SFM Notes

For CA-Final

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Chapter-8

Dividend Decision

* Decision between Earnings retained & Distributed.

* Factors affecting Dividend decision:

1) Expectation of Equity shareholders
2) Trend of Industry
3) Investment opportunities in hand.
4) Availability of Profits
5) Availability of Liquidity / Funds
6) Legal Constraint
7) Taxation
8) Restrictions imposed by financial Institutions / Public banks that have granted Loan to the company.
9) Stability of Earnings
10) Age of the company
11) Availability of other Sources of Finance
12) Inflation Rate
13) Cost of Capital (Ke) v/s. Rate of Return on Investment (R) by Co.
14) Discretion of BOD
15) Nature of Business.

* Types of Dividend Policy :

1) Constant Dividend per share policy
2) Constant Dividend payout policy
3) Constant Dividends per share with Extra Dividends
4) Constant dividend payout policy with minimum guaranteed dividend.
5) Stable Dividend Policy
6) Residual Income dividends policy

* Some Important ratios :

1) Dividend per Share (DPS) $= \dfrac{\text{Dividend Paid to Equity S/H}}{\text{No. of Equity Shares Outstanding}}$

2) Earnings per Share (EPS) $= \dfrac{\text{Earnings available for Equity S/H}}{\text{No. of Equity Shares}}$

3) Book Value per Share/Net Asset Value per Share/Theoretical value/Intrinsic value per share $= \dfrac{\text{Equity Shareholder's Fund}}{\text{No. of Equity Shares}}$

4) Dividends Yield on Equity Share/Dividend Price Ratio $= \dfrac{\text{Div Per Share}}{\text{Mkt Price per Share}} \times 100$

5) Earnings Yield Ratio $= \dfrac{\text{Earnings per share}}{\text{Mkt Price per Share}} \times 100$

6) Dividend Payout Ratio $= \dfrac{\text{Dividends Per Share}}{\text{Earnings per share}} \times 100$

7) Retention Ratio $= \dfrac{\text{Retained Earnings}}{\text{Earnings Available}} \times 100$

(or) $\dfrac{EPS - DPS}{EPS} \times 100$ (or) $(100 - \text{Div. Payout Ratio})$

8) Price Earning Ratio or PE Ratio $= \dfrac{\text{Market Price Per Share}}{\text{Earnings per share}}$

9) Capital Gearing Ratio $= \dfrac{\text{Long term Debt} + PSC}{\text{Equity Shareholders fund}}$

(or) $\dfrac{\text{Fixed Income Capital}}{\text{Variable Income Capital}}$

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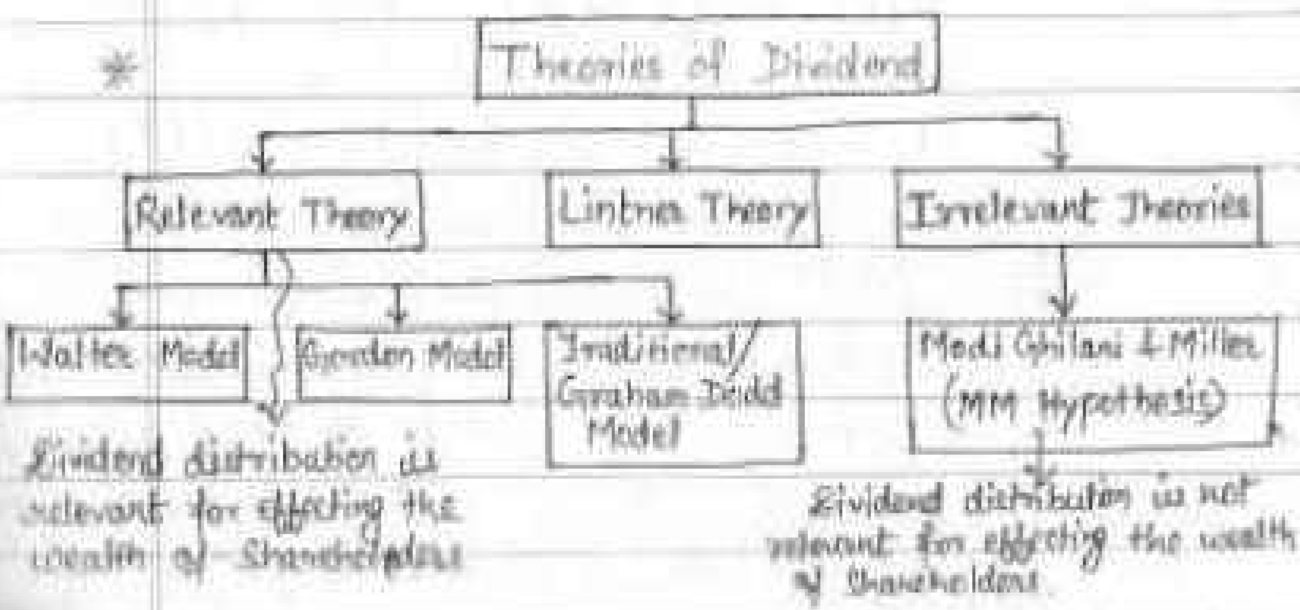

* Lintner Model

$$\boxed{D_1 = (E \times DPR \times Adj.\ Rate) + D_0\,(1 - Adj.\ Rate)}$$

where, D_1 = Next Expected Dividend
E = Earning per share
DPR = Dividend Payout ratio
Adjustment rate = an arbitary figure between 0 & 1
D_0 = Dividend paid for last year

Chapter - 7

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Bond Valuation

* Return = Revenue Return + Capital Appreciation

* Holding Period Return (HPR)

$$HPR = \frac{(P_s - P_c) + I}{P_c}$$

where, P_s = Sale Price
P_c = Purchase cost
I = Interest

* Issue Price of Irredeemable Bonds

$$\text{Issue Price} = \frac{\text{Amount of Interest}}{\text{Rate of Return to be offered to the investors}}$$

* Issue Price of Redeemable Bonds

Issue Price = P.V. of future interest + P.V. of Redeemable value discounted at the rate of return that co. wants to offer to its investors.

