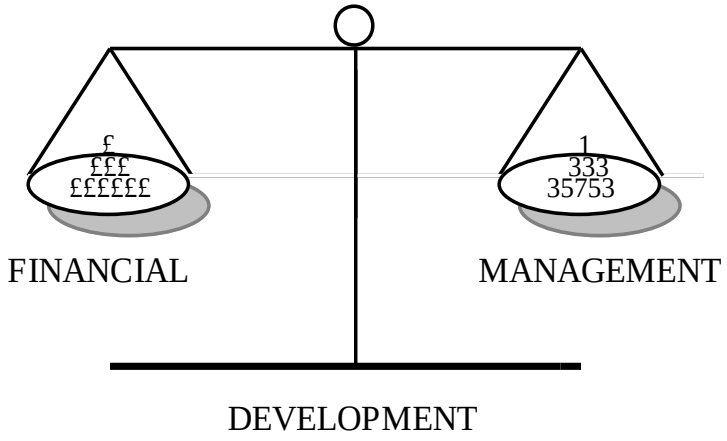
FINANCIAL MANAGEMENT DEVELOPMENT

Decision Making

Capital Expenditure

NO 332

DISCOUNTED CASHFLOW ANALYSIS



ONE OF A SERIES OF GUIDES FOR

FINANCIAL MANAGEMENT DEVELOPMENT

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DISCOUNTED CASH FLOW ANALYSIS

WHY DISCOUNT CASHFLOWS?

DCF is a necessary part of capital expenditure appraisal because money is not fixed in value. The measure is not like metres or miles. It changes over time and these changes need to be allowed for in any calculation which involves the using of money values for periods of over one year. This paper sets out why a discount rate is used, how it is calculated and how discounted cashflow analysis can help managers reduce complex decisions to simple quantifiable alternatives.

EVALUATION OF OPTIONS

Would you lend someone £100 if they promised to give it back in a year's time?
Most people would say no. When asked why, they would, after some thought come up with three basic reasons:

Inflation
The general movement in prices means that the value of £1 now in terms of purchasing power is more than it will be in one year's time.

Opportunity Cost (interest)
Money invested for a year normally attracts interest and thus lending it has an opportunity cost of the interest foregone. Note that this is the real interest rate as inflation must be allowed for separately.

Risk
There is always a risk involved in lending or investing. This is normally quantified by adding a percentage likelihood that the money will not be repaid.

Typically an individual or organisation will assess these three items and come up with a total percentage extra charge (or interest) which will be required to compensate the lender.

This might be:

Inflation	3%
Interest	3%
Risk	4%

	10%

Thus the lender would be prepared to lend at an interest rate of 10%. They consider that they would be no worse off if at the end of the year they received back £110.

To put this another way.

If the required discount rate is 10% a lender or investor is ambivalent whether they have £100 now or £110 in a year's time. These have the same value to that investor at the current time.

Thus £100 now = £110 in one year's time.

But what is £100 in a year's time worth now?

If 100 (Now) = 110 (1 year)

then 100 (1 year) = $\frac{100}{110}$ (now)

= 91 (or £90.91)

We can use this fact as a basis to convert any money values in the future to present day values to help make decisions.

WHICH IS THE BETTER PROJECT?

PROJECT A (50% RETURN)

CASH INVESTED NOW			10,000
CASH INFLOWS	YEAR 1	1,000	
	YEAR 2	2,000	
	YEAR 3	3,000	
	YEAR 4	4,000	
	YEAR 5	5,000	
		15,000	

OR PROJECT B (40% RETURN)

CASH INVESTED NOW			10,000
CASH INFLOWS	YEAR 1	5,000	
	YEAR 2	4,000	
	YEAR 3	2,000	
	YEAR 4	2,000	
	YEAR 5	1,000	
		14,000	

PAYBACK

The percentage return looks better for A but most people would choose project B because you get your money back faster.

Project A returns the initial investment by the end of year 4. Project B returns the initial investment by the middle of year 3.

This is a very simple method of investment appraisal known as payback. It is useful to qualify out doomed proposals. If a project has a payback of over 10 years then only Governments and large corporations are likely to be interested. If it has a payback of under one year then do it!

The problem with payback is that it is very short term. It fails to consider cashflows beyond the payback period. It makes no allowance for the time value of money. The payback is not a payback in real terms.

NET PRESENT VALUE

Consider how the use of discounting cashflows can help to reduce the problem of alternative uses of cash to simple arithmetic.

Using Discounting tables all the cashflows can be reduced to pounds of one value, today's value.

Assume a discount rate of 10%. We can borrow at 6% and we believe the premium for risk should be a further 4% to add up to 10%.

The project returns now look very different.

PROJECT A

		Discount Factor	Present Value
NOW	(10,000)	1.0000	(10,000)
YEAR 1	1,000	0.9091	909
YEAR 2	2,000	0.8264	1,652
YEAR 3	3,000	0.7513	2,254
YEAR 4	4,000	0.6830	2,732
YEAR 5	5,000	0.6209	3,104

NET PRESENT VALUE			651
			=====

PROJECT B

		Discount Factor	Present Value
NOW	(10,000)	1.0000	(10,000)
YEAR 1	5,000	0.9091	4,545
YEAR 2	4,000	0.8264	3,306
YEAR 3	2,000	0.7513	1,503
YEAR 4	2,000	0.6830	1,366
YEAR 5	1,000	0.6209	621

NET PRESENT VALUE			1,341
			======

The Net Present Value is defined as the value in today's money of the cash inflows after deduction of the cash outflows. All cashflows are discounted to today's values and thus the NPV is the profit on the investment i.e. the excess over the required rate of return measured in today's Pounds.

This is the most common method of capital investment appraisal. It gives an instant answer to the questions:

Is the project worth doing?
By how much will I be better off?
Which of two or more competing alternatives is the best project?

A investment is worthwhile if it has a positive NPV.

INTERNAL RATE OF RETURN

There are two problems associated with using NPV.

1. The discount rate has to be calculated or assumed in advance.
2. The initial investment figures for competing projects are seldom the same.

To cope with these it is necessary to consider a form of break-even analysis.

If we used a higher discount rate the Net Present Value of the project would be made worse. Presumably there is a rate at which the NPV would be zero.

Consider the use of a 20% discount rate for Project B.

PROJECT B

		Discount at 10%	Present Value	Discount at 20%	Present Value
NOW	(10,000)	1.0000	(10,000)	1.0000	(10,000)
YEAR 1	5,000	0.9091	4,545	0.8333	4,166
YEAR 2	4,000	0.8264	3,306	0.6944	2,778
YEAR 3	2,000	0.7513	1,503	0.5787	1,157
YEAR 4	2,000	0.6830	1,366	0.4823	965
YEAR 5	1,000	0.6209	621	0.4019	402
			---		---
NPV			1,341		(532)
			=====		=====

The project has a negative NPV at 20% and therefore should not be carried out if that is the cost of money plus risk premium. At 20% the project will waste £532 in today's money if it is undertaken. Note that the Accounts would still show a profit of £4,000 on the project! Accounts do not show the impact of inflation, nor the lost opportunity cost of investment.

If the project is viable at 10% but not viable at 20%, there must be a rate at which it breaks even. At that rate the NPV will be zero. This is the rate at which the value of the outlay is exactly matched by the value of the inflows in today's terms.

This rate can only be found by trial and error (preferably using a spreadsheet application on a PC) and is called the INTERNAL RATE OF RETURN.

PROJECT B

		Discount at 16%	Present Value	Discount at 17%	Present Value
NOW	(10,000)	1.0000	(10,000)	1.0000	(10,000)
YEAR 1	5,000	0.8627	4,310	0.8547	4,274
YEAR 2	4,000	0.7432	2,973	0.7305	2,922
YEAR 3	2,000	0.6407	1,281	0.6244	1,249
YEAR 4	2,000	0.5523	1,105	0.5337	1,067
YEAR 5	1,000	0.4761	476	0.4561	456
			---		---
NPV			145		(32)
			=====		=====

At 17% the NPV is effectively zero so therefore Project B's rate of return is 17%.

