Current Price Per share = Intrinsic / Equilibrium Price Per share

Dividend Policy

Siddharth Jain

(1) Modigliani & Miller Approach :-

$$P_0 = \left(\frac{P_1 + D_1}{1 + ke}\right)$$

$$r = \frac{\text{Earning}}{\text{Equity}} \times 100$$

where, P_0 = Current Price / Share

P_1 = Ex-div. Price/Share

D_1 = Dividend of Current Yr.

$$ke = \frac{1}{P/E}$$

(2) Current Value of Business (V_0) — M.M. Approach

$$V_0 = \frac{1}{1+ke} \times \left[(n+n_1)P_1 + E - I\right]$$

Where,

ke = Cost of Capital (Req. Return)

n = existing no. of shares.

n_1 = No. of new shares alloted.

P_1 = Year ended Ex-Div. Price/Share

E = Total Earning of the Company.

I = Investment budget.

⇓

If we interpolate the Supra formula we can get ⇒ $\boxed{V_0 = P_0 \times n}$

P_0 = Current Price/Share

n = existing no. of shares.

(3) Walter Model :-

$$\text{Current value of Share}(P_0) = \frac{D + (E-D) \times \frac{r}{ke}}{ke}$$

Where, r = Available Rate of Return from Project.

ke = Req. Rate of Return by equity.

P_0 = Current Price / Share.

(4) Dividend growth Model :-

$$\left[P_0 = \frac{D_1}{Ke - g}\right] \text{ or } \left[ke = \frac{D_1}{P_0} + g\right]$$

Where, g = Constant growth rate.

(5) Gorden Model :-

$$\text{Current Price Per share}(P_0) = \frac{E \times (1-b)}{Ke - (b \times r)}$$

Where,

E = Earning Per Share.

b = Retention Ratio.

(1−b) = Dividend Payout ratio.

r = rate of return on Equity. (Return From Internal Project for Eq.)

We Can Say that :-

E × (1−b) = Dividend Per share.

Growth rate(g) = b × r.

b → Retention ratio; r → rate of return on Equity

Mutual Fund

$$\text{(1) NAV Per unit} = \frac{\text{value of security invested by fund} + \text{Accrued Income} + \text{Cash/Bank} - \text{O/S Exp. \& Liab.}}{\text{No. of units of funds}}$$

$$\text{\% ge Return} = \frac{\text{End value of Invt.} - \text{Beg. value of Invt.}}{\text{Beg. value of Invt.}} \times 100$$

$$\text{(2) Rate of Return} = \frac{\left(\text{NAV Per unit at the End} - \text{NAV Per unit at beginning}\right) + \text{Dividend Income} + \text{Capital Gain Distribution}}{\text{NAV Per unit at beginning}} \times 100$$

$$\text{(3) Value of Securities} = \text{Amount Invested} \times \frac{\text{Current Index}}{\text{Index at the time of Invt.}}$$

(4) At indifference Point :- % Rate of Return on own fund = % Rate of Return from Mutual fund.

$$\text{\% Return from own fund} = (1 - \text{issue Exp.})\left(\text{\% Rate of Return to MF} - \text{\% Recurring Exp.}\right)$$

Right & Bonus Issue

① Post Right Price per Share $= \dfrac{\left(\text{Current Price/Share} \times \text{N/share existing}\right) + \left(\text{N/of Right Share} \times \text{Subscription Price Per Right share}\right)}{\text{N/of existing Shares} + \text{N/of Right Shares}}$

② value of a Right (1 coupon) $= \left(\text{Current Price/share} - \text{Post Right Price/sh}\right)$ ⑧

③ value of the Right (value of no. of coupon for 1 new share) $=$ value of a right $\times$ No. of existing Share (Right) for 1 new share

Or

" $= \left(\text{Post Right Price/share} - \text{Subscription Price/share}\right)$

④ value of a Right (Alternative formula) $= \left(\dfrac{\text{Post Right Price/sh} - \text{Subscription Price/sh}}{\text{No. of existing Shares}}\right)$

☞ (when Cum Right Price is used instead of Post Right Price/Share)

then,

value of a Right $= \left(\dfrac{\text{Cum Right Price/sh} - \text{Subscription Price/sh}}{\text{No. of existing sh} + 1}\right)$

Merger & Acquisition

① Xchange Ratio or Swap ratio $= \dfrac{\text{EPS / Price Per share / NAV Per share of vendor Co. (targeted Co.)}}{\text{EPS / Price Per share / NAV Per share of Purchasing Co. (acquiring Concern)}}$

② $\boxed{\text{Avg.}}$ P/E Ratio = Sum of (weight × P/E) of the two Co.
where, weight will be based on Earning of the two Co.

If we wish to maintain Pre-merger Price of Purchasing Co. or vendor Co. then we should multiply this EPS with Avg. P/E ra

③ Free Cashflow = (PAT + Depreciation) − (Add Cap. Exp. + Add. W/Cap.).

<u>Cost to the Purchasing Co.</u> :-

NPV to vendor Co (Benefit to vendor Co.) ⇒ value of Consideration received − Pre-merger value of vendor Co

NPV to Purchasing Co. (Benefit to Purch. Co.) ⇒ Total Synergy Gain on Merger − Cost of merger to Purchasing Co.

Or ⇒ value of total Extra Payment/benefit − Extra Payment to vendor Co

Or ⇒ (Post Merger value of Combined business − Sum of Pre-merger value of two business) − Cost of Merger to Purchasing Co.

Maximum offer :- When the max. is offered by Purchasing co. to vendor Co., the Purchasing retain its Pre-merger Position & the Balance is given (offered) to vendor co.

Minimum offer :- When the Min. is offered, the vendor co. is offered an amount equal to Pre-merger Position & the Balance is available for Purchasing co.

