Fixing the roof

Does IT work: Shopkeepers need to show their agility

FT

Stephen Pritchard

Consumer spending figures are flat in the UK and a report by consultancies PwC and Retail Forward published last month predicted that retail sales in the US would be flat, or even negative, this year.

The poor outlook has hit capital spending plans. Gartner, the IT industry research firm, estimates that half the world's top 10 retailers will cut their capital spending plans in half.

But at the same time, there are pockets of investment. Again according to Gartner, 'cash-rich' companies are poised to make significant investments. And retailers across the board are looking to technology as a way of cutting costs, winning new business or exploiting gaps in the market left by others.

'Many retailers have slashed their capital spending by between 30 and 70 per cent,' says John Davidson, joint author of the Gartner report. 'They are also scaling back on the number of projects.'

There are two challenges for retailers – and especially those with large physical estates.

The first is that consumer spending overall is down, and the prospect of deflation in a number of markets is making consumers cautious about parting with their cash

The second challenge is to compete with leaner online outlets with lower fixed overheads, lower staff costs and often, more attractive customer service. So-called 'multi-channel' strategies, for example, where retailers allow customers to order goods online but collect them from a store, have tended to add to the shopkeeper's costs.

www.ft.com, 13 May 2009.

Source: Reproduced with permission of *The Financial Times*.

About this chapter

This is the third chapter in Part 4 of the book dealing with management accounting decision making. It explains how various calculative techniques can help management select a particular investment. Accountants call this exercise *capital investment appraisal*. The chapter also explores the main sources of external short-, medium- and long-term finance available for the financing of a project once it has been selected.

Learning objectives

By the end of this chapter, you should be able to:
- describe what is meant by capital investment appraisal;
- identify five capital investment appraisal techniques;
- incorporate such techniques into quantitative examples;
- recognize the significance of such techniques;
- list the main external sources of financing capital investment projects.

! Why this chapter is important

As a junior manager you may be involved in capital investment decisions. At this stage of your career not much money will be involved and all you might be doing is deciding which one of two filing cabinets your section should buy. As you become more senior, the projects will become bigger and perhaps cost millions of pounds. You will have to decide which to go for and how they should be financed.

Such decision making will involve a consideration of various projects on both a quantitative and a qualitative basis. Your accountants will process the data for you, and they may use one of the techniques discussed in this chapter. They will then present you with the results. It is extremely unlikely that you will be involved in the detailed number crunching but in order to make a decision about which project you should select you will need to question your accountants about their recommendations.

You will not be able to do so with any confidence unless you have some knowledge of their methods. This chapter provides you with the basic material. After studying it you will be in a much better position to make your own capital investment decisions and not just do what your accountants tell you to do.

Background

News clip

Capital expenditure cut

In order to improve its performance Punch Taverns is to undergo a cut-price makeover even though it is short of cash. In order to help pay for it Punch has announced a 20% cut in its capital expenditure budget.

Source: Adapted from *The Observer Business and Media*, 26 April 2009, p. 2.

Accountants make a distinction between *capital* expenditure and *revenue* expenditure. Expenditure of a capital nature provides a benefit to an entity for more than a year. Revenue expenditure does so for only one year and it has to be renewed if the benefit is to be continued.

Besides its long-term nature some other features of capital expenditure may be distinguished. They include the following:

- its purpose is to help the entity achieve its long-term objectives;
- it will often involve huge sums of money being spent on major projects;
- it may have a considerable impact on how many staff the entity employs and how they react;
- the benefits may be spread over very many years;
- it is difficult to assess precisely what those benefits will be.

All entities would find it difficult to survive if they did not invest in some form of capital expenditure from time to time, and they certainly would not be able to grow and to develop. Plant and machinery will begin to wear out and become obsolete, for example, while in the longer term buildings will need to be replaced. In addition many entities have to set aside resources for projects that do not relate directly to their main business, such as the provision of leisure and social facilities for their employees.

All entities, whether public or private, usually have to select from a long list of possible capital investment projects because they certainly will not have either the time or the resources to do them all at once. So which should they choose? And how should they be financed? This chapter begins to answer these sort of questions.

Main methods

News clip

Off the balance sheet

A European accounting standard means that many of the government's capital expenditure projects will be able to be kept 'off the books'. This means that many hospitals, clinics, schools, waste and local authority projects can continue to be built under private finance initiatives (PFIs) without counting against the government's capital expenditure totals.

Source: Adapted from www.ft.com/cms/s, 13 May 2009.

In this section we are going to examine the main methods used in capital investment (CI) appraisal. We will assume that we are dealing mainly with profit-making entities. Such entities will expect all their projects to make a profit except for those undertaken on health, social and welfare grounds (these types of project are particularly difficult to assess). There are five main techniques that accountants can use in CI appraisal. They are shown in diagrammatic form in Figure 19.1 and we examine each of them in the following subsections.

Payback

The payback method is an attempt to estimate how long it would take before a project begins to pay for itself. For example, if a company was going to spend £300,000 on
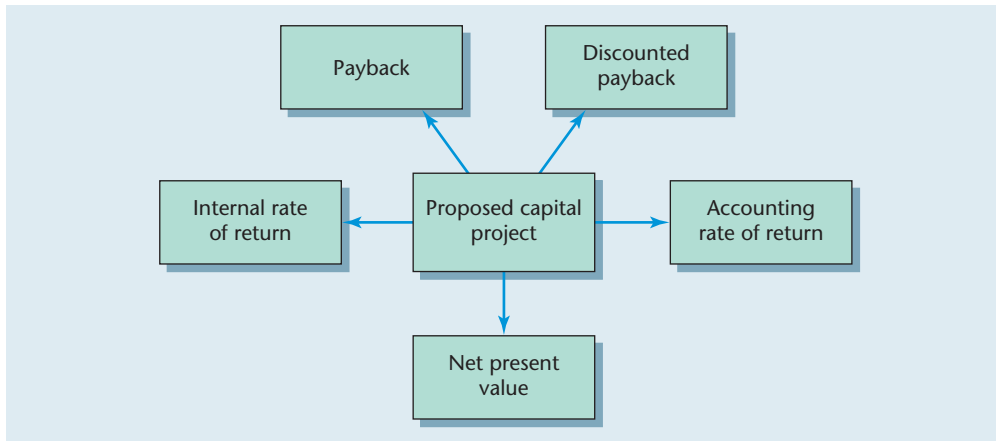
Figure 19.1 Capital investment appraisal methods

purchasing some new plant, the accountant would calculate how many years it would take before £300,000 had been paid back in cash. The recovery of an investment in a project is usually measured in terms of *net cash flow*. This is the difference between cash received and cash paid during a defined period of time. In order to adopt this method the following information is required:

- Total cost of the investment.
- Amount of cash instalment payable on the investment.
- Accounting periods in which the instalments will be paid.
- Cash receipts and any other cash payments connected with the project.
- Accounting periods in which they fall.