* $$\text{I.V. of Irredeemable Bonds} = \frac{\text{Amount of Interest}}{\text{Market Rate of Return}}$$

* I.V. of Redeemable Bonds = P.V. of future interest + P.V. of Redeemable value discounted at the market rate of return.

* ## Walter Model

$$\boxed{P_0 = \frac{D + \frac{r}{K_e}(E-D)}{K_e}}$$

Where, P_0 = MPS at 0 Period / MPS Now
D = Dividend per Share
E = EPS
r = Rate of Return on Co's investment
K_e = Cost of Equity = $\frac{EPS}{MPS}$ or $1/$PE Ratio

→ If, $r > K_e$; Retain 100% earnings & pay no dividend
→ If, $r < K_e$; Nil Retention, distribute all earnings.
→ If, $r = K_e$; Paying Div. doesn't effect on S.H. wealth.

* ## Gordon Model

$$\boxed{K_e = \frac{D_1}{P_0} + g} \quad \left(P_0 = \frac{D_1}{K_e - g}\right)$$

Where, K_e = Equity Capitalisation rate / required rate of return of Eq SH.
$\frac{D_1}{P_0}$ = Dividend Yield or Div. Price Ratio
g = Growth Rate
D_1 = $E(1-b)$
E = Expected Earning of C.Y.
b = Retention Ratio.

$D_1 = D_0(1+g)$
D_0 = dividends paid at the beginning of the year / dividends paid at the end of last year / Div. paid out of previous or last year earnings.

* Present Value of Growth Opportunities (PVGO)

PVGO = P_0 of Share when growth opportunities are exploited (−) P_0 of share when growth opportunities are not exploited

$$= \boxed{\frac{D_1}{Ke - g} (-) \frac{D_1}{Ke}}$$

* Extention of Gordon Model

If abnormal growth is expected for some years, then

P_0 = P.V. of future dividends recievable till the end of Abnormal Growth period (+) P.V. of Maturity value or Market value at end of abnormal growth period

* Graham & Dodd Model (Traditional Formula)

$$\boxed{P = m\left(D + \frac{E}{3}\right)}$$

where, 'm' = a multiplier

* MM Hypothesis (Irrelevant Theory)

$$\boxed{P_1 = P_0 (1 + Ke) - D}$$

where,

P_1 = Price at the end of year 1

P_0 = Price at beginning of year 1

D = Dividends at the end of year 1

* Issue price of Deep Discount Bond = Face Value × P.V. factor of Re.1 of maturity

* Bond Risk : Types

→ Interest Rate risk
→ Default Risk
→ Marketibility risk
→ Callability Risk

* Basics of Compounding :

Annual Compounding : $FV_n = P.V. (1+r)^n$

Semi-Annual Compounding : $FV_n = P.V. \left(1+\frac{r}{2}\right)^{n \times 2}$

* Basics of Discounting :

Annual Discounting : $P.V. = \frac{F.V_n}{(1+r)^n}$

Semi-Annual Discounting : $P.V. = \frac{F.V_n}{\left(1+\frac{r}{2}\right)^{n \times 2}}$

* Current Yield :

$$\text{Current Yield} = \frac{\text{Next Annual Interest}}{\text{Current Price}} \times 100$$

* Yield to Maturity (YTM) of a Bond :

⇒ Determination of YTM of Deep Discount Bonds

Step 1) Determine PVF of Re.1 of YTM :

$$= \frac{\text{Issue Price / Present Market Value}}{\text{Face Value}}$$

Step 2) Refer Annuity Table (PVF of Re 1) in accordance with the life of the deep discount bond. The PVF at which it falls is the YTM.

⇒ Determination of YTM of an Irredeemable Bonds

$$YTM = \frac{I}{P_0}$$

where, I = Amount of Interest

P_0 = Price of Security today / Current Market Value.

$$\text{Post-Tax } YTM = \frac{I(1-t)}{P_0}$$

where, t = Personal Tax rate on normal income of an investor.

⇒ Determination of YTM of a Redeemable Bonds

Step 1)

$$\text{Approx. } YTM = \frac{I + \left(\frac{RV - MP}{n}\right)}{\left(\frac{RV + MP}{2}\right)}$$

where, I = Amount of Interest

RV = Redeemable value of bond/debenture

MP = Current Mkt Price of bond/debenture or Issue Price

n = Life till Maturity (no. of years)

Step-2) Take a discount rate nearest to the approx. YTM & Compute P.V. from that rate. If P.V. is > the CMP, compute P.V. by taking a rate above that level, and vice-versa. Finally interpolate.

* Yield from T-Bill $= \frac{(F-P)}{P} \times \frac{365}{M} \times 100$

* Post-Tax YTM (Approx) $= \dfrac{I(1-t) + \dfrac{RV_{\text{net of cap. gain tax}} - MP}{n}}{\left(\dfrac{RV_{\text{net of cap. gain tax}} + MP}{2}\right)}$

* Yield to Call (YTC)

Step 1) Approx. YTC $= \dfrac{I + \left(\dfrac{C.V. - M.P.}{n}\right)}{\left(\dfrac{C.V. + MP}{2}\right)}$

where, C.V = Call Value i.e. Value at which call upon & cancel

Step 2> Same as YTM.

