2$$

22. Fixed Income Portfolio

a. Arithmetic Average Rate of Return

$$AARR = \frac{\sum R_i}{N}$$

Where, $\mathbf{R_i}$ = Returns of respective period, **N** = no. of periods

b. Time Weighted Rate of Return

$$TWRR = [(1+R_1)(1+R_2)\ldots\ldots(1+R_n)] - 1$$

c. Money Weighted Rate of Return

MWRR (IRR), 0 = PV of CIF – PV of COF

d. Annualised Return

$$ARR = (1+R) \times \frac{365}{\text{No. of days}}$$

R= Entire return for holding period

Chapter 8 Mutual Funds

1. Net Assets Value

$$NAV=\frac{(\text{Total Assets-Total Liabilities})}{\text{No. of Units}}$$

2. Holding Period Return

$$HPR=\frac{(NAV_1-NAV_0)+CG+D}{NAV_0}$$

3. Return in case the dividend and capital gains are reinvested

$$HPR=\frac{(N_1 x\ NAV_1)-(N_0 x\ NAV_0)}{(N_0 x\ NAV_0)}$$

4. Return earned by Mutual Funds/Investor

$$r_2=\frac{1}{\text{1-Initial exp.}}\times r_1+\text{recurring exp.}$$

Where,

r_2 = Return Required by Mutual Funds

r_1 = Return earned by Investor

5. Expense Ratio

$$ER = \frac{\text{Expenses incurred per unit}}{\text{Average NAV}}$$

$$ER = \frac{\text{Total Expenses}}{\text{Average value of portfolio}}$$

Note: ER can also be calculated based on Closing NAV.

6. Public Offer Price (POP) & Front End Load (FEL

$$POP = \frac{NAV}{[1-FEL]}$$

Where,
POP = Public Offer Price,
NAV = Net Asset Value,
FEL = Front End Load (%)

7. Redemption Price (RP) & Back End Load (BEL)

$$RP = \frac{NAV}{[1+BEL]}$$

Where,
RP = Redemption Price,

NAV = Net Asset Value,
BEL = Back End Load (%)

8. Dividend Equalisation Reserve

Issue Price = NAV + Contribution to DEL +Entry Load

Repurchase Price = NAV + Contribution to DEL - Exit Load

9. Tracking Error

$$TE = \sqrt{\frac{\sum(d - \bar{d})^2}{n-1}}$$

Where,

d= differential return

$\bar{d}$= average differential return

n = no. of observation

Fund A Return (%)	Index X Return (%)	Differential d	$d - \bar{d}$	$(d - \bar{d})^2$
10	8	2	-1.8	3.24
12	12	0	-3.8	14.44
15	10	5	1.2	1.44
20	18	2	-1.8	3.24
25	15	10	6.2	38.44
		$\bar{d}$ = **3.8**		60.8
		Variance = 60.8 /4		15.2
	Tracking Error = $\sqrt{15.20}$			**3.90%**

Chapter 9 Derivatives Analysis & Valuation

1. Price of the Forward / Future

Basis	Derivatives
Cost of Carry Model	**Spot Price + Cost of Carry - Dividend**
Normal Compounding	$F=S(1+r)^t$
Continuous Compounding	$F=Se^{rt}$
Continuous Compounding (with dividend in yield)	$F=Se^{(r-y)t}$

Where, **r** = Risk free rate of return , **t** = Time **remaining** for expiry

Note:

1. If the value of e is given in question use Continuous Compounding formula and if value of e is not given then use Normal Compounding formula (Annual)

2. In case of dividend paying stock the Present Value of the Dividend is to be deducted from Spot Price i.e. $F = (S - PV\ of\ D)(1+r)^t$ or $S(1+r)^t - D$

Calculating Value of e on Calculator

Say we want to calculate the value of $e^{0.75}$

- Press 2.7183 on calculator
- Press √ Square Root 12 times
- Press - Minus 1
- Press x 0.75
- Press + Plus 1
- Press x = 12 times

Note: e to the power negative value = 1/ e to the power positive value e.g.

$$e^{-0.03} = \frac{1}{e^{0.03}}$$

2. Contango & Backwardation

Basis = Spot Price – Futures Price

If Basis is Negative = Market is in Contango

If Basis is Positive = Market is in Backwardation

3. Initial Margin = μ + 3σ

Where,
μ= Average daily absolute change in the value of contract
σ= Standard Deviation of these changes

