Capital Investment Appraisal Techniques

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A practising Bookkeeper asked me recently how and by what methods one would appraise a proposed investment in new or replacement assets.

My response to this is contained in the technical article below.

This short article covers the following concepts:

- Average return on investment
- Payback period
- Discounted cash flow – NPV, Net Present Value Method
- IRR – Internal Rate of Return

Those advising small businesses owe it to themselves, the business owners and the employees to see that the approach to the investment of funds in tangible assets is based on sound financial techniques.

What then are the main factors when considering a project when there is a choice to be made?

- The amount of capital available and the source of capital
- Cost of capital
- The life of the project
- The cash flow from the project or projects and its timing
- Capital allowances and taxation
- Grants
- Residual value of the asset

- Sensitivity analysis eg: effect on the project of say a % variation on one or more of the following:
    - Sale volume
    - Sale prices
    - Operating costs
    - Capital expenditure

We should be aware that £100 in the bank today is worth more than £100 in the bank tomorrow – this concerns the time value of money.

This basic doctrine influences many decisions eg: credit control, cash flow and indeed choice of capital project.

To demonstrate the time value of money concept assume that we can invest funds at, say, 10% per annum.

It is evident that £1000 today is equivalent to £1100 in a year's time. Likewise £5500 in a year's time is equivalent to £5000 today. With the time value concept in mind one can examine the relative merits of the three main methods of evaluating a capital project.

- Return on investment
- Payback period
- Discounted cash flow – NPV, Net Present Value Method

Case Study

The objective of this case study is to examine an investment and measure its performance using the following techniques:

- Average return on capital
- Payback period

- DCF – NPV method
- IRR – Internal Rate of Return

NB: The firm's existing return on capital is 15% and in this case this is assumed to be their cost of capital for appraisal purposes.

R Noble, Agricultural Engineers are considering an investment programme. It has a choice of three projects each of which cost £60000, but capital is limited in supply to £60000.

	Project A Hydraulic Ramps Workshop	**Project B** Modification to metal cutting machine	**Project C** Special Delivery vehicle
Forecasted Cash Flows:			
	£	**£**	**£**
Year 1	12000	18000	24000
2	21000	12000	27000
3	27000	21000	15000
4	15000	21000	15000
5	21000	19500	9000
	£96000	£91500	£90000

NPV factors at 15%

Yr	1	0.870
	2	0.756
	3	0.658
	4	0.572
	5	0.497

Return on Investment

The return on investment method expresses the average annual profit earned over the life of the project as a % of the initial capital outlay or the average capital outlay.

	Project A **£**	**Project B** **£**	**Project C** **£**
Cash flow	96000	91500	90000
Depreciation (20% straight-line)	60000	60000	60000
Incremental Profit	36000	31500	30000
Average profit	7200	6300	6000
% of initial outlay	12%	10.5%	10%

This method is easily understood but has two main weaknesses as it ignores both the cost of capital and the timing of the cash flow.

Payback Period

This is the measure of time it takes to recover the original outlay and is usually defined as the number of years it will take for the cumulative cash flow from the project to equal the capital outlay.

Although this method does give weighting to the timing of the cash flow, it fails to take account of the cash flow after the capital has been recovered and does not relate to cost of capital.

Project		A	B	C
Cumulative Cash Flow				
		£	£	£
Year	1	12000	18000	24000
	2	33000	30000	51000
	3	60000	51000	66000
	4	75000	72000	81000
	5	96000	91500	90000

Payback Period

A	B	C
3 years	3 years	2 years
	$+\left(\frac{9000}{21000} \times 12\right)^{*}$	$+\left(\frac{9000}{15000} \times 12\right)$
	= 3 years 5 months	= 2 years 7 months

* You will note that project B, has £51000 cumulative cash flow after 3 years, therefore a further £9000 is required to cover the initial £60000. This is from a further £21000 in year 4.

Discounted Cash Flow

It was demonstrated earlier assuming the possibility of investment money at 10%, that £1100 in a year's time was the equivalent of £1000 today.

This conclusion could have been derived by referring to NPV tables and reading off the NPV factor at 10% for year one ie: 0.909 and multiplying £1100 x 0.909, which equals £1000, the net present value of the future £1100.

In discounted terminology the £1000 is termed the present value of £1100 in one year's time.

To calculate the DCF return, a rate of discount is assumed, this usually relates to the cost of capital or the target return required. The present values of all the future cash flows are listed by multiplying the cash flow for each year by the appropriate discount factor.

The aggregate of these present values is then compared with the initial outlay and the NPV – net present value is determined.

If the NPV is positive then the return achieved is greater than the rate at which the cash flows have been discounted, and therefore the project would be acceptable.

Conversely if the NPV is negative then the rate of return is less than the rate at which the cash flows have been discounted and therefore the project would be rejected.

