Risk and Return

What is Risk?

- Risk is a situation wherein objective probability distribution of the values a variable is known, even though the exact values it would take are not known.
- The objective probability is one which is supported by rigorous theory, past experience, and the laws of chance.
- the risk can be defined as the chance that the expected or prospective advantage, gain, profit or return may not materialise; that the actual outcome of investment may be less than the expected outcome.
- The greater the variability or dispersion in the possible outcomes, or the broader the range of possible outcomes, the greater the risk.

Measures of Risk

- The variance and standard deviation of return serve as the alternative statistical measures of the risk of the security in an absolute sense
- Covariance measures the risk of the security relative to other securities in a portfolio
- Value-at-risk is a statistical measure of the riskiness of financial assets or portfolios of assets. It is defined as the maximum amount expected to be lost over a given time horizon, at a pre-defined confidence level. For example, if 95% one-month VAR is Rs. 5 million, there is 95% confidence that over the next month the portfolio will not lose more than Rs.5 million.

Types of Risk

- The variability in a security's total return that is directly associated with the overall movements in the general market or economy is called **systematic risk**. This risk can not be diversified. The systematic risk arises due to the fluctuations of the macroeconomic fundamentals like interest rate, inflation etc.

- The variability in a security's total return that is not related to the overall market variability is called **unsystematic risk**. This type of risk can be diversified and it is specific to individual entity i.e. individual company. The unsystematic risk can also be called as idiosyncratic risk.

Types of Systematic Risk

- **Market Risk (Beta)**
- **Interest Rate Risk**
- **Inflation Risk**
- **Exchange Rate or Currency Risk**

Market Risk (Beta)

- **Beta** indicates the extent to which the risk of a given asset is non-diversifiable; it is a coefficient measuring a security's relative volatility. Statistically, beta is the covariance of a security's return with that of the market for a security class.
- It is the slope of the regression line relating a security return with the market return. The security with a higher (than 1) beta is more volatile than the market, and the asset with a lower (than 1) beta would rise or fall more slowly than the market.

Interest Rate Risk

- Interest rate risk is the variability in return on security due to changes in the level of market interest rates
- Interest rate risk has two parts. First, the **price risk** resulting from the inverse relationship between the security price and interest rates.
- Second, the **reinvestment risk** resulting from the uncertainty about the interest rate at which the future coupon income or principal can be reinvested.
- These two parts of interest rate risk move in opposite directions.

Inflation Risk

- Inflation risk is also known as purchasing power risk as there is always a chance or possibility that the purchasing power of invested money will decline, or that the real (inflation-adjusted) return will decline due to inflation.
- Inflation risk is really the risk of unanticipated or uncertain inflation

Exchange Rate or Currency Risk

- Exchange rate risk refers to cash-flow variability experienced by economic units engaged in international transactions or international exchange, on account of uncertain or unexpected changes in exchange rates.
- There is no exchange rate risk under the fixed exchange rate system, while it is the highest under the freely floating exchange rate system.

Country Risk

- Country risk is the degree to which political and economic unrest affect the securities of issuers doing business in a particular country

- It is the probability of loss due to political instability in the buyer's country resulting in inability to pay for imports.

Types of Unsystematic Risk

- Business Risk
- Financial Risk
- Default Risk
- Liquidity Risk
- Maturity Risk
- Call Risk

Business Risk

- Business risk is the uncertainty of income flows that is caused by the nature of a firm's business
- This risk has two components: internal and external. The former results from the operating conditions or operating efficiency of the firm, and it is manageable within or by the firm. The latter is the result of operating conditions which the firm faces but which are beyond its control.
- Business risk is measured by the distribution of the firm's operating income (i.e., firm's earnings before interest and tax) over time

Financial Risk

- Financial risk is associated with the use of debt financing by firms or companies
- There is a risk that the earnings of the firm may not be sufficient to meet these obligations towards the creditors
- The use of debt by the firm causes variability of return for both creditors and shareholders
- Financial risk is usually measured by the debt/equity ratio of the firm; the higher this ratio, the greater the variability of return and higher the financial risk