④ Terminal value (at beg. of 6th Yr.) = $(\text{Free Cashflow})_5 \times P/E$

Bond Valuation

① When bond is redeemable

$$\text{Fair Price/Current Price} = \left(\text{Interest} \times \begin{array}{c}\text{Sum of PVF @ Req.}\\ \text{Rate of Return}\\ \text{for given Period}\end{array}\right) + \left(\begin{array}{c}\text{Redeemable}\\ \text{value}\end{array} \times \begin{array}{c}\text{PVF of last}\\ \text{Year}\end{array}\right)$$

② When Bond is irredeemable

$$\text{Fair Price} = \frac{\text{Annual Interest}}{\text{Req. Rate of Return}}$$

Calculation of available Rate of Return (YTM) :-

③ $$\text{Approximate YTM} = \frac{\text{Annual Intt} + \left(\dfrac{\text{Redeemable value} - \text{Mkt Price}}{\text{Life}}\right)}{\left(\dfrac{\text{Redeemable value} + \text{Mkt Price}}{2}\right)} \times 100$$

We get a figure near to YTM(%), now we use two %ge Rate Surrounding this approximate YTM to find the PV. of inflows, which Provides a negative & a Positive NPV (Similar to IRR)

④ $$\text{YTM} = \text{Low rate} + \frac{\text{NPV at Low rate}}{\left(\text{NPV at Low rate} - \text{NPV at High rate}\right)} \times \text{Difference in rates}$$

Note - If the Redeemable value is equal to face value,
Also, the Current Price/ fair Price of Securities equal to the face value,
then YTM(%) is equal to Intt rate.

* At Fair Price = Req. Rate of Return is equal to YTM (Yield to maturity)

Or If the Redeemable value is equal to face value & YTM(%) is equal to Coupon Intt. rate, then Current Price of Bond is equal to face value

⑤ $$\text{Current Yield} = \frac{\text{Cr. Year Intt. inflows}}{\text{Current Mkt Price}} \times 100$$

Bond ~~value~~ Replacement :-
use Post tax Cost of Capital as discount rate. If it is not given in Q, then

$$\text{Discount rate} = \left[\text{New Intt rate } (1 - \text{tax rate})\right]$$

(6) Net outflow at this time = [Replacement of old bond with Premium (−) T/Saving on Premium (−) T/Saving on Unamortized Exp. now w/off] (−) Net Receipt on new bonds (after deduction of Expenses)

— then Calculate incremental Saving between Existing & new Bond. —
Calculate NPV = P.V. of inflow − outflow, If NPV is (+)ve then bond is Replaced.

(7) Duration :— i) Firstly Calculate YTM.
ii) use YTM as dis. rate & find PV of inflow (Intt & Red. value).
iii) Tk weight for this PV of inflows & multiply the weight with Corresp Yr & get the total. This Sum of (weight × Year) Shows duration

(or) → Do not take weight, simply multiply PV of inflows with the no. of Yrs & get total. The Sum of (P.V. × Yr) is divided by Sum of P.v. of inflows & find duration.

(8) $\text{volatility} = \left(\dfrac{\text{Duration}}{1 + YTM}\right)$ ⇒ It Shows the no. of times %ge change in Price of bond (Reverse direction) for Certain %ge change in YTM.

If we hv. to calculate a different rate for each year which will make position equal to the average rate :—

$$\left(1 + \text{Avg rate two Year}\right)^2 = (1+r_1)(1+r_2) \Bigg/ \left(1 + \text{Avg rate three Year}\right)^3 = (1+r_1)(1+r_2)(1+r_3).$$

(9) $\%\text{ge Premium on face value} = \dfrac{\text{Issue Price} - \text{face value}}{\text{face value}} \times 100$

Miscellaneous

Factoring

Compounded Quarterly Intt rate

(1) $\text{Annual cost} = \left(1 + \text{Periodic Intt rate}\right)^{\text{No. of Period}} - 1$

(2) Commercial Paper

$$\text{Issue Price} = \frac{\text{Maturity value}}{1 + \text{Period Intt rate}}$$

While Calculating the no. of days, the date of issue of CP is included & maturity date is excluded.

(3) Certificate of Deposit

$$\text{initial Amt} = \frac{\text{Final Amount}}{(1 + \text{Periodic Intt rate})}$$

Financial Services

(1) Breakeven Lease Rental from Leasee Point of view
When Breakeven Lease Rent is to be Calculated using NAL/NPV Approach

For lease alternative :—

Installment of Lease Rent
t/Saving on Lease Rent } Intt rate (Pre tax) as Discounting rate.

For Bank alternative :-

Present value of installement → Intt rate as discounting Rate.

Note: - Payment of Intt is not Considered as outflow (Refer Pg @ 82

~~If~~ (
Note :-

Inflows = t/saving on Dep. & Intt Cost & P.v. of amt of salvage (without adjusted for tax)

{Here the Discount rate will be cost of capital of the Co.}
If here Cost of capital not given, then = Bank Intt rate (1-tax) as discount rate

(2) Breakeven Lease Rental (BELR) from Lessor Point of View :-

Using cost of Capital as discounting rate -

[Net outflow (ignoring Rent Receipt) = Cost of Asset - P.v. of t/saving on Deprication - P.v. of Salvage (Net of tax)]

Assume Post tax Rent Receipt = x p.a.
use cost of capital to discount it.

{Rent (Post tax) × Sum of Pvf @ Cost of capital for x Years = Net outflow}

Convert the Rent into its {Pre-tax Rent Receipt = $\frac{\text{Rent (Post tax)}}{1 - \text{tax rate}}$

(3) Interest inclusive Equal Annual instal.

⇒ $\frac{\text{Amount of Loan}}{\text{Sum of Pvf @ Intt rate for given Period.}}$

When Cash flow are Pre-tax then discount rate used is al Pre-tax, vice-versa.

(4) BHW Model

Financial advantage
⇒ P.v. of outflow under Loan - P.v. of outflow in lease.

Calculate P.v. of outflow in Loan using Intt rate as discount rate.

& Calculat P.v of outflow under Lease using Intt rate as discount rate.

Value of Business can be based on :-
* Present Yield Basis.
* Net Asset Basic.

