

## RISK AND RETURNS

- In order to analyze the performance of an investment it is very important that investors learn how to measure returns such as holding period return, annualized return, etc.
- Since return and risk are related, the measurement of return also helps in the understanding of the riskiness of an investment.

### *Risk Concepts*

- If an outcome is known with certainty, such as the value of a treasury bill at maturity, it is considered riskless.
- On the other hand, if an investment has a potential for loss, it would be considered risky.
- Hence, risk can be defined as a measure of the uncertainty in a set of potential outcomes for an event in which there is a chance of some loss.
- In statistics, measures of dispersion such as variance and standard deviation can help determine how spread out investment outcomes are around their mean or average value. The larger the variance, the greater is the variability and hence the riskiness of the set of values.

### *Investment Rules*

- **Investment rule number 1:** If two investments have the same expected return and different levels of risk, the investment with the lower risk is preferred.
- **Investment rule number 2:** If two investments have the same level of risk and different expected returns, the investment with the higher expected return is preferred.
- Since investors aim to maximize return and minimize risk, it is obvious that an investment with both a *higher expected return* and *lower level of risk* is preferred over another asset.

### *Diversification*

- Following the principle of diversification or “spreading out” of risk, holding a portfolio of assets is better than just investing in one or two securities.
- Diversification is the spreading of wealth over a variety of investment opportunities so as to eliminate some risk.
- By dividing up one’s investments across many relatively low-correlated assets, companies, industries, and countries, it is possible to considerably reduce one’s exposure to risk.
- The benefits of diversification are best realized by combining stocks that are not perfectly positively correlated with each other.
- The more negatively correlated a stock is with the other stocks in an investment portfolio, the greater will be the reduction in risk achieved by adding it to the portfolio.

### *Types of Risk*

- The total risk of an investment can be broken down into
  - Unsystematic or diversifiable or company-specific risk, and
  - Systematic or non-diversifiable risk or beta or market risk
- *Unsystematic risk* can be diversified away by efficient portfolio formation and diversification into investments that have low correlation with each other. Examples include product problems, labor problems, etc. that plague individual companies or sectors.
- *Systematic risk* is non-diversifiable risk in that it exists through-out the system and affects everyone, albeit some more than others. For example, recession or inflation.

- A *Well-diversified portfolio* is one whose unsystematic risk has been completely eliminated. For example, large mutual fund companies.

### *Beta*

- **Beta** is a statistical measure of the volatility of an individual security compared with the market as a whole. It is the relative tendency of a security's returns to respond to overall market fluctuations.
- The average beta is 1.0, and a stock with a beta of 1.0 is said to have the same level of risk as that of the market in general.
- Securities with a beta less than 1.0 are considered less risky than the average stock and the market in general, for example, utility stocks.
- Securities with a beta greater than 1.0 are considered more risky than the average stock and the market in general, for example technology stocks.
- A zero-beta, such as a Treasury bill, is uncorrelated or independent of the market in general.
- Betas are estimated by running a regression of the returns (typically weekly returns) on a stock (dependent variable) with those on a market index (independent variable), such as the Standard and Poor's 500. The slope of the regression line (coefficient of the independent variable) measures beta or the systematic risk estimate of the stock.
- Once individual stock betas are determined, the portfolio beta is easily calculated as the weighted average.

**The Capital Asset Pricing Model (CAPM):** is the equation form of the SML and is used to quantify the relationship between the expected rate of return and the systematic risk of individual securities as well as portfolios.

- It states that the expected return on an investment is a function of
  1. The time value of money (the reward for waiting)
  2. A reward for taking on risk
  3. The amount of risk

$$\text{Return on an investment} = R_f + (R_m - R_f) * \text{beta}$$

### Questions

- 1. What are the two parameters for selecting investments in the finance world? How do investors try to get the most out of their investment with regard to these two parameters?**

The two parameters are risk and return. Investors try to maximize return and minimize risk.

- 2. What are the two ways to measure performance in the finance world?**

Two ways to measure performance are dollar profits and percentage return.

- 3. Why is it not practical to convert holding period returns from very short periods to annual returns?**

Extrapolating small period returns to a much longer period requires that the investment is reinvested in all subsequent periods for the same return. This is often not attainable.

**4. How do we define risk?**

Risk can be defined in terms of uncertainty. Uncertainty is the absence of exact knowledge about an outcome prior to the event.

**5. What are the two investment rules and how do they influence choices when considering a pair of potential investments?**

Investment rule #1 says that given two assets with identical returns, you select the one with the least amount of risk. Investment rule #2 says that given two investments with the same amount of risk, you select the one with the higher return.

**6. Why might two different investors select two different potential investments if one investment had the highest return and the highest risk over the other investment?**

Each investor has his or her own tolerance for risk. So one investor may be more risk averse than another investor and select a lower risk investment versus someone with a higher tolerance for risk.

**7. What does it mean to diversify your portfolio, and what are you trying to gain by so doing?**

Diversification is a means to lower risk without giving up substantial return for that level of risk reduction. By selecting a series of investments over a small number of investments the portfolio provides a better return for that level of risk than individual assets.

**8. What is a positive correlation between two assets' returns? What is a negative correlation between two assets' returns? Which correlation is better for reducing the variance of a portfolio made up of two assets?**

A positive correlation is when two random variables (investments) move in the same direction when an underlying feature (the economy) changes. A negative correlation is when two random variables move in opposite directions when an underlying factor changes. For portfolio diversification, a negative correlation offers more risk reduction.

**9. What is the difference between unsystematic and systematic risk? Which risk can you avoid? Which risk can you not avoid?**

Unsystematic risk is firm specific risk while systematic risk is risk that varies with changes in the economy. You can avoid unsystematic risk by diversification. You cannot avoid systematic risk.

**10. What is beta in the financial world? What is standard deviation in the financial world? What type of risk does each measure? What assumption do you make about the stock when you use beta as a measure of its risk?**

Beta is the systematic risk of an asset in a well-diversified portfolio or a well-diversified portfolio's total risk measure. Standard deviation is the total risk of an asset. Beta measures systematic risk, standard deviation measures both systematic risk and unsystematic risk. When using beta for an individual stock you assume the stock is part of a well-diversified portfolio.