As the payback measures the rate of recovery of the original investment in terms of net cash flow, it follows that non-cash items (such as depreciation and profits and losses on sales of fixed assets) are not taken into account.

The payback method is illustrated in Example 19.1.

Example 19.1

The payback method

Miln Limited is considering investing in some new machinery. The following information has been prepared to support the project:

	£000	£000
Cost of machinery		20
Expected net cash flow:		
Year 1	1	
2	4	
3	5	
4	10	
5	10	30
Net profitability		10

Required:
Calculate the prospective investment's payback period.

Answer to Example 19.1

The payback period is as follows:

		£000
Cumulative net cash flow:		
Year 1		1
2	(£1 000 + £4 000)	5
3	(£5 000 + £5 000)	10
4	(£10 000 + £10 000)	20
5	(£20 000 + £10 000)	30

The investment will, therefore, have paid for itself at the end of the fourth year. At that stage £20,000 will have been received back from the project in terms of net cash flow and that sum would be equal to the original cost of the project.

As can be seen from Example 19.1 the payback method is a fairly straightforward technique, but it does have several disadvantages. These are as follows:

- An estimate has to be made of the amount and the timing of cash instalments due to be paid on an original investment.
- It is difficult to calculate the net cash flows and the period in which they will be received.
- There is a danger that projects with the shortest payback periods may be chosen even if they are not as profitable as projects with a longer payback period. The payback method only measures cash flow; it does not measure profitability.
- The total amount of the overall investment is ignored and comparisons made between different projects may result in misleading conclusions. A project with an initial investment of £10,000 may have a shorter payback period than one with an initial investment of £100,000, although in the long run the larger investment may prove more profitable.
- The technique ignores any net cash flows received after the payback period.
- The timing of the cash flows is not taken into account: £1 received now is preferable to £1 received in five years' time. So a project with a short payback period may recover most of its investment towards the end of its payback period while another project with a longer payback period may recover most of the original investment in the first few years. There is clearly less risk in accepting a project that recovers most of its cost very quickly than in accepting one where the benefits are deferred.

Irrespective of these disadvantages, the payback method has something to be said for it. While it may appear to be rather simplistic, it does help managers to compare projects and to think in terms of how long it takes before a project has recovered its original cost.

Activity 19.1

What do you think about the simple payback method? Tick the appropriate column.

	True	False
(a) It is easy to understand.		
(b) It is too simple.		
(c) It is good enough for most capital investment decisions.		

Discounted payback

The simple payback method ignores the timing of net cash receipts but this problem can be overcome by *discounting* the net cash receipts. You will probably be familiar with discounting in your everyday life. You know, for example, that if you put £91 into the building society and the rate of interest is 10% per annum, your original investment will be worth about £100 [£91 + £9 (10% × £91)] at the end of the year. We could look at this example from another point of view. Assuming a rate of interest of 10% per annum, what amount of money do you have to invest in the building society in order to have £100 at the end of the year? The answer is, of course, £91 (ignoring the odd 10p). In other words, £91 received now is about the same as £100 received in a year's time. This is what is meant by *discounting*. The procedure is as follows:

1 Calculate the future net cash flows.
2 Select an appropriate rate of interest.
3 Multiply the net cash flows by a discount factor.

The discount factor will depend on the cost of borrowing money. In the case of the building society example above, the discount factor is based on a rate of interest of 10%. The factor itself is 0.9091, i.e. £100 × 0.9091 = £90.91. To check: take the £90.91 and add the year's interest, i.e. £90.91 × 10% = £9.091 + £90.91 = £100.00. You will not have to calculate discount factors as they are readily available in tables. We include one in Appendix 2 on page 478 of this book.

   In order to confirm that you understand the point about discounting, turn to Appendix 2. Look along the top line for the appropriate rate of interest: in our case it is 10%. Work down the 10% column until you come to the line opposite the year (shown in the left-hand column) in which the cash would be received. In our example, the cash is going to be received in one year's time, so it is not necessary to go further than the first line. The present value of £1 receivable in a year's time is, therefore, 0.9091, or £90.91 if £100 is to be received in a year's time.

Activity 19.2	Assuming a rate of interest of 15% per annum, what is the present value of £200 receivable in two years' time?

We can now show you how the discounted payback method works. We do so in Example 19.2.

Example 19.2	**The discounted payback method**

Newland City Council has investigated the possibility of investing in a new project, and the following information has been obtained:

	£000	£000
Total cost of project		500
Expected net cash flows:		
Year 1	20	
2	50	
3	100	
4	200	
5	300	
6	30	700
Net return		200

Required:
Assuming a rate of interest of 8%, calculate the project's overall return using the following methods:
(a) payback
(b) discounted payback.

Answer to Example 19.2

(a) Payback method

Year	Net cash flow	Cumulative net cash flow
	£000	£000
0	(500)	(500)
1	20	(480)
2	50	(430)
3	100	(330)
4	200	(130)
5	300	170
6	30	200

Calculation:
After 4 years the total cash flows received = £370,000 (£20,000 + 50,000 + 100,000 + 200,000). The £30,000 still necessary to equal the original cost of the investment (£500,000 – 370,000) will be met part way through Year 5, i.e. (£130,000 ÷ 300,000) × 12 months = 5.2 months. So the payback period is about 4 years and 5 months (41 months), assuming that the net cash flows accrue evenly throughout the year.

(b) Discounted payback

Year	Net cash flow	Discount factors	Present value at 8% [Column (2) × Column (3)]	Cumulative present value
(1)	(2)	(3)	(4)	(5)
	£000		£000	£000
0	(500)	1.0000	(500)	(500)
1	20	0.9259	19	(481)
2	50	0.8573	43	(438)
3	100	0.7938	79	(359)
4	200	0.7350	147	(212)
5	300	0.6806	204	(8)
6	30	0.6302	19	11

Calculation:
Using the discounted payback method, the project would recover all of its original cost during Year 6. Assuming that the net cash flows accrue evenly, this would be about the end of the fifth month because (£8000 ÷ 19,000) × 12 months = 5.1 months. So the discounted payback period is about 5 years 5 months (65 months).

The discounted payback method has the following advantages.

● Relatively easy to understand.
● Not too difficult to compute.
● Focuses on the cash recovery of an investment.
● Allows for the fact that cash received now may be worth more than cash receivable in the future.

- Takes more of the net cash flows into account than is the case with the simple payback method because the discounted payback period is always longer than the simple payback method.
- Enables a clear-cut decision to be taken, since a project is acceptable if the discounted net cash flow throughout its life exceeds the cost of the original investment.

However, like the simple payback method, it has some disadvantages.

- Sometimes difficult to estimate the amount and timing of instalments due to be paid on the original investment.
- Difficult to estimate the amount and timing of future net cash receipts and other payments.
- Not easy to determine an appropriate rate of interest.
- Net cash flows received after the payback period are ignored.

Irrespective of these disadvantages, the discounted payback method can be usefully and readily adopted by those entities that do not employ staff specially trained in capital investment appraisal techniques.

Activity 19.3	On balance do you think that the discounted payback method (a) is more helpful than the payback method in capital investment appraisal; and (b) is relatively easy to understand?

(a) Yes [ ]   No [ ]   (b) Yes [ ]   No [ ]

Accounting rate of return

The *accounting rate of return* (ARR) method attempts to compare the *profit* of a project with the capital invested in it. It is usually expressed as a percentage. The formula is as follows:

$$ARR = \frac{profit}{capital\ employed} \times 100$$

Two important problems arise from this definition.

- *Definition of profit.* Normally, the average annual net profit earned by a project would be used. However, as explained in earlier chapters, accounting profit can be subject to a number of different assumptions and distortions (e.g. depreciation, taxation and inflation) and so it is relatively easy to arrive at different profit levels depending on the accounting policies adopted. The most common definition is to take profit before interest and taxation. The profit included in the equation would then be a simple average of the profit that the project earns over its entire life.
- *Definition of capital employed.* The capital employed could be either the initial capital employed in the project or the average capital employed over its life.

So, depending on the definitions adopted, the ARR may be calculated in one of two ways:

- Using the original capital employed:

$$ARR = \frac{average\ annual\ net\ profit\ before\ interest\ and\ taxation}{initial\ capital\ employed\ on\ the\ project} \times 100$$

● Using the average capital employed:

$$ARR = \frac{\text{average annual net profit before interest and taxation}}{\text{average annual capital employed on the project}^{*}} \times 100$$

* $\dfrac{\text{Initial capital employed} + \text{residual value}}{2}$

The two methods are illustrated in Example 19.3.

Example 19.3	**The accounting rate of return method**

Bridge Limited is considering investing in a new project, the details of which are as follows:

Project life		*5 years*
	£000	*£000*
Project cost		50
Estimated net profit:		
Year 1	12	
2	18	
3	30	
4	25	
5	5	
Total net profit	90	

The estimated residual value of the project at the end of Year 5 is £10,000.

Required:
Calculate the accounting rate of return of the proposed new project using:
(a) the original capital employed
(b) the average capital employed.

Answer to Example 19.3

The accounting rate of return would be calculated as follows:

(a) *Using the initial capital employed*:

$$\frac{\text{Average annual net profits}}{\text{Cost of the investment}} \times 100$$

Average annual net profits = £18 000 (£90 000/5)

∴ Accounting rate of return $= \dfrac{£18\,000}{50\,000} \times 100 = \underline{36\%}$

(b) *Using the average capital employed*:

$$\frac{\text{Average annual net profits}}{\text{Average capital employed}} \times 100$$

$$= \frac{£18\,000}{\frac{1}{2}\,(£50\,000 + 10\,000)} \times 100 = \underline{60\%}$$

Like the payback and discounted payback methods, the accounting rate of return method has several advantages and disadvantages.

Advantages
- Compatible with a similar accounting ratio used in financial accounting.
- Relatively easy to understand.
- Not difficult to compute.
- Draws attention to the notion of overall profit.

Disadvantages
- Net profit can be subject to different definitions, e.g. it might or it might not include the depreciation on the project.
- Not always clear whether the original cost of the investment should be used, or whether it is more appropriate to substitute an average for the amount of capital invested in the project.
- Use of a residual value in calculating the average amount of capital employed means that the higher the residual value, the lower the ARR. For example, with no residual value, the ARR on a project costing £100,000 and an average net profit of £50,000 would be 100%, i.e.:

$$\frac{£50\,000}{\frac{1}{2} \times (100\,000 + 0)} \times 100 = \underline{100\%}$$

With a residual value of (say) £10,000, the ARR would be 90.9%, i.e.:

$$\frac{£50\,000}{\frac{1}{2} \times (100\,000 + 10\,000)} \times 100 = \underline{90.9\%}$$

The estimation of residual values is very difficult but it can make all the difference between one project and another.

- Gives no guidance on what is an acceptable rate of return.
- Benefit of earning a high proportion of the total profit in the early years of the project is not allowed for.
- Method does not take into account the time value of money.

Irrespective of these disadvantages, the ARR method may be suitable where very similar short-term projects are being considered.

Activity 19.4	What are your views on the accounting rate of return capital investment appraisal method? Tick the box that best reflects your own views.
	(a) Useless [ ] (b) Could be of some help [ ] (c) Extremely useful [ ]

Net present value

Unlike the payback and ARR capital investment appraisal methods, the net present value (NPV) method does take into account the time value of money. In summary the procedure is as follows.

1 Calculate the annual net cash flows expected to arise from the project.
2 Select an appropriate rate of interest, or required rate of return.
3 Obtain the discount factors appropriate to the chosen rate of interest or rate of return.
4 Multiply the annual net cash flow by the appropriate discount factors.
5 Add together the present values for each of the net cash flows.
6 Compare the total net present value with the initial outlay.
7 Accept the project if the total NPV is positive.

Example 19.4 illustrates this procedure.

| Example 19.4 | **The net present value method** |

Rage Limited is considering two capital investment projects. The details are outlined as follows:

Project	1	2
Estimated life	3 years	5 years
Commencement date	1.1.01	1.1.01
	£000	£000
Project cost at year 1	100	100

Estimated net cash flows:

Year:	1	20	10
	2	80	40
	3	40	40
	4	–	40
	5	–	20
		140	150

The company expects a rate of return of 10% per annum on its capital employed.

Required:
Using the net present value method of project appraisal, assess which project would be more profitable.

Answer to Example 19.4

Rage Ltd

Project appraisal:

	Project 1			Project 2		
Year	Net cash flow	Discount factor	Present value	Net cash flow	Discount factor	Present value
(1)	(2)	(3)	(4)	(5)	(6)	(7)
	£	10%	£	£	10%	£
1	20 000	0.9091	18 182	10 000	0.9091	9 091
2	80 000	0.8264	66 112	40 000	0.8264	33 056
3	40 000	0.7513	30 052	40 000	0.7513	30 052
4	–	–	–	40 000	0.6830	27 320
5	–	–	–	20 000	0.6209	12 418
Total present value			114 346			111 937
Less: Initial cost			100 000			100 000
Net present value			14 346			11 937

Tutorial notes

1 The net cash flows and the discount factor of 10% (i.e. the rate of return) were given in the question.

2 The discount factors may be obtained from the discount table in Appendix 2.

3 Column (4) has been calculated by multiplying column (2) by column (3).

4 Column (7) has been calculated by multiplying column (5) by column 6.

Both projects have a positive NPV, but project 1 will probably be chosen in preference to project 2 because it has a higher NPV, even though its total net cash flow of £140,000 is less than the total net cash flow of £150,000 for project 2.

The advantages and disadvantages of the NPV method are as follows:

Advantages
- Use of net cash flows emphasizes the importance of liquidity.
- Different accounting policies are not relevant as they do not affect the calculation of the net cash flows.
- Time value of money is taken into account.
- Easy to compare the NPV of different projects and to reject projects that do not have an acceptable NPV.

Disadvantages
- Difficulties may be incurred in estimating the initial cost of the project and the time periods in which instalments must be paid back (although this is a common problem in CI appraisal).
- Difficult to estimate accurately the net cash flow for each year of the project's life. This is a problem that is again common to most other methods of project appraisal.
- Not easy to select an appropriate rate of interest. The rate of interest is sometimes referred to as the *cost of capital*, i.e. the cost of financing an investment. One rate that could be chosen is that rate which the company could earn if it decided to invest the funds outside the business (the external rate of interest). Alternatively an internal rate of interest could be chosen. This rate would be based on an estimate of what return the company expects to earn on its existing investments. In the long run, if the internal rate of return is lower than the external rate then it would appear more profitable to liquidate the company and invest the funds elsewhere. A local authority does not have the same difficulty because it would probably use a rate of interest set by central government.

NPV is considered to be a highly acceptable method of CI appraisal. It takes into account the timing of the net cash flows, the project's profitability and the return of the original investment. However, a project would not necessarily be accepted just because it had an acceptable NPV as non-financial factors have to be allowed for. In some cases less profitable projects (or even projects with a negative NPV) may go ahead, for example if they are concerned with employee safety or welfare.

Activity 19.5

How easy did you find the net present value method of capital investment appraisal to understand? Tick which applies.

(a) Very difficult [ ]   (b) Difficult [ ]   (c) Neither difficult nor easy [ ]   (d) Easy [ ]
(e) Very easy [ ]

Internal rate of return

The internal rate of return (IRR) method is also based on discounting. It is very similar to the NPV method, except that instead of discounting the expected net cash flows by a *predetermined* rate of return, it estimates what rate of return is required in order to ensure that the total NPV equals the total initial cost.

In theory, a rate of return that is lower than the entity's required rate of return would be rejected but in practice the IRR would only be one factor to be taken into account in deciding whether to go ahead with the project. The method is illustrated in Example 19.5.

| Example 19.5 | **The internal rate of return method** |

Bruce Limited is considering whether to invest £50,000 in a new project. The project's expected net cash flows would be as follows:

Year	£000
1	7
2	25
3	30
4	5

Required:
Calculate the internal rate of return for the proposed new project.

Answer to Example 19.5

Bruce Ltd

Calculation of the internal rate of return:

Step 1: Select two discount factors

The first step is to select two discount factors, and then calculate the NPV of the project using both factors. The two factors usually have to be chosen quite arbitrarily but they should preferably cover a narrow range. One of the factors should produce a *positive* NPV, and the other factor a *negative* NPV. In this question factors of 10% and 15% have been chosen to illustrate the method. In practice, you may have to try various factors before you come across two that are suitable for giving a positive and a negative result.

Year (1)	Net cash flow (2)	Discount factors (3) 10%	(4) 15%	Present value (5) 10%	(6) 15%
	£			£	£
1	7 000	0.9091	0.8696	6 364	6 087
2	25 000	0.8264	0.7561	20 660	18 903
3	30 000	0.7513	0.6575	22 539	19 725
4	5 000	0.6830	0.5718	3 415	2 859
Total present values				52 978	47 574
Initial cost				50 000	50 000
Net present value				2 978	(2 426)

Notes:

1 Column (2) has been obtained from the question.

2 Columns (3) and (4) are based on the arbitary selection of two interest rates of 10% and 15% respectively. The discount factors may be found in Appendix 2.

3 Column (5) has been calculated by multiplying column (2) by column (3).

4 Column (6) has been calculated by multiplying column (2) by column (4).

The project is expected to cost £50,000. If the company expects a rate of return of 10%, the project will be accepted because the NPV is positive. However, if the required rate of return is 15% it will not be accepted because its NPV is negative. The maximum rate of return that will ensure a *positive* rate of return must, therefore, lie somewhere between 10% and 15%, so the next step is to calculate the rate of return at which the project would just pay for itself.

Step 2: Calculate the specific break-even rate of return

To do this, it is necessary to interpolate between the rates used in Step 1. This can be done by using the following formula:

$$\text{IRR} = \text{positive rate} + \left(\frac{\text{positive NPV}}{\text{positive NPV} + \text{negative NPV*}} \times \text{range of rates} \right)$$

*Ignore the negative sign and add the positive NPV to the negative NPV.

So in our example:

$$\begin{aligned}
\text{IRR} &= 10\% + \left(\frac{2978}{(2978 + 2426)} \times (15\% - 10\%) \right) \\
&= 10\% + (0.5511 \times 5) \\
&= 10\% + 2.76\% \\
&= \underline{\underline{12.76\%}}
\end{aligned}$$

The project will be profitable provided that the company does not require a rate of return in excess of about 13%. Note that the method of calculation used above does not give the precise rate of return (because the formula is only an approximation), but it is adequate enough for decision-making purposes.

