PIPSO
Pacific Islands Private Sector Organisation

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CAPITAL EXPENDITURE DECISIONS

2014

This Module compares five methodologies for calculating the rate of return on an investment. It highlights the strengths & weaknesses of each. The Module concludes with an example to give participants some calculation practice & highlight the relevant issues arising.

MODULE 3.4

CAPITAL EXPENDITURE DECISIONS (MODULE 3.4)

Contents

PURPOSE

While most small businesses will use capital expenditure techniques to assess asset purchases only, the early slides of this Module emphasise that new investments or projects can also be assessed the same way. The same principles apply to the purchase of a business, company or other capital project as to the purchase of a single business asset.

There are five methodologies considered in this Module. These are:

1. Cost-benefit analysis
2. Accounting rate of return
3. Payback period
4. Net present value/profitability index
5. Internal rate of return

The Module explains the use of each of the above, in the order in which they are listed above.

The first three methods make no allowance for the time value of money, whist the last two do. The payback method, while commonly used, must be used in conjunction with at least one of the other methods, preferably one of the last two.

However the early methodologies are simpler to apply &, therefore, less time consuming for a small business. As a result a combination of two of the first three methods may be sufficient for their purpose.

An example concludes the Module & provides participants with the opportunity to:

- Do some calculations
- Assess the different methods
- Draw conclusions with regard to the investments assessed.

On completion of this Module, each participant should understand the alternative valuation methods &be able to decide which methods, if any, they prefer to use.

ASSESSING THE VALUE OF AN INVESTMENT

Capital expenditure is usually associated with the purchase of assets for a business. However the same techniques may be applied to:

- The creation of, or purchase, of a new business
- Replacement of an obsolete, old existing asset or repair versus replacement of an asset seriously damaged during use.
- A new project or to compare projectscompeting for limited available funds
- Assessment of a joint venture or partnering arrangement

This Modulewill explore five techniques.

6. Cost-benefit analysis
7. Accounting rate of return
8. Payback period
9. Net present value/profitability index
10. Internal rate of return

ASSESSMENT TECHNIQUES

Remember, also, that as each of the assessment techniques that follow uses a forecast of financial information, they are only as good as the forecast. Rubbish in equals rubbish out.

ASSESSMENT TECHNIQUES

It is preferable to use several of the available techniques, particularly when:

1. Comparing more than one opportunity, &
2. For opportunities that are competing for the same funds

Why? Because they may give different answers.

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COST-BENEFIT ANALYSIS

COST-BENEFIT ANALYSIS

A method that requires estimation of annual cash flows during the life of an asset or investment.

Clearly an investment or asset must offer a positive return.

This method is not recommended for comparative analysis of investments.

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Consistency of analysis is an issue using this methodology as discussed later. As the method uses cash flows, but ignores timing it is not recommended for comparison of alternatives with significantly different cash forecasts or over different periods of time.

COST-BENEFIT ANALYSIS

Benefits usually include:
- Additional income
- Costs saved
- Sale value at end of life
- Only include quantitative benefits

Some benefits may be qualitative

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Net cost benefit = Sum of (Cash inflows – cash outflows). The result of this calculation must be a positive number.

Frequently, users of this method include a mixture of cash flows & accounting (non-cash) flows, e.g. depreciation. The mixed use of cash & non-cash flows may lead to a hybrid costing methodology that includes some double counting of expenses. This is highly undesirable, if not downright misleading.

For this reason it is recommended that cost/benefit analysis be undertaken using cash flows only. At least the preparer can argue that the analysis is technically consistent. The second method discussed uses purely accounting information & provides alternative method that isat leasttechnically consistent.

Other incremental expenses may also include:

- Rental of premises or floor space,
- Repairs & maintenance
- Registration costs

NOTE: As stated above, this method does not take into account that early cash flows are of higher value than later cash flows because:

- A forecast of short-term cash flows is more likely to be reliable than a long-term one
- Cash received early in the life of a project is available for reinvestment sooner

ACCOUNTING RATE OF RETURN

This methodology includes non-cash flows, in particular depreciation. It focuses on accounting profit rather than cash flows, but should apply accounting principles in a consistent manner.

However, it also fails to recognise that early cash flows are of higher value than later cash flows.

This method simply calculates the net addition to profits & divides these by the value of total capital outlays to achieve the profits.

ARR = (Sum of(Revenues – Expenses) / Sum of Capital outlays) x 100

This method requires that the business owner or manager also have a preconceived view of what is a minimum acceptable accounting rate of return.

