Unit 25
Capital Budgeting: Net Present Value Method (NPV)

ILO1. Capital Budgeting – An Overview
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ILO1. Capital Budgeting – An Overview

When addressing capital budgeting, it refers to answering a number of questions. Questions that can be particularly relevant to manufacturers include:

- Should equipment be leased, or purchased?
- Which equipment should be purchased if leasing is not an option?
- Should a new facility be built, or leased?
- Should older equipment be replaced, or repaired?
- When should such new equipment be purchased if leasing is not available?

These types of questions fall into a number of categories, from leasing to buying decisions, equipment decisions, and those relating to plant expansion for future strategy or marketing positioning. With this mind, we can concentrate on two specific capital budgeting decisions; screening, and preference.

Screening decisions concern investment proposals ability to pass certain criteria; namely a return on investment. For example, an organization may require that all opportunities promise a return of 15% in order to be considered. This differs to preference decisions which is part of the selection process. A preference decision chooses between a number of alternative opportunities.

With the decision making process, we also need to consider cash flows and net operating income. As discussed in other units, the simple rate of return method focuses on the net operating income, whereas the internal rate of return, the payback method, and net present value all deal with the analysis of cash flows associated with capital investment.

Another influencing factor is the time value of money. This concept recognizes that current value of capital will be greater in the future than it is today. This suggests that investments that offer an earlier return are favourable in comparison with those that promise returns at later dates. The capital budgeting that best recognize the time value of capital are those that include discounted cash flows.

ILO2. The Payback Method

The payback method refers to the payback period of an investment. In other words, it's the time it takes for the company to recover its initial investment. This method focuses solely on cash flows and does not include in its analysis the time value of capital. Under the condition of an equal and consistent cash flow, we can calculate the payback period as follows.

$$\text{Payback period} = \frac{\text{Investment required}}{\text{Annual net cash inflow}}$$

Fig 25.1 Payback Period Formula

If we use the example of restaurant Steaks and Things, with their decision to install an espresso bar. The bar costs $140,000 and has a 10 year life span. Its estimated the bar will produce an annual cash floe of $35,000. Management has determined that it needs to recover its investment in 5 years or less. By using our formula above we can make this calculation.

$140,000 / $35,000 = 4 years.

With this analysis, the restaurant should move ahead with purchasing the bar.

With this simple equation comes criticism. As previously stated the payback method does not consider the time value of money. Nor does it appreciate cash flows that can be generated after the initial investment is recouped. It has no facility to analyze differences in lifespans between investments. Finally, it falsely assumes that the sooner capital can be recovered makes it a better investment.

Contrary to this, the payback method also has advantages. It can serve in the screening process to eliminate potential investment opportunity that do not meet company criteria. For companies that frequently deal with obsolete products; namely technology, it helps identify products that will recover investments sooner rather than later. And finally, for companies low in capital reserves, using the payback method it makes it easier for them to identify viable investment opportunity.

If we consider the occurrence of an uneven cash flow, meaning the investment weight changes; seasons, or following industry/business cycle, then the payback formula cannot be use. Rather then, the recovered investment needs to be monitored each year. For example, if the investment has an outlay of $4,000 but also produces uneven cash flows (see below), then the capital outlay is recovered in the 4th year.

Fig 25.2 Uneven Cash Flows

ILO3. The Net Present Value Method

This method contrasts the present value of an investments cash inflows with the present value of its cash outflows. The difference between these values is called the net present value. When generating this figure, you must assume that all cash flows excluding the investment outlay occur at the end of the period. Furthermore, the company must take the stance to immediately reinvest the cash flows produced by the investment at the discount rate o return. We can illustrate this with the following information.

Cost and revenue information	
Cost of special equipment	$ 160,000
Working capital required	100,000
Relining equipment in 3 years	30,000
Salvage value of equipment in 5 years	5,000
Annual cash revenue and costs:	
Sales revenue from parts	750,000
Cost of parts sold	400,000
Salaries, shipping, etc.	270,000

Fig 25.3 Net Present Value Example

This information above relates to hypothetical company Kings. We include the details that at the end of 5 years the investment capital will be redistributed to fund other projects. Kings have a 11% discount rate.

We begin by calculating the net cash inflow from operations, as such.

Sales revenue	$ 750,000
Cost of parts sold	(400,000)
Salaries, shipping, etc.	(270,000)
Annual net cash inflows	$ 80,000

Fig 25.4 Annual Net Cash Flow from Operations

The conditions for this investment stem from the cost of equipment $160,000 and working capital $100,000, and a discounting factor of 1. We find the present value factors for an annuity of $1 (please consult financial textbooks for present value of annuities) for a period of 5 years at 11% is 3.696. We can now determine the present value of the annual cash inflow at $295,680. We use this calculation to arrive at this amount.