* Yield to Put (YTP)

Step 1> Approx YTP $= \dfrac{I + \left(\frac{P.V. - M.P.}{n}\right)}{\left(\frac{P.V. + M.P.}{2}\right)}$

where, P.V. = Put Value (usually at Par)

Step 2> Same as that of YTM.

* Valuation of Convertible Bonds/Debenture

⇒ Conversion Value of Bonds/Stock Value = MPS × No. of Eq. Shares into which 1 bond will get converted.

⇒ Conversion Parity price per equity share = $\dfrac{\text{Market Value of Convertible Bond}}{\text{No. of Equity shares into which 1 bond will get converted}}$

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* Incremental Cost on Refunding :

Call Price of old Bonds
(–) Net Proceeds of New bonds
(–) Tax savings on Call premium
(–) ~~Tax~~ Tax savings on unamortised balance of old bonds amortised immediately on bond refunding.
(+) Interest on ~~B~~old bonds during overlap period (net off tax)

* Steps for Computing Bond Duration:

Step 1) Compute the P.V. of bond for each year till maturity taking YTM as discount rate.

Step 2) Determine the weight of P.V. of intt. & principal for each year $= \dfrac{\text{P.V. of Intt.} + \text{P.V. of Principal}}{\text{Total P.V. of the Bond.}}$

Step 3) Compute Weight × Life. Sum of weighted avg. no. of yrs is termed as Bond Duration.

OR After Step 1

Compute P.V. × Life Time. Sum of this will also give Bond Duration.

If Bond/Debentures are redeemable at par, then

$$\text{Bond Duration } (D) = \frac{1+y}{y} - \frac{(1+y) + t(c-y)}{c[(1+y)^t - 1] + y}$$

$$\text{I.V./P.V. of Bond } (P) = \left\{ c + \frac{y-c}{(1+y)^n} \right\} \times \frac{1}{y} \times \text{F.V.}$$

* Bond Volatility

$$\text{Modified Duration} = \frac{\text{Bond Duration}}{1 + \text{YTM}}$$

Modified Duration is approx. change in market value if MRI changes by 1% (ie 1% increase/decrease)
MRI has inverse ~~$~~ relation with Value of Bond.

⇒ Duration of DDB (Deep Discount Bonds) = Its time to maturity

⇒ Duration of a Perpetual Bond = $\frac{1 + YTM}{YTM}$

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⇒ Percentage of Downside Risk = $\frac{\text{Mkt Price of Bond} - \text{Straight value of bond}}{\text{Straight value of bond}}$

⇒ Conversion Premium = $\frac{\text{Mkt Price} - \text{Conversion Value}}{\text{Conversion Value}} \times 100$

Portfolio Management & Mutual Funds

* Return on Investment (R(i))

$$= \frac{\left(\begin{array}{c}\text{Price at the end}\\ \text{of year 1 } (P_1)\end{array} - \begin{array}{c}\text{Price at the begining}\\ \text{of year 1 } (P_0)\end{array}\right) + \begin{array}{c}\text{Revenue Returns}\\ \text{(Div, Int, etc)}\end{array}}{\text{Price at the begining of yr 1 } (P_0)}$$

* $\text{Simple Moving Average (SMA)} = \dfrac{\Sigma \text{ Closing Mkt Price for a no. of days}}{\text{No. of days (time period)}}$

* (Current EMA)
  $\text{Exponential Moving Average (EMA)} = \left(\begin{array}{c}\text{Current}\\ \text{Closing}\\ \text{Price}\end{array} - \begin{array}{c}\text{Previous}\\ \text{EMA}\end{array}\right) \times \text{Multiplier} + \begin{array}{c}\text{Previous}\\ \text{EMA}\end{array}$

* $\text{Typical Price } (T_p) = \dfrac{Hi + Lo + Closing}{3}$

$\text{Multiplier/exponent} = \dfrac{2}{\text{Time Period} + 1}$

* Linear Weighted Moving Average (LWMA):

eg)

Day	Price
1	15
2	18
3	12
4	16
5	17

$$\text{Day } 3 = \frac{(12\times3)+(18\times2)+(15\times1)}{3+2+1} = 14.50$$

$$\text{Day } 4 = \frac{(16\times3)+(12\times2)+(18\times1)}{3+2+1} = 15$$

$$\text{Day } 5 = \frac{(17\times3)+(16\times2)+(12\times1)}{3+2+1} = 15.83$$

Assign more weight to more recent prices

* **Expected Return / Mean Return :**

$$ER_{(p)} = \frac{\sum \text{Rates of Return of past no. of years}}{\text{No. of years}}$$ (Ex-post data)

$$ER_{(p)} = \sum(\text{Return expected in a particular state of Economy} \times \text{Probability of that state})$$ (Ex-Ante data)

* **Standard Deviation i.e. Risk Measure (σ)**

$$\sigma_{(p)} = \sqrt{\frac{(x_1-\bar{x})^2 + (x_2-\bar{x})^2 + \dots + (x_n-\bar{x})^2}{n}}$$

$$\sigma_{(p)} = \sqrt{(x_1-\bar{x})^2 \times Prob_1 + (x_2-\bar{x})^2 \times Prob_2 + \dots + (x_n-\bar{x})^2 \times Prob_n}$$

* **Variance of Portfolio**

$$= \frac{(x_1-\bar{x})^2 + (x_2-\bar{x})^2 + \dots + (x_n-\bar{x})^2}{n}$$

or $= (x_1-\bar{x})^2 Prob_1 + (x_2-\bar{x})^2 Prob_2 + \dots + (x_n-\bar{x})^2 Prob_n$

