PART I MPT [Markowitz]

1 ER & S.D.

Single stock

- Ex post data

$$ER = \frac{\Sigma x}{n}$$

$$\sigma_x = \sqrt{\frac{\Sigma(x-\bar{x})^2}{n}}$$

- Ex-Ante data

$$ER = \Sigma px$$

$$\sigma_x = \sqrt{\Sigma(x-\bar{x})^2 p}$$

- $C.V. = \frac{\sigma}{\bar{x}}$

2. Covariance & correlation

- Cov xy
- Ex post data

$$Cov_{xy} = \frac{\Sigma(x-\bar{x})(y-\bar{y})}{n}$$

- Ex Ante data

$$Cov_{xy} = \Sigma(x-\bar{x})(y-\bar{y})p$$

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

Concept

1. $r_{xy} = +1$

Risk can't Reduced

$$\sigma_p = (\sigma_x \times w_x) + (\sigma_y \times w_y)$$

2. $r_{xy} = -1$

Zero Risk portfolio

$$w_A = \frac{\sigma_B}{\sigma_A + \sigma_B}$$

$$\sigma_p = \sqrt{\sigma_A^2 w_A^2 + \sigma_B^2 w_B^2 + 2 \times \sigma_A \times w_A \times \sigma_B \times w_B \times r_{AB}}$$

3. r_{xy} = other

Minimum Risk portfolio

$$w_A = \frac{\sigma_B^2 - COV_{AB}}{\sigma_A^2 + \sigma_B^2 - 2\,COV_{AB}}$$

Sharpe Ratio

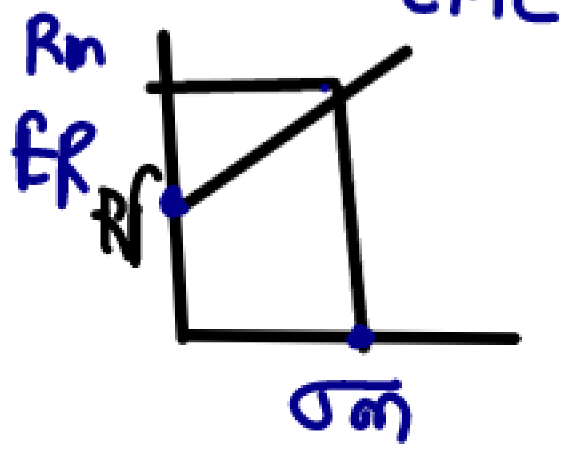
$$SR = \frac{ER - R_f}{\sigma_p}$$

PART II CAPM

Capital Market Theory

- $ER_p = R_f + \left(\frac{R_m - R_f}{\sigma_m}\right)\sigma_p$
- $\sigma_p = \sigma_m \times w_m$

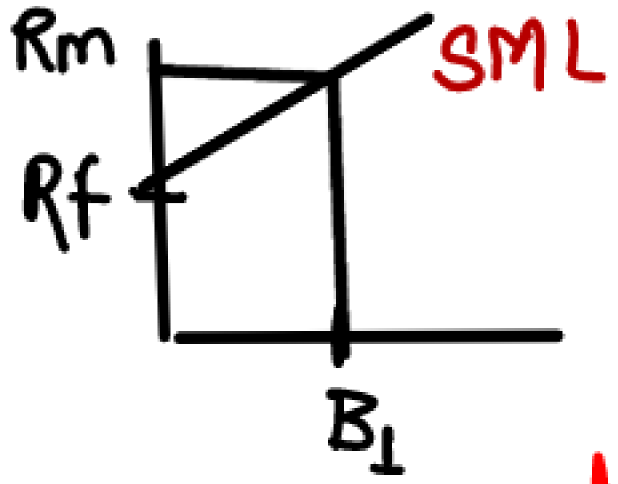
[Market & Rf]