Value of Business

① Value of Business = $\frac{\text{Total Earning}}{Ke - g}$ or $\frac{\text{FMP}}{\text{Capitalization rate}}$

② % yield from Co. = $\frac{\text{\% Yield from Co. (as Dividend or Earning)}}{\text{Paid up Value of Shares}}$

* When Small lot is transferred the value of share is made from the angle of yield in the form of Dividend.
* When Big lot is transferred the value of share is made from the angle of Yield in the form of earning.

③ Mkt value/share = $\frac{\text{\% yield from Co.}}{\text{Normal yield in Mkt}} \times$ Paid up Value Per share

⑤ [Growth rate = $b \times r$]
where, b = Retention rate
r = Rate of Return.

④ Free Cash flow for equity = PAT for equity (EPS) (+) Dep. Per share (1 − Debt ratio) (−) Cap. Exp. Per share (1 − Debt ratio) (−) Incr. in W.Cap Per share (1 − Debt ratio)

or

= EPS + (Dep. − Cap. Exp − Incr. in W/Cap) (1 − Debt ratio)

⑧ using NOI Approach (when no tax)

value of business = $\frac{\text{EBIT}}{\text{overall Cost of Capital}} \times 100$

⑥ EVA = (Net operating Profit after tax) − (WACC × Cap. Employed)
NOPAT

or

= EBIT (1 − tax) − (WACC × Cap. Invest

Capital Budgeting

① NPV = P.v. of inflow − outflows

② Profitability Index = $\frac{\text{P.v. of inflows}}{\text{P.v. of outflows}}$

③ IRR − When Annual inflows are odd/unequal.

[IRR = Low rate + $\frac{\text{NPv at low rate}}{\text{NPv at Low rate} - \text{NPv at High rate}} \times$ Diff in rates

When Annual inflows are [illegible] / [illegible]equal

When,

Sum of Pvf at IRR = $\frac{\text{Initial outflow}}{\text{Annual inflow}}$

IRR = Low rate + $\frac{\text{Sum of Pvf at Low rate} - \text{Sum of Pvf at IRR}}{\text{Sum of Pvf at Low rate} - \text{Sum of Pvf at high rate}} \times$ Diff in rate

④ Sensitivity Analysis :-

The evaluation of a Project comprises of four elements :-
i) Initial outflow.
ii) Annual inflow life.
iii) Life.
iv) Cost of Capital used as discount rate

The Sensitivity analysis is carried to find the Possible change in the each component of Project to arrive at Zero NPV.
The element which shows minimum (The lowest) change is the most sensitive element.

(5) Calculation of Cash inflows :-

Cash inflow = Profit after tax before Dep.
&
alternative way = Sales (Net of tax) − Cash cost (N/tax) + T/saving on Dep.

(6) Certainity Equivalent factor (C.E factor)

It indicates that cash inflows will be certain upto some extent.

C.E factor = Cash inflow × factor rate

* If Cash inflow are Risk free, then the discount rate is risk free rate
* If Cash inflow are Risky, then discount rate should be risk adjusted

Probability based Cashflows :-

Expected Avg Cashflows = Sum of (Cashflow × Prob.)

then solve the Q

Coefficient of variance :-

$$CV = \frac{\text{Std dev.}}{NPV}$$

Project with lower CV is selected.

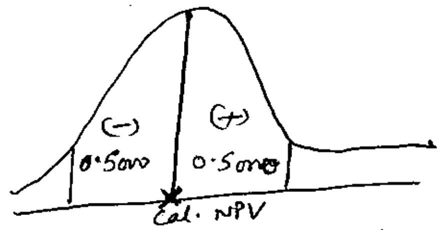
When Cashflow along with Prob. for different outcome are given :-
Firstly expected Cashflow & std dev. of Cashflow for each year is calculated, &
then NPV & overall std dev. of NPV is calculated.

overall std dev :-

overall std dev. = $(\text{Std} \times PVf)^2$
& then value calculated ↓ (square root) = std. dev

Distribution Curve

$$Z = \frac{\text{Desired NPV} - \text{Calculated NPV}}{\text{Std dev.}}$$



Z value would be look upon normal distribution curve & find the Prob. of Required NPV

Capital Budgeting under inflation

Inflation adjusted Cashflow is also called Cashflow in money term or Cashflow in nominal term

The figure against which Q does not specifies shall be assumed that the figure is in Money term.

[Money Cashflow (inflation adj cashflow) = Real Cashflow × $(1 + \text{inflation rate})^{time}$]

The real discount rate may be converted into money discount rate =>

[(1 + Money Cost of Capital) = (1 + Real Rate)(1 + inflation rate)]

While Calculating NPV both Cashflow & discount rate should be in similar term.

NPV calculated in foreign Currency will be converted into Indian Rupee Currency at spot rate // Forward rate can be calculated using :- (1) Intt rate Parity, (2) inflation Rate Parity

Using Foreign Currency Approach :-

(1 + Risk adjusted discount rate for Project) = (1 + Risk free Intt rate)(1 + Risk Premium)

Where
Risk Premium in Project in India & in foreign Country is the same.

The Risk Premium in India is calculated by putting in this formula rate of India's Project & then risk Premium is again placed in this formula to calculate Risk adjusted discount rate for foreign Project

Using Rupee Currency Approach :-

The inflow in foreign currency will be converted into Rupee currency at forward rate, which will be calculated using below formula.

& then NPV is calculated in Indian currency via Rupee cashflows.

$$\frac{\text{Forward rate } (₹/\$)}{\text{Spot rate } (₹/\$)} = \left(\frac{1 + i_₹}{1 + i_\$}\right)^{\text{time}}$$

$$FR(Y_1) = \left(\frac{1 + i_₹}{1 + i_\$}\right)^1 \times \text{Sp. rate } (₹/\$).$$

Replacement of a Machine :-

In this case,

Old M/c's relevant worth/value is to be treated as initial outflow for existing/old M/c.

⇓

Then incremental outflow & inflow & Salvage are calculated.

Then NPV is calculated & decision is taken.