$(\text{Variance} = \sigma^2)$ or $(\sigma = \sqrt{\text{Variance}})$

* **Co-efficient of Variation (C.V.)**

$$C.V. = \frac{\text{Standard Deviation } (\sigma)}{\text{Expected Return } (ER) \text{ or } (\bar{x})}$$

* Covariance $(COV_{xy}) = \dfrac{\sum (x-\bar{x})(y-\bar{y})}{n}$

  or $\sum (x-\bar{x})(y-\bar{y}) \times \text{Probability}$

* Coefficient of Correlation (r)

  $$r_{(xy)} = \frac{COV_{xy}}{\sigma_x \times \sigma_y}$$ or

  $$\frac{(x-\bar{x})(y-\bar{y}) \times \text{Probability}}{\sqrt{(x-\bar{x})^2 \times \text{Probability}} \times \sqrt{(y-\bar{y})^2 \times \text{Probability}}}$$

  $$\left(COV_{xy} = (\sigma_x \times \sigma_y \times r_{xy}) \right)$$

* Standard Deviation of 2 Asset Portfolio

  $$\sigma_{AB} = \sqrt{(\sigma_A \times W_A)^2 + (\sigma_B \times W_B)^2 + (2 \times \sigma_A \times W_A \times \sigma_B \times W_B \times r_{AB})}$$

  as like $(a+b)^2$ $= (a+b)^2 + (a-b)^2 - 2ab$

When there is a perfectly +ve correlation, is $+1r$, then $\sigma_{AB} = (\sigma_A \times W_A) + (\sigma_B \times W_B)$

* $\beta \rightarrow$ Systematic Risk $\therefore$ higher β means higher S Risk.

  $\sigma \rightarrow$ Unsystematic Risk $\therefore$ higher σ means higher U Risk.

* When 2 Asset portfolio have $r = -1$ (Perfectly -ve)

Optimal Weights are:

$$W_A = \frac{\sigma_B}{\sigma_A + \sigma_B} \quad \& \quad W_B = 1 - W_A$$

* When in 2 Asset portfolio, 1 asset is Riskfree Asset:

$$\sigma_{Portfolio} = (\sigma_A \times W_A)$$

* When 2 Assets portfolio have +ve Correlation, then optimal weights are:

$$W_A = \frac{\sigma_B^2 - \sigma_A \times \sigma_B \times r_{AB}}{\sigma_A^2 + \sigma_B^2 - 2 \times \sigma_A \times \sigma_B \times r_{AB}} \text{ or } \frac{\sigma_B^2 - COV_{AB}}{\sigma_A^2 + \sigma_B^2 - 2COV_{AB}}$$

$$W_B = 1 - W_A$$

* Standard Deviation of 3 Asset Portfolio:

$$\sigma_{ABC} = \sqrt{\begin{aligned}&(\sigma_A \times W_A)^2 + (\sigma_B \times W_B)^2 + (\sigma_C \times W_C)^2 + \\ &(2 \times \sigma_A \times W_A \times \sigma_B \times W_B \times r_{AB}) + (2 \times \sigma_B \times W_B \times \\ &\sigma_C \times W_C \times r_{BC}) + (2 \times \sigma_A \times W_A \times \sigma_C \times W_C \times r_{AC})\end{aligned}}$$

* Systematic Risk: Common Risk i.e. Political, Inflation, etc.

Unsystematic Risk: Unique Risk i.e. Loss by fire, Shortage of Material, Strike, etc.

* CAPM) $K_e = R_f + \beta\,(\overbrace{ER_M - R_f}^{\text{Mkt Risk Prem.}})$

K_e ⇓ Min Expected return; R_f ⇓ Risk free Return; β ⇓ Risk; ER_M ⇓ Expected return of Market; R_f ⇓ Risk free return

$\underbrace{\beta\,(ER_M - R_f)}_{\text{Expected Risk Prem. of portfolio}}$

* Computation of Beta Co-efficient (β)

$$\beta_{Asset} = \left(\frac{\sigma_{Asset} \times r_{Asset\,\&\,Market}}{\sigma_{market}}\right)$$

$$\beta_{Asset} = \frac{(\sigma_{Asset} \times r_{Asset\,\&\,Mkt}}{(\sigma_{market}} \times \frac{\sigma_{market})}{\sigma_{market})} = \frac{COV_{Asset\,\&\,Mkt}}{\text{Variance of Mkt}}$$

$$\beta(i) = \frac{COV(R_i, R_m)}{\sigma_{(R_m)}^2}$$

* SML Equation) $ER_{(P)} = R_f + \beta\,(ER_{(m)} - R_f)$

CML/CAL Equation) $ER_{(P)} = R_f + \frac{\sigma_{sec}}{\sigma_{market}}\,(ER_{(m)} - R_f)$

* Sharpe Index (SI) $= \frac{ER_{(P)} - R_f}{\sigma}$ (Reward to Variability ratio)

* Performance Index $= \frac{ER_{(P)}}{R_f + \beta\,(ER_{(m)} - R_f)}$

* Treynor Ratio (Ti) $= \frac{ER_{(P)} - R_f}{\beta}$ (Reward to Volatility Ratio)

Expected return of Portfolio

Min. required rate of return

* Jensen's Alpha : $\alpha = ER_{(p)} - \{ R_f + \beta (ER_{(m)} - R_f) \}$

(or) $\alpha = \underbrace{(ER_{(p)} - R_f)}_{\text{Expected risk premium}} - \underbrace{[\beta (ER_{(m)} - R_f)]}_{\text{Min. reqd. risk prem.}}$