Example 19.5 shows that the IRR method is similar to the NPV method in two respects:

- the initial cost of the project has to be estimated as well as the future net cash flows of the project; and
- the net cash flows are then discounted to their net present value using discount tables.

The main difference between the two methods is that the IRR method requires a rate of return to be estimated in order to give an NPV equal to the initial cost of the investment. The main difficulty arises in deciding which two rates of return to use so that one will give a positive NPV and the other will give a negative NPV. You will find that you may have to have many attempts before you arrive at two suitable rates!

The advantages and disadvantages of the IRR method may be summarized as follows.

Advantages
- Emphasis is placed on liquidity.
- Attention is given to the timing of net cash flows.
- Appropriate rate of return does not have to be calculated.
- Method gives a clear percentage return on an investment.

Disadvantages
- Not easy to understand.
- Difficult to determine two rates within a narrow range.
- Method gives only an approximate rate of return.
- Gives some misleading results in complex CI situations, e.g. if there are negative net cash flows in subsequent years and where there are mutually exclusive projects.

As a non-accountant, you do not need to be too worried about the details of such technicalities. All you need to know is that in practice the IRR method has to be used with some caution.

Activity 19.6

With reference to the internal rate of return method of capital investment appraisal: (a) examine the advantages and disadvantages in the text; (b) score each one on a scale of 1 to 3 [1 = not very important; 2 = important; 3 = very important]; (c) add up your scores for each advantage and disadvantage; (d) take the total score for all the advantages away from the total score for all the disadvantages.

What is the net result? The advantages or the disadvantages? Does your result match your basic instincts about the IRR method?

Selecting a method

Of the five capital investment appraisal methods we have covered, which one is the most appropriate?

We consider it important that the time value of money is taken into account in a CI appraisal since the profitability of a future project may be grossly optimistic if such a concept is ignored. The discounted payback method, the net present value method and the internal rate of return method all meet this requirement.

The internal rate of return method involves some complex calculations, although the overall result is relatively easy to understand. Nonetheless, it may be a little too sophisticated for most entities. The discounted payback method is simple to understand and it is intuitively appealing. Its main disadvantage is that net cash flow received after the payback period may be ignored. Almost by default, therefore, the net present value method would appear to be the most favoured method. The main difficulty with the NPV method is the selection of a suitable rate of return for a particular project. So great care needs to be taken before accepting or rejecting a project based on the NPV method because it is highly dependent on the arbitrary determination of a specified rate of return.

Activity 19.7

The text has covered five methods of capital investment appraisal. Rank them in order of usefulness (1 being the most useful and 5 being the least useful).

Net cash flow

News clip

Cheaper prices

Retailers have been hammering away at suppliers' contracts in order to make savings or pass on cheaper prices to customers. Judith McKenna, Asda's finance director, says that retailers have an arsenal of weapons that they can use to cut prices. With suppliers, for example, they have three main levers: extend payment days, cut inventories to improve working capital, and drive down the amount they pay for goods.

Source: Adapted from www.ft.com/cms/s, 29 April 2009.

Four of the capital investment appraisal methods that we have covered in this chapter require the calculation of a project's net cash flow (payback, discounted payback, NPV and IRR). This is obviously not an easy task because it requires making a great many

assumptions and estimates of what might happen in the future – possibly for very many years ahead. There are two issues in particular that can cause a problem: the impact of inflation on future net cash flows and the treatment of taxation. We discuss each of these problems below.

Inflation

In simple terms, inflation means that in (say) a year's time £1 received *then* will not buy the same amount of goods and services as £1 received *now* (see Figure 19.2). So if we calculate future net cash flow on the basis of the currency's value *now* we are, in effect, expecting to receive less cash in the future. Or to put it another way, we should estimate our future net cash flows on the basis of what it will take to purchase the equivalent of £1 of goods and services now. For example, if prices have risen by 10 per cent in a year, you will need to spend £1.10 in a year's time to buy exactly the same goods and services as you could today for £1.

There are two ways of allowing for inflation in capital investment appraisal: (1) indexing; and (2) adjustment of the rate of return. Brief explanations of both methods are given below.

- *Indexing*. Future net cash flows may be indexed using a recognized price index. For example, assume that the net cash flow arising from a particular project will be £100 in Year 1, £150 in Year 2 and £200 in Year 3. The relevant current price index at the beginning of Year 1 is 100 but the index is expected to rise to an average level of 120 for Year 1, 140 for Year 2 and 175 for Year 3. In order to compare the net cash flows over the next three years more fairly, they need to be put on the same price base. If they are indexed, Year 1's net cash flow becomes £83 [(£100 × 100) ÷ 120]; Year 2's net cash flow becomes £107 [(£150 × 100) ÷ 140]; and Year 3's net cash flow becomes £114 [(£200 × 100) ÷ 175]. The adjusted future net cash flows of £83, £107 and £114 for Years 1, 2 and 3 respectively will then be incorporated into a CI exercise and discounted at the entity's cost of capital.
- *Adjusting the rate of return*. Instead of indexing, we could select a higher rate of return. The easiest approach would be to add the expected rate of inflation to the entity's cost of capital. So with inflation at a rate of 5% per annum and a required rate of return of 10%, £100 receivable in 12 months would be discounted at a rate of return of 15%, i.e. £86.96 [(£100 × 100) ÷ 115, or using discount tables £100 × 0.8696].
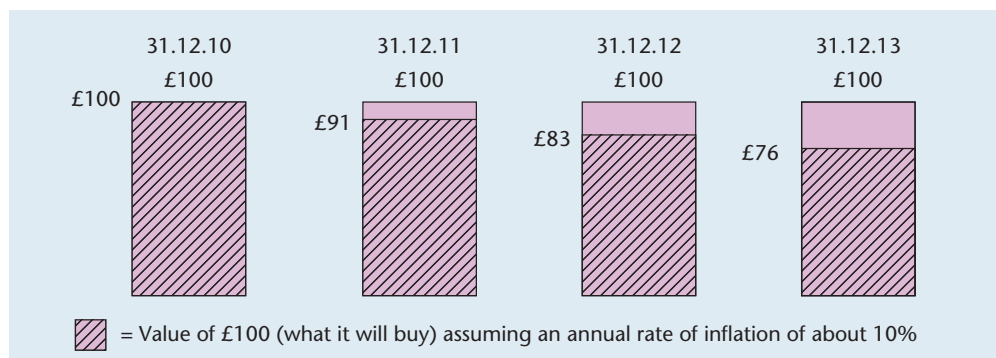
Figure 19.2 **The impact of inflation**

Taxation

Corporation tax is based on the *accounting profit* for the year. In order to calculate the amount of *tax payable* for the year, the accounting profit is adjusted for those items that are not allowable against tax, e.g. depreciation. There are also tax concessions that are not included in the calculation of accounting profit. Capital allowances, for example, are a tax allowance given when fixed assets are purchased. In essence, they are the equivalent of a depreciation allowance. Sometimes up to 100% capital allowances are given so that the entire cost of purchase can be deducted from the profit in the year that a fixed asset was purchased. This means that in the year in the year of purchase, other things being equal, the amount of corporation tax will be low, although in later years it will probably be higher.