① Equation

$ER = R_f + (R_m - R_f)\beta$

- SR = Market Related
- UR = Specific Risk



② Beta Calculation

(i) $\beta = \frac{\Delta \text{ Stock Return}}{\Delta \text{ Market Return}}$

(ii) $\beta = \frac{\sigma_x}{\sigma_y} \times r_{xy}$

(iii) $\beta = \frac{Cov_{xy}}{\sigma_m^2}$

(iv) $\beta = \frac{\Sigma xm - n\bar{x}\bar{m}}{\Sigma m^2 - n\bar{m}^2}$

③ Beta Management

β_p = Weighted Avg

- Using Rf

  $W_A = \frac{\beta_T}{\beta_P}$

- Using other stock

④ Alpha

Alpha = ER - Ke

Positive → Buy

Negative → Sell

⑤ Asset pricing

$P_0 = \frac{D_1}{K_e - g}$

Actual price > P_0 - Sell

Actual price < P_0 - Buy

⑥ TR, SR & UR

- **Single Stock**

$TR = \sigma_x^2$

$SR = \beta^2 \sigma_m^2$

$\sigma_{ex}^2 = TR - SR$

$r^2 = \frac{SR}{TR}$ (coefficient of Determination)

- **PORTFOLIO**

- $SR_p = \beta_p^2 \sigma_m^2$
- $\sigma_{ep}^2 =$ ① $TR_p - SR_p$

  ② $\sigma_{eA}^2 w_A^2 + \sigma_{eB}^2 w_B^2$

- $TR_p = \sigma_A^2 w_A^2 + \sigma_B^2 w_B^2 + 2 w_A w_B\, Cov_{AB}$

Sharpe: $\beta_A \beta_B \sigma_m^2$

Markowitz: $\sigma_A \sigma_B r_{AB}$

PART III

APT

(Multifactor Model)

$ER = Rf + FRP_1 B_1 + FRP_2 B_2 \dots$

PART IV

PORTFOLIO REBALANCING

1. Buy & Hold
2. Contant Ratio [Equal Amt of Bond & Equity]
3. CPPI

$E = m(A-f)$

PART V

Sharpe optimization Model

(i) Treynor Ratio $= \dfrac{ER-Rf}{\beta}$

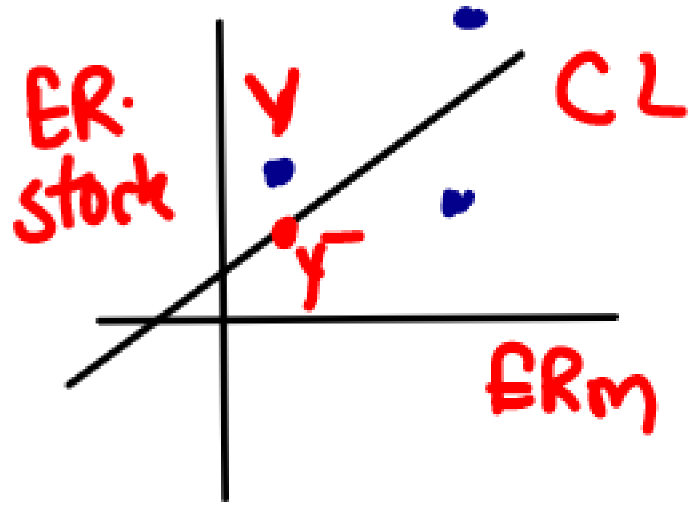
(ii) $C = \dfrac{\sigma_m^2 \times \sum \left(\dfrac{ER-Rf}{\sigma_e^2}\right)\beta}{1+\left(\sigma_m^2 \sum \dfrac{B_1^2}{\sigma_{e_1}^2}\right)}$

Highest cut-off

(iii) $Z_i = \dfrac{\beta}{\sigma_{e_1}^2}\left[\dfrac{ER-Rf}{\beta} - C\right]$

Characteristic Line

$\boxed{\bullet\ ER = \alpha + B R_m}$



Corner theory

$Y = a + bx$

MUTUAL FUND

① NAV Calculation

Assets	xxx
(-) Liabilities	xxx
Net Asset	xxx
÷ No. of Units	xxx
NAV	xxx

Entry Load / Front End

POP = NAV + Entry

Exit Load / Back End Load

Redemption = NAV − Exit

$$\text{Expenses Ratio} = \frac{\text{Exp. P.U.}}{\text{NAV}}$$

② Return Calculation

- $$\text{HPR} = \frac{\Delta \text{NAV} + \text{Dividend} + \text{Cap. Gain}}{\text{Beginning NAV}} \times 100$$
- $$\text{Annualised Return} = \text{HPR} \times \frac{12}{\text{period}}$$
- Indifference Return