* Net Assets Value (NAV) $= \dfrac{\text{Net Assets of the Scheme}}{\text{No. of units outstanding}}$

* Ungearing of Beta : $\beta_{EU} = \beta_{EG} \times \dfrac{E}{E+D}$ (If β of Debt is not given)

$$\beta_{EU} = \left(\beta_{EL} \times \frac{E}{E+D}\right) + \left(\beta_{Debt} \times \frac{D}{E+D}\right)$$ (If β of Debt is given)

$\beta_{EU} = \beta_A \rightarrow$ Beta of Asset/business/project

β_{EU}: Beta Equity Unlevered/Ungeared

β_{EU} : All equity firm

β_{EL} : Levered firm.

$$\left(Ke_L = Ke_U + (Ke_U - Kd) \times \frac{D(1-t)}{E} \right)$$

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

* Proxy Beta : If Co. has to start new business, hence no experience, In such case, Beta of similar risk class company is taken i.e. Proxy Beta.

* Single Index Model/One factor Model/ Sharpe Index Model :

Characteristic Line

$$\underbrace{ER_i}_{\substack{\text{Exp.}\\ \text{Return on}\\ \text{Security}}} = \underbrace{\overset{\alpha_i}{\text{alpha } i}}_{\substack{\text{Unsystematic Risk}\\ \downarrow \\ \text{individual co.}}} + \underbrace{\beta i\,(ER_M)}_{\substack{\text{Systematic Risk}\\ \downarrow \\ \text{whole market.}}}$$

$$\underbrace{\sigma^2}_{\substack{\text{Variance}\\ \text{of Sec. Return}}} = \underbrace{\beta_i^2\,\sigma_m^2}_{\substack{\text{Systematic}\\ \text{Risk}}} + \underbrace{\sigma_{Ei}^2}_{\substack{\text{Unsystematic}\\ \text{Risk.}}}$$

* Covariance under Sharpe Single Index Model of 2 Securities :

$$\text{COV of return of } i \,\&\, j = \left(\beta_i\,\beta_j\,\sigma_m^2\right)$$

* When there're multifactor in market, generally we use APT (Abitrage Pricing Theory) & Reqd. return for stock i under the APT

$$E(R_i) = R_f + \beta_1(r_1 - R_f) + \beta_2(r_2 - R_f) \pm \dots \pm \beta_n(r_n - R_f)$$

* Steps for Computing Adjusted Present Value (APV):

Step 1) Determine Ungeared/Asset Beta & Compute Ke (taking asset beta into consideration)

Step 2) Compute Base NPV taking Ke computed in step 1 as discount rate. Ignore issue expenses & Tax Savings.

Step 3) Determine the P.V. of side effects i.e. Tax Savings on interest & issue expenses (net of tax). (Discount Rate = Rf)

Step 4) (APV = Base NPV + P.V. of Tax Savings on Interest + P.V. of Issue expenses (net of Tax))

* Sharpe's Optimal Portfolio

Excess Return to β Ratio $= \dfrac{R_i - R_f}{\beta_i}$ → Reward / → Potential risk

R_i = ER of Stock i

β_i = Expected change in rate of return on Stock i associated with one unit change in the Mkt return.

Steps for finding out Stocks to be included in the Optimal Portfolio:

Step 1) $\dfrac{R_i - R_f}{\beta_i}$

Step 2) Rank it Highest to Lowest

Step 3) $\left[(R_i - R_f) \times \dfrac{\beta}{\sigma_{E_i}^2} \right]$

Step 4) Compute Cumulative value of Step 3 as per Ranking.

Step 5) β^2 to $\sigma_{E_i}^2$ of each security as per Rank.

Step 6) Cumulative of Step 5

Step 7) $C_i = \dfrac{\sigma_m^2 \times \text{Step IV}}{1 + \sigma_m^2 \times \text{Step VI}}$

Step 8) Cut off point is Highest value of $C_i \Rightarrow C^*$

Step 9) %age to be invested in each security = $\frac{\text{Systematic Risk}}{\text{Unsystematic Risk}}$ × Excess of Excess return to risk ratio cut off point.

⇓ ⇓ ⇓ ⇓

Step 9)

$$Z_i = \frac{\beta_i}{\sigma_{i}^{2}}\left(\frac{R_i - R_0}{\beta_i} - C^*\right)$$

Step 10) Convert Z_i into percentage → $\frac{Z_i}{\Sigma Z_i} \times 100$

DERIVATIVES

* Long Asset position: Asset + , Expection on Price ↑
  Short Asset position: Asset − , Expectation on Price ↓

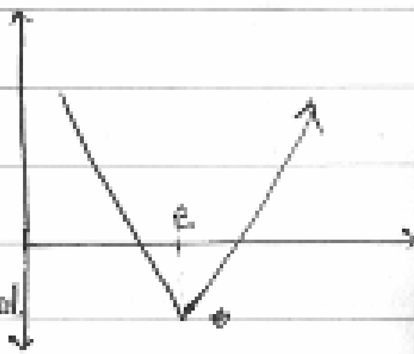
* Option Buyer: Right but not obligation to Buy or sell
  Option seller/Writer: Obligation but not right to Buy or sell

OPTION STRATEGIES

1 * Straddle Strategy:

