

- **Security's Beta** The market or systematic risk of a security is measured in terms of its sensitivity to the market movements. This sensitivity is referred to the security's beta.

Beta is a ratio of the covariance of returns of a security, j , and the market portfolio, m , to the variance of return of the market portfolio:

$$\beta_j = \frac{\text{Cov}_{jm}}{\text{Var}_m} = \frac{\sigma_j \sigma_m \text{Cor}_{jm}}{\sigma_m^2} = \frac{\sigma_j \text{Cor}_{jm}}{\sigma_m}$$

In practice, the following regression equation is used to estimate beta:

$$R_j = \alpha + \beta_j R_m + e_j$$

The expected return on the share of a company depends on its beta. The higher the beta, the higher the expected return.

We can use historical data to determine a firm's beta. The estimate of beta would depend on the period of analysis (say, one year, three years or five years) and the frequency of returns (e.g., daily, weekly or monthly). The analyst should be careful in using a reasonable period and time interval.

- **Determinants of Beta** The beta of a firm depends on a number of factors. The three most important factors are: (a) nature of business, (b) operating leverage and (c) financial leverage. Beta increases with the degree of operating and financial leverage.
- **Market Portfolio** may be approximated by a well-diversified share price index such as the Bombay Stock Exchange's National Index or Sensitivity Index (Sensex).
- **Accounting Beta** A cyclical firm would have higher beta. If we relate the cyclical firm's earnings with the aggregate earnings, we would obtain accounting beta. Higher the accounting beta, higher the market beta.
- **Asset Beta and Equity Beta** The calculated beta of a firm is the beta of its equity. In case of a firm that does not employ debt; the equity beta is the same as the firm's asset beta. However, in case of a firm with debt, the asset beta is the weighted average of the equity beta and the debt beta. Since debt is less risky, the debt beta would be less than the equity beta.

If debt is risk free, the debt beta will be zero and the asset beta and the equity beta are given as follows:

$$\beta_A = \beta_E \times \frac{E}{D+E} + \beta_D \times \frac{D}{D+E}$$

$$\beta_A = \beta_E \times \frac{E}{D+E} \quad (\text{since } \beta_D = 0)$$

$$\beta_E = \beta_A \frac{D+E}{E} = \beta_A \left[1 + \frac{D}{E} \right]$$

- **Cost of Equity** The firm uses capital supplied by shareholders. Alternatively, shareholders could invest their funds in securities in the capital market. Thus, they would require firm to earn a return equal to the expected rate of return on security of the equivalent risk. Hence, the cost of equity is equal to the expected rate of return, and can be calculated using SML. The risk-free rate and market premium is common to all firms; betas of firms would be different.