4. Hedging with Futures

$$N = \frac{\text{Value to be hedged}}{\text{Futures Contract Value}} \times \text{Risk to be reduced}$$

Where, Futures Contract Value = Actual Futures Price × Lot Size

5. Arbitrage with Futures

Situation	AFP> TFP	AFP<TFP
Meaning	Forward / Futures is overvalued	Forward / Futures is undervalued

Time = 0		
Action in Futures	Sell Futures	Buy Futures
Spot Action	Buy Stock	Sell Stock
	Borrow in Spot	Invest in Spot
Time = T		
Settle Futures	Buy Futures	Sell Futures
Settle Spot	Sell Stock	Buy Stock
	Repayment of Borrowings	Investment Proceeds
Arbitrage Gain	Gain	Gain

6. Hedge Ratio

$$H = r \times \frac{\sigma_s}{\sigma_f}$$

Where,
σ_s = Standard deviation of changes in Spot Prices
σ_f = Standard deviation of changes in Futures Prices
r = Coefficient of correlation between spot and futures prices
Note – This is the same formula as of Beta according to correlation analysis

7. Portfolio Beta = ΔPortfolio/ΔMarket

8. Binomial Model

$$\text{Value of Call Option} = \frac{C_u \times p + C_d \times (1-p)}{(1+r)}$$

Where,

P is the probability of price moving upwards

r is the risk free rate of interest

t is the time interval

C_u is the options value at upper level

C_d is the options value at lower level

Also, **P** can be calculated using this formula

$$p=\frac{(1+r)-d}{u-d}$$

Where,

$$u=\frac{\text{stock price at upper level}}{\text{spot price}},$$

$$d=\frac{\text{stock price at lower level}}{\text{spot price}}$$

or,

u= volatility of price moving upwards,

d= volatility of price moving downwards.

Note:

1. If the value of e is given in question use Continuous Compounding formula i.e. e^{rt} instead of (1+r) in the above formula of Probability and Value of Option.
2. Use P_u & P_d in place of C_u & C_d while calculating Value of Put Option.

9. Risk Neutral Method

$$\text{Spot Price So}=\frac{Su \times p+Sd \times (1-p)}{1+r}$$

Where,

S_0 is the Current Stock Price

S_u is the Stock Price at upper level

S_d is the Stock Price at lower level

10. Black Scholes Model

$$C_o = S \times N(d_1) - Ke^{-rt} \times N(d_2)$$

Where,

$$\mathbf{d_1} = \frac{\ln\left(\frac{S}{K}\right) + \left(r + \frac{\sigma^2}{2}\right)t}{\sigma\sqrt{t}},$$

$$\mathbf{d_2} = d_1 - \sigma\sqrt{t}$$

S=current stock price
K=strike price of the option

t=time remaining until expiration

r=current continuously compounded risk free interest rate

σ=standard deviation of continuously compounded annual return

ln=natural logarithm

N(x)=Standard normal cumulative distribution function

e=exponential function

Adjusting for Dividends

Call Option= $C_o = Se^{-yt} \times N(d_1) - Ke^{-rt} \times N(d_2)$

Put Option= $P_o = Ke^{-rt} \times [1 - N(d_2)] - Se^{-yt} \times [1 - N(d_1)]$

Where,

$$d_1 = \frac{\ln\left(\frac{S-y}{K}\right) + \left([r-y] + \frac{\sigma^2}{2}\right)t}{\sigma\sqrt{t}}$$

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

11. Put Call Parity Theory

$$S+P_0=C_0+\text{PV of Exercise price of the stock}$$

Where,

S = Current price of the underlying asset

P = Price (Premium) of the put option

C_0 = Price (Premium) of the call option

12. Portfolio Replicating Theory

According to the Replicating Portfolio Model, value of the option can be calculated as follows

Call Option

C_0=Buy Delta Stock-Borrowing required to replicate the portfolio

$C_0 = \Delta \times S - \text{Borrowings}$

Where,

C_0=value of the call option

Δ= Delta/ Hedge Ratio = Number of units of the underlying asset bought =

(Cu - Cd)/(Su - Sd)

Cu = Value of the call if the stock price is Su

Cd = Value of the call if the stock price is Sd

Borrowing needed to replicate the option=PV of [$\Delta \times S_d$-Option value at S_d]

Put Option

P_0=Investment required –Sell Delta Stock

$P_0 = \text{Investment} - \Delta \times S$

Where,

P_0=value of the put option

Lending needed to replicate the option=PV of [$\Delta \times S_u$+Option value at S_u]

