PORTFOLIO (bundle of stocks) MANAGEMENT

CLASS - 1

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PM+ MF ≥ 20 marks

Recent exams → full paper → only 8 marks theory out of which 4 marks compulsory

PART I - Modern Portfolio Theory (MPT) by Markowitz

⇓

Objective

⇓

Optimum Portfolio

⇓

Highest (Utility)

⇓

$U = f[E(R_p)^+, \sigma_p^-]$

$E(R_p)$ → Expected Return of the portfolio

$\sigma_p$ → s.d of the portfolio i.e. Risk

Agenda ⇒ How to calculate :

a) Expected Return of Portfolio i.e. $E(R_p]$ or $R_p$ ] Type III

b) Volatility i.e. sd of the Portfolio i.e. $\sigma_p$

This return depends upon —

a) Expected return on each stock $E(R_i)$ ] Type I

b) sd of each stock $\sigma_i$

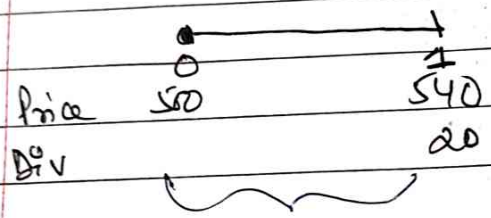
c) Pair wise correlation i.e. $\rho$ → Type II

# How to calculate $E(R_i)$ & $\sigma_i$

Depends on the data —

- Past data [Expost]
- Future data [Exante]

TP




$$HPR = \left(\frac{40+20}{500}\right) \times 100 = 12\%$$

$$= \frac{\text{Div + Price change}}{\text{Initial Price}} \times 100$$

$$= \frac{D_t + (P_t - P_{t-1})}{P_{t-1}} \times 100$$

# Ex

| Yrs | DPS | Price @ end of the yr | Return |
|---|---|---|---|
| 2019 | 20 | 600 | |
| 2020 | 30 | 660 | |
| 2021 | 40 | 500 | |
| 2022 | 50 | 600 | |
| 2023 | 60 | 800 | |

calculate HPR for each year.

2019 HPR cannot be calculated.

| Yrs | Return (X) | Deviation $(x-\bar{x})$ | $(x-\bar{x})^2$ |
|---|---|---|---|
| ~~2019~~ | | | |
| 2020 | 15% $\left(\frac{90}{600}\times 100\right)$ | −2.54 | 6.45 |
| 2021 | −18.18% $\frac{400+(-160)}{660}\times 100$ | −35.72% | 1275.92 |
| 2022 | 30% $\left(\frac{50+100}{500}\right)\times 100$ | 12.46 % | 155.25 |
| 2023 | 43.33% $\left(\frac{60+200}{600}\times 100\right)$ | 25.79 % | 665.12 |
| | 70.15% | 0 | 2102.74 |

∴ Average return $E(R_i) = \frac{70.15}{4} = 17.54\%$ (Mean)

Variance i.e. $\sigma x^2$ = Avg of the squared deviation

$$= \frac{2102.74}{4}$$

$$= 525.69\ (\%^2)$$

∴ Sd $(\sigma x) = \sqrt{525.69}$

$$= 22.93\%$$

HINT: MAD = mean of absolute deviation $= \frac{\Sigma |x-\bar{x}|}{n}$

$$= \frac{12.46 + 25.79 + 2.54 + 35.72}{4}$$

$$= 19.12\%$$

∴ Sd > MAD → Help in guess work

## Case Study 5

Stock P

Sol: $E(R_P) = 11\%$

$\therefore Sd = \frac{24}{5} = 4.8\%$

Stock Q

$E(R) = 11.8\%$

$\text{var} = \frac{1226.8}{5} = 245.36$

$\therefore Sd\ \sigma = \sqrt{245.36}$

$= 15.66\%$

Q1. c) 11%.

Q2. b) 11.8%.

Q3. b) 15.38%.

Q4. c) Stock P because it has lower volatility & close to similar average returns as stock Q.

So, past data ke help se mean ($\bar{x}$) & $\sigma$ nikalna simple hai —

| Yrs | Ret (x) | $x - \bar{x}$ | $(x-\bar{x})^2$ |
|---|---|---|---|
| | | | |
| | $\Sigma x$ | | $\Sigma (x-\bar{x})^2$ |

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

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

(*) If return not given, calculate it by "HPR".