$$R_2 = \frac{R_1}{1 - \text{Initial Exp}} + \text{Recurring Exp.}$$

- Hedge fund

Basic fee = on AUM

Incentive fee = Over Maximum Value

3 Performance Evaluation

1. $$\text{Sharpe Ratio} = \frac{R_p - R_f}{\sigma}$$
2. $$\text{Treynor's Ratio} = \frac{R_p - R_f}{\beta}$$
3. Jensen's Alpha

$$\text{Alpha} = R_P - K_e$$

$$K_e = R_f + \beta(R_m - R_f)$$

Higher is better.

4 FAMA Model

- Return due to skill of Manager

Return = Rp − CML

- Return for compensation of UR

Return = CML − SML

5 Tracking Error

- Active Return = Actual Return − BM Return
- $$\text{S.D. of Active Return} = \sqrt{\frac{(x-\bar{x})^2}{n-1}} \leftarrow \text{TR}$$
- $$\text{Information Ratio} = \frac{\text{Avg Active Return}}{\text{TR}}$$

DERIVATIVES

PART I option

- Call option ⇒ price Rise
- put option ⇒ price fall
- European option ⇒ on maturity
- American option ⇒ Anytime

	ITM	ATM	OTM
Call	$S>E$	$S=E$	$S<E$
put	$S<E$	$S=E$	$S>E$

- premium
  - → Intrinsic Value
    - Call = $S-E$, 0
    - Put = $E-S$, 0
  - → Time Value
    - premium − I.Value

- Expected value of option
  = Gross payoff × prob.

OPTION PRICING

- **Binomial Model**

① Risk Neutral prob.

$$P = \frac{R-d}{u-d}$$

$$C_0 = \frac{C_u P + C_d(1-P)}{R}$$

② Delta Hedging

$$\Delta_{Call} = \frac{C_1 - C_2}{S_1 - S_2}$$

$$C_0 = S_0 \times \Delta - \text{P.V. of CI}$$

- **Put Call parity**

$$S_0 + P_0 = C_0 + \text{P.V. of EP}$$

- **Black Scholes model**

$$d_1 = \frac{\ln\frac{S_0}{E} + \left(r + \frac{\sigma^2}{2}\right)t}{\sigma\sqrt{t}}$$

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

$$C_0 = S_0 \times N(d_1) - \frac{E}{e^{rt}} N(d_2)$$

$$P_0 = \frac{E}{e^{rt}} \times N(-d_2) - S_0 \times N(-d_1)$$

FUTURE

(i) Margin

If Initial margin is less than maintenance margin, then margin call upto Initial

Initial Margin = $\mu + 3\sigma$

(ii) Future pricing

$$F = S_0(1+r) - D$$

or

$$F = S_0 \times e^{(r-y)t}$$

If Actual F & Theoretical F are not equal then possibility of arbitrage

(iii) Beta management

No. of Contracts

$$= \frac{V_P \times (\beta_T - \beta_P)}{F \times m \times \beta_F}$$

We take opposite position in Nifty for Hedging.

Commodity future

① Future pricing

$$F = (S + \text{P.V.SC} - \text{P.V.CY})(1+r)$$

② Future Hedging

$$\text{Hedge Ratio} = \frac{\sigma_S}{\sigma_F} \times r$$

Amt in future
= Exposure × Hedge Ratio
short position

Interest Rate Risk Management

PART I
FRA

(I) FRA for Hedgers

$$\text{Net Settlement Amt} = \frac{N(RR - FR)\frac{Dtm}{Y}}{1 + \left(RR \times \frac{Dtm}{Y}\right)}$$

(II) FRA for ARBITRAGEUR

$$\text{Theoretical FRA} = \frac{\text{Bigger factor}}{\text{Smaller factor}}$$

- Actual FRA > Theoretical FRA
  → Sell FRA (Invest)
- Actual FRA < Theoretical FRA
  → Buy FRA (Borrow)

