Portfolio Management

(Self Published Handwritten E-Book)

Revision
&
Reference Notes

HINGLISH

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Must be done with Pravin Khatod sir's Lectures

SFM

· FOREX V.3.

· DERIVATIVES – PM के Que

- some questions from Portfolio - B.
- some from valuation shares / Bonds.
- some from M&A

Derivatives के concepts

forward future options

Accounting covered under Ind AS 32, 109.

forex. - customer view point

I. Basic

as importer

foreign currency PAYABLE

Afraid of ₹ ↓ or $ ↑

"₹ ज्यादा देने पड़ जाएंगे"

as exporter

foreign currency RECEIVABLE

Afraid of ₹ ↑ $ ↓

"कम पैसे मिलेंगे।"

₹ depriciate हो रहा है, Discount पे है ₹ गया

(IMP) II. Mitigating or Managing Risk

HOW?

No Hedge - Due date का spot

Hedge cover

Lead & Lag | forward - pre del. | futures | swaps | MM | options | Arbitrage

Portfolio Management

Index

Questions based on portfolio Management

Calculate expected Returns of portfolio.

Static answer

$R_p = w_x r_x + w_y . r_y$.

(opening wale weights)

Calculate σ_p.

Risk of portfolio.

Dynamic ans.

Basics

Case (I)

very simple

multiple period data given.

(A) past

(Page. 3,4)

(B) Future (probability)

same format

Case II - single period data given.

sab maths h

imp

If talks about individual securities risks, तो आप मान लो

• we need to calculate covariance of securities → cov(x,y)

• calculate cov(x,y)

or

page No. 7 ← r(x;y) is given.

page No. 10

$$\sigma_p = \sqrt{w_x^2\sigma_x^2 + w_y^2\sigma_y^2 + 2 w_x w_y + cov(x,y)}$$

closing wale weights

$$r(x,y) = \frac{cov(x,y)}{\sigma_x . \sigma_y}$$

$\therefore cov(x,y) = r(x,y)\sigma_x \sigma_y$

%^{2} % %

समान Portfolio ← A, B, C, D, E, F, G, H, I, J, K, L, M, N, ... — Market portfolio consisting individual securities

का → Portfolio Management

NOV18 | 1 | Port

3

$\beta m = NIFTY$

Maximize | Minimize

I. Returns of the Portfolio (RP)

II. #Risk of the portfolio

Returns of portfolio are "Weighted Average Returns" (use opening weights)

$R_P = W_a \times r_a + W_y \cdot r_y$

- Not weighted ave. Risk; rather it is "Devirsification of Risk"
- Diversification of Risk, depends upon co-relation betn 2 securi. in the portfolio.

Step 1: Calculating Returns ($\bar{x}$) & Risk (σ_x) of individual security

same mechanical process to be followed for portfolio — PTO

1) From Past data (No. of years)

Year.	Return(%) $= \frac{D_1 + \Delta P + CG}{P_0}$	(Deviation) $x - \bar{x}$	(variance) $(x-\bar{x})^2$
20X1			
X2			
X3			

$\Sigma x =$ ____ %

$\bar{x} = \Sigma x / N$

$\sigma_x^2 = SD_x^2 =$ ____ $\%^2$

$\boxed{\Sigma \sigma_x^2 / N}$

$SD_x = \sqrt{\frac{\Sigma (x-\bar{x})^2}{N}}$

(Note:- weights in decimals, Returns in %)

2) Future Data

Probability (P)	R(x)	Px	$x-\bar{x}$	$P(x-\bar{x})^2$

$SD_x = \sqrt{\Sigma P(x-\bar{x})^2}$

$\Sigma Px = \bar{x} =$ ____

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

(Multiple period Data)

(B) Returns $(E R_p)$ & σ_p - Risk of portfolio.

1) Past Data is given

Year	$R_p = w_x r_x + w_y r_y$	$R_p - \bar{R}_p$	$(R_p - \bar{R}_p)^2$

$\Sigma R_p =$ ______

$\bar{R}_p = \frac{\Sigma R_p}{N}$

$\sigma_p = \sqrt{\frac{(R_p - \bar{R}_p)^2}{N}}$

2) Probabilistic Data Given:

Prob. (P)	$R_p = w_x r_x + w_y r_y$	$P \times R_p$	$R_p - \bar{R}_p$	$P(R_p - \bar{R}_p)^2$

