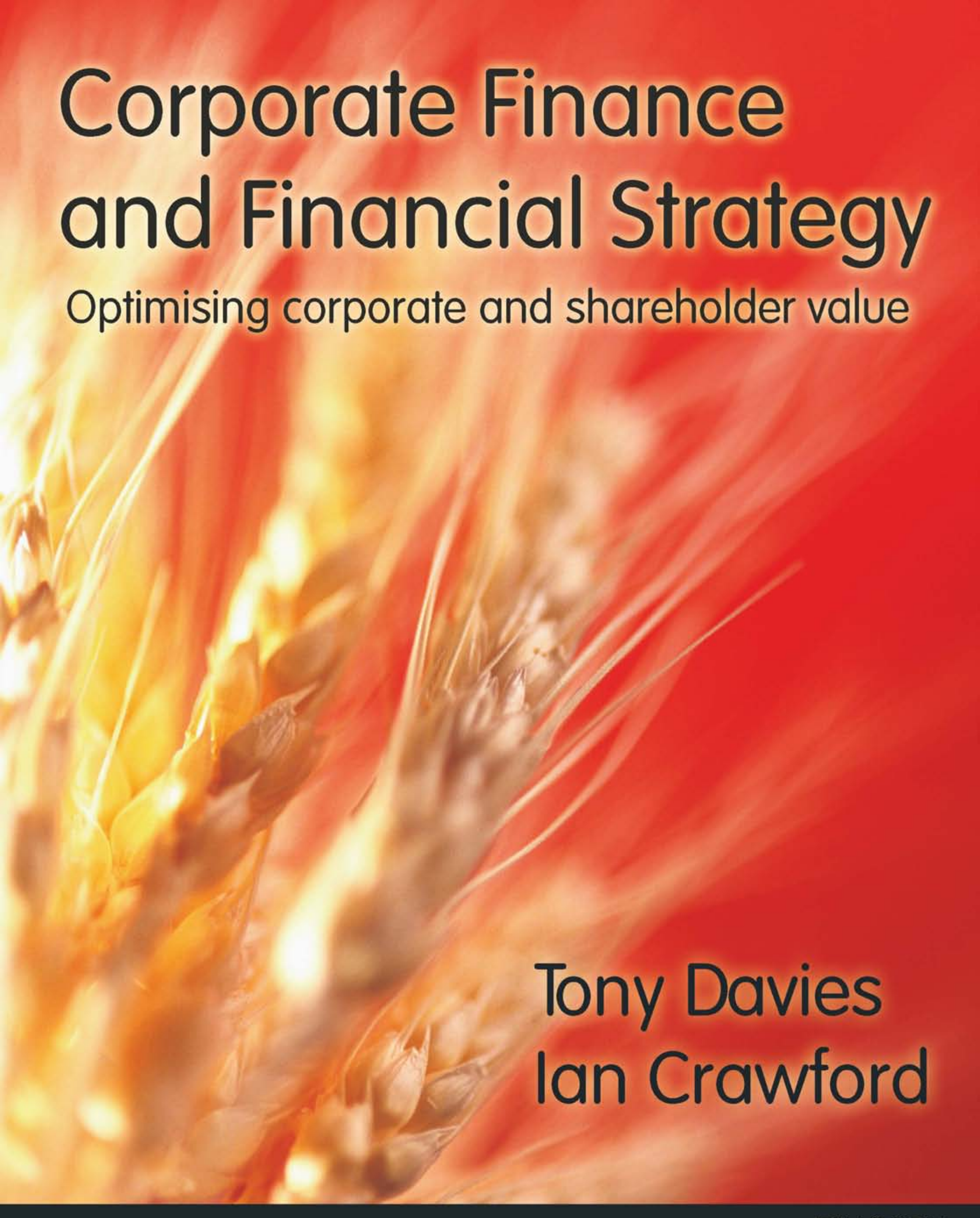

Corporate Finance and Financial Strategy

Optimising corporate and shareholder value

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Corporate Finance and Financial Strategy

$$PV = \frac{C}{r} = \frac{£150{,}000}{0.06} = £2{,}500{,}000$$

Alternatively, if it is decided that the first £150,000 payment should not be received until five years from today, we can calculate the different sum of money that needs to be set aside today.