EANPV = Equal Annual Yr ended Net Surplus

$$\Rightarrow \frac{NPV}{\text{Sum of PVf}}$$

Project with better EANPV is chosen.

EAC = Equal Annualised Cost :-

$$\Rightarrow \frac{\text{Present value of Cashflows (outflows)}}{\text{Sum of P.V. for given years.}}$$

When time & amount of project are different.

The proposal with Lower EAC is selected.

Capital Rationing

For Divisible Projects :-

→ Firstly Rank per project is founded on the basis of Profitability Index.

→ Then based on these Rank, the funds are invested.

& then NPV of individual Projects are calculated.

$$\text{Profitability Index} = \frac{NPV}{\text{initial Invt.}}$$

For Indivisible Projects :-

→ Take the total available funds.

→ Find the max. No. of low value Projects possible for investment with limited total funds.

→ Arrange Project on the basis of NPV (decreasing order) & ascertain Req. funds.

→ Form a table specifying the combination of Project, Req. investment, Available funds, Shortage, Surplus, feasibility & overall NPV.

The Highest NPV of combined Projects is selected.

Block of Asset :-

Asset of same type, constitute a Block.

$$\boxed{\text{initial incremental outflow} = \text{Purchase Cost of New Asset} - \text{Sale value of old Asset}}$$

* Incremental outflow is considered for calculating of incremental depreciation.
* Incremental annual cash inflows & incremental salvage are used to find incremental NPV.
* At the end of Period, Capital gain/loss is calculated, ~~WD~~ as asset (block) is sold at Yr end.

Note :- Book value of old Asset & original cost is not a relevant information.

NPV = P.v. of inflow — outflow.

$\Rightarrow$ (P.v. of sales − P.v. of cost) − initial outflow

If tax rate is given, effect is taken then.

$\Rightarrow$ [P.v of Sales (Net of tax) − P.v of cash cost (Net of tax) + P.v of t/Saving on Dep] − initial outflow

Base NPV

$\Rightarrow$ P.v. of inflow − outflow.

Adjusted NPV

$\Rightarrow$ Base NPV + P.v of t/Saving on finance cost (

Equity IRR = Project IRR + (Project IRR − Cost of Debt) × $\frac{\text{Debt}}{\text{Equity}}$

Portfolio Management

Rate of Return (A.R.)

⇓

$\frac{(\text{Yr end value} - \text{Yr. beg. value}) + \text{Dividend}}{\text{Yr. begn. value}} \times 100$

overall Return

⇓

Sum of (Return × Probability)

(or) Sum of (Return × weight) of the secu

Std deviation(σ) = $\sqrt{\text{Sum of } [(R-\bar{R})^2 \times \text{Probability}]}$

where,
R = Return , $\bar{R}$ = Avg. Return

Coefficient of variance (C.V.)

⇓

$\frac{\text{Std. deviation}}{\text{Return}}$

It shows proportionate Risk

For two Securities

when,

Return is equal = lower Risk Security is selecte

Risk is equal = high Return Security is selec

Return & Risk are unequal = Coefficient of variance is calculated & Security with lower Coefficient of variance is selecte

Covariance$_{AB}$

⇓

$(R_A - \bar{R}_A)(R_B - \bar{R}_B)$Prob.

Correlation(r) = $\frac{\text{Co-variance of two securities}}{(\text{Std dev of 1st security}) \times (\text{Std. dev of 2nd security})}$

Range of correlation is between (−)1.00 to (+) 1.00.

overall Std. dev$_{AB}$ = $\sqrt{(S_A W_A)^2 + (S_B W_B)^2 + 2(S_A W_A)(S_B W_B)(r_{AB})}$

where,
W = weight or may be Probability

overall Return of two Securities :-

$\Rightarrow$ Sum of (Return Exp. × weight) of two Sec

Selection of a number of Securities :-

* Place all Securities in increasing order of risk (along with their Return), select the first security.
* Take the next Security & Compare with Previously selected security.
* If the return & Risk, both are more than those of Previously selected Security, then this cu security is also selected.
* If the return of this Security is lower than Previously security then it is rejected.
* If the risk of current Security is the same as the Previously Selected Security but return is more than this current Security is Selected & Previous one is rejected.

Calculation of Return, Std. dev., Covariance & Correlation :-

When data are given for few years :-

$$\bar{R}_x = \frac{\text{Sum of Return}}{\text{No. of Years } (n)}$$

$$\text{Variance}_x = \frac{\Sigma (R_x - \bar{R}_x)^2}{n-1}$$

$$\text{Std. dev.} = \sqrt{\text{Variance}}$$

$$\text{Correlation} = \frac{\text{Co-variance}}{\text{Std dev}_1 \times \text{Std dev}_2}$$

$$\text{Co-variance}_{xy} = \frac{(R_x - \bar{R}_x)(R_y - \bar{R}_x)}{n-1}$$

Where,

n = No. of Years.

R = Return.

$\bar{R}$ = Avg. Return

Range of Correlation -1 to +1

(I) When Correlation is (-) 1.00 (Perfect negative)

Overall Risk will be Minimum

It Can be brought to Zero, when the following Proportion of investment is used for two Securities A & B.

$$\text{Invt. Proportion in Security A} = \frac{\text{Std dev }(B)}{(Sd_A + Sd_B)}$$

(II) When correlation is other than (-) 1.00 :

Overall Risk will be maximum @ (+) 1.00

$$\text{Invt. Proportion in Security A} = \frac{\text{Variance}_{(B)} - \text{Co-variance}_{AB}}{\text{Variance}_{(A)} + \text{Variance}_{(B)} - 2 \times \text{Co-var}}$$

If the Portfolio Risk is to be brought to Zero, the Correlation should be Perfect negative (-1).