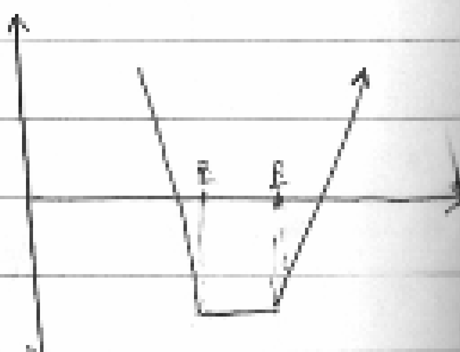
Buy 1 CA & 1 PA of same Exercise Price

Either of the option will be excised

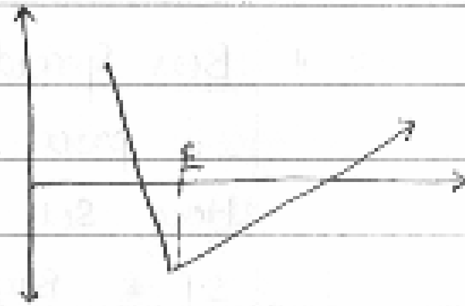


2 * Strangle Strategy:

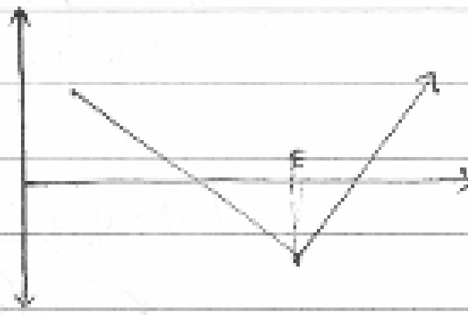
Buy 1CA & also buy 1PA at Exercise price lower than that of CA option.



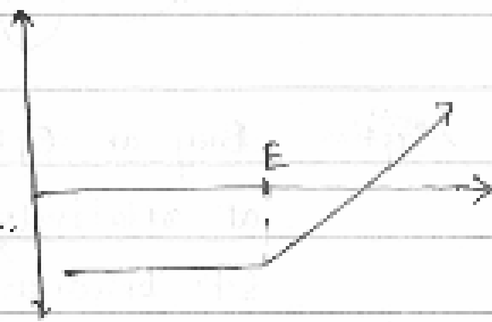
3 * **Strip Strategy** : Buy more Put than Calls at same Exercise price. Expectation is price to go down.



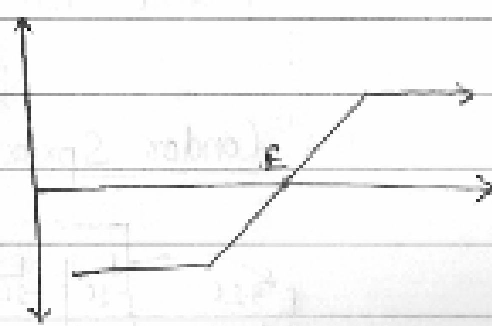
4 * **Strap Strategy** : Buy more Calls than no of Put at same strike price. Expectation is price will go up.



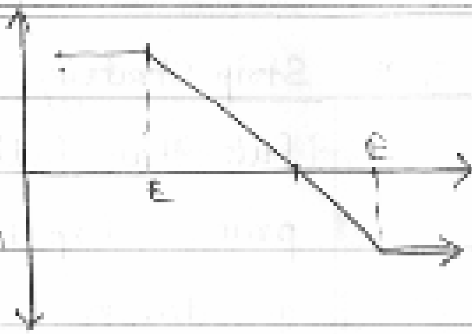
5 * **Protective Put Strategy** :
Buy a Put against purchase of an asset to limit the loss. downside (fall in price)



6 * **Bull Spread** : Expectation is price will go up.
Buy 1 CA/PA (Option) at lower strike price & Sell a CA/PA (Option) at higher Strike Price.

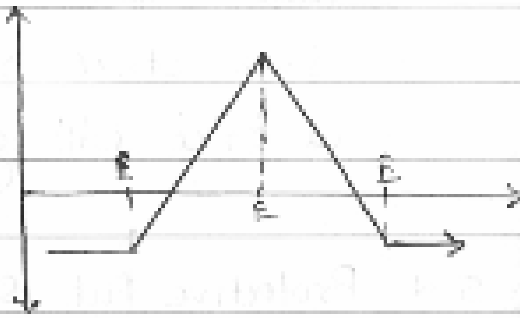


7 * **Bear Spread:** Expectation is price will go down. Here, sell an option at Lower S.P & Buy another Option at Higher Strike Price.



(In Bull & Bear Spread, option should be same)

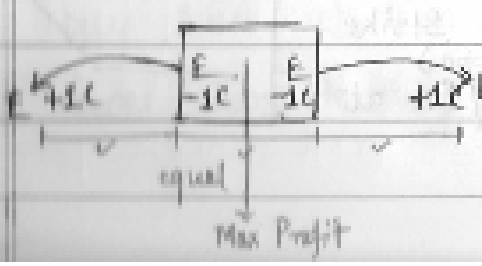
8 * **Butterfly Spread:**

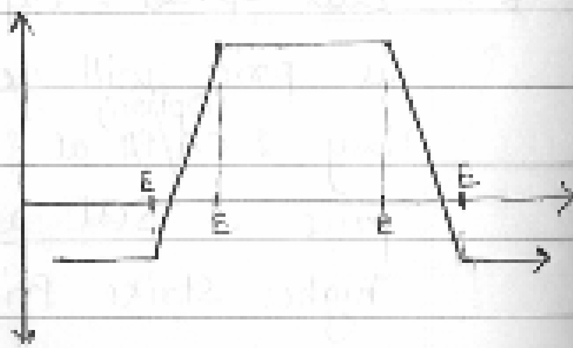


Same option

Buy an Option at low Strike price & another at relatively high S.P., also sell 2 option at S.P. between both above S.P., Expectation is market will remain near S.P where 2 options are sold.