ACCOUNTING RATE OF RETURN

The ARR should, at least, equal owners required rate of return.

This method does not take into account that early **cash flows** are of higher value than latter ones due to:
- Time value of money
- Future uncertainty

You can use this technique to compare the percentage return across a range of projects or investments to determine which project should be undertaken with limited available fund.

Later methods are, however, preferred.

PAYBACK PERIOD

While inadequate when used alone, this method is ideal for use in combination with at least one of the other measures, preferably with one that follows. While it does not take into account the time value of money, it does recognise the time taken to recoup the initial outlay for the purchase or investment. Clearly, the shorter the period is the lower the risk.

NET PRESENT VALUE

It is important for a user of this method to have a clear view on the required rate of return on any investment of funds by the business. No investment should be undertaken unless this investment hurdle is met.

If the borrowing of funds is a part of the overall project, the required rate of return must exceed the interest rate that is to be paid to a lender.

NET PRESENT VALUE

Step to follow to calculate NPV:
1. Determine the life of the investment
2. Estimate net cash flows
3. Determine discount rate to apply
4. Calculate & sum NPVs
5. Deduct initial investment costs
6. Accept investment if NPV>0 or accept highest NPV if comparing investments

The outflow & inflow of cash from borrowings, both principal & interest, must be included in the cash flow forecast.

NPV = Sum of the discounted values of the net cash flows calculated using the required rate of return of the business.

The answer to this calculation is a dollar ($) amount. A range of projects can be compared using the $ values to rank them. Where there is not a significant difference between the $ values of alternative projects this method should be used in conjunction with at least one other method, say payback.

NET PRESENT VALUE

This method overcomes the weaknesses of previous methods but does not calculate the actual rate of return of the investment.

PROFITABILITY INDEX

This index when used in conjunction with the NPV for investments competing for the same funds provides an additional indicator to the NPV because the index takes account of the amount of the initial outlay.

Used in conjunction with the payback period this method produces reliable comparative results.

INTERNAL RATE OF RETURN

This method takes the trouble to determine the actual rate of return of each investment or project. However, as the process is one of trial & error, it is much more time consuming. While it is arguably provides the most reliable comparative measure, it is not for all users.

The additional use of the payback method is also recommended.

COMPARING RESULTS

The important thing to remember when comparing the results of any of the previous methodologies is not to make judgments of small differences.

There will also be qualitative issues that influence a judgement &, where the technical assessment does not provide a material difference between the future values, the qualitative issues may be sufficiently important to make the difference.

The example is designed to draw out some of the issues mentioned above.

COMPARING RESULTS

Short Quiz time.

Complete Activity 3.4.2

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Activity 3.4.1

MAKING A CAPITAL EXPENDITURE DECISION

Jone owns a toolmaking business. He is considering a capital investment decision. He must decide whether to buy a lathe for $8,400 or a grinder for $9,500.

The cost of the lathe includes delivery, but installation will cost $500. The useful life of the lather is estimated at five years. He will have to upgrade the skills of his staff in the use of the lathe in year one at a cost of $700.

The purchase price of the grinder does not include delivery costs of $300, but it requires no extra installation costs.

The grinder will be fully depreciated at the end of 4 years, but will cost $1,000 to dispose of. The lathe will have a residual value of $4,500 at the end of 5 years. Cash revenues & expenses for each asset are as follows:

Item		Revenues	Expenses		Net cash flow		
Lathe	Year 1	5,000	2,000		3,000		
	Year 2	5,000	2,000		3,000		
	Year 3	5,000	2,000		3,000		
	Year 4	5,000	2,000		3,000		
	Year 5	5,000	2,000		3,000		
					15,000		
Grinder	Year 1	7,400	1,600		5,800		
	Year 2	6,900	1,600		5,300		
	Year 3	6,300	1,600		4,700		
	Year 4	5,800	2,000		3,800		
					19,600		

For each piece of equipment calculate the:

1	Net cost/benefit	
2	Accounting rate of return	
3	Payback period	
4	Net present value at a discount rate of 16%	
5	Profitability index	
6	Internal rate of return	