$$PV = \frac{2{,}500{,}000}{(1 + 0.06)^5} = £1{,}868{,}145$$

An **annuity** comprises an equally spaced level stream of cash flows for a limited period of time. The present value (PV) of an annuity, where C is the annual cash payment, r is the per annum discount rate, and t is the number of years each cash payment is received is:

$$\mathbf{PV = C \times \left\{\frac{1}{r} - \frac{1}{r(1 + r)^t}\right\}}$$

where $\left\{\frac{1}{r} - \frac{1}{r(1 + r)^t}\right\}$

is described as the present value annuity factor (PVAF), which is the present value of £1 a year for each of t years, and therefore:

$$\mathbf{PV = C \times PVAF}$$

Worked example 6.6

Let's assume that you are planning to purchase a car, which requires payment by four annual instalments of £6,000 per year. We can calculate the real total cost you will incur for purchase of the car, assuming a rate of interest of 6% (in other words the PV).

$$PV = C \times \left\{\frac{1}{r} - \frac{1}{r(1 + r)^t}\right\}$$

$$PV = £6{,}000 \times \left\{\frac{1}{0.06} - \frac{1}{0.06(1 + 0.06)^4}\right\}$$

$$\text{Real total cost PV} = £20{,}794$$

This is obviously considerably lower than the total of the actual cash payments for the four years, which is £24,000 (4 × £6,000).

As we discussed earlier in this chapter, the relationship between present value and future value is:

$$PV = \frac{FV}{(1 + r)^t}$$

and therefore

$$FV = PV \times (1 + r)^t$$

We also saw that:

$$PV = C \times PVAF$$

Therefore, by combining each of the above two equations, we can see that the future value (FV) of equal annual payments over t periods is:

$$\mathbf{FV = (C \times PVAF) \times (1 + r)^t}$$

Worked example 6.7

Let's assume that you plan to save £7,000 every year for 30 years and then retire, and the rate of interest is 5% per annum. We can calculate the future value (FV) of your retirement fund as follows:

$$FV = (C \times PVAF) \times (1 + r)^t$$

or

$$FV = C \times \left\{\frac{1}{r} - \frac{1}{r(1 + r)^t}\right\} \times (1 + r)^t$$

$$FV = £7{,}000 \times \left\{\frac{1}{0.05} - \frac{1}{0.05(1 + 0.05)^{30}}\right\} \times (1 + 0.05)^{30}$$

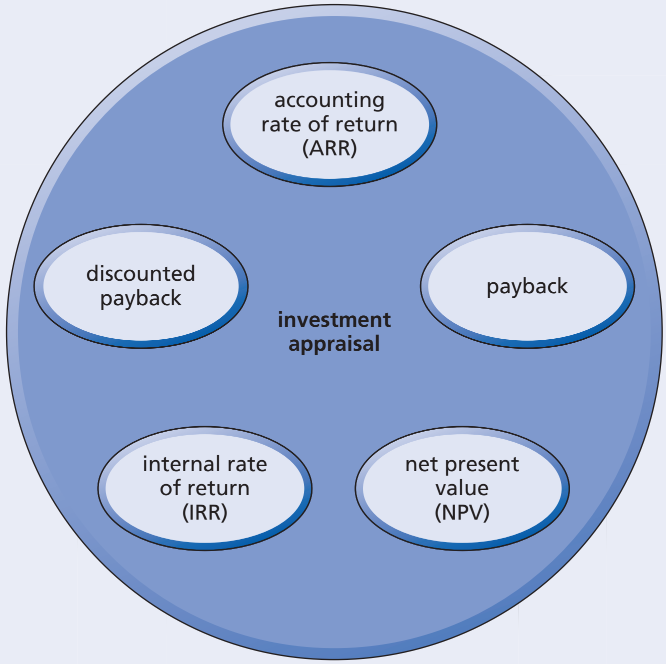
Value of fund at retirement FV = £465,072

Investment appraisal methods

The five main methods used in investment appraisal are shown in Figure 6.1:

- 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 (or possibly profits), 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 second 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.

Figure 6.1 The five main investment appraisal criteria methods



We will look at examples of each of the five appraisal criteria and the advantages and disadvantages of using each of them.

Accounting rate of return (ARR)

ARR is a simple measure that may be used for investment appraisal. It is a form of return on capital employed, based on profits rather than cash flows, and ignores the time value of money.

ARR may be calculated using:

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

There are alternative ways of calculating ARR. For example, total profit may be used instead of average profit, or average investment may be used instead of initial investment. It should be noted that in such a case if, for example, a machine originally cost £800,000 (the initial investment) and its final scrap value was £50,000 (investment at end of project) then the average investment is £850,000/2, or £425,000.