DCF Schedule

		Project A		Project B		Project C	
Years	**NPV Factor**	**Cash Flow**	**NPV**	**Cash Flow**	**NPV**	**Cash Flow**	**NPV**

0	1.000	(60000)	(60000)	(60000)	(60000)	(60000)	(60000)
1	0.870	12000	10440	18000	15660	24000	20880
2	0.756	21000	15876	12000	9072	27000	20412
3	0.658	27000	17766	21000	13818	15000	9870
4	0.572	15000	8580	21000	12012	15000	8580
5	0.497	21000	10437	19500	9693	9000	4473
		NPV:	3099		255		4215

As each project has a positive NPV they are all achieving a rate in excess of 15%.

Project C has the higher NPV and is therefore achieving the highest return.

If a decision to adopt was made purely on a financial perspective then project C would be the first choice.

IRR – Internal Rate of Return

In order to determine the rate the project is achieving we need to consider the IRR.

The IRR is simply that % discount rate at which the NPV would be equal to zero. That is where the cumulative present values equal the initial outlay.

You will need an awareness of this concept and may not necessarily have to calculate it in an examination.

In the case of project C we need to discount the cash flows at a higher rate.

Project C

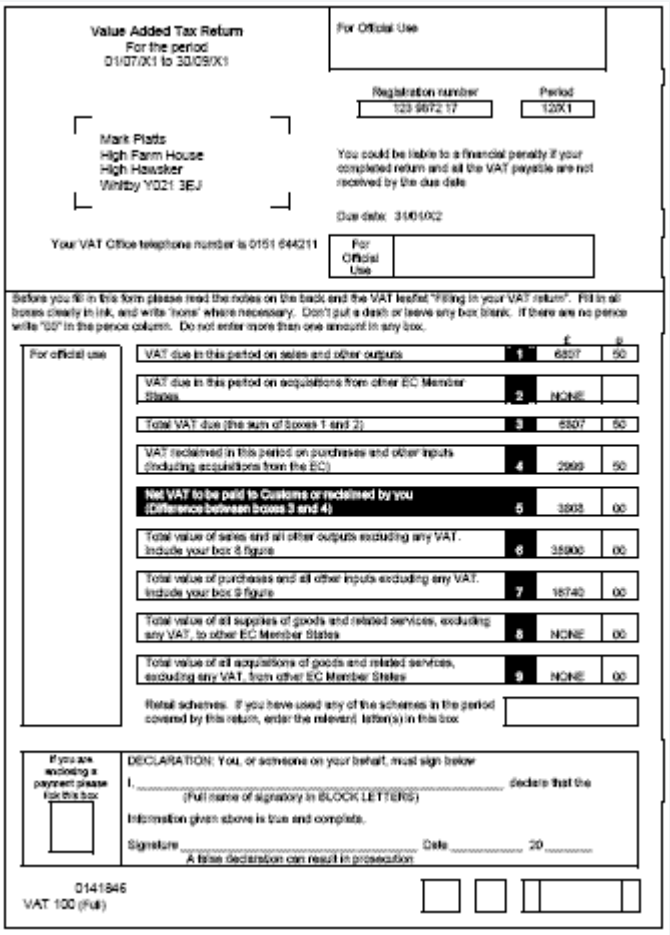
Years	NPV Factor 20%	Cash Flow	NPV
0	1.00	(60000)	(60000)
1	0.833	24000	19992
2	0.694	27000	18738
3	0.578	15000	8670
4	0.482	15000	7230
5	0.401	9000	3609
		NPV:	(1761)

As the project, when discounted at 20%, has a NPV of (£1761) negative, it is not achieving that discounted rate of return.

The IRR therefore falls between 15% and 20%.

This can be determined by graph or formula.

By Graph



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For the period
01/07/X1 to 30/09/X1

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Period: 12/X1

Mark Platts
High Farm House
High Hawsker
Whitby YO21 3EJ

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Your VAT Office telephone number is 0151 644211

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Net VAT to be paid to Customs or reclaimed by you (Difference between boxes 3 and 4)	5	3908	00
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Total value of purchases and all other inputs excluding any VAT. Include your box 7 figure	7	16740	00
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By Formula

$$IRR = \text{Lower Rate \%} + \left(\frac{\text{NPV at lower rate}}{\text{Range of NPV}} \times \text{Range of Rates} \right)$$

$$= 15 + \left(\frac{4215}{5976} \times 5 \right)$$

$$= \underline{18.53\%}$$

This project is achieving a discounted return of 18.53% which is also termed the projects internal rate of return.

There is no one technique that will result in the right decision being taken; any method has to be based on a subjective assessment of sales, relevant costs and cash flow.

Competence in the use of these techniques is a must for all practicing bookkeepers and anyone advising small businesses.