Beta

$$\text{Formula} \Rightarrow \left[\text{Correlation Security With Mkt} \times \frac{\text{Std dev. Security}}{\text{Std dev. Market}}\right]$$

(or)

$$\text{Beta} = \frac{\text{Covariance}}{\text{Variance Mkt}}$$

Mkt Beta is always assumed to be 1

Capital Asset Pricing Model (CAPM)

$$RR/ke = R_f + \text{Beta}\,\underbrace{(R_M - R_f)}_{\text{Mkt Premium}}$$

A.R.

Inverse Relationship bet. Price & available Return of Security.

AR v RR — Decision

AR = RR Fairly Priced Security.

AR > RR Under Priced Security (Purchase)

AR < RR Over Priced Security (Sell)

Fair Price is also known as Equilibrium Price / Intrinsic value

If No Debt in Capital Structure, then Beta Asset = Beta equity.

Beta Asset & Beta Equity (Without tax)

$$\text{Beta Asset} = \frac{E}{E+D} \times \text{Beta equity.}$$

$$\text{Beta Equity} = \frac{E+D}{E} \times \text{Beta Asset.}$$

Beta Asset is Same at all levels of Operation (Business), Industry level, Company level (or) unit Level.

Beta Debt is normally assumed Zero

Beta Asset is also known as Beta Firm (or) overall Beta.

Req. Return on assets
⇓
$[R_f$ + Beta asset × MKt Premium$]$

Req. Return on Equity
⇓
$[R_f$ + Beta equity × MKt Premi$]$

Avg Beta Portfolio = $\frac{\text{Sum of (value × Beta)}}{\text{Sum of value}}$

Govt. Securities / R.B.I. Bonds → Beta is Zero, as they are Risk free

Total Risk (Variance Security) = Systematic Risk + Unsystematic Risk (Residual Variance)

Systematic Risk = (Beta Security)^2 × Variance MKt

or

= (Correlation) coefficient of Security with MKt × Variance Security

Unsystematic Risk = Total Risk (Variance Security) − Systematic Risk

<u>Fixing</u> <u>Expression</u> of <u>characteristics</u> <u>line</u> :-

1) For this Purpose find variance Security, Variance MKt, Covariance Security with MKt & the Beta Security.

2) overall Alpha value = (overall Return Security) − ($B_{security}$ × R_{MKt})

Character line = Alpha value + $B_{security}$ × R_{MKt}

use arbitrage Pricing theory & get required return security ⇒

$[R_f + B_1 R.Premium_1 + B_2 RP_2]$

Factor Sensitivity = Beta for the given factor

Security Risk Premium = Beta equity × MKt Premium

<u>With</u> <u>tax</u> :-

Beta Asset = $\left[\frac{E}{E+D(1-tax)} \times B_{eq}\right] + \left[\frac{D(1-tax)}{E+D(1-tax)} \times\right.$

Assuming Debt is Risk free & B_D is Zero

then,

<u>Beta</u> <u>Asset</u> (unlevered Beta) = $\frac{E}{E+D(1-tax)}$ × Beta equity

Beta equity = $\frac{E+D(1-tax)}{E}$ × B Asset

Alpha value = Available Return − Required Return

<u>Alpha value</u>	<u>AR v RR</u>	<u>Position</u>
Positive	AR > RR	underPriced (Purchase)
Negative	AR < RR	over Priced (Sell)
Zero	AR = RR	Fair Price (Hold)

Minimum variance = $W_B = a + b W_A$

W_A = Weight of Security A,

W_B = " " " B.

When Portfolio is insensitive to change in the factor, the <u>Portfolio beta is Zero.</u>

When overall Portfolio Beta is Zero for each factor hence Risk Premium is zero for each factor.

For calculating <u>Cut-off point</u>

refer to Pg No. 380.

using Sharpe Model :-

1) Systematic Risk Portfolio $= (\text{Beta Portfolio})^2 \times \text{Variance}_{MKt}$

2) Total Risk Portfolio (Portfolio Variance) = Systematic Risk Portfolio + Sum of $\left[(\text{weight})^2 \times \text{unsystematic Risk}\right]$ of all Security in Portfolio.

unsystematic Risk

3) Overall Return Portfolio = Alpha value Portfolio + $\left[\text{Beta Portfolio} \times \text{Return}_{MKt}\right]$

Covariance between two stock :-

$(\text{Beta stock}_1) \times (\text{Beta stock}_2) \times \text{Variance}_{MKt}$

Overall std dev. of three securities ABC :-

$$\sqrt{(S_A W_A)^2 + (S_B W_B)^2 + (S_C W_C)^2 + 2(S_A W_A)(S_B W_B)(\rho_{AB}) + 2(S_B W_B)(S_C W_C)(\rho_{BC}) + 2(S_C W_C)(S_A W_A)(\rho_{CA})}$$

Sharpe Measure of fund
(Reward to variability Ratio)

Risk Premium as a Proportion of std. dev. is calculated for each fund $= \left(\dfrac{R - R_f}{\text{Std dev.}}\right)$

* Risk Premium > MKt → Better Performance.
* Risk Premium < MKt → lower Performance.
* Risk Premium = MKt → Req. Performance exactly.

Evaluation of Performance of funds

Jensen's Alpha Measure

Alpha value of each fund = Actual Return − Req. Return CAPM

If,

Alpha Positive value → better Performance than Required
Alpha Negative value → Lower Performance
Alpha Zero value → Desired Performance exactly.

Treynor Measure
(Reward to volatility Ratio)

Proportionate Risk Prem $= \dfrac{R - R_f}{\text{Beta Security}}$

Conclusion is same as Sharpe Model.

FOREX

Indirect Quote $= \dfrac{1}{\text{Direct Quote}}$

Forward Premium/Discount of a Currency (using Direct Quote of Currency) $= \dfrac{FR - SR}{SR} \times 100$

Forward Premium/Discount of a currency (using indirect Quote of currency) $= \dfrac{SR - FR}{FR} \times 100$

When Spot Rate & forward Premium/discount is given & forward rate is calculated :-

Ex- SR = 1\$ = ₹ 40
Premium = 25% on \$ at 6 month time

6 month forward rate = \$1 = ₹ 40 × (100+25)%
\$1 = ₹ 50

Ex- SR = 1\$ = ₹ 40
Discount = 20% on ₹ at 6 month

6 month forward rate = \$1 (100−20)% = ₹40
\$1 × 80% = ₹40
\$1 = ₹ 40/80%
\$1 = ₹ 50

Effect of Gain/Loss/Premium/Discount of Currency is given on opposite currency

Money Market Operation :-

$/₹ = Dollar per Rupee
No. of Dollar per 1 Rupee.