The Internal Rate of Return gives an instant way of ranking projects which allows for different sizes of initial outlay. This is probably the best method of investment appraisal although most organisations also consider NPV in order to ensure that a large profitable project is not rejected in favour of a smaller project with a higher rate of return.

SUMMARY

Identification of cashflows is vital for proper capital expenditure evaluation. The investor needs to decide

Should I invest?
Which of several competing investments should I make?

PAYBACK

Simple to use but ignores cashflows after the payback period and is not payback in real terms.

DISCOUNTED PAYBACK

Allows for payback in real terms but still fails to consider cashflows beyond the payback period. Once the cashflows have been discounted the NPV is available.

NET PRESENT VALUE

Useful to consider sensitivities
Indicates the true level of profit

INTERNAL RATE OF RETURN

Useful as a benchmark, often set as a hurdle rate in large organisations.

SENSITIVITY ANALYSIS

Now that spreadsheets are easily available on PC's there is no reason not to carry out sensitivity analysis on all aspects of an investment appraisal.

In particular different models of sales and major costs should be used to recalculate their impact on NPV and IRR. This can not only be helpful in decisions regarding risk but can also provide an indication of the benefit from buying out the risk. Thus to protect against possible low sales with a consequent lowering of NPV it may be worth agreeing prices and contracts in advance to protect the NPV. The cost of this can then be used as a comparison with the original, riskier sales forecast.

The use of NPV in this way often helps management to assess the main assumptions and find ways of establishing their validity.

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David is an experienced financial professional who has devoted his skills to management training in practical understanding and utilisation of financial information. A Graduate, Chartered Accountant, and Associate of the Institute of Taxation, he is also a Member of the Chartered Institute of Personnel and Development and has been an Ordained as a Deacon in the Catholic Church.

He has worked as a Financial Controller and Company Secretary in the Finance industry and as a Director of Finance and Administration in the Computer Services industry. Since 1990 he has conducted management development programmes for over forty major organisations including Arla Foods, Blue Circle, BP, CSC Computer Sciences, Conoco, Ernst & Young, Lloyds Bowmaker, Royal Mail, Unilever and Zeneca. He also runs programmes for the Leadership Foundation and the management teams at a number of Universities. International training experience includes work in Belgium and Holland for CSC, in Denmark, Kenya and the Czech Republic for Unilever, in Holland and the US for Zeneca, in Dubai for Al Atheer, in Bahrain and Saudi Arabia for Cable & Wireless.

He specialises in programmes in financial management for both tactical and strategic decision making. In addition he has run courses in acquisition evaluation (The Economist, Eversheds, Blue Circle and Hays Chemicals) and in post-acquisition management (Unilever). All training is specifically tailored to the needs of the organisation with the emphasis on practical applications to enhance profitability and cashflow. He has developed material for delivery by in-house personnel (Royal Mail, Lloyds Bowmaker and Conoco), computer based training packages (The Post Office, Unilever and BP), and post course reinforcement self-study workbooks (CSC and Zeneca). He has also produced a training video on Cashflow Management.

He is a prolific writer of case studies, role plays and course material. He has also published articles on the financial justification of training, financial evaluation of IT investment proposals, the use of Activity Based Costing and Customer Profitability statements, commercial considerations for consultants, the need for taxation awareness training for general managers, evangelisation and Christian business ethics.

Many of his generic documents are freely available on his website: **FinancialManagementDevelopment.com** including papers on Charity Management.

In addition to his Diaconal work in the Church, he has held a number of voluntary positions including University, College and School Governor, Hospice Treasurer and Trustee of various charitable institutions. He continues to provide ad hoc commercial advice to several other charitable organisations. He has been married for over 35 years and has one daughter and three granddaughters.

This series of papers is designed to help managers by providing a basic understanding of key financial concepts to assist them in their work. It is provided at no cost since this knowledge is a Gift from God and thus to be shared (Matthew 10:8).