$\bar{R}_p = \Sigma P \cdot R_p =$ ______

$\Sigma P(R_p - \bar{R}_p)^2$

Returns = $R_p = \Sigma P \cdot R_p$

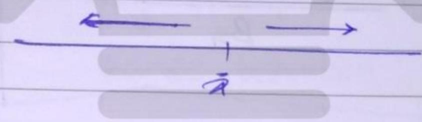
Risk = $\sigma_p = \sqrt{\Sigma P (R_p - \bar{R}_p)^2}$

To COV(x,y) ⇒

(P) Prob.	x	Px	$x - \bar{x}$	$P(x-\bar{x})^2$	y	Py	$y - \bar{y}$	$P(y-\bar{y})^2$	$P(x-\bar{x})(y-\bar{y})$
		$\bar{x} =$ ______							$COV(x,y) = \Sigma P(x-\bar{x})(y-\bar{y})$

What do we mean by Risk? (Audit मे भी है!)

- ज्यो सोचा था उससे हटके, उससे अलग कुछ हो।
- Risk is not a subsitute for Loss, Risk can result either is profit or loss.
- Denoted by "Standard Deviation" "SD" "σ" "sigma"
- It is deviation around mean "$\bar{x}$"



$\boxed{\text{How to make a choice Between multiple Poortfolios}}$

↓

Step 1: Eliminate the insufficient portfolios

↓

where Risk acertions are not given.

↓

Chek for following, based on data provided.

Risk as a % of Mean.

(σ_x) ($\bar{x}$)

$$CV = \frac{\sigma_x}{\bar{x}} \times 100$$

"co-efficient of variation"

↓

"Lower the Better"

Rf is given

↓

$$\frac{Rm \text{ (or) } E(Rp) - Rf}{\sigma}$$

Denominator मे क्या आता है

↓

Sharp's (Risk) Ratio.

↓

Denotes "Excess ~~Risk rate~~ Returns for each unit of Risk)

↓ (PTO)

Utility function

$$U = E(R) - 0.3(\sigma)^2$$

↓

Max to be choosen.

used in MF | Q.35/9.39 | PM | ⇒ E(Rp) by CAPM

comparison of

Jensen's alpha (α)	Treynor's (β) Ratio	Sharpe's (Risk) Ratio
$E(R_p) - R_p = \text{"}\alpha\text{"}$	$\frac{E(R_p) - R_f}{\beta_p}$	$\frac{E(R_p) - R_f}{\sigma_p}$
	$\frac{E(R_x) - R_f}{\beta_x}$	$\frac{R_m - R_f}{\sigma_x}$
	Reward for volatility	Excess Returns for each unit of Risk taken.

α^+ - take ~~s~~. Long.

α^- take short

Higher the better (in all three cases)

CMA CA CS

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Date / Page 7

Managing the Risk of Portfolio.

- for diversification we need to understand Relationship between two securities.

- Angle of Relationship can be expressed through ⇒ co-efficient of co-relation ⇒ $r(x, y)$

"साथ साथ चलने का Tendancy"

$$r(x,y) = \frac{COV(x,y)}{\sigma_x \sigma_y}$$

(Pure Numbers)

" Average of Joint Deviation of x around $\bar{x}$ & y around $\bar{y}$ "

Range between

-1 Negative co-relation

$+1$ positive co-relation

$\sigma p =$
$w_x \sigma_x + w_y \sigma_y$

- Yes, scope for diversifica^n. क्यु की, $x\uparrow y\downarrow$; $x\downarrow y\uparrow$ (moves in opposite directions)

- Not good for diversification. क्यु की, $x\uparrow y\uparrow$; $x\downarrow y\downarrow$ (move into same direction)

(Co-relation formulas are important Exam view point) PTO ⇒

$\sigma p = w_x \sigma_x - w_y \sigma_y$

$\therefore w_x \sigma_x - w_y \sigma_y$

$\therefore w_x \sigma_x = w_y \sigma_y$

$\cancel{w_x} = \cancel{\frac{w_y + \sigma_y}{\sigma_x}}$

$w_x = \frac{\sigma_y}{\sigma_x + \sigma_y}$ ... दूसरे का SD divided by दोनों का SD का ε

weighted average Risk.
0%/No Diversion

$\sigma p = w_x \sigma_x + w_y \sigma_y$

Just like we have calculated Returns

Calculating COV(x,y). [Co-variance]

- Variance ⇒ x का x के साथ अपना अपने साथ
- Co-variance ⇒ x का Deviation y के Deviation के साथ

given that future data

Basic वाला Table Pg.4 use करेंगे।

$$\boxed{COV(x,y) = \Sigma P[(x-\bar{x})(y-\bar{y})]}$$ → %², Not a pure Num

$$\boxed{COV(x,y) = \frac{\Sigma (x-\bar{x})(y-\bar{y})}{N}}$$ ... दोनो के Deviation का Σ (Past data)

Or where r(x,y) is given along ~~with~~ without $\sigma_x . \sigma_y$.

$$\boxed{COV(x,y) = r(x,y)\,\sigma_x . \sigma_y}$$

→ Just used co-rela^n wala Formula.