9 * **Condor Spread:**

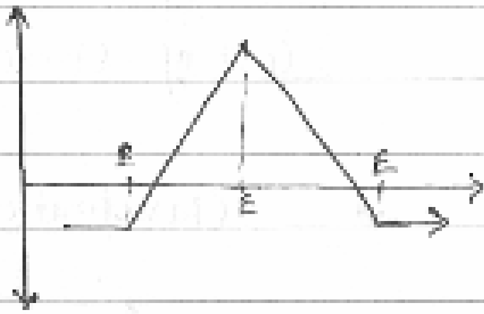




Buy an option at relatively low S.P. & also at a relatively High S.P., Sell 2 options at different S.P. between 2 S.P. of above. Diff. between all 4 strike price should be same.

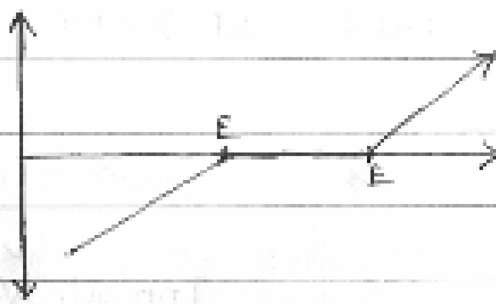
10 * <u>Call Ratio Backspread :</u>

Adjusted Bull Spread,
Buy 1 call at Lower Strike price & Sell 2 calls at Higher Strike Price.



11 * <u>"Bull Cylinder Strategy" / "Split Strike Zero Cost option Bullish Strategy" :</u>

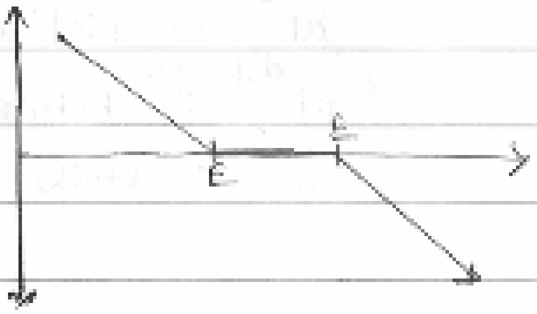
Short 1 put at Lower S.P. & Long 1 call at Higher S.P. Cost of strategy should be Zero (0).



12 * "Bear Cylinder Strategy" / "Split Strike Zero Cost option Bearish Strategy":

Long 1 put at a lower S.P. & Short 1 Call at a higher strike price.

Cost of Strategy = Zero (0).



* Classification of Options on the basis of Cash Flows

	ITM	ATM	OTM
	In the Money	At the Money	Out of the Money
Call ⇒	SP < CMP	SP = CMP	SP > CMP
Put ⇒	SP > CMP	SP = CMP	SP < CMP

* Value of Options

Intrinsic Value (IV)

Diff. of CMP & S.P in case of ITM & 0 in case of OTM & ATM

Time Value (TV)

If option is ATM or OTM, Vo = Time Value of Option.

In ITM, Diff of Total Op. Prem − IV.

* European option : On Maturity Date
American option : Any time before Maturity.

* **Factors affecting determination of V_0.**

1) Current Market Value / Spot price
2) Strike Price / Exercise Price
3) Time to Expiration
4) Rf. (Risk free rate of Int) (If high Rf, then C = High & P = Lower)
5) Volatility
6) Dividends

* **Valuation of Option**

(1) Binomial Model (For Call Option)

Step-1)

$$\text{Hedge Ratio} = \frac{\text{swing of call}\left\{\text{Return of the option buyer if price goes up} - \text{Return of the Option buyer if price goes down}\right.}{\text{swing of stock}\left\{\text{Upper Price} - \text{Lower Price}\right.}$$

An option writer shall buy shares equal to numerator and write call option (no) equal to denominator

Step 2 Compute Loss to option writer in both case (Up & Low price)

In both case Loss will be same.

Step 3
$$\left[\underbrace{\frac{\text{Net Investment}}{(1+rt)}}_{PVCI} = \underbrace{V_s \text{ of Shares bought} - n \times V_0}_{PVCO}\right]$$

$$\text{Net Inv} = V_s - \text{Loss}$$

n = no. of call options sold

Or

$$\left(n \times V_0 = \text{P.V. of Loss} + \text{P.V. of Interest}\right)$$

Simplified form of Binomial Model

$$\left(V_s(1+rt) = (UP \times P_u) + (LP \times (1-P_u))\right)$$

$$\left(P_u = \frac{V_s(1+rt) - LP}{UP - LP}\right)$$

(2) Put-Call Parity theorem (PCPT)

$$\left(E = (V_s + P - C)(1+rt)\right)$$

Or

$$\left(\text{P.V. of E.P.} + C = V_s + P\right)$$

(3) Two State Binomial Option Pricing

Step 1) Draw 2 step Binomial tree

Step 2) Compute Pay-off at Upper Node } by Binomial Method.

