

Fig. 24.1.

1. Pay Back Period Method:

The payback period is the length of time required to recover the initial cash outlay of the project. It can be calculated as follows:

$$\text{Payback Period} = \text{Cash Outlay} / \text{Annual cash inflow}$$

The method can be understood as follows:

If a project involves a cash outlay of Rs. 1,50,000 and Rs. 2,00,000 in the first, second and third and fourth years respectively. Its payback period is 4 years because the sum of cash inflows during 4 years is equal to the initial outlay. When the annual cash inflow is a constant sum, the payback period is simply the initial outlay divided by the annual cash inflows.

For example, a project which has an initial cash outlay of Rs. 10,00,000 and a constant annual cash inflow of Rs. 3,00,000 has a payback period of $\text{Rs. } 1,00,000 / 3,00,000 = 3\frac{1}{2}$ years.

According to the pay back criterion, the shorter the payback period, the more desirable the project.

Advantages:

1. It is a ready method, both in concept and application. It does not use involved concepts and tedious calculations and has few hidden assumptions.
2. Since it emphasizes earlier cash inflows, it may be sensible criterion when the firm is facing the problem of liquidity.
3. It is a rough and ready method for dealing with risk. It favours projects which generate substantial cash inflows in earlier years and discriminates against projects which bring

⇒ Importance of Capital Budgeting -

- 1) Indirect forecast of sales.
- 2) Long-term effect on profitability.
- 3) Comparative study of alternative projects.
- 4) Timing of assets acquisition.
- 5) Cash forecast.
- 6) Long-term commitment of funds.
- 7) Irreversible nature.
- 8) National importance - it determines employment, economic activities & economic growth. etc.
- 9) Costs - maximization of shareholders

⇒ Process of Capital Budgeting -

- 1) Identification of investment proposals.
 - 2) Screening the proposals.
 - 3) Evaluation of various proposals.
 - 4) Establishing priorities.
- ↓ generally, priority is fixed in

the following order -

- