

LESSON 23: CAPITAL BUDGETING TECHNIQUES – OTHER METHODS

Learning Objectives

- Profitability Index or Benefit-cost ratio.
- Payback Method
- Accounting rate of return (ARR) method.

Introduction

In earlier lesson you have learnt about the one of the mainly used capital budgeting techniques i.e., NPV method and Internal Rate of Return method (IRR). Now, you will know more about the same.

The other time adjusted method of evaluating the investment proposals are as follows: -

1. Profitability Index or Benefit-cost ratio
2. Payback Method
3. Accounting rate of Return method

Profitability Index or Benefit-cost Ratio

It is the ratio of the present value of cash inflows at the required rate of return, to the initial cash outflow of the investment. It may be gross or net, net being simply gross minus one. The formula to calculate benefit-cost ratio or profitability index is as under: -

$$\text{PI} = \frac{\text{PV of cash inflows}}{\text{Initial cost outlay}} = \frac{\text{PV}(C_1)}{C_0}$$

$$= \frac{\sum_{t=1}^n \frac{C_t}{(1+k)^t}}{C_0} + C_0 = 0$$

Acceptance Rule

The following are the Profitability Index (PI) rules:

- Accept $\text{PI} > 1$
- Reject $\text{PI} < 1$
- May accept $\text{PI} = 1$

When PI is greater than one, then the project will have positive NPV.

Evaluation of PI Method

Like NPV and IRR rules, PI is a conceptually sound method of appraising investment projects. It gives due consideration to the time value of money. It is a variation of the NPV method and requires the same computation as the NPV method. In PI method, since the present value of cash flows is divided by the initial cash outflow, it is a relative measure of a project's profitability.

Payback Method

The payback (PB) is one of most popular and widely recognized traditional methods of evaluating investment proposals. It is defined as the number of years required to recover the original cash outlay invested in the a project. If the project

generates constant annual cash inflows, the payback period can be computed by dividing the cash outlay by the annual cash inflow.

$$\text{Payback} = \frac{\text{Initial investment}}{\text{Annual cash inflow}} = \frac{C_0}{C}$$

Acceptance Rule

Many firms use the payback period as an accept or reject criterion as well as method of ranking projects. If the payback period calculated for a project is less than the maximum payback period set by management, it would be accepted; if not it would be rejected. As a ranking method, it gives highest ranking to the project, which has shortest payback period, and lowest ranking to the project with highest payback period. Thus if the firm has to choose between two mutually exclusive projects, project with shorter payback period will be selected.

Evaluation of Payback

The most significant merit of payback is that it is simple to understand and easy to calculate. The business executives consider the simplicity of method as a virtue, which is evident from their heavy reliance on it for appraising investment proposals in practice. Another merit is that it costs less than most of the sophisticated techniques, which require a lot of the analysis time and the use of computers.

Limitations

In spite of its simplicity, the payback may not be a desirable investment criterion since it suffers from a number of serious limitations:

1. It fails to take account of the cash inflows earned after the payback period. For example, consider the following projects X and Y:

	Cash Flows (Rs)					
Project	C_0	C_1	C_2	C_3	Payback	NPV @ 10% .
X	-4,000	0	4,000	2,000	2 yrs	+806
y	-4,000	2,000	2,000	0	2 yrs	-530

As per the payback rule, both the projects are equally desirable since both return the investment outlay in two years. If we assume an opportunity cost of 10 per cent, Project X yields a positive net present value of Rs 806 and Project Y yields a negative net present value of Rs 530. As per the NPV rule, Project X should be accepted and Project Y

rejected. Payback rule gave wrong results because it failed to consider Rs 2,000 cash flow in third year for Project X.

- It is not an appropriate method of measuring the profitability of an investment project as it does not consider all cash inflows yielded by the project. Considering Project X again, payback rule did not take into account its entire series of cash flows.
- It fails to consider the pattern of cash inflows, i.e., magnitude and timing of cash inflows. In other words, it gives equal weights to returns of equal amounts even though they occur in different time periods. For example, compare the following projects C and D where they involve equal cash outlay and yield equal total cash inflows over equal time periods:

	Cash Flows (Rs)					
Project	C ₀	C ₁	C ₂	C ₃	Payback	NPV @ 10%
C	- 5,000	3,000	2,000	2,000	2 yrs	+881
D	- 5,000	2,000	3,000	2,000	2 yrs	+798

Using payback period, both projects are equally desirable. But Project C should be preferable as larger cash inflows come earlier in its life. This is indicated by the NPV rule; project C has higher NPV (Rs 881) than Project D (Rs 798) at 10 per cent opportunity cost. It should be thus clear that payback is not a measure of profitability. As such, it is dangerous to use it as a decision criterion.

- Administrative difficulties may be faced in determining the maximum acceptable payback period. There is no rational basis for setting a maximum payback period. It is generally a subjective decision.
- The payback period method is not consistent with the objective of maximizing the market value of the firm's shares. Share values do not depend on payback periods of investment projects.¹

Despite its weakness, payback period method is popular in practice. Besides simplicity the causes for its popularity are:

- A company can have more favourable short-run effects on earnings per share by setting up a shorter standard payback period? It should, however, be remembered that this may not be a wise long-term policy as the company may have to sacrifice its future growth for current earnings.
- The riskiness of the project can be tackled by having a shorter standard payback period as it may ensure guarantee against loss. A company has to invest in many projects where the cash inflows and life expectancies are highly uncertain. Under such circumstances, payback may become important, not so

much as a measure of profitability but as a means of establishing an upper bound on the acceptable degree of risk.