It should also be noted that the method of calculation of ARR that is selected must be used consistently. However, ARR, although simple to use, 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. The impact of cash flows and time on the value of money really should be considered in investment appraisal, which we will discuss in a later section about key principles underlying investment selection criteria.

Worked example 6.8

Alpha Engineering Ltd is a company that has recently implemented an investment appraisal system. Its investment authorisation policy usually allows it to go ahead with a capital project if the accounting rate of return is greater than 25%. A project has been submitted for appraisal with the following data:

	£000
Initial investment	100 (residual scrap value zero)
Per annum profit over the life of the project:	
Year	Profit
	£000
1	25
2	35
3	35
4	25

The capital project may be evaluated using ARR.

$$\text{Average profit over the life of the project} = \frac{£25{,}000 + £35{,}000 + £35{,}000 + £25{,}000}{4}$$

$$= £30{,}000$$

$$\text{Accounting rate of return} = \frac{£30{,}000}{£100{,}000} \times 100\% = 30\%$$

which is higher than 25% and so acceptance of the project may be recommended.

Progress check 6.2

What is the accounting rate of return (ARR) and how is it calculated?

Payback

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 process in evaluating two mutually exclusive projects. The project that pays back in the shortest time may on the face of it be the one to accept.

Worked example 6.9

Beta Engineering Ltd's investment authorisation policy requires all capital projects to pay back within three years, and views projects with shorter payback periods as even more desirable. Two mutually exclusive projects are currently being considered with the following data:

	Project 1 £000	Project 2 £000	
Initial investment	200	200	(residual scrap values zero)

Per annum cash inflows over the life of each project:

Year	Project 1		Project 2	
	Yearly cash inflow £000	Cumulative cash inflow £000	Yearly cash inflow £000	Cumulative cash inflow £000
1	60	60	100	100
2	80	140	150	250
3	80	220	30	280
4	90	310	10	290

The projects may be evaluated by considering their payback periods.

- Project 1 derives total cash inflows of £310,000 over the life of the project and pays back the initial £200,000 investment three quarters of the way into year three, when the cumulative cash inflows reach £200,000 [£60,000 + £80,000 + £60,000 (75% of £80,000)].
- Project 2 derives total cash inflows of £290,000 over the life of the project and pays back the initial £200,000 investment two thirds of the way into year two, when the cumulative cash inflows reach £200,000 [£100,000 + £100,000 (67% of £150,000)].
- Both projects meet Beta Engineering Ltd's three-year payback criterion.
- Project 2 pays back within two years and so is the preferred project, using Beta's investment guidelines.

Worked example 6.9 shows how payback may be used to compare projects. However, in practice the total returns from a project should also be considered, in addition to the timing of the cash flows and their value in real terms. As with ARR, although from experience the use of payback appears to be widespread among companies, it is not recommended as the main method. This method can also provide an overview but should not be the primary appraisal method used in larger companies or with regard to large projects because it ignores the time value of money.

Progress check 6.3

What is payback and how is it calculated?

Key principles underlying investment selection criteria: cash flow, the time value of money, and discounted cash flow (DCF)

The first two appraisal criteria we have considered are simple methods that have limitations in their usefulness in making optimal capital investment decisions. The three further appraisal criteria are NPV, IRR, and discounted payback. Whichever of these three methods is used, three basic principles apply: ***cash is king***, ***time value of money***, and ***discounted cash flow (DCF)***.

Cash is king

- Real funds 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 when a contract is signed.

Time value of money

Receipt of £100 today has greater value than receipt of £100 in one year's time. There are three reasons for this:

- The money could have been invested alternatively in, for example, risk-free UK Government gilt-edged securities.
- Purchasing power will have been lost over a year due to inflation.
- The risk of non-receipt in one year's time.

Discounted cash flow (DCF)

Whichever of the three methods of appraisal is used:

- NPV
- IRR
- discounted payback,

a technique of discounting the projected cash flows of a project is used to ascertain its **present value**. Such methods are called discounted cash flow or DCF techniques. They require the use of a discount rate to carry out the appropriate calculation.

Let's assume that a specific sum of money can be held in reserve for some unforeseen future need, or used:

- to earn interest in a bank or building society account over the following year
- to buy some bottles of champagne (for example) at today's price
- to buy some bottles of champagne at the price in one year's time, which we may assume will be at a higher price because of inflation.

We may also assume that the bank or building society interest earned for one year, or the amount by which the price of champagne goes up due to inflation over one year is, say, 5%. Then we can see that £100 would be worth £105 if left in the building society for one year, and £100 spent on champagne today would actually buy just over £95 worth of champagne in one year's time because of its price increase.