	Interest Rate per Year														
Number of Years	16%	17%	18%	19%	20%	21%	22%	23%	24%	25%	26%	27%	28%	29%	30%
1	.862	.855	.847	.840	.833	.826	.820	.813	.806	.800	.794	.787	.781	.775	.769
2	.743	.731	.718	.706	.694	.683	.672	.661	.650	.640	.630	.620	.610	.601	.592
3	.641	.624	.609	.593	.579	.564	.551	.537	.524	.512	.500	.488	.477	.466	.455
4	.552	.534	.516	.499	.482	.467	.451	.437	.423	.410	.397	.384	.373	.361	.350
5	.476	.456	.437	.419	.402	.386	.370	.355	.341	.328	.315	.303	.291	.280	.269
6	.410	.390	.370	.352	.335	.319	.303	.289	.275	.262	.250	.238	.227	.217	.207
7	.354	.333	.314	.296	.279	.263	.249	.235	.222	.210	.198	.188	.178	.168	.159
8	.305	.285	.266	.249	.233	.218	.204	.191	.179	.168	.157	.148	.139	.130	.123
9	.263	.243	.225	.209	.194	.180	.167	.155	.144	.134	.125	.116	.108	.101	.094
10	.227	.208	.191	.176	.162	.149	.137	.126	.116	.107	.099	.092	.085	.078	.073
11	.195	.178	.162	.148	.135	.123	.112	.103	.094	.086	.079	.072	.066	.061	.056
12	.168	.152	.137	.124	.112	.102	.092	.083	.076	.069	.062	.057	.052	.047	.043
13	.145	.130	.116	.104	.093	.084	.075	.068	.061	.055	.050	.045	.040	.037	.033
14	.125	.111	.099	.088	.078	.069	.062	.055	.049	.044	.039	.035	.032	.028	.025
15	.108	.095	.084	.074	.065	.057	.051	.045	.040	.035	.031	.028	.025	.022	.020
16	.093	.081	.071	.062	.054	.047	.042	.036	.032	.028	.025	.022	.019	.017	.015
17	.080	.069	.060	.052	.045	.039	.034	.030	.026	.023	.020	.017	.015	.013	.012
18	.069	.059	.051	.044	.038	.032	.028	.024	.021	.018	.016	.014	.012	.010	.009
19	.060	.051	.043	.037	.031	.027	.023	.020	.017	.014	.012	.011	.009	.008	.007
20	.051	.043	.037	.031	.026	.022	.019	.016	.014	.012	.010	.008	.007	.006	.005

Activity 3.4.2

Capital Expenditure Short Quiz

Section A: True or False

1. A purchase of a new business is a valid reason for capital expenditure.

2. Mutually exclusive projects may be undertaken concurrently.

3. Accounting rate of return equals average annual cash flow divided by original outlay.

4. Under the net present value method, a project with the highest internal rate of return is chosen.

5. Payback period is a commonly used method using cash flows.

Section B: Multiple Choice

Question 1

Which of the following is an example of capital expenditure?
a) Purchase of inventory for sale
b) Purchase of additional production capacity
c) Purchase of office stationery for use in business
d) Purchase of advertising space on several billboards

Question 2

The timing of capital expenditure impacts the:
a) Cash flow forecast
b) Profit forecast
c) Forecast balance sheet
d) All of the above

Question 3

Only the present value of operating cash flows is used for calculating the:
a) Accounting rate of return
b) Net present value
c) Profitability index
d) Internal rate of return

Question 4

What is the net present value of $8,000 in 18 years based on a discount rate of 16% (refer the Table provided in 3.4.1)?
a) $552
b) $568
c) $648
d) $728

Question 5

Of the following methods of evaluating capital expenditure projects, which is the most complex?
a) Net present value method
b) Accounting rate of return method
c) Payback period method
d) Cost-benefit analysis

Question 6

Project	Outlay	Rate of Return
1	25,000	16.50%
2	30,000	14.75%
3	15,000	15.95%
4	40,000	15.45%

My business has $70,000 for capital expenditure & four projects under review for 2017 as detailed in the table above. Projects are not mutually exclusive. If the required rate of return of My Business is 15% & it wants to maximize its capital expenditure which projects will it forecast investment in for 2017?
a) Projects 1, 2 & 3
b) Projects 1, 3 & 4
c) Projects 1 & 3
d) Projects 1 & 4

Question 7

Which of the following is not a long-term asset of a business?
a) Land & buildings
b) Computers
c) Inventories
d) Motor vehicles

Question 8

Which of the following methods of evaluating capital expenditure does not make allowance for the changing value of money over time?
a) Net present value
b) Profitability index
c) Payback period
d) Internal rate of return

This activity ends this Module.