II IRG

- premium paid
- FRAPTION

III IRF

- Quotation = 100 - Rate
- Int Rate Rise = Sell future

IV Financial Swap

(i) Plain Vanilla Swap

$$\text{A Ltd} \xrightarrow{\text{FIXED}} \text{B Ltd}$$
$$\text{B Ltd} \xrightarrow{\text{LIBOR}} \text{A Ltd}$$

(ii) Overnight Index Swap
- MIBOR
- Daily compounding

(iii) Two party swap

V Cap, collar, floor

(i) Cap
- Borrow
- Int Rate Rise

(ii) Floor
- Invest
- Int Rate fall

(iii) Collar
Buy cap & sell floor

FOREX

1. BASICS
- ₹/$ 70 $1000
- $/₹ 0.0140 ₹5000

Bid Ask Rates
₹/$ 70.25/70.75
$1000 Buy
¥/$ 125/145
¥2000 Buy

Cross Rates
- ₹/$ 60
  $/£ 1.50 ₹/£
- ₹/£ 90
  $/£ 1.50 ₹/$
- ₹/$ 70.25/70.75
  $/£ 1.50/1.52
  ₹/£ = ?
- ₹/£ 90.45/91.25
  ₹/$ 71.25/71.75
  $/£ = ?

2. ARBITRAGE
₹/$ 60.50 India
$/£ 1.5045 USA
£/₹ 0.0125 UK
₹100000

3. Forward Cover
- Expected Loss
  Expected SR & SR
- Saving in Loss
  Expected SR & FR

premium or disc.
$$₹/\$ = \frac{F-S}{S}\ (\$)$$
$$= \frac{S-F}{F}\ (₹)$$

Swap points
10/15 plus in SR
15/10 Less from SR

4 COVER DEAL
Bank covers from other Bank & Calculate Gain/Loss

5 IRP & PPP
IRP Equation
$$\frac{F}{S} = \frac{1+R_A}{1+R_B}$$
PPP Equation
$$\frac{E_S}{S} = \frac{1+i_A}{1+i_B}$$

Covered Intt Arbitrage
SR ₹/$ = 60
FR ₹/$ = 61.50
Intt ₹ = 12%
$ = 8%
Borrow ₹6000000 or $100000

6. Currency Exposure
(i) Leading & Laggings
Immediate or delay
(ii) MMC
Liability है तो Asset create
(iii) Future
जिस बात का डर, उसी पे betting
(iv) Option
Afraid of Rise – Call
Afraid of fall – put
premium – SR
uncovered – FR

7 Cancellation
- Opposite position Rate of same date
- Early delivery & overdue FC
- Swap Loss & Intt

Early Delivery
Bank Recovers & Pay
overdue
Bank only Recover

(8) Currency A/C
Nostro A/C
- Nostro A/C
- position

9. Borrowing
Borrow वहाँ से करे, जहाँ cost कम पड़े

10. Investment
Invest वहाँ करे जहाँ से CI ज्यादा आए

11. Cash Management
- Centralised
- Decentralised

12. Currency Swap
Drilldip Inc.

13. Economic Exposure
Transaction Exposure
- Currency Fluctuation

Economic or operating
- price elasticity of demand

OMEGA Inc.

INTERNATIONAL FINANCIAL MANA.

PROJECT APPRAISAL

- **HOME Currency Approach**

  Convert FC into HC at FR using IRP or PPP & Calculate NPV

- **Foreign Currency Approach**

  Disc. FC using Ko of FC.

  $$\text{Disc. Rate} = \left(\frac{1+k}{1+i}\right) 1+i$$

GDR/ADR

- Gross Issue $= \dfrac{\text{Amt required}}{1 - \text{Issue Exp}}$

- **Issue price of GDR**

  Issue price per share × No. of share in 1 GDR

- No. of GDR $= \dfrac{\text{Gross Issue}}{\text{Issue price of GDR}}$

- Cost of GDR $= \dfrac{D_1}{P_0} + g$

  P_0 = Issue price of GDR − Issue Exp.

BOND VALUATION

1. Bond Pricing

I.V. = PV of Intt. + PV of RV

ZCB = PV of R.V.