→ VVVImp in exams.

while calculating $\sigma_p = \sqrt{w_x^2 \sigma_x^2 + \ldots\ldots}$

(written in Advance here).

$COV(x,y) = \beta_A \times \beta_B \times \sigma_m^2$

$cov(x,m) = \beta_x \times \beta_m \times \sigma_m^2$ (Ref. page 12) ↓ calculating β (1)

Where co-relation between two securities is not given & co-relation with market is given.

then calculating co.-relation between two securit.

$r(AB) = 0.6 \times 0.75 = 0.45$

A $\xleftarrow{r = 0.6}$ Market (m), $\beta_m = 1$ $\xrightarrow{r = 0.75}$ B

Market (m) $\xrightarrow{r = 0.95}$ C

$r(A,C) = 0.6 \times 0.95 = 0.57$

$r(B,C) = 0.95 \times 0.75 = 0.71$

SUMMARY ways to calculate cov(x,y)

- Table through → page No 4.
- using co-relation → $cov(x,y) = \sigma_x \cdot \sigma_y \cdot r(x,y)$
- using β. → $cov(x,y) = \beta_x \beta_y \sigma_m^2$

Building a minimum Risk portfolio:

$$W_x = \frac{\sigma_y^2 - cov(x,y)}{\sigma_x^2 + \sigma_y^2 - 2\,cov(x,y)}$$

Imp for Exams

$$W_x = \frac{\text{दूसरे का variance} - \text{दोनो का covariance}}{\text{दो के variance का total} - (2 \times \text{covariance})}$$

Calculating σ_p - Risk of Portfolio

Remember: σ_p is diversified;

$\therefore$ σ_p < weighted ave. Risk

$\sigma_p < w_x \sigma_x + w_y \sigma_y$

	x	y
x	σ_x^2 var	cov(x,y)
y	cov(x,y)	~~cov(x,y)~~ σ_y

$$\sigma_p = \sqrt{w_x \sigma_x + w_y \sigma_y}$$

apply $(a+b)^2 = a^2 + 2ab + b^2$

$$\sigma_p^2 = \sqrt{w_x^2 \sigma_x^2 + w_y^2 \sigma_y^2 + 2\, w_x \sigma_x \cdot w_y \sigma_y}$$

① cov(x,y) = should have been deviation x × deviation y but यहां SD से लिया है।

$$= \sqrt{w_x^2 \sigma_x^2 + w_y^2 \sigma_y^2 + 2\, w_x w_y (\sigma_x \cdot \sigma_y)}$$

$$\boxed{\sigma_p^2 = \sqrt{w_x^2 \sigma_x^2 + w_y^2 \sigma_y^2 + 2 w_x w_y \cdot cov(x,y)}}$$

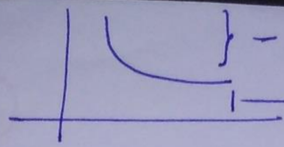
① Markowitz Theory

Q.44, 47

$cov(x,y) = r(x,y)\, \sigma_x \sigma_y$

② Sharpe's index - Total variance of p = systematic variance of p + weighted ve of securities

$\sigma_m^2 \beta_p^2$ +



Analysis of Risk ($6p$)

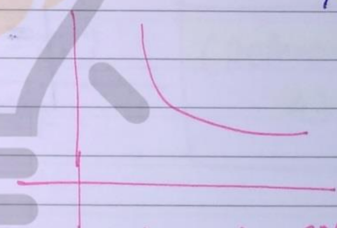
💡 cap.Budget में भी है।

systematic	unsystematic
• unavoidable	• Diverciflable / elimanation possible.
• Inherent	(Advanced Audit :- control & Detect^n)
• common to entire eco-nomy	

• for individual securities it is "~~β~~" measured in in terms of "β" ⇒ systematic Risk of security ~~as well~~ is in terms of $\beta_a 6_z$ & for portfolio. $\beta_p^2 \times 6_m^2$

• It is the sensitivity of a stock that, if market changes by 1%, how much it will change?