Step 3) Compute Payoff at Lower Node }

Step 4)

$$\text{Hedge Ratio} = \frac{\text{Payoff at (Upper Node} - \text{Lower Node)}}{\text{Upper Price} - \text{Lower price}}$$

Step 5) Compute Loss

Step 6) Compute Vo ⇒ [(n × Vo) = P.V of loss + P.V of Interest (-)]

(4) Theoritical Minimum Price Model

CALL $\left(V_0 = V_s - \frac{E}{(e^{rt})} \right)$ $e = 2.71827$

PUT $\left(V_0 = \frac{E}{(e^{rt})} - V_s \right)$

(5) Black Scholes Model

Fischer Myron

CALL
$$\boxed{V_0 = V_s \times N(d_1) - \frac{E}{e^{rt}} \times N(d_2)}$$

where,
$$d_1 = \frac{\ln\left(\frac{V_s}{E}\right) + \left(r + \frac{1}{2}\sigma^2\right)t}{\sigma\sqrt{t}}$$

→ rate p.a.

$$d_2 = \frac{\ln\left(\frac{V_s}{E}\right) + \left(r - \frac{1}{2}\sigma^2\right)t}{\sigma\sqrt{t}}$$

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

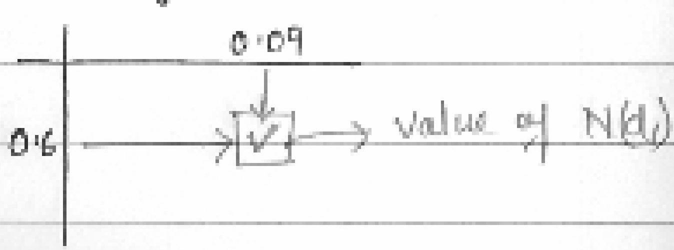
While Solving: ★ $\boxed{\ln\left(\frac{V_s}{E}\right)}$ → 1stly. $\left(\frac{V_s}{E}\right)$ → $\sqrt{\ }$ 12 times − 1 M+

2ndly: 2.71827 $\sqrt{\ }$ 12 times − 1 ÷ MRC = ÷ (÷100)

put this value in place of $\left[\ln\left(\frac{V_s}{E}\right)\right]$

★ Refer Normal Distribution Table (E) for finding value of N(d):   eg. $d_1 = 0.6915$

In Table ⇒



PUT $\boxed{V_0 = \frac{E}{e^{rt}} \times N(-d_2) - V_S \times N(-d_1)}$

(or)

by PCPT $\Rightarrow$ $\left(V_{put} = V_{call} + \frac{E}{(1+rt)} - V_S \right)$

<u>While Solving</u>:

* In $\ln < 1$, then do reciprocal of $\frac{V_S}{E}$ & then proceed by putting '$-ve$' sign before it.

* $N(-d) = 1 - N(d)$

* **Concept of Convergence :** As per this concept, on Maturity, the M.P. & E.P. along with premium should converge in a manner, that there is no Arbitrage Possiblity.

CALL : MP = EP + Prem.

PUT : MP = EP − Prem.

* **Cost to Carry Model :**

(1) In case of shares futures

$$F = S(1+rt)$$ (Absence of Div.)

$$F = S(1+rt) - D$$ (D = Amt. of Div.)

(2) In Case of Index futures

$$F = S(1+rt)$$ (Absence of Div. Yield)

$$F = S\{1 + (r - \text{Div. Yield}) \times t\}$$ (Div. Yield)

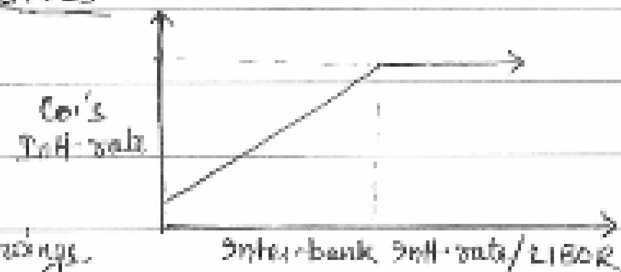
or $$F = S\left(e^{(r - \text{Div. Yield})t}\right)$$

(3) In case of Commodity Futures

$$\left[F = (S + \underbrace{PVS}_{\text{P.V. of Storage Cost}} - \underbrace{PVC}_{\text{P.V. of Convenience Yield.}})(1+rt) \right]$$

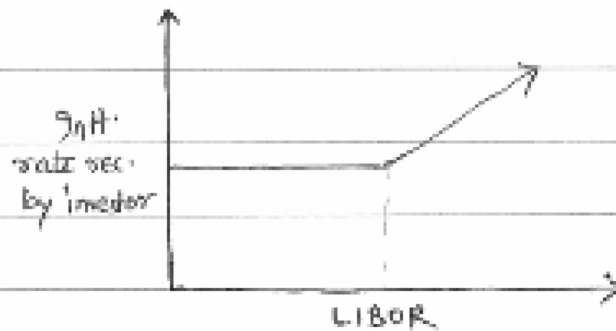
* **Interest Rate Derivatives**

(1) CAPS



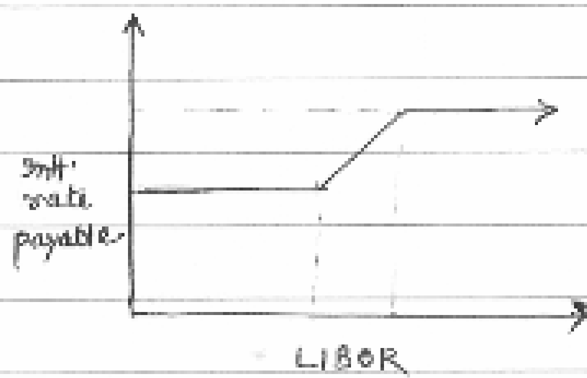
Applying a cap (limit) on intt rate on borrowings.

(2) FLOOR



In this, a floor (min.) rate of interest is guaranteed.

(3) COLLAR



It is combination ~~opposite~~ of Cap & floor ie Caps fixes the max. & floor fixes the min.