(I). When there is a Payment in foreign Currency
i) Find the amount finally Payable
ii) Find the Present value of final Payment ⟹ $\frac{\text{Final Payment}}{1 + \text{Periodic Intt rate (Foreign Currency)}}$

Deposit this amount in a Bank in foreign Currency.
iii) On due date the Bank will Pay the deposited amount along with interest to the foreign Supplier.
iv) Find equivalent amount of domestic currency for the amount to be deposited today. It is calculated at Spot Xchange rate.

☞ Raise this amount (Domestic currency) as loan from a Bank.
v) Repay this Loan with intt. on due date.

Two way Quote
$1 = ₹ 40 - 41
Buying rate   Selling rate

(II) When Amount is Receivable in foreign Currency :-
i) Find the amount of final Receipt.
ii) Find Current value of final Receipt = $\frac{\text{Final Receipt}}{1 + \text{Periodic Intt rate (r) (Foreign Currency)}}$

☞ Raise foreign Currency loan for this amount from a Bank in foreign currency.
iii) Bring the Proceed in our Country, Convert it into home Currency in home Country.
iv) Deposit the amount in a Bank in home Country.
v) At due date Receive the deposited amount back with Intt thereon.

deposited amount on due date = Deposit × (1 + Periodic Intt rate)

Conversion of Direct Quote to Indirect Quote :-

$\$1 = ₹20 - ₹21$

$₹1 = \$\frac{1}{21} - \$\frac{1}{20}$

$= \$0.0476 - \$0.0500$

Selling rate is always higher than buying rate

Interest Rate Parity Theory (IRPT) :-

$$\frac{\text{Forward }(₹/\$)}{\text{Spot }(₹/\$)} = \frac{1 + \text{Periodic Intt rate (r) (₹)}}{1 + \text{Periodic Intt rate (r) (\$)}}$$

Premium/Discount can be founded using Intt rate of two countries :- (IRPT)

$$\text{Forward Premium/Discount on dollar} = \frac{\text{Periodic Intt. rate other Country (₹)} - \text{Periodic Intt. rate Same Country (\$)}}{1 + \text{Periodic Intt rate Same Country (\$)}} \times 100$$

Swap Points given – adjust to spot rate & calculate forward rate. (Diff. between spot rate and forward rate).
Swap Point for Buying & selling rate :-
* Increasing order – add to spot rate.
* Decreasing order – deduct from Spot rate.

Cross Rate for Currencies Can be found:-

To Calculate (₹/ff).

$$(₹/Ff) = (₹/\$) \times (\$/£) \times (£ \times DM) \times (DM/ff)$$

1st ... last → (₹/ff)

When Two way Quote :-

Then Place all buying rate together at one Place & all Selling rate at Second Place.

$$(₹/\$) = \underbrace{(₹/£)(£/DM)(DM/\$)}_{\text{buying rate}} - \underbrace{(₹/£)(£/DM)}_{\text{selling rate}}$$

Banker Selling Rate of a Currency to custom = Inter Bank rate + Margin

Banker Buying Rate from Customer = Inter Bank rate − Margin

Using Inflation Rate Parity (IRPT):- Purchasing Power Parity Theory.

$$\frac{FR(\$/£)}{SR(\$/£)} = \frac{1 + \text{Periodic inflation rate (USA)}}{1 + \text{Periodic inflation rate (UK)}}$$

Calculation of FR when time is More than 1

$$\frac{FR(\$/£)}{SR(\$/£)} = \left(\frac{1+i_\$}{1+i_£}\right)^{N/Years}$$

Derivatives

Call option :- value of option

⇒ Mkt Price of Asset − Ex. Price of Asset

Put option Value (Right to sell)

⇒ Ex. Price at Exp. Dt − Mkt Price at exp

value of option when different Probability are given for various Mkt Price at expiration dt:-

xpected value of option at expiration date = Sum of (value of option × Probability)

Current value of option = xpected value of option / 1 + Periodic Intt rate

Warrant is Same as Call option

value of Asset will never be negative, it is taken as Zero

Theortical value = Value based on Formula

Net Gain to Put writer = [Sale value of \$ under forward Contract + Premium Received] − Cost of dollar (Purchase)

Put Call Parity

At Parity Position

Cash outflow in Call option = Cash outflow in Put option

value of Call (today) + P.V. of Ex. Price = value of Put today + value of Share t

When there are Two expected Price of a share at Expiration date (Risk Neutralisation Method):-

i) one Price is more than exercise Price & the Second Price is less than exercise Price.

ii) Calculate the Prob. of high Price of share at expiration date as ⇒

$$\Rightarrow \left[\frac{\text{Spot Price }(1 + \text{Periodic Intt rate}) - \text{Low Price}}{\text{High Price} - \text{Low Price}}\right]$$

The Prob. of Low Price of share = [1 − Prob. of high Price.]

iii) Find expiration date:-

value of option = Sum of (value of option × Prob.)

iv) Find :-

Current value of option = Expiration date value / 1 + Periodic Intt rate.

If Q Provides Dividend yield & Intt rate :-

Net rate = Intt rate − Dividend y

we use this rate at Spot Price & find future Price

Future Price = Spot Price (1 + Periodic Intt r

P.V. of Dividend = Dividend / (1 + Periodic Intt rate

Binomial Model :-

Calculation of the value of option using Binomial model.

i) A call writer (seller of call option) has written a call & Receives Premium. At expiration date if the Mkt Price goes up then he has to Pay value of option to buyer of call. It create risk of his Part.

ii) To avoid this risk he may buy certain no. of Shares from Mkt. It is calculated through hedge ratio.

$$\text{Hedge Ratio} = \frac{\text{Diff. in option Price at high \& Low value of Share}}{\text{Diff. in Share Price}}$$

He will get the N/shares to be Purchased to eliminate the Risk.

iii) The expiration date value of Hedge Position is calculated for high & low Price of Share.