Default Risk

- Default risk arises from the failure on the part of the borrower or debtor to pay the specified amount of interest and/or to repay the principal, both at the time specified in the debt contract or covenant or indenture
- The default risk has the capital risk and income risk as its components, and that it means not only the complete failure to pay but also the delay in payment

Liquidity Risk

- Liquidity risk refers to a situation wherein it may not be possible to dispose off or sell the asset, or it may be possible to do so only at great inconvenience, and cost in terms of money and time
- The greater the uncertainty about time element, price concession, and transaction cost, the greater the liquidity risk
- For banks and financial institutions, liquidity risk refers to their inability to meet the liabilities towards depositors when they want to withdraw their deposits

Maturity Risk

- Maturity risk arises when the term of maturity of the security happens to be longer
- Since foreseeing, forecasting and envisioning the environment, conditions and situations becomes more and more difficult as we stretch more and more into the future, the long-term investment involves risk

Call Risk

- Call risk is associated with the corporate bonds which are issued with call-back provision or option whereby the issuer has the right of redeeming the bonds before their maturity
- In case of such bonds, the bond holders face the risk of giving up higher coupon bonds, reinvesting proceeds only at lower interest rates, and incurring the cost and inconvenience of reinvestment

What is Return?

- Return is the amount or rate of produce, proceeds, gain, profit which accrues to an economic agent from an investment
- It is a reward for and a motivating force behind investment
- The objective of the investor is usually to maximise return

Return Components

- Return on a typical investment has two components: the basic one which is the periodic cash or income receipts, either interest or dividend; and the other which is the appreciation or depreciation in the price or value of the asset, called the capital gain or the capital loss
- The income component is usually but not necessarily received in cash viz., stock dividend
- The capital gain (or loss) is the difference between the purchase price of the asset and the price at which it can be or is sold
- The total return on an investment thus can be defined as income plus/minus price appreciation/depreciation

Types of Return Concepts

- Expected return is an anticipated, predicted, desired, ex-ante return which is subject to uncertainty
- Realised return, on the other hand, is actually earned; it is an ex-post return
- Holding period return (HPR) measures the total return from an investment during a given or designated time period in which the asset is held by the investor.
- HPR= Ending Value of Investment / Beginning Value of Investment
- HPY=HPR-1
- Annual HPR= $HPR^{1/n}$, n = number of years the investment is held

Nominal and Real Return

- Nominal return is the return in nominal rupees (terms).
- Real return is equal to the nominal return adjusted for changes in prices i.e., the rate of inflation
- The relation between nominal and real return:
- (1 + Nominal Return) = (1+ Real Return) (1+ Inflation Rate)

Required Rate of Return (RRR)

- The RRR for a security is defined as the minimum expected rate of return needed to induce or persuade an investor to purchase the security, given its risk
- The RRR has two components. First, the risk-free rate of return and second is the risk premium
- RRR = Risk-free rate of return + Risk premium
- Risk premium = f (macroeconomic fundamentals, industry specific variables and company specific variables)

Calculation of RRR (Capital Asset Pricing Model)

- The Capital Asset Pricing Model (CAPM) is used in finance to determine a theoretically appropriate required rate of return of an asset, if that asset is to be added to an already well-diversified portfolio, given that asset's non-diversifiable risk
- The model takes into account the asset's sensitivity to non-diversifiable risk (also known as systematic risk or market risk), often represented by beta (β)

The CAPM can be represented in equation as follows:

$$E(R_i) = R_f + \beta(R_m - R_f)$$

where $E(R_i)$ = Expected return of individual security, R_f = Risk-free rate of return, β = Market risk of individual security, R_m = market return.

Testing CAPM

According to Capital Asset Pricing Model (CAPM) the market risk (β) is the sole factor which determine the expected return of the stock, which is used as the cost of equity of the company. For testing the validity of CAPM, generally we follow a two step procedure.

Step-1: Run the time series regression to estimate the market risk (β) following the equation

$$R_i = \beta(R_m)$$

Where, R_i = Individual Stock Return, R_m = Market Return

Step-2: After getting the (β) for each company/portfolio we run a cross sectional regression to examine whether (β) is statistically significant and for this, we have used the function

$\overline{R_i} = \alpha + \lambda(\beta)$. λ = premium: if the β will be statistically significant, then we can conclude that β gives the premium and the CAPM holds good.