↓



(CAPM) SML

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

$\boxed{\beta \text{ is a function of}}$

Business Risk	Financial Risk
Due to nature of business	Debts, etc. equity Rati

e.g. Automobile
pharmacutical

Low Risk → Risky

Analysis of $6p^2$ = Total Risk

(A) systematic
β से निकालो.
1) calculate βp ... (page12) →
2) $\beta_p^2 \times 6_m^2$

(B) unsystematic
(B|F)
$6p^2 - (A)$.

Calculating 'β' of single security

I

$$\frac{\Delta \text{ Stock Return}}{\Delta \text{ Market Return}}$$

II

$$\beta_x = \frac{cov(x,m)}{\sigma^2_m}$$

replace cov(x,m) by r(x,m)

$$= \frac{\sigma_x \times r(x,m) \times \sigma_m}{\sigma^2_m}$$

III

$$\boxed{= \frac{\sigma_x}{\sigma_m} \times r(x,m)}$$

IV

joint movement — mean of movement

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

Where,
x = security Return
m = market returns
σ^2_m = variance of market port. return

Calculating "β" for portfolio

$$\beta_p = \frac{\Delta \text{ in Portfolio value}}{\Delta \text{ in Index value}}$$

(~~Returns~~, ~~Market Return~~)

(Derivatives में दिया है)

weighted average of β_i.

equally weighted.

$$= \frac{\beta_x + \beta_y + \beta_z}{3}$$

using CML (CAPM)

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

How to calculate index? (page no.)

$$\beta_p = \beta_x w_x + \beta_y w_y + \beta_z w_z$$

value के basis पे weights.

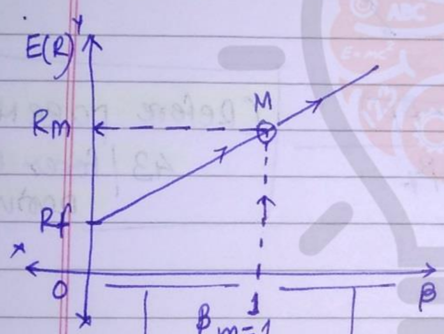
Building a portfolio with given criteria of the investors:

1) Required Rate of Return
2) Risk Assersssion level.

using Capital Asset Pricing Model :-

SML — Security Market Line
· concerned with Individual security

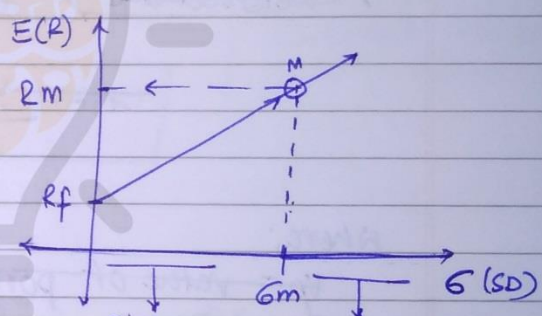
CML (Capital Market L.) — Capital Allocation Line.



$\beta m = 1$ always.

Defensive Stock

aggressive Stock



Risk Averse फट्टूलोग

Less Risk averse जिगरवाला

$$E(R_p) = R_f + \frac{R_m - R_f}{6m} \times 6p$$

$\frac{R_m - R_f}{6m}$ → Sharpe's Ratio

$$E(R_x) = R_f + (R_m - R_f)\beta_x$$

$(R_m - R_f)$ → Systematic Risk taken for Market Portfolio.

β_x → sensitivity of Individual security

premium for Risk Taken

Temporory Equilibrium:

similar to Bond valuation

Q.43/7.59 comparasion between

Re & E(R)

If E(R) > Re ... go Long ~~short~~ ... positive α ... fresh invest

E(R) < Re ... go short ... Negative α ... sale or out

$Re = Rf + (Rm - Rm)\beta$

Jason's α is on the similar lines.

Page 17

Portfolio of portfolios

e.g. security / portfolio	X	₹	Y	₹	Combined ₹	W.
x — A	0.30		0.20		2100	
y — B	0.40		0.50		3500	
C.	0.30		0.30		2400	
	1	5000	1	3000	8000	8000

Q.41 | 7.55 PM

Changing composition :-

use equation :- $y = a + bx$.

Port. (x) —— (y) port.

$0.40 = a + 0.30b$ $\quad$ $0.50 = a + 0.20b$.

solve. - $a = 0.70$ & $b = -1$.

construct new portfolio.

Arbitrage Pricing Theory :

Q.50, Q.48.

Adjusted for all factors, ⇒

$$Rf + \left[(\text{Risk premium}) \times \beta_{\text{factor I}} + BV \times \text{factor II} + \text{Inflation} \times \text{factor III} \right] \times w$$