

# Chapter 13 revision notes

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## Capital investment decisions

### What is an investment?

An investment requires expenditure on something today that is expected to provide a benefit in the future.

The decision to make an investment is extremely important because it implies the expectation that expenditure today will generate future cash gains in real terms that greatly exceed the funds spent today.

For the accountant an investment appears on the assets side of the balance sheet under fixed assets. For the finance director an investment is any decision that implies expenditure today with the expectation that it will generate cash inflows tomorrow.

Investment decisions are extremely important because they are invariably concerned with the future survival, prosperity and growth of the organisation. The organisation's primary objective of maximisation of shareholder wealth is a basic assumption that continues to hold true. Investments must be made both to maintain shareholder wealth and to increase it. To meet the shareholder wealth maximisation objective it is crucial that those managing the organisation make the best decisions that are based on the best information available and use of the most appropriate appraisal techniques.

At the corporate level investment (in shares) relates to the amount that shareholders are willing to invest in the equity of a company in the expectation of future cash flows in the form of dividends and enhancement of share price. The level of future dividends and share price enhancement are in turn dependent to what extent the company is able to optimise returns on 'real' investment (investment in companies, plant, machinery, working capital) in new products, projects, new business, and so on. Investment may appear within fixed assets in the balance sheet, for example, land buildings, plant, machinery, etc. It may also appear in the profit and loss account in terms of public relations, staff training, or research and development.

An investment decision needs to be one that shareholders and lenders would be happy with; it is one that is expected to provide anticipated gains in real terms that greatly exceed the funds spent today, in other words a good return on the money invested. Otherwise the investment should not be made.

### Investment appraisal criteria

There are five main criteria used to appraise investments, the last three being discounted cash flow (DCF) techniques:

- ◆ the accounting rate of return (ARR) for appraising capital investment projects is based on profits and the costs of investment; it takes no account of cash flows or the time value of money
- ◆ the payback method for appraising capital investment projects is based on cash flows, but also ignores the time value of money
- ◆ net present value (NPV) is one of the two most widely used investment decision criteria that are based on cash flow and the time value of money
- ◆ internal rate of return (IRR) is the other of the two most widely used investment decision criteria that are based on cash flow and the time value of money
- ◆ the discounted payback appraisal method is also based on cash flow and the time value of money

### Accounting rate of return (ARR)

ARR is a simple measure which is sometimes used in investment appraisal. It is a form of return on capital employed. It is based on profits rather than cash flows and ignores the time value of money. ARR may be calculated using:

$$\frac{\text{average accounting profit over the project} \times 100\%}{\text{initial investment}}$$

ARR is a simple method to use but it is not recommended as a primary appraisal method. The method can provide an 'overview' of a new project but it lacks the sophistication of other methods.

### Paybac

Payback is defined as the number of years it takes the cash inflows from a capital investment project to equal the cash outflows. An organisation may have a target payback period, above which projects are rejected. It is useful and sometimes used as an initial screening project in evaluating two mutually exclusive projects. The project that pays back in the shortest time may then on the face of it be the one to accept.

As with ARR, although its use is widespread amongst companies, payback is not recommended as a primary appraisal method, since it also ignores the time value of money

### Key principles underlying investment selection criteria: cash flows, and the time value of money

'£1 received today is worth more than £1 received in a years time' is an expression of what is meant by the 'time value of money'.

The principles underlying the investment appraisal techniques that use the DCF method: NPV; IRR; discounted payback, are cash flow (as opposed to profit), and the time value of money.

### CASH IS KING

**Real funds flows can be seen in cash but not in accounting profit.**

**Interest charges become payable as soon as money is made available, for example, from a lender to a borrower, not when an agreement is made or a contract is signed.**

### TIME VALUE OF MONEY

**Receipt of £100 today has greater value than receipt of £100 in one years time.**

**There are two reasons for this:**

**The money could have been alternatively invested in say risk-free Government gilt-edged securities – in fact the actual rate of interest that will have to be paid will be higher than the Government rate, to include a risk premium, because neither companies nor individuals are risk-free borrowers. Generally, the higher the risk of the investment, the higher the return the investor will expect from it.**

**Purchasing power will have been lost over a year due to inflation.**

### **Discounted cash flow (DCF)**

Whichever of the three methods of appraisal is used: NPV; IRR; or discounted payback, a method of discounting the projected cash flows of the project is used to ascertain its present value.

The technique of discounted cash flow (DCF) discounts the projected net cash flows of a capital project to ascertain its present value, using an appropriate discount rate, or cost of capital.

Using  $i$  to represent the cost of capital (the discount rate), and  $n$  the number of periods e.g. years, the present value discount factor is:

$$1/(1+i)^n \quad \text{where } n \text{ may have a value from } 0 \text{ to infinit}$$

If we consider a project where the initial investment in year 0, is  $I$ , and each subsequent years' net cash flows are  $CF_1$ ,  $CF_2$ ,  $CF_3$ ,  $CF_4$  and so on for  $n$  years up to  $CF_n$ , and the cost of capital is  $i$ ,

then the present value of the cash flows

$$= -I + CF_1/(1+i) + CF_2/(1+i)^2 + \dots + CF_n/(1+i)^n$$

The present value of the cash flows using an appropriate cost of capital is called the net present value or NPV.