Perpetual Bond = $\frac{\text{Coupon}}{\text{required yield}}$

2. Bond Yield

- C.Y. = $\frac{\text{Coupon}}{\text{CMP}} \times 100$
- YTM = $\frac{I + \left(\frac{R.V. - P}{n}\right)}{\frac{RV + P}{2}} \times 100$

  or

  IRR Method
- Realised YTM = MIRR

Dirty Price & Clean Price

Dirty Price = I.V. of Bond Including Acc. Intt

Clean Price = Dirty − Acc. Intt.

3. Bond Risk

(i) ED = $\frac{P_2 - P_1}{2 P_0 \Delta Y}$

(ii) Macaulay Duration

D = Σ W of P.V. × YEAR

MD = $\frac{D}{1 + YTM}$

D of ZCB = Maturity

D of perpetual = $\frac{1 + YTM}{YTM}$

(iii) Convexity

$C^* = \frac{P_2 + P_1 - 2P_0}{2 \times P_0 \times \Delta y^2}$

Convexity = $C^* \times \Delta y^2 \times 100$

(iv) Bond Immunization

D of Assets = D of Liabilities

4. Convertible Bonds

- Straight value of Bond
  = P.V. of future Intt + RV.
- Stock value of Bond
  = Shares per Bond × CMP share
- Premium over straight value
  = $\frac{\text{CMP} - \text{S.V. of Bond}}{\text{S.V. of Bond}} \times 100$
- Percentage of downside risk
  = $\frac{\text{CMP} - \text{S.V. of Bond}}{\text{CMP}} \times 100$
- Conversion parity price
  = $\frac{\text{CMP of Bond}}{\text{No. of shares}}$
- Favourable Income differential
  = Intt per share − Dividend per share
- Premium Pay Back period
  = $\frac{\text{parity price} - \text{CMP share}}{\text{Favourable Income differential}}$

5. Option Embedded Bonds

- Bond Refunding
- NPV decision
- disc. at Kd

6. Yield Structure

If forward rate given

P.V. = $\frac{CI}{(1+r_1)} + \frac{CI}{(1+r_1)(1+r_2)}$

If yield is given

PV = $\frac{CI}{(1+r)^1} + \frac{CI}{(1+r)^2}$

EQITY VALUATION

1 Value of share

Walter's Model

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

Dividend Growth Model

$$P_0 = \frac{D_1}{Ke - g}$$

Two stage dividend disc.

P_0 = P.V. of Dividend (Abnormal growth)
+
P.V. of Terminal Value

2 Right

$$\text{Ex Right price} = \frac{M \times N + S \times R}{N + R}$$

Value of Right = Ex. Right price − Sub price

or

$(M - P) N$

SECURITY ANALYSIS

Exponential Moving Avg

$$EMA = \text{previous EMA} + (\text{closing price} - \text{previous EMA}) \times \text{Exponential factor}$$

$$\text{Exponential factor} = \frac{2}{n+1}$$

2. EMH

Test of WEAK FORM

Run Test

$$\mu_r = \frac{2n_1n_2}{n_1+n_2} + 1$$

n_1 = No. of plus

n_2 = No. of Minus

$$\sigma_r = \sqrt{\frac{(\mu-1)(\mu-2)}{n_1+n_2-1}}$$

$$df = n_1+n_2-1$$

$$\text{limit} = \mu \pm t\sigma$$

Auto correlation Test

Find out correlation between 2 period & correlation should be "0"

CORPORATE VALUATION

1 EVA

NOPAT

EBIT(1-t)

EVA

NOPAT - C|E × WACC

2 Valuation of firm

FCFF

EBIT	xxx
(-) Tax	xxx
NOPAT	xxx
(-) [C.E - Dep]	xx
(-) Δ WC	xx
FCFF	xxx

Disc. at Ko &

get V_F

$V_E = V_F - V_D$

3 GEARING of BETA

Asset Beta of 2 similar firm should be same

$$\beta_A = \left(\beta_E \times \frac{E}{E+D}\right) + \left(\beta_d \times \frac{D}{E+D}\right)$$

If not given, assume β_d is zero