13. Option Greeks

Options Greeks

Greeks	Symbol	Represents	Formula,
Delta	δ	Delta represents the change in the Option value with ₹1 change in the Stock Price	$\text{Delta } (\delta) = \frac{\Delta Vo}{\Delta So}$
Gamma	γ	Gamma represents the change in the Options Delta with ₹1 change in the Stock Price	$\text{Gamma } (\gamma) = \frac{\Delta \delta}{\Delta So}$
Rho	ρ	Rho represents the change in the Options Value with 1% change in the Interest Rates	$\text{Rho } (\rho) = \frac{\Delta Vo}{\Delta r}$
Theta	θ	Theta represents the change in the Options Value with 1 day change in the time to expiry	$\text{Theta } (\theta) = \frac{\Delta Vo}{\Delta t}$
Vega	ν	Vega represents the change in the Options Value with 1% change in the volatility of the stock	$\text{Vega } (\vartheta) = \frac{\Delta Vo}{\Delta \sigma}$

Where, Vo= value of the option, So= Spot price of the stock, r= rate of Interest, t= time to expiration

14. Intrinsic Value [IV] & Time Value [TV]

a. Intrinsic Value

For a call option, IV= Max (0, S-K)

For a put option, IV= Max (0, K-S)

b. Time Value

Time value = Option Premium – Intrinsic Value

15. Option Payoff

Position	Option	Payoff	Effect
Long (Holder of the option)	Call	Payoff= Max (0,S-K)	Limited Loss, Unlimited Profit

	Put	Payoff= Max (0,K-S)	Limited Profit, Limited Loss
Short (Writer of the option)	Call	Payoff= Min (0,K-S)	Limited Profit, Unlimited Loss
	Put	Payoff= Min (0,S-K)	Limited Loss, Limited Profit

Break Even = Break-even price is the price at which your net payoff is "0"

	Call	Put
Long	S-K-P=0	K-S-P=0
Short	K-S+P=0	S-K+P=0

16. Put Call Ratio = Put Volume / Call Volume

– A rising put-call ratio, or a ratio greater than 0.7 or exceeding 1, means that equity traders are buying more puts than calls. It suggests that bearish sentiment is building in the market. ...

– A falling put-call ratio, or below 0.7 and approaching 0.5, is considered a bullish indicator.

Chapter 10 Interest Rate Risk Management

1. Forward Rate Agreement

$$\text{Settlement} = \frac{(N)(RR\text{-}FR)\left(\frac{dtm}{DY}\right)}{\left[1+RR\left(\frac{dtm}{dy}\right)\right]} \text{x}100$$

Where, Positive Answer = Gain , Negative Answer = Loss

N = the notional principal amount of the agreement;

RR = Reference Rate for the maturity specified by the contract prevailing on the contract settlement date; typically LIBOR or MIBOR

FR = Agreed-upon Forward Rate; and

dtm = maturity of the forward rate, specified in days (FRA Days)

DY = Day count basis applicable to money market transactions which could be 360or 365 days.

If LIBOR > FR the seller owes the payment to the buyer, and if LIBOR<FR the buyer owes the seller the absolute value of the payment amount determined by the above formula.

2. Theoretical FRA

$$\mathbf{F_1} = \mathbf{S_1}$$

$$\mathbf{F_2} = \frac{(1+S_2)^2}{(1+S_1)} - 1$$

$$\mathbf{F_3} = \frac{(1+S_3)^3}{(1+S_2)^2} - 1 \text{ or } \mathbf{F_3} = \frac{(1+S_3)^3}{(1+S_1)(1+F_2)} - 1$$

$$\mathbf{F_4} = \frac{(1+S_4)^4}{(1+S_3)^3} - 1 \text{ or } \mathbf{F_4} = \frac{(1+S_4)^4}{(1+S_1)(1+F_2)(1+F_3)} - 1$$

A lot of combinations like these are possible

3. Interest Rate Futures

a. IRF = 100 – IR

b. Asset under IRF is ~~Interest Rate~~ Bond

c. IRF α 1/IR

d.

If IR are expected to	IRF are expected to	Action
Increase	Decrease	Sell IRF Today
Decrease	Increase	Buy IRF Today

e. Default Lot Size of IRF in India = 2000

4. Cheapest to Deliver Bond

IRF Position	Profit /(Loss)
Short	[IRF x CF – CMP]
Long	[CMP – IRF x CF]

Bond with highest profit or lowest loss will be the CTD Bond

Where, **IRF** = Interest Rate Futures , **CF** = Conversion Factor , **CMP** = Current Market Price

5. Value of the Swap

$$V_{swap} = B_{fl} - B_{fix}$$

6. Possible Swap Gain / Quality Spread

Quality Spread	Difference in Fixed Rate	-	Difference in Floating Rate

When you get tired, learn to rest not quit.