So in estimating future net cash flows it is necessary to forecast what changes are likely to take place in the taxation system, what allowances will be available, what effect any changes will have on the amount of corporation tax payable and in what periods tax will have to be paid. Needless to say, the forecasting of such events is enormously difficult!

Activity 19.8	In calculating net cash flow for capital investment appraisal purposes, which method do you think is the most useful for dealing with the following problems? Tick the relevant box.

(1) *Inflation*: (a) indexing   [ ]
             (b) adjust the rate of return   [ ]

(2) *Taxation*: (a) current rate of corporation tax   [ ]
             (b) likely corporation tax rate for each year of the project's life   [ ]

Sources of finance

News clip

Homebuilder purchase

One of the largest homebuilders in the USA, Pulte, has announced that it was going to buy its rival Centex for $1.3 billion in stock. The deal will double the amount of cash on Pulte's balance sheet and allow it to cut $1 billion of debt off its balance sheet. It also expects to save $250 million in overheads and $100 million in debt expenses.

Source: Adapted from www.ft.com/cms/s, 9 April 2009.

Once a decision has been taken to invest in a particular project it is then necessary to search out a suitable method of financing it. There are a considerable number of available sources (both internal and external) although they vary depending on what type of entity is involved. Central and local government, for example, are heavily dependent on current tax receipts for financing capital investment projects, while charities rely on loans and grants. In this section we will concentrate on the sources of external finance available to companies. Such sources depend on the time period involved.

For convenience, we will break our discussion down into the short term, the medium term, and the long term. The various sources of finance are shown in diagrammatic format in Figure 19.3 and we discuss each of them below.

Short-term finance

There are five major sources of external short-term finance.

- *Trade credit.* This is a form of financing common in all companies (and for all other entities). An entity purchases goods and services from suppliers and agrees to pay for them some days or weeks after they have been delivered. This method is so common that sometimes discounts are given for prompt payment. By delaying the payment of creditors, the entity's immediate cash needs are less strained and it may be able to finance projects that otherwise could not be considered. However, it is clearly only a temporary method of financing projects (particularly long-term ones). The entity is also highly vulnerable to pressure from its creditors. This method often operates in tandem with a demand for debtors to settle their accounts promptly.
- *Bank overdraft.* This is a form of loan where the bank's customer is allowed to draw out more from the bank than has been deposited. An entity's overdraft may have to be secured by a *floating charge*. This means that the bank has a general claim on any of the entity's assets if the entity cannot repay the overdraft. There is usually an upper limit, the amount overdrawn can usually be called in at any time and the interest charge may be high. The main advantages of an overdraft are that it is flexible and that interest is normally only charged on the outstanding balance on a daily basis.
- *Factoring.* Factoring relates to an entity's debtors. There are two types of factoring:
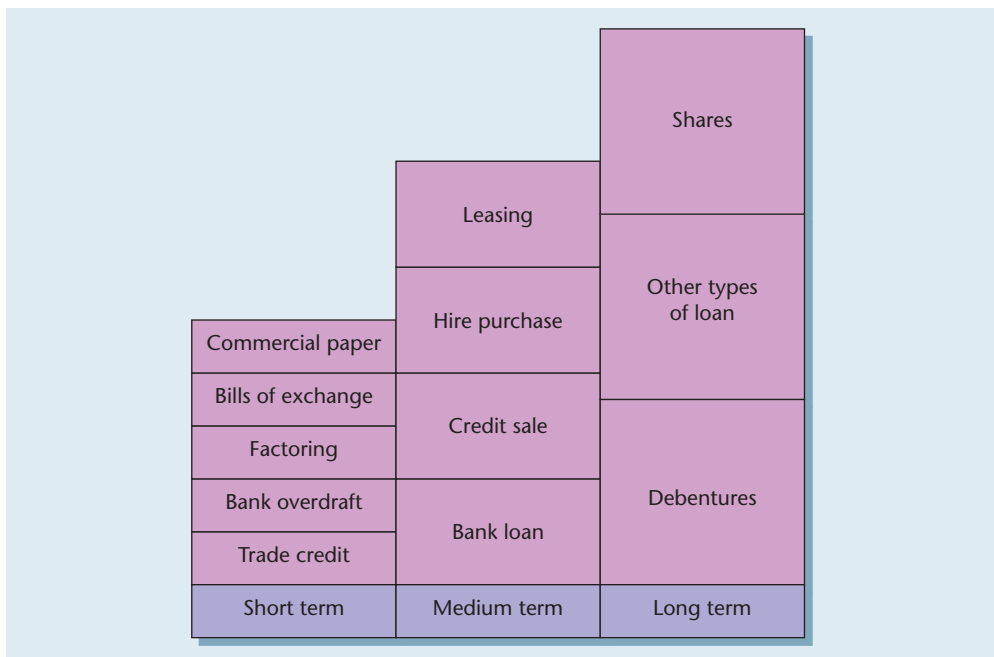 - recourse factoring, where an entity obtains a loan based on the amount of its debtor balances;

Figure 19.3 Sources of finance

– non-recourse factoring, where the debtor balances are sold to a factor and the factor then takes responsibility for dealing with them.

Factoring is a convenient way of obtaining ready cash but either the interest rate on the loan or the discount on the invoices may be high.

- *Bill of exchange.* This is simply an invoice that has been endorsed (i.e. accepted) by a merchant bank. It can then be sold by the legal holder to obtain immediate finance. The interest charged depends on the creditworthiness of the parties involved, and if a company has a poor reputation then it will expect to pay more interest.
- *Commercial paper.* This is a form of short-term borrowing used by large listed companies. It is a bearer document, i.e. a person to whom the document is payable without naming that person.

