RISK

The capital investment decision is necessarily a long-term decision. When forecasting potential benefits there will always be an element of risk and uncertainty in the figures to be achieved. This makes any **result** uncertain i.e. A positive or negative NPV may not be a reliable estimate of the attractiveness of a project. We may consider the impact of risk on a project using the following techniques:

1. **Expected values**
2. **Payback Period**
3. **Adjusted discount rates**
4. **Sensitivity analysis**

Expected values

Where there are a range of possible outcomes which can be identified and a probability distribution can be attached to those values. In this situation then we may use a variety of techniques to establish some sort of '**average**' return. The measure of average return is then assumed to be the value that we should use. The expected value is the arithmetic mean of the outcomes as expressed below:

$$EV = \Sigma px$$

Where P = the probability of an outcome
x = the value of an outcome

Payback Period

Estimates of cash flows several years ahead are quite likely to be inaccurate and unreliable. It may be difficult to control capital projects over a long period of time. Risk may be limited by selecting projects with short payback periods.

Adjusted discount rates

The discount rate we have assumed so far is that reflecting the cost of capital of the business. In simple terms this means that the rate reflects either the cost of borrowing funds in the form of a loan rate or it may reflect the underlying return of the business (i.e. the return required by the shareholder), or a mix of both.

An individual investment or project may be perceived to be more risky than existing investments. In this situation the increased risk could be used as a reason to adjust the discount rate up to reflect the additional risk. Such a technique does not consider risk directly, but the application of increased discount rate is often successful in eliminating marginal projects. These projects often are the self-same projects that would not achieve the required return. The addition to the usual discount rate is called the **Risk Premium**.

Although a slightly rough and ready technique, it has an underlying logic and in practice is very useful.

Sensitivity Analysis

Where the variables of the project are identified, if we are looking at investment appraisal this may include the following:

- Initial investment
- Discount rate
- Future expected sales or revenues
- Cost base per annum

A NPV is calculated for a project. This NPV is then altered by changing a single variable of the sum. The idea is to see by how much the value must change before the decision changes (say from accept to reject).

A single variable is changed in isolation from the original sum.

This maximum possible change is often expressed as a percentage;

$$\text{Sensitivity margin} = \frac{\text{NPV}}{\text{PV of flow under consideration}}$$

Example

An investment of $40,000 in year 0 is expected to give rise to annual contribution of $25,000 and annual fixed cost of $10,000 for each of years 1 to 4; the discount rate is 10%

Required

(a) Should we accept or reject the investment based on NPV analysis?

(b) By how much would the values have to change for the decision to alter for:

(i) Initial investment?
(ii) Contribution?
(iii) Fixed costs?
(iii) Discount rate?