**NPTEL**

**Course Name: Security Analysis and Portfolio Management**

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## **Session 21: Introduction to Portfolio Management**

1. Explain the meaning of Variance of Returns for an Individual Investment?

Variance (Standard Deviation) is a measure of the variation of possible rates of return $R_i$, from the expected rate of return $[E(R_i)]$. Standard deviation is the square root of the variance

$$\text{Variance}\,(\sigma^2) = \sum_{i=1}^{n} [R_i - E(R_i)]^2 P_i$$

Where, $P_i$ is the probability of the possible rate of return, $R_i$

Example:

| Possible Rate of Return ($R_i$) | Expected Return $E(R_i)$ | $R_i - E(R_i)$ | $[R_i - E(R_i)]^2$ | $P_i$ | $[R_i - E(R_i)]^2 P_i$ |
|---|---|---|---|---|---|
| 0.08 | 0.11 | 0.03 | 0.0009 | 0.25 | 0.000225 |
| 0.10 | 0.11 | 0.01 | 0.0001 | 0.25 | 0.000025 |
| 0.12 | 0.11 | 0.01 | 0.0001 | 0.25 | 0.000025 |
| 0.14 | 0.11 | 0.03 | 0.0009 | 0.25 | 0.000225 |
| | | | | | 0.000500 |

Variance ( $\sigma^2$ ) = .0005

Standard Deviation ( $\sigma$ ) = .02236

2. What is the relationship between Relation between Covariance and Correlation Coefficient?

Ans.

The correlation coefficient is obtained by standardizing (dividing) the covariance by the product of the individual standard deviations.

$$r_{ij} = \frac{Cov_{ij}}{\sigma_i \sigma_j}$$

where:

$r_{ij}$ = the correlation coefficient of returns

$\sigma_i$ = the standard deviation of $R_{it}$

$\sigma_j$ = the standard deviation of $R_{jt}$

Correlation coefficient only in the range +1 to -1. A value of +1 would indicate perfect positive correlation. This means that returns for the two assets move together in a completely linear manner. A value of –1 would indicate perfect correlation. This means that the returns for two assets have the same percentage movement, but in opposite directions.

3. How you will explain Portfolio Risk?

Ans.

- Any asset of a portfolio may be described by two characteristics:
  - The expected rate of return
  - The expected standard deviations of returns
- The correlation, measured by covariance, affects the portfolio standard deviation. Low correlation reduces portfolio risk while not affecting the expected return
- Portfolio Risk:

$$\sigma_{port} = \sqrt{\sum_{i=1}^{n} w_i^2 \sigma_i^2 + \sum_{i=1}^{n} \sum_{i=1}^{n} w_i w_j \mathrm{Cov}_{ij}}$$

where:

$\sigma_{port}$ = the standard deviation of the portfolio

$W_i$ = the weights of the individual assets in the portfolio, where weights are determined by the proportion of value in the portfolio

$\sigma_i^2$ = the variance of rates of return for asset i

$\mathrm{Cov}_{ij}$ = the covariance between the rates of return for assets i and j,

where $\mathrm{Cov}_{ij} = r_{ij} \sigma_i \sigma_j$