Activity 19.9

Five main sources of external short-term finance are outlined in the text. Can you identify other sources of both internal and external short-term finance that may possibly be available to a company? List as many as you can.

Medium-term finance

There are four main types of external medium-term finance.

- *Bank loan.* Banks may be prepared to lend a fixed amount to a customer over a medium- to long-term period. The loan may be secured on the company's assets and the interest charge may be variable. Regular repayments of both the capital and the interest will be expected. Bank loans are a common form of financing but the restrictions often placed on the borrower may be particularly demanding.
- *Credit sale.* This is a form of borrowing in which the purchaser agrees to pay for goods (and services) on an instalment basis over an agreed period of time. Once the agreement has been signed, the legal ownership of the goods is passed to the purchaser and the seller cannot reclaim them. Sometimes very generous terms can be arranged, e.g. no payment may be necessary for at least 12 months, but the basic cost of the goods may be far higher than other suppliers are charging.
- *Hire purchase.* HP is similar to a credit sale except that the seller remains the legal owner of the goods until all payments due have been completed. An immediate deposit may be necessary, followed by a series of regular instalments. Once the goods have been paid for the ownership passes to the purchaser. HP is usually an expensive method of financing the purchase of fixed assets.
- *Leasing.* This is a form of renting. A fixed asset (such as a car or a printing press) remains legally in the ownership of the lessor. In the case of some leases the asset may never actually be returned. In effect, the lessee becomes the *de facto* owner. Leasing can be expensive although if the lessor passes on what can sometimes be very generous tax allowances it can be a reasonably economic method of financing projects.

Activity 19.10

The following are four forms of external medium-term finance. Rank your preferences in rank order (1 to 4).

Bank loans [ ]   Credit sales [ ]   Hire purchase [ ]   Leasing [ ]

Long-term finance

External long-term finance can generally be obtained from three main sources.

- *Debentures.* These are formal long-term loans made to a company; they may be for a certain period or open-ended. Debentures are usually secured on all or some of an entity's assets. Interest is payable but because it is allowable against corporation tax debentures can be an economic method of financing specific projects.
- *Other types of loan*:
  - *Loan capital* is a form of borrowing in which investors are paid a regular amount of interest and their capital is eventually repaid. The investors are creditors of the entity but they have no voting rights.
  - *Unsecured loan stock* is similar to debenture stock except that there is no security for the loan. The interest rate tends to be higher than that on debenture stock because of the greater risk.
  - *Convertible unsecured loan stock* gives stockholders the right to convert their stock into ordinary shares at specified dates.
  - *Eurobond loan capital* can be obtained by borrowing overseas in the 'Euro' market. The loans are usually unsecured and they are redeemed at their face value on a certain date. Interest is normally paid annually. The rate depends partly on the size of the loan and partly on the particular issuer.
- *Shares.* Expansion of the company could be financed by increasing the number of ordinary shares available, either on the open market or to existing shareholders in the form of a *rights issue.* An increase in an entity's ordinary share capital dilutes the holding of existing shareholders and all shareholders will expect to receive increasing amounts of dividend. Alternatively new or additional preference shares could be offered; preference shareholders would have an automatic right to a certain percentage level of dividend and so the issue of preference shares limits the amount of dividend available to ordinary shareholders.

Activity 19.11

You are in a small business as (a) a sole trader, (b) a partnership, and (c) a limited liability company. You wish to purchase some new machinery costing £50 000.
In each case, which main form of financing the project would you prefer?

(a) ————————————————————————————————————

(b) ————————————————————————————————————

(c) ————————————————————————————————————

! Questions you should ask

Capital investment appraisal is a most important decision-making function. The selection of a particular project and the most appropriate means of financing it are difficult decisions to make. As a senior manager you will receive some expert advice on what you can do. Ultimately, the final decision will be one for you. As far as the financial data are concerned, what questions should you put before your accountants? We suggest that the following may provide a framework for some detailed questioning.

- What capital appraisal method have you used?
- Why did you select that one?
- What problems have you encountered in calculating the net cash flow (or estimated net profit)?
- What allowances have you made for inflation and taxation?
- What rate of return have you used and why?
- What qualitative factors do you think should be taken into account?
- Are you able to put a monetary cost or value on them?

Conclusion

CI appraisal is a complex and time-consuming exercise. It is not possible to be totally accurate in determining the viability of individual projects but a valid comparison can usually be made between them.

Managers tend to be very enthusiastic about their own sphere of responsibility. As a result a marketing manager may be *sure* that additional sales will be possible, a production director may be *certain* that a new machine will pay for itself quickly and the data processing manager may be *convinced* that a new high-powered computer is essential.

In helping management to choose between such competing projects, the accountant's role is to try to assess their costs and to compare them with the possible benefits. Once a choice has been made he then has to ensure that the necessary finance will be available for them. CI appraisal should not be used as a means of blocking new projects. It is no different from all the other accounting techniques. It is meant to provide additional guidance to management and ultimately it is the responsibility of management to ensure that other factors are taken into account.

Key points

1 Capital investment appraisal forms part of the budgeting process.

2 There are five main methods of determining the viability of a project:
- payback
- discounted payback
- accounting rate of return
- net present value
- internal rate of return.

3 All the methods listed above have their advantages and disadvantages but the recommended methods are discounted payback and net present value.

4 Capital expenditure may be financed by a variety of external sources (as well as internal). Sources of short-term finance for entities include trade credit, bank overdrafts, factoring, bills of exchange and commercial paper. Medium-term sources include bank loans, credit sales, hire purchase and leasing. Long-term sources include debentures and other types of loans, and share issues.

Check your learning

The answers to these questions can be found within the text.

1 What is the distinction between capital and revenue expenditure?

2 List five characteristics associated with capital expenditure.

3 What is meant by 'net cash flow'?

4 What is the payback method of capital investment appraisal?

5 What information is needed to adopt it?

6 List four disadvantages of the payback method.

7 What is the discounted payback method of capital investment appraisal?

8 What is meant by 'discounting'?

9 What does a discount factor depend on?

10 List four advantages and four disadvantages of the discounted payback method.

11 What is the accounting rate of return method of capital investment appraisal?

12 What formula should be used in adopting it?

13 And how should (a) the numerator and (b) the denominator be determined?

14 List three advantages and three disadvantages of the accounting rate of return method.

15 What is the net present value method of capital investment appraisal?

16 Outline seven steps needed to adopt it.

17 List three advantages and three disadvantages of the method.

18 What is the internal rate of return method of capital investment appraisal?

19 What is its basic objective?

20 What formula is used to determine the required rate of return?

21 List three advantages and three disadvantages of the method.

22 How may (a) inflation and (b) taxation be allowed for in capital investment appraisal?

23 List three main external sources of (a) short-term finance, (b) medium-term finance and (c) long-term finance.

News story quiz

Remember the news story at the beginning of this chapter? Go back to that story and reread it before answering the following questions.