Value of hedge (Just like net Asset value) = value of N/Share held (Purchased to hedge) — value of Call (Payable to buyer of call)

This value of Hedge at expiration date is the same (equal) at high Price or Low Price of Share.

iv) It is assumed that own funds invested to buy Shares Shares along with risk free rate of Intt. is equal to value of hedge at expiration date.

$$\text{own fund invested} = \frac{\text{value of Hedge}}{(1+r)}$$

v) Purchase Cost of Share (at Current Price) = own fund invested + value of option (Premium initially received from buyer of option)

[We can then calculate value of option from starting]

Arbitrage : Through Call Option

i) Find Current value of call option for 1 share
⇓
Mkt Price — Ex. Price at exp. d
or
$$\text{Mkt Price} - \frac{\text{Exp. Price}}{(1+r)}$$

ii) If actual Mkt Price of optio is compared with current va of call, If actual Mkt Price of call option is lower than t current Price, then option is Purchased from Mkt.

iii) The option provides right to buy the share at exp dt. It is assumed that the arbitra has a share, which he sells today & buy a call option. The rest (balance) of mo is invested at risk free rate.

At expiration date the M Price of Share may be mo than Ex. Price or Less than exercise Price.

- If Mkt Price is more than ex Price then he Purchase the sh by using option at exercise Price.
- If Mkt Price is lower than Exercise Price he will buy the Share from Mkt.

[Under both cases he Gain]

- If actual Price is lower than Current Price of Put hence arbitrager will buy Put.

Assumed he Purchase a Put & a share today. For this Purpose he raise a loan, equal to amt of Premium Paid & Mkt Price of Share.

Arbitrage through Put option

Current value of Put option
⇓
$$\frac{EP}{1+r} - \text{Mkt Price}$$

Where, r is not continuous compounding.

Future :- Long Position — Buyer
Short Position — Seller.

Fair value of future = Spot Price + Cost to Carry − intermediate Period inflow (Dividend if any)

The Person may arbitrage through future if the fair Price is different from actual Price Quoted in future Mkt.

(I) If actual Price is less than fair future Price :-
i) The Person will buy future (and sell the same share in Cash Mkt, Spot).
ii) He will invest this money at risk free rate of return for given Period.
iii) At future date he will get invested amount with interest thereon. Now he buys back his share from future Mkt at committed Price (earlier contracted). He Gains.

(II) If actual future Price is more than the fair future Price :-
i) The Person should sell future (and buy the same share in Cash Mkt spot).
ii) For Purchase the share he will raise Loan. At given future he receives sale consideration from sale of share at committed Price in future Contract.
He repays the loan with interest.
iii) Some Cash Surplus is left with him & he gains.

Beta Index
The overall risk of index is represented as index Beta. It taken as 1.
For Hedging his risk, If he Purchase shares he should sell index for a Particular v… by Considering the Req. hedging of Risk & then his risk will be managed (Hedged).

$$\text{Current day value of Index} = \frac{\text{Current day Mkt value of Shares}}{\text{Prev. day Mkt value of shares}} \times \text{Prev. day value of index}$$

$$\text{value of Index} = \text{value of Share} \times \text{Beta Share} \times \text{\%ge hedge Required}$$

$$\boxed{\text{Value of Index} \times \text{Beta Index} = \text{value of Shares} \times \text{Beta Share}}$$

The Risk in Index & Shares can be brought to Parity & then reverse transaction is made in index to hedge the Position in share.

Reverse Contract for same Index future :- A Person transacting in index future may settle his Position anytime by entering a reverse contract for same index future.

Portfolio with Desired Beta

$$\text{Amount invested in Risky Portfolio} = \text{Current Investment in risky asset} \times \frac{\text{Desired Beta}}{\text{Portfolio Beta}}$$

* To reduce existing Beta the investor should sell one Portion of existing risky Portfolio & invest this money in risk free investment.
* To increase the existing Beta the investor should raise Risk free loan & invest the money in risky Portfolio.

$$\text{Efficiency of Saving} = \frac{\text{Reduction in loss}}{\text{Amount of loss}} \times 100$$

Strangle & Straddle :- A Person buying a Strangle or Straddle buys both a call & Put.
When the strangle is used the exercise Price of call option is more than Exercise Price of Put.
The Straddle strategy has the exercise Price of both Call & Put are equal.
There is Scope of good Profit, If there is loss, The Max. loss is equal to the amt. of total Premium Paid (both for Call & Put)

Note :- At Break-even Position -
outflow under forward alternative = outflow under option alternative

Cap & floor :- when a Person buys a Cap./Ceiling (call option) & sells a floor (Put option). under above Case it is called Collar.

When he buy a call & Pay Premium & sell a Put & receives the Same Premium the net Premium is Zero.

→ When the Price moves up, the Mkt Price exceeds the Exercise Price of Call he Purchases the asset by using Call option.

→ When the Price moves down, the Mkt Price moves below exercise Price, then buyer of Put Sells the asset to him (Seller of Put) at exercise Price of Put.

→ If Mkt Price stay in between then neither the Call nor the Put is exercised he will buy the asset from Mkt.

While Continuous Compounding (or) Continuous Discounting is Carried :-

$$\text{Future Value} = \text{Current Value} \times e^{(+)rt} \quad (\text{or}) \quad \text{Future value} \times \frac{1}{e^{(+)rt}} = \text{Current Value}$$

$$\text{Future value} \times e^{(-)rt} = \text{Current value}, \text{ where, } r = \text{rate of intt p.a.}, \; t = \text{time}$$

→ When current value is converted into future value the current value is multiplied with $e^{(+)rt}$.