Chapter 11 Forex

1. Exchange Rate – **Rate at which one currency is converted in another currency.**

2. Base Currency & Counter Currency

Base Currency = Underlying Asset

Counter Currency = Price or Quote Currency

USDINR 68.90

Here, USD is Base Currency and INR is Counter Currency.

3. Bid & Ask Rate

Bid Rate – Bank's buying rate for Base Currency (Lower Rate)

Ask Rate – Bank's selling rate for Base Currency (Higher Rate)

4. Direct Quote and Indirect Quote

Direct Quote = 1/ Indirect Quote

Bid(DQ) = 1/ Ask (IDQ)

Ask(DQ) =1/ Bid (IDQ)

5. Spot & Forward Rate

Spot Rate – Rate at which one currency can be converted into another currency at **spot, (t =0)**

Forward Rate – Rate at which one currency can be converted into another currency at **future date, (t =3,6,9)**

6. Spread and Swap

Spread = Difference between Bid and Ask Rate

Swap = Difference between Spot and Forward Rate

USDINR ₹/$	Bid	Ask	Spread Points
Spot Rate	83.70	83.80	10
Forward Rate	83.75	83.90	15
Swap Points	5	10	

7. American & European Quote

American Quote – Foreign currency is quoted in terms of the US dollar = **$/₹ 0.0133 = $ is Price Currency**

European Quote – US dollar is quoted in terms of a foreign currency = **₹/$ 75 = $ is Base Currency**

Your CA journey is tough, but so are you—every challenge is a stepping stone to your dream.

8. Cross Rates

$$\frac{A}{C} = \frac{A}{B} \times \frac{B}{C}$$

USDINR = USDGBP x GBPINR

Bid(USDINR) = Bid(USDGBP) x Bid(GBPINR)

Bid(USDINR) = 1/Ask(GBPUSD) x 1/Ask(INRGBP)

Ask(USDINR) = Ask(USDGBP) x Ask(GBPINR)

Ask(USDINR) = 1/Bid(GBPUSD) x 1/Bid(INRGBP)

9. Premium/Discount

Premium/(Discount) in Base Currency	Premium/(Discount) in Counter Currency
$\frac{F-S}{S}$ or $\frac{F}{S}-1$	$\frac{S-F}{F}$ or $\frac{S}{F}-1$

Where,

F = Forward exchange rate

S = Spot exchange rate

N= Number of months of the forward contract

10. Interest Rate Parity Theory

When Exchange Rates are in **Direct Quote**

$$\frac{1+r_d}{1+r_f} = \frac{F}{S}$$

When Exchange Rates are in **Indirect Quote**

$$\frac{1+r_f}{1+r_d} = \frac{F}{S}$$

Where,

r_d = Rate of interest in domestic market

r_f = Rate of interest in foreign market

F= Forward rate of the foreign currency

S= Spot rate of the foreign currency

11. Purchasing Power Parity Theory

When Exchange Rates are in **Direct Quote**

$$\frac{1+i_d}{1+i_f} = \frac{F}{S}$$

When Exchange Rates are in **Indirect Quote**

$$\frac{1+i_f}{1+i_d} = \frac{F}{S}$$

Where,

i_d = Rate of interest in domestic market

i_f = Rate of inflation in foreign market

F= Forward rate of the foreign currency

S= Spot rate of the foreign currency

12. Merchant Rates

Inter Bank Rates +/- Banks Margin = Merchant Rate

Bid (Inter Bank Quote) - Margin = Bid (Merchant Rate)

Ask (Inter Bank Quote) + Margin = Ask (Merchant Rate)

13. Broken Period Forward Rate

Broken Period Forward Rate

For broken period the convenient way is to interpolate the rates between the two standard day

Spot ₹/$ 47.0725/745	1m ₹/$ 133/140	3m 145/160	6m 155/175
Bid Rate	145 + (155-145) x 25/90	148	47.0725+0.0148 = **47.0873**
Ask Rate	160 + (175-160) x 25/90	164	47.0745+0.0164 = **47.0909**
Spot ₹/$ 47.0725/745	**1m ₹/$ 140/133**	**3m 160/145**	**6m 175/155**
Bid Rate	160 + (175-160) x 25/90	164	47.0725-0.0164 = **47.0561**
Ask Rate	145 + (155-145) x 25/90	148	47.0745-0.0148 = **47.0597**