### Net present value (NPV)

NPV is today's value of the difference between cash inflows and outflows projected at future dates, attributable to capital investments or long term projects. The value now of these net cash flows is obtained by using the discounted cash flow method with a specified rate of return.

### **Internal rate of return (IRR)**

The NPV of a capital investment project is calculated by:

- ◆ discounting using a rate of return, discount rate, or cost of capital, to obtain
- ◆ the difference in present values between cash inflows and cash outflows

The internal rate of return (IRR) method calculates:

- ◆ the rate of return, where
- ◆ the difference between the present value cash inflows and outflows, the NPV, is zero

Through this calculation, the IRR provides the exact rate of return that the project is expected to achieve. An organisation would then undertake the project if the expected rate of return, the IRR, exceeds its target rate of return.

IRR may most easily be determined graphically through interpolation or extrapolation, which assumes a linear relationship between the NPVs of a capital investment project derived using different discount rates. NPVs of a project are calculated using two discount rates. The IRR of the project is the discount rate where the line drawn through the calculated NPVs cuts the horizontal axis of the graph.

The IRR may also be determined using the appropriate spreadsheet function, using Excel for example.

### **NPV or IRR?**

Which is the better method for the appraisal of capital investment projects?

IRR is relatively easy to understand particularly for non-financial managers. It can be stated in terms that do not include financial jargon, for example 'a project will cost £1m and will return 20% per annum, which is better than the company's target of 15%'. Whereas, NPV is not quite so clear, for example 'a project will cost £1,000,000 and have an NPV of £250,000 using the company's weighted cost of capital of 12%'.

There are three major disadvantages with the use of IRR:

- ◆ IRR ignores the size of investment projects:
  - two projects may have the same IRR, but
  - one project may return many times the cash flow returned by the other project, and so
  - the projects if judged solely on IRR may seem to rank equally
- ◆ if project cash flows do not follow the usual 'outflow at the start of the project followed by inflows over the life of the project' the result may be two or more IRRs, which can lead to uncertainties and difficulties in interpretation
- ◆ IRR should not be used to decide between mutually exclusive projects because of its inability to allow for the relative size of investments

If mutually exclusive projects need to be compared then the following rule for acceptance apply:

- ◆ is the IRR greater than the hurdle rate

if so

- ◆ then the project with the highest NPV should be chosen assuming the NPV is greater than zero

A company may be considering a number of projects in which it may invest. If there is a limited amount of funds available then capital rationing is required. This method requires ranking of the competing projects in terms of NPV per each £ of investment for each project. Investments may then be allocated according to NPV rankings, given the assumption that the investments are infinitely divisible.

### **Discounted payback**

The discounted payback appraisal method requires a discount rate to be chosen and then the payback is the number of years required to repay the original investment.

### **Other factors affecting investment decisions**

Additional factors impacting on investment criteria calculations are:

A number of further factors may have an additional impact on the investment criteria calculations:

- ◆ the effect of inflation on the cost of capital
- ◆ whether additional working capital is required for the project
- ◆ the length of the project
- ◆ taxation
- ◆ risk and uncertain

### **Risk and uncertainty and decision-making – sensitivity analysis**

There may be a number of risks associated with each of the variables included in a capital investment appraisal decision: estimates of initial costs; uncertainty about the timing and values of future cash revenues and costs; the length of project; variations in the discount rate.

Actual outcomes usually differ considerably from expected outcomes. In terms of capital investment, the greater the timescale of the project the more time there is for more things to go wrong; the larger the investment, the greater may be the impact.

As a final step in evaluation of the investment in a project it is prudent to carry out some sort of sensitivity analysis. Sensitivity analysis may be used to assess the risk associated with a capital investment project. A project having a positive NPV may on the face of it seem viable. It is useful to calculate how much the NPV may change should there be changes to the factors used in the appraisal exercise.

The same technique of sensitivity analysis may be used as an early warning system before a project begins to show a loss.

There are limitations to the use of sensitivity analysis: two or more factors may change simultaneously; there may be an absence of clear rules governing acceptance or rejection of projects, which require the subjective judgement of management.

### **Control of capital investment projects**

Once a project has been appraised and a sensitivity analysis carried and the approval has been given at the relevant level in the organisation, project controls must be established and then post project completion audits carried out. The controls cover the three main areas of:

- ◆ capital spend - note the number of subjective areas where things can go wrong
- ◆ project timing - delays appear to be 'routine' in many major projects as evidenced almost daily in the financial press
- ◆ benefits - evidenced almost as frequently in the financial press, this is another area where things may not turn out as planned

To establish the appropriate levels of control, the appointment of a good project manager with the appropriate level of responsibility and authority, together with regular project reviews, are absolute essentials to ensure that projects run to plan.

A good project manager in place cannot be over-emphasised. He/she should ensure that expected benefits actually materialise and are as large in value as anticipated. The project manager should also ensure that costs are kept in line with expectation.

Post implementation audits should be carried out for all projects if possible. Although after the event corrective action cannot usually be taken, variances may be analysed to use the project as an information and learning tool:

- ◆ to appraise manager performance
- ◆ to identify strengths and weaknesses in the forecasting and estimating techniques
- ◆ to identify areas of improvement in the capital investment process
- ◆ to advertise the fact that project and manager performance are being monitored