→ When future value is converted into Current Value the future value is divided by $e^{(+)rt}$ (or) multiplied by $e^{(-)rt}$.

Risk neutralisation Method :-

$$\text{High Prob. of Share} = \frac{e^{(+)rt} - d}{u - d} \Big/ \frac{(1+r) - d}{u - d}$$

u = Increased Price as Proportion of S.Price.
d = Decreased " " " " "
r = rate of Intt p.a. (Continuous compounded)

European option - It Can be exercised on expiration Date only.

American option - It Can be exercised on any day between the date of writing of option & exercise Date.

Black Schole Model for valuation of Option

$$\text{Current value of a Call option} = \text{Current Price of Share} \times N(d_1) - \text{Exp. dt Exercise Price} \times N(d_2) \times e^{(-)rt}$$

where,

$$d_1 = \frac{\ln\left(\frac{SP}{EP}\right) + \left[r + 0.5(Sd)^2\right] \text{time}}{\text{Std dev.} \times \sqrt{\text{time}}}, \quad d_2 = d_1 - \text{Std dev.} \sqrt{\text{time}}$$

$$\text{Current value of a Put option} = \text{Ex. Price} \times e^{(-)rt} \times [1 - N(d_2)] - \text{Current Price/ Mkt Price} \times [1 - N(d_1)]$$

If Q informs dividend then use adjusted Spot Price in Place of Spot Price.

The Intt rate Will alway be Continously Compounded.

The Intt rate will always be Continously Compounded.

Put the value of d_1 & use table for the value of $N(d_1)$ & $N(d_2)$.

$N(d_1)$ = Put the value of d_1 & use table for the value of $N(d_1)$ & $N(d_2)$.

Exponential Moving average for Current day ⇒

$$\text{EMA for Current Day} = \text{Previous day EMA} + \left[\text{Current day Index} - \text{Previous day EMA}\right] \times \text{EMA factor}$$

Extra Notes/formula's

$$\text{Operating leverage} = \frac{\text{Contribution}}{\text{EBIT}}$$

$$\text{Financial Leverage} = \frac{\text{EBIT}}{\text{EBT}}$$

$$\text{Combined leverage} = \frac{\text{Contribution}}{\text{EBT}}$$

$$\text{\%ge Increase in EBT} = \text{\%ge Increase in EBIT} \times \text{financial leverage}$$

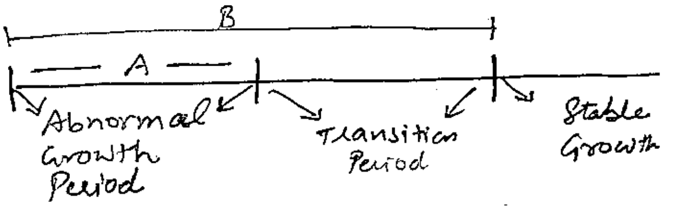
$$\text{\%ge Increase in EBT} = \text{Increase in Sales} \times \text{Combined leverage}$$

$$\text{Increase in EBIT} = \text{\% Increase in Sales} \times \text{operating leverage}$$

When there is Pref. Share Capital in Capital Structure

$$\text{Financial Leverage} = \frac{\text{EBIT}}{\text{EBT for Equity}} \text{ or } \frac{\text{EBIT}}{\left[\frac{\text{EAT for Equity}}{(1-\text{tax rate})}\right]}$$

Dividend Growth Stages



$$\text{Growth rate for a Particular Year in transaction Period} = g_a - (g_a - g_n) \times \left[\frac{t-A}{B-A}\right]$$

where, t is the time (Period) from starting Point.

Abnormal growth rate $= g_a$

Normal growth rate $= g_n$

Abnormal Growth Period $= A$

Total Period before stable growth $= B$

$$\text{Daily Margin Gain/Loss} = \left[\text{Current day Cl. index} - \text{Previous day Cl. index}\right] \times \text{Multiplier factor}$$

Adj. Margin bal. = OP. Bal. + Margin Gain/Loss.

initial Margin

⇓

$$\left\{\text{Avg. daily absolute change} + 3 \times \text{Std. dev}\right\}$$

Time weighted Rate of Return :-

$$(1+r)^t = \left(\frac{C_1}{C_0}\right) \times \left(\frac{C_2}{C_1}\right) \times \left(\frac{C_3}{C_2}\right) \times \left(\frac{C_4}{C_3}\right)$$

Money weighted Rate of Return (MWRoR) :-

It is Calculated just like IRR.

$$\text{Proportion of Investment in Risky Asset} = \frac{\text{Desired Std. dev.}}{\text{Std dev. of Risky Asset}}$$

Derivatives — Future

$$\text{No. of future Contract to be Purchased \& Sold} = \frac{\text{Value of Invt.} \left(\text{Desired Beta Portfolio} - \text{Existing Beta Portfolio}\right)}{\text{Value of 1 index Contract} \times \text{Beta}_{\text{index}}}$$

$$\text{Value of 1 Contract} = \text{N/units} \times \text{Price/units}$$

$$\text{No. of index Contract} = \frac{\text{N/Sh} \times \text{Price/Sh} \times \text{Beta Share}}{\text{N/units of index size} \times \text{Price/unit} \times \text{Beta index}}$$

r = No. of runs (Change in index)

n_1 = No. of Positive changes.

n_2 = No. of negative changes.

$$\boxed{\text{Degree of freedom} = n_1 + n_2 - 1}$$

$$\boxed{\text{Mean value} = \frac{2 \times n_1 \times n_2}{n_1 + n_2} + 1}$$

$$\boxed{\text{Variance} = \frac{2n_1 n_2 \times (2n_1 n_2 - n_1 - n_2)}{(n_1+n_2)^2 \times (n_1 + n_2 - 1)}}$$

$$\boxed{\text{Std dev.} = \sqrt{\text{Variance}}}$$

$$\boxed{\text{Upper/Lower Limit} = \text{Mean value} \pm (\text{Sd.} \times t \text{ value under given degree of freedom})}$$

Siddharth Jain