14. Arbitrage using IRPT

If Low Interest Rate Currency is at		Action on Low Interest Rate Currency
Discount		Borrow
Premium	Less than IRD	Borrow
	Equals IRD	No Arbitrage
	More than IRD	Invest

If Low Interest Rate Currency is at		Action on Low Interest Rate Currency
Discount		Borrow
Premium	Less than IRD	Borrow
	Equals IRD	No Arbitrage
	More than IRD	Invest

15. Forward Contracts – Delivery, Cancellation and Extension

Delivery Cancellation & Extension of Forward Contracts

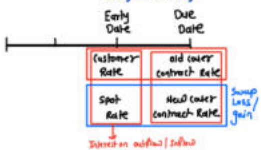
	Early	On due date	Late
Delivery	1. Deliver at Agreed Rate 2. Interest on outflow or inflow of funds (if any) 3. Swap Gain or Loss (if any)	Deliver at Agreed Rate	**Cancel the Old Contract** 1. Cancel at Spot Rate or the rate on 3rd day from due date whichever is earlier 2. Interest on outflow of funds (if any) 3. Swap Gain or Loss (if any) **Enter into New Contract** 4. Deliver at Spot Rate
Cancellation	Cancel at Forward Rate for the balance period of the original forward contract	Cancel at Spot Rate	**Cancel the Old Contract** 1. Cancel at Spot Rate or the rate on 3rd day from due date whichever is earlier 2. Interest on outflow of funds (if any) 3. Swap Gain or Loss (if any)
Extension	**Cancel the Old Contract** 1. Cancel at Forward Rate for the balance period **Enter into New Contract** 2. At relevant Forward Rate	**Cancel the Old Contract** 1. Cancel at Spot Rate **Enter into New Contract** 2. At relevant Forward Rate	**Cancel the Old Contract** 1. Cancel at Spot Rate or the rate on 3rd day from due date whichever is earlier 2. Interest on outflow of funds (if any) 3. Swap Gain or Loss (if any) **Enter into New Contract** 4. At relevant Forward Rate

1. In case of Late Delivery, Cancellation, Extention profit if any is not passed on but loss if any is recovered from customer.

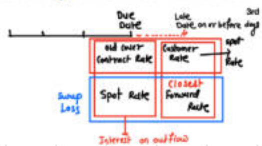
2. **Swap Gain or Loss**
   - In case of Early Delivery - Swap loss or gain is the Difference between Early Date Spot Rate & New Forward Contract Rate taken to cancel cover contract
   - In case of Late delivery, cancellation or extension-Swap loss is the Difference between Due Date Spot Rate & Closest Forward Contract Rate

3. **Interest on Outlay or Inflow of Funds**
   - In case of Early Delivery - Interest is calculated on the net inflow or outflow on **early date** which is the difference between the **agreed rate** with customer & **spot rate.**
   - In case of Late delivery, cancellation or extension- Interest is calculated on net inflow or outflow **on due date** which is the difference between the original **cover rate & spot rate.**

Early Delivery



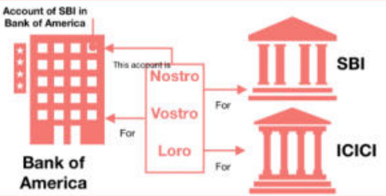
Late Delivery, Cancellation & Extension



Don't think about what can happen in a month, Don't think about what can happen in year. Just focus on 24 hours in front of you and do what you can to get closer to where you want to be.

16. Nostro, Vostro and Loro Account

Nostro, Vostro & Loro Account			
Nostro Account	"**Our** account with **your** bank"	Nostro accounts are generally held in a foreign country (with a foreign bank), by a domestic bank (from our perspective, our bank). It is obvious that account is maintained in that foreign currency.	State Bank of India account in Bank of America is a Nostro Account for State Bank of India
Vostro Account	"**Your** account with **our** bank"	Vostro accounts are generally held by a foreign bank in our country (with a domestic bank). It is generally maintained in Indian Rupee (if we consider India)	State Bank of India account in Bank of America is a Vostro Account for Bank of America
Loro Account	"**Your** account with **their** bank"	Loro accounts are generally held by a 2nd party bank account in 3rd Party's bank.	State bank of India account in Bank of America is Loro Account for ICICI Bank