$80,000 x 3.696 = $295,680.

If we then consider the present value factor of $1 over three years also at 11%, is 0.731 then the present vale of the cost of relining the equipment after 3 yeas will be $21,930.

$30,000 x 0.731 = $21,930.

We repeat this process looking at the salvage value of the equipment. The present value factor for 5 years at 11% is 0.593. The resultant present value of the salvage value of the equipment is $2,965, and the present value of the working capital is $59,300

$5,000 x 0.593 = $2,965.
$100,000 x 0.593 = $59,300.

We can now summarize in the following table.

	Years	Cash Flows	11% Factor	Present Value
Investment in equipment	Now	$ (160,000)	1.000	$ (160,000)
Working capital needed	Now	(100,000)	1.000	(100,000)
Annual net cash inflows	1-5	80,000	3.696	295,680
Relining of equipment	3	(30,000)	0.731	(21,930)
Salvage value of equip.	5	5,000	0.593	2,965
Working capital released	5	100,000	0.593	59,300
Net present value				$ 76,015

Fig 25.5 Net Present Value Method Calculation

If we repeat this process using the net present value method and discount factors; assuming identical information from company Kings, we reproduce this data.

Cost and revenue information	
Cost of special equipment	$ 160,000
Working capital required	100,000
Relining equipment in 3 years	30,000
Salvage value of equipment in 5 years	5,000
Annual cash revenue and costs:	
Sales revenue from parts	750,000
Cost of parts sold	400,000
Salaries, shipping, etc.	270,000

Fig 25.6 Cost and Revenue Data

We focus now on total cash flows for years 1-5 discounted to their present values using the discount factors we see the partial table below.

	Years	Cash Flows	11% Factor	Present Value
Investment in equipment	Now	$ (160,000)	1.000	$ (160,000)
Working capital needed	Now	(100,000)	1.000	(100,000)

Fig 25.7 Discounting

If the total cash flows for year 1 of $80,000 is reduced by the discount factor (0.901) this results in the future cash flow present value of $72,080.

For year 3 the total cash flow is $50,000 which we reduce by the discount factor (0.731) to produce the future cash flow present value of $36,550.

Using the table below we can see the net present value of the investment is $76,015 which coincides with the previous total found.

	Years	Cash Flows	11% Factor	Present Value
Investment in equipment	Now	$ (160,000)	1.000	$ (160,000)
Working capital needed	Now	(100,000)	1.000	(100,000)
Annual net cash inflows	1	80,000	0.901	72,080
Annual net cash inflows	2	80,000	0.812	64,960
Annual net cash inflows	3	50,000	0.731	36,550
Annual net cash inflows	4	80,000	0.659	52,720
Annual net cash inflows	5	80,000	0.593	47,440
Salvage value of equip.	5	5,000	0.593	2,965
Working capital released	5	100,000	0.593	59,300
Net present value				$ 76,015

Fig 25.8 Net Present Value Method Calculation

In analyzing the results we can make a number of observations.

- A positive net present value suggests the investment returns will exceed the discount rate
- A negative net present value suggests the investment returns will not exceed the discount rate
- There is also the consideration if the company's minimum required rate of return is used as the discount rate, we find the following results.
    - An investment with a positive net present value with a return greater than the minimum required rate is favourable
    - An investment with a zero net present value with a return equal to the minimum required rate is favourable
    - An investment with a negative net present value with a return less than the minimum required rate is unfavourable
- The cost of capital is often considered as the minimum required rate of return for many companies, and under this context we see this impact.
    - Capital cost is the mean return that a company must disburse to long term creditors and shareholders
    - When the capital cost is used as the discount rate, it likewise functions as a screening instrument in net present value analysis

To finalize our review of this material we end with the recovery of our initial investment. The net present value method automatically provides for return of the initial investment. To demonstrate this process we use company Bridge Work, who are in the position to acquire attachments to their current machinery.

Cost	$ 3,169
Life	4 years
Salvage value	$ -
Increase in annual cash inflows	$ 1,000

Fig 25.9 Investment Recovery Process

Bridge Work have decided that the purchase will not proceed unless they have a 10% annual return on investment. We can then see from the data, the net present value is equal to zero.

	Year(s)	Amount of Cash Flow	10% Factor	Value of Cash Flows
Initial investment (outflows)	NOW	$ (3,169)	1.000	$ (3,169)
Annual cash inflows	1	$ 1,000	0.909	$ 909
Annual cash inflows	2	$ 1,000	0.826	$ 826
Annual cash inflows	3	$ 1,000	0.751	$ 751
Annual cash inflows	4	$ 1,000	0.683	$ 683
Net present value				-

Fig 25.10 Zero Net Present Value

This suggests that cash inflows are large enough to recoup the investment outlay of $3,169, and to provide the required 10% annual return on investment.

References

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