Activity 3.4.1

MAKING A CAPITAL EXPENDITURE DECISION

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The grinder will be fully depreciated at the end of 4 years, but will cost $1,000 to dispose of. The lathe will have a residual value of $4,000 at the end of 5 years. Cash revenues & expenses for each asset are as follows:

Item		Revenues	Expenses	Net cash flow
Lathe	Year 1	5,000	2,000	3,000
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	Year 2	6,900	1,600	5,300
	Year 3	6,300	1,600	4,700
	Year 4	5,800	2,000	3,800
				19,600

For each piece of equipment calculate the:
1   Net cost benefit
2   Accounting rate of return
3   Payback period
4   Net present value at a discount rate of 16%
5   Profitability index
6   Internal rate of return

Net cost-benefit

		Revenues	Residual	Cost+ Install	Expenses	Dep'n
Lathe	Year 0			8,900	700	
	Year 1	5,000			2,000	880
	Year 2	5,000			2,000	880
	Year 3	5,000			2,000	880
	Year 4	5,000			2,000	880
	Year 5	5,000	4,500		2,000	880
		25,000	4,500	8,900	10,700	4,400

Lathe net cost-benefit   9,900

		Revenues	Residual	Cost+ Install	Expenses	Dep'n
Grinder	Year 0			9,800		
	Year 1	7,400			1,600	2,450
	Year 2	6,900			1,600	2,450
	Year 3	6,300			1,600	2,450
	Year 4	5,800			3,000	2,450
		26,400	-	9,800	7,800	9,800

Grinder net cost-benefit   8,800

Accounting rate of return

Lathe   = (25,000 - 15,100) / 5 / 8,900   = (25,000 - 15,100) / 5 / (8,900 - 4,500)

        =   22.2%   45.0%

It is not normal to include the residual in the above calculation as it may distort the outcome by giving a much higher apparent benefit. This is highlighted in the more sophisticated analysis that follows using the last two of the five methods presented.

Grinder   = (26,400 - 17,600) / 4 / 9,800

        =   22.4%

Payback period

		Revenues	Residual	Cash expenses	Net Cash
Lathe	Year 0			700	(700)
	Year 1	5,000		2,000	3,000
	Year 2	5,000		2,000	3,000
	Year 3	5,000		2,000	3,000
	Year 4	5,000		2,000	3,000
	Year 5	5,000	4,500	2,000	7,500
Grinder	Year 1	7,400		1,600	5,800
	Year 2	6,900		1,600	5,300
	Year 3	6,300		1,600	4,700
	Year 4	5,800		3,000	2,800

Lathe payback period

Cost   8,900

Payback   = 3 year + 600 / 3,000

             =   3.2 years

Grinder payback period

Cost   9,800

             = 1 year + 4,000 /5,300

             =   1.75 years

Net Present Value & Internal Rate of Return

	Net Cash	16%	24%	25%	16%	24%	25%
Lathe	(9,600)	1	1	1	(9,600)	(9,600)	(9,600)
	3,000	0.862	0.806	0.800	2,586	2,418	2,400
	3,000	0.743	0.650	0.640	2,229	1,950	1,920
	3,000	0.641	0.524	0.512	1,923	1,572	1,536
	3,000	0.552	0.423	0.410	1,656	1,269	1,230
	7,500	0.476	0.341	0.328	3,570	2,558	2,460
					2,364	167	(54)

Lathe	NPV (16%)	2,364
	Profitability index	1.25
	IRR	24.8%

	Net Cash	16%		30%	16%		30%
Grinder	(9,800)	1		1	(9,800)		(9,800)
	5,800	0.862		0.769	5,000		4,460
	5,300	0.743		0.592	3.938		3,138
	4,300	0.641		0.455	3,013		2,139
	2,800	0.552		0.35	1,546		980
					3,696		916

Grinder	NPV (16%)	3,696
	Profitability index	1.38
	IRR	30%+

Activity 3.4.2

Capital Expenditure Short Quiz

Section A: True or False

1. A purchase of a new business is a valid reason for capital expenditure.   T
2. Mutually exclusive projects may be undertaken concurrently.   F
3. Accounting rate of return equals average annual cash flow divided by original outlay.   F
4. Using the net present value method, a project with the highest internal rate of return is chosen. F
5. Payback period is a commonly used method using cash flows.   T

Section B: Multiple Choice

Question 1

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c) Projects 1 & 3
d) **Projects 1 & 4**

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a) Land & buildings
b) Computers
c) **Inventories**
d) Motor vehicles

Question 8

Which of the following methods of evaluating capital expenditure does not make allowance for the changing value of money over time?
a) Net present value
b) Profitability index
c) **Payback period**
d) Internal rate of return