Chapter 13 Business Valuation

1. Based on Net Assets

Book Value = Total Assets – Long Term Debt

Total Assets = Fixed Assets + Intangible Assets + Current Assets – Current Liabilities

This can also be equated to share capital plus free reserve

2. Based on Earnings

$$\text{Value of the Equity} = \frac{\text{EAT}}{K_e}$$

$$\text{Value of the Company} = \frac{\text{EBIT(1-tax)}}{K_o}$$

3. Based on Market Price

Market Value = Market Price x No. of Shares

4. Based on Discounted Cash Flow

$$\text{Present Value} = \sum CF_t \text{ x } PVF_t$$

5. Based on Enterprise Value

Enterprise Value =

Market Value of Equity

+ Market Value of Preference

+ Market Value of Debt

+ Minority Interest

- Cash & Cash Equivalent

6. Based on FCFE

$$\text{Value of Equity} = \frac{FCFE_1}{Ke - g} \text{ or}$$

$$\text{Value of Equity} = \text{Value of Firm} - \text{Value of Debt}$$

7. Based on FCFF

$$\text{Value of Firm} = \frac{FCFF_1}{Ko - g}$$

Where, **Ko** = Overall Cost of Capital

8. Other Methods

a) Economic Value Added

EVA = NOPAT – (Invested Capital * WACC)

Or

EVA = NOPAT – Capital Charge

Or

EVA= EBIT (1-tax) - (Invested Capital * WACC)

b) Market Value Added

MVA = Market Value – Book Value

c) Shareholders Value Analysis

Steps involved in SVA computation:

- Arrive at the Future Cash Flows (FCFs) by using mix of the 'value drivers'
- Discount these FCF using WACC
- Add the terminal value to the present values computed in step (b)
- Add market value of non-core assets
- Reduce the value of debt from the result in step (d) to arrive at value of equity

9. Discount Rates

Calculation of	Rate	
Value of Firm	Ko	Weighted Average Cost of Capital
Value of Equity	Ke	Cost of Equity
Value of Preference Shares	Kp	Cost of Preference Shares
Value of Debt	Kd(1-tax)	Cost of Debt

10. P/B Ratio = Market Price / Book Value

11. P/S Ratio = Market Value of Equity/ Total Sales

12. P/CF Ratio = Market Value of Equity / Cash Flow

Chapter 14 Mergers, Acquisitions & Corporate Restructuring

1. Basic Operating Structure

Sales	XXXX
- Operating Cost	XX
Operating PBIT	XXXX
- Interest	XX
PBT	XXX
- Tax	XX
PAT	XXX
- Pref. Dividend	X
PAT for Equity	XXX
÷No. of Equity Shares	X
EPS	XX
×PE Ratio	X
Market Price	XX
×No. of Equity Shares	X
Market Value of Equity	XXXX

2. Swap Ratio / Share Exchange Ratio

a. For Positive Factors (EPS, MPS, Book Value etc.)

$$\frac{\text{Target's Value}}{\text{Acquirer's Value}}$$

b. For Negative Factors (NPA, Loss, etc.)

$$\frac{\text{Acquirer's Value}}{\text{Target Value}}$$

3. Maximum and Minimum Value

Acquirer is a Buyer who would always want to pay less while buying other company.

1. Acquirer will never limit the minimum value payable by him, but would surely put a cap on maximum value payable.
2. Maximum Value/ Price to be paid is a point where acquirer's pre acquisition market value and share in post acquisition value is equal

Maximum Value = Post Acquisition Value – Pre Acquisition Value

Acquiree/Target is a Seller who would always want to receive higher amount while selling its company.

3. Target will never limit the maximum value to be received but would surely put a limit on minimum value
4. Minimum Value to be received is a point of no profit, no loss i.e. Target Company should be

getting cash/shares of the same value as it is before selling their company.

Minimum Value = Pre Acquisition Market Value of Target Company

Note: Consider the Opportunity cost if some additional information is given in question in exam

4. Gross NPA Ratio = $\frac{\text{Gross NPA}}{\text{Total Advances(Loans)}}$

5. Net NPA Ratio = $\frac{\text{Gross NPA} - \text{Provision}}{\text{Total Advances(Loans)}}$

6. CAR = $\frac{\text{Total Capital}}{\text{Risk Weighted Assets}}$

Where,

CAR = Capital Adequacy Ratio or Capital to Risk Weighted Asset Ratio

Notes