Two stocks mein se one ko choose karna hai?

Case I: Inefficient market [Ek stock faltu hai]

| # | Stock | E(R) | σ | |
|---|---|---|---|---|
| | A | 18% | 5% | ✓ |
| faltu hai ← | (B) | 18% | 12% | ✗ |

| # | Stock | E(R) | σ | |
|---|---|---|---|---|
| | A | 18% | 5% | ✓ ∵ E(R) ↑ |
| | B | 15% | 5% | |

| # | Stock | E(R) | σ | |
|---|---|---|---|---|
| | A | 20% | 5% | ✓ Ret ↑ Risk ↓ |
| | B | 17% | 12% | ✗ |

Case II: Efficient Market [Competition hai]

| Stock | E(R) | σ | (*) CV $\left(\frac{Sd}{mean} \times 100\right)$ | |
|---|---|---|---|---|
| A | 15% | 5% | 33.33% | $\left(\frac{5}{15} \times 100\right)$ ✓ |
| B | 20% | 9% | 45% | $\left(\frac{9}{20} \times 100\right)$ ✗ |

← lower the better

* Coefficient of variation
= Risk is what % of return
= $\frac{Sd}{mean} \times 100$ (lower the better)

However, if Rf = 6% is given and we have to choose one stock, we calculate —

Sharpe ratio [Reward to Volatility Ratio]

= $\frac{E(R) - Rf}{\sigma}$ → Higher the better

Stock A : $\frac{15-6}{5} = 1.8\%$ W.

B : $\frac{20-6}{9} = 1.56\%$

Case Study 8

Soln:-

1. b) High risk averse chose X & low risk will chose Y.

2. Stock X: CV = [illegible]
$\frac{\sigma}{\mu} = \frac{[illegible]}{71.43}$

Stock Y: $\frac{10}{13} = 77.78\%$

a) Stock X because CV is [illegible]

3. $X = \frac{14-5}{10} = 0.9$.

$\frac{18-5}{14} = \frac{13}{14} = 0.93$ ✓

b) stock Y Sharpe ratio ↑

* future data (Probability)

Stock A ka forecast :

| Scenario | Prob | (*) Return (r) | Px | x − x̄ | (x − x̄)² | P(x − x̄)² |
|---|---|---|---|---|---|---|
| I | 0.6 | −10% | −6 | −16% | 256 | 153.6 |
| II | 0.4 | 30% | 12 | 24% | 576 | 230.4 |
| | | | 6 | | | 384 |

$E(R) = \Sigma Px$

$= 6\%$

$\sigma x^2 = 384$

$\sigma x = \sqrt{384} = 19.6\%$.

(*) Ho sakta hai, Prob wala sum mein bhi return nahi dega ... To apne ko "HPR" nikalna hoga but aaj ka Price ($P_0$) har scenario ke lie initial price hoga.

Ex: Price today 500

Ex: Price today 500

Forecast

| Scenario | DPS | Price | Prob |
|---|---|---|---|
| I | 10 | 440 | 0.3 |
| II | 30 | 570 | 0.5 |
| III | 60 | 640 | 0.2 |

Calculate E(R) & Sd of the stock

Soln:-

| P | Ret (X) | PX | $P(x-\bar{x})^2$ |
|---|---|---|---|
| 0.3 | $\frac{440-500}{500} = -10\%$ | -3 | $0.3(-10-15)^2 = 187.5$ |
| 0.5 | $\frac{570-500}{500} = 20\%$ | 10 | $0.5(20-15)^2 = 12.5$ |
| 0.2 | $\frac{640-500}{500} = 40\%$ | 8 | $0.2(40-15)^2 = 125$ |
| | | 15% | 325 |

$E(R) = \bar{x} = 15\%$

$\therefore \sigma x^2 = 325 (\%^2)$

$\therefore \sigma x = \sqrt{325}$

$= 18.03\%$

Case study 7

| | X | PX | $P(x-\bar{x})^2$ |
|---|---|---|---|
| I | 20% | 5 | 50.13 |
| II | 6.67% | 3.34 | 0.34 |
| III | -10% | -2.5 | 62.73 |
| | | 5.84% | 113.2 |

$\sigma x = \sqrt{113.2} = 10.64\%$

1) 5.84 %.

2) 10.64 %.