

2.2 Risk of a single asset

Risk Defined

Financial risk may be defined as the uncertainty of the expected return being realized, also:

- The chance of financial loss
- The variability of returns associated with a given asset
- The potential variability in future cash flows

Variance

Measures the dispersion of observations around the mean of the distribution.

The variance is the expected value (average value) of squared deviations from the mean divided by one less than the number of observations in the sample.

$$\sigma^2 = \frac{(R_1 - \bar{R})^2 + (R_2 - \bar{R})^2 + (R_3 - \bar{R})^2 \dots \dots}{n - 1}$$

Standard Deviation

Used when estimate risk based on historic returns – squared root of the variance – by subtracting each annual return from the expected return we can calculate the deviation, that being the amount each annual return differs from the expected return.

- Measures how much returns fluctuate around the average
- The standard deviation measures an asset's total risk, equal to the sum of its systematic and unsystematic risk

$$\sigma = \sqrt{\frac{(R_1 - \bar{R})^2 + (R_2 - \bar{R})^2 + (R_3 - \bar{R})^2 \dots \dots (R_n - \bar{R})^2}{n - 1}}$$

Where:

- σ_i is the standard deviation of the returns of security i
- n is the number of possible outcomes
- R_i is the value of the i th possible rate of return
- \bar{R} is the expected return

2.3 Different Asset Classes

Different Asset Classes:

- Individual shares usually display a much higher volatility than a portfolio of shares
- The higher the risk of the asset class, the higher the expected return on the asset class

Treasury Bills	US equivalent of Australian Treasury Notes and are a form of debt investment and may be referred to as debt securities or fixed income assets. Mature in one year or less, are guaranteed by the government and insensitive to the effect of interest rate changes.
Government Bonds	Backed by the government with maturities longer than 1 year and are more sensitive to the effect of interest rate changes.
Shares	Depend on the ability of the company to generate cash flow growth and are sensitive to a range of macroeconomic factors.

There is a positive relationship between risk and return.

Asset classes that have higher volatility offer investors higher returns, on average, than investments that provide more stable returns.

Risk Premium

The additional return that investment must offer, relative to some alternative, because it is riskier than the alternative.

2.4 Diversification

Diversification

The act of investing in a variety of different asset classes rather than just one or two similar assets.

In any given year some securities in a portfolio will earn higher returns and others will earn much lower returns, and therefore, basically cancel each other out. This is also the reason portfolios have lower standard deviations than individual shares.

Diversification can reduce a portfolios volatility, but only to a point

Even if we put every security in a portfolio, there will still be some volatility remaining.

Systematic Risk

Risk that cannot be eliminated through diversification.

- Changes of health of the economy
- Interest rate movements
- Change in inflation

Unsystematic Risk

Risk that can be eliminated through diversification.

- Failure of a company's new product to gain market share
- Scandal involving top management
- Loss of key employees

2.5 Methods to Estimate Expected Returns

The Historical Approach

- Relies on historical data and assumes that the future and the past share much in common
- Yields a naïve estimate of expected returns
- Some markets may not have a long enough history to estimate returns

$$ER = \frac{R_1 + R_2 + R_3 \dots R_n}{n}$$

Where:

ER = expected return

R = individual return

N = sample size

The Probabilistic Approach

- Uses statistical concepts of probability (lists all possible values that the variable of interest might take, as well as the probability the outcome will occur)

$$E(r) = P_1(R_1) + P_2(R_2) + P_3(R_3) \dots P_n(R_n)$$

Multiply each probability by the associated return and then sum together

The Risk-Based Approach

- Requires an analyst to first measure the risk of the asset, then translate that risk measure into an expected return estimate
 - Step 1: define risk and measure it
 - Step 2: quantify how much return we should expect on an asset given the amount of risk

Beta

A standardized measure of the risk of an individual asset that captures only the systematic component of its volatility; it measures the sensitivity of the asset's return to movements in the overall market.

- A share's beta measures the sensitivity of its return to movements in the overall market return, and is therefore a measure of systematic risk.
- Returns on shares with a high-beta typically experience dramatic up and down swings when the market return moves
- The trend line shows the average tendency for each share to move with the market
- Example: if beta is equal to 1.4 then the return of xxx shares move on average 1.4 times as much as does the market return.
- In contrast, if there is a beta of 0.4, the return of xxx moves much less on average when the overall market fluctuates

Interpreting Beta

- A beta of 1 indicates that securities returns move with the market
- A beta of less than 1 indicates that security is theoretically less volatile than the market:
 - If the beta is 0.65, it is 35% less volatile than the market
- A beta greater than 1 indicates that the securities return is theoretically more volatile than the market
 - If the beta is 1.2, it is 20% more volatile than the market