This is yet another news story of companies struggling to stay in business during a particularly deep recession. As the story indicates, one way of saving money is to cut capital expenditure. But that could mean that if a company survives the recession it will not be in a position to take full advantage of an upturn in the market. This story suggests that an investment in IT will help retailers survive the recession.

Questions

1 How can 'technology' help the retail industry to cut costs, win new business or exploit gaps in the market?

2 What sources of finance are open to retailers to finance such expenditure when spending is down and consumers are reluctant to part with their cash?

3 How far do you think the retailers' problems during the recession have been caused by not providing for the bad times during the good times?

Tutorial questions

The answers to questions marked with an asterisk can be found in Appendix 4.

19.1 'In capital expenditure appraisal, management cannot cope with any technique that is more advanced than payback.' How far do you think that this assertion is likely to be true?

19.2 'All capital expenditure techniques are irrelevant because:
(a) they cannot estimate accurately future cash flows;
(b) it is difficult to select an appropriate discount rate.'
Discuss.

19.3 Do any of the traditional capital investment appraisal techniques help in determining social and welfare capital expenditure proposals?

19.4 'We can all dream up new capital expenditure proposals', asserted the Managing Director, 'but where is the money coming from?' How might the proposals be financed?

19.5* Buchan Enterprises is considering investing in a new machine. The machine will be purchased on 1 January in Year 1 at a cost of £50,000. It is estimated that it will last for five years, and it will then be sold at the end of the year for £2000 in cash. The respective net cash flows estimated to be received by the company as a result of purchasing the machine during each year of its life are as follows:

Year	£	
1	8 000	(excluding the initial cost)
2	16 000	
3	40 000	
4	45 000	
5	35 000	(exclusive of the project's sale proceeds)

The company's cost of capital is 12%.

Required:
Calculate:
(a) the payback period for the project
(b) its discounted payback period.

19.6* Lender Limited is considering investing in a new project. It is estimated that it will cost £100,000 to implement, and that the expected net profit after tax will be as follows:

Year	£
1	18 000
2	47 000
3	65 000
4	65 000
5	30 000

No residual value is expected.

Required:
Calculate the accounting rate of return of the proposed project.

19.7* The following net cash flows relate to Lockhart Limited in connection with a certain project that has an initial cost of £2,500,000:

Year	Net cash flow £000	
1	800	(excluding the initial cost)
2	850	
3	830	
4	1 200	
5	700	

The company's required rate of return is 15%.

Required:
Calculate the net present value of the project.

19.8 Moffat District Council has calculated the following net cash flows for a proposed project costing £1,450,000:

Year	Net cash flow £000	
1	230	(excluding the initial cost)
2	370	
3	600	
4	420	
5	110	

Required:
Calculate the internal rate of return generated by the project.

19.9 Prospect Limited is considering investing in some new plant. The plant would cost £1,000,000 to implement. It would last five years and it would then be sold for £50,000. The relevant profit and loss accounts for each year during the life of the project are as follows:

Year to 31 March	1 £000	2 £000	3 £000	4 £000	5 £000
Sales	2 000	2 400	2 800	2 900	2 000
Less: Cost of goods sold					
Opening stock	–	200	300	550	350
Purchases	1 600	1 790	2 220	1 960	1 110
c/f	1 600	1 990	2 520	2 510	1 460

	b/f 1 600	1 990	2 520	2 510	1 460
Less: Closing stock	200	300	550	350	50
	1 400	1 690	1 970	2 160	1 410
Gross profit	600	710	830	740	590
Less: Expenses	210	220	240	250	300
Depreciation	190	190	190	190	190
	400	410	430	440	490
Net profit	200	300	400	300	100
Taxation	40	70	100	100	10
Retained profits	160	230	300	200	90

Additional information:
1 All sales are made and all purchases are obtained on credit terms.
2 Outstanding trade debtors and trade creditors at the end of each year are expected to be as follows:

Year	Trade debtors	Trade creditors
	£000	£000
1	200	250
2	240	270
3	300	330
4	320	300
5	400	150

3 Expenses would all be paid in cash during each year in question.
4 Taxation would be paid on 1 January following each year end.
5 Half the plant would be paid for in cash on 1 April Year 0, and the remaining half (also in cash) on 1 January Year 1. The resale value of £50,000 will be received in cash on 31 March Year 6.

Required:
Calculate the annual net cash flow arising from the purchase of this new plant.

19.10 Nicol Limited is considering investing in a new machine. The machine would cost £500,000. It would have a life of five years and a nil residual value. The company uses the straight-line method of depreciation.

It is expected that the machine will earn the following extra profits for the company during its expected life:

Year	Profits
	£000
1	200
2	120
3	120
4	100
5	60

The above profits also represent the extra net cash flows expected to be generated by the machine (i.e. they exclude the machine's initial cost and the annual depreciation charge). The company's cost of capital is 18%.

Required:
(a) Calculate:
    (i) the machine's payback period; and
    (ii) its net present value.
(b) Advise management as to whether the new machine should be purchased.

19.11 Hewie Limited has some capital available for investment and is considering two projects, only one of which can be financed. The details are as follows:

	Project (1)	Project (2)
Expected life (years)	4	3
	£000	£000
Initial cost	600	500
Expected net cash flows (excluding the initial cost)		
Year		
1	10	250
2	200	250
3	400	50
4	50	–
Residual value	Nil	Nil

Required:
Advise management on which project to accept.

19.12 Marsh Limited has investigated the possibility of investing in a new machine. The following data have been extracted from the report relating to the project:

Cost of machine on 1 January Year 6: £500,000.
Life: four years to 31 December Year 9.
Estimated scrap value: Nil.
Depreciation method: Straight-line.

Year	Accounting profit after tax	Net cash flows	
	£000	£000	
6	100	50	(excluding the initial cost)
7	250	200	
8	250	225	
9	200	225	
10	–	100	

The company's required rate of return is 15%.

Required:
Calculate the return the machine would make using the following investment appraisal methods:
(a) payback
(b) accounting rate of return
(c) net present value
(d) internal rate of return.