- The emphasis in payback is on the early recovery of the investment. Thus, it gives an insight into the liquidity of the project. The funds so released can be put to other uses.

Let us re-emphasize that the payback is not a valid method for evaluating the acceptability of the investment projects. It can, however, be used along with the NPV rule as a first step in roughly screening the projects. In practice, the use of DCF techniques has been increasing but payback continues to remain a popular and primary method of investment evaluation.

Discounted Payback Period

One of the serious objections to the payback method is that it does not discount the cash flows for calculating the payback period. Some people, therefore, discount cash flows and calculate the discounted payback period. The number of periods taken in recovering the investment outlay on the present value basis is called the discounted payback period. The discounted payback period still fails to consider the cash flows occurring after the payback period. Let us consider an example.

Projects P and Q involve the same outlay of Rs 4,000 each. The opportunity cost of capital may be assumed 10 per cent. The cash flows of the projects and their discounted payback periods are shown in the following table:

Table : Discounted Payback

Projects	Cash Flows (Rs.)					Simple payback period	Discounted payback period	NPV at 10%
	C ₀	C ₁	C ₂	C ₃	C ₄			
P	4000	3000	1000	1000	1000	2 years	--	--
PV of cash flows	4000	2727	826	451	683		2.6 years	+ 987
Q	4000	0	4000	1000	2000	2 years	--	--
PV of cash flows	4000	0	3304	751	1366		2.9 years	+ 1421

The projects are indicated of same desirability by the simple payback period. When cash flows are discounted to calculate the discounted payback period, Project P recovers the investment outlay faster, and therefore, would be preferred over Project Q, which takes more time to recover the investment outlay. Discounted payback rule is better as it does discount the cash flows until the outlay is recovered. But it does not help much. It does not take into consideration the entire series of cash flows. It can be seen in our example that if we use the NPV rule, Project Q is better.

Accounting Rate of Return Method

The accounting rate of return (ARR), also known as the return on investment (ROI), uses accounting information, as revealed by financial statements, to measure the profitability of an investment. The accounting rate of return is found out by dividing the average after-tax profit by the average investment. The average investment would be equal to half of the original investment if it is depreciated constantly. Alternatively, it can be found out dividing the total of the investment's book values after depreciation by the life of the project. The accounting rate of return, thus, is an average rate and can be determined by the following equation:

$$\text{ARR} = \frac{\text{Average income}}{\text{Average investment}}$$

In above equation average income should be defined in terms of earnings after taxes without an adjustment for interest viz. EBIT (I-T). Thus:

$$\text{ARR} = \frac{[\sum_{t=1}^n \text{EBIT}_t (1 - T)] / n}{(I_0 = I_n) / 2}$$

Where EBIT is earnings before interest and taxes, T tax rate, I_0 book value of investment in the beginning, I_n book value of investment at the end of n number of years.

Acceptance Rule

As an accept-or-reject criterion, this method will accept all those projects whose ARR is higher than the minimum rate established by management and reject those projects which have ARR less than the minimum rate. This method would rank a project as number one if it has highest ARR and lowest rank would be assigned to the project with lowest ARR.

Evaluation of ARR Method

The ARR method may claim some merits.

1. It is very simple to understand and use.
2. The ARR can be readily calculated from the accounting data; unlike the NPV and IRR rules, no adjustments are required to arrive at cash flows of the project,
3. The ARR rule incorporates the entire stream of income in calculating the project's profitability.

The ARR is a method commonly understood by accountants, and frequently used as a performance measure.

Shortcomings

As a decision criterion, however, it has serious shortcomings.

- It uses accounting profits, not cash flows, in appraising the projects. Accounting profits are based on arbitrary assumptions and choices and also include non-cash items. It is, therefore, inappropriate to rely on them for measuring the acceptability of the investment projects.
- The averaging of income ignores the time value of money. In fact, this procedure gives more weightage to the distant receipts.
- The firm employing the ARR rule uses an arbitrary cut-off yardstick. Generally, the yardstick is the firm's current return

on its assets (book-value). Because of this, the growth companies earning very high rates on their existing assets may reject profitable projects (i.e., with positive NPV s) and the less profitable companies may accept bad projects (i.e., with negative NPV s).

The ARR method continues to be used as a performance evaluation and control measure. But its use as an investment criterion is certainly undesirable. It may lead to unprofitable allocation of capital.

Points to Ponder

- Other capital budget evaluation methods other than NPV & IRR methods.
- Evaluate and take decision regarding the acceptance and rejection of any investment projects.
- Limitations of every capital budgeting method.

Review Questions

1. Name different capital budgeting techniques?
2. How you will accept or reject any project under Profitability Index, Payback and Accounting Rate of Return methods?
3. Differentiate between B-C Ratio method and Payback method of capital budget technique?

Note

[illegible]