Unit - 3

① Correlation (ρ)

$$\rho = \frac{Cov_{1,2}}{\sigma_1 \cdot \sigma_2}$$

It helps in relation b/w 2 stocks i.e. tells how much are they inter connected and values lie b/w -1 and 1
At 1 there is high risk which means no diversification and at -1 no risk.
Co-relation / co-efficient of co-relation tells difference b/w actual and predicted values

② Co-variance

$$Cov(x, y) = \rho \cdot \sigma_1 \cdot \sigma_2$$

$$Cov(x, y) = \frac{\sum (x-\bar{x})(y-\bar{y})}{N} \quad \text{(Population)}$$

or

$$= \frac{\sum (x-\bar{x})(y-\bar{y})}{N-1} \quad \text{(sample)}$$

If a specific time frame is given out of a range of time then sample will be used.

It is a measure to show the extent to which given 2 random variables change with respect to each other.
It's value lies b/w $-\infty$ and $+\infty$

If probability is given then we don't use N

$$Cov(x, y) = \sum p(x-\bar{x})(y-\bar{y})$$

$\bar{X}$ (mean) is the return of the single security

③ Weighted Average

$$\bar{r} = w_1 r_1 + w_2 r_2$$

If weight not given then take equal i.e. 0.5 in case of 2 and 0.33 in case of 3

This the return of complete portfolio

④ Standard Deviation

It tells the volitality or risk of portfolio.

A high S.D. means high risk and return is more volatile and unstable

measures the degree of dispersion of data around the sample's mean, used to see risk of an investment

(variance) $\sigma_i^2 = \frac{\sum (x - \bar{x})^2}{N}$ or $\sum p (x - \bar{x})^2$ } single security

$$\sigma = \sqrt{w_1^2 \sigma_1^2 + w_2^2 \sigma_2^2 + 2 w_1 w_2 Cov_{1,2}} \quad \text{(2 securities)}$$

or

$$\sigma = \sqrt{w_1^2 \sigma_1^2 + w_2^2 \sigma_2^2 + w_3^2 \sigma_3^2 + 2 w_1 w_2 Cov_{1,2} + 2 w_2 w_3 Cov_{2,3} + 2 w_1 w_3 Cov_{1,3}}$$

⑤ Co-efficient of Variation

$$\text{Coefficient of Variation} = \frac{\sigma_x}{\bar{x}}$$

It tells the risk taken for per unit return.

⑥ Beta

It measures the volatility of a security compared to the market

$$\beta = \frac{Cov_{(i,m)}}{Variance_m} = \frac{\rho_{i,m}}{\sigma_m^2}$$

Beta of market is 1 if securities' beta is less than 1 then it is good.

⑦ Systematic Risk

$$\text{Systematic Risk} = \beta^2 \sigma_m^2$$

$$\text{Total Risk} = \sigma_i^2$$

$$\text{Unsystematic Risk} = \text{Total Risk} - \text{Systematic Risk}$$

⑧ Minimum Variance of Portfolio

Find:

$$\text{Weight of any 1 of the security } (A) = \frac{\sigma_B^2 - Cov_{AB}}{\sigma_A^2 + \sigma_B^2 - 2Cov_{A,B}}$$

Now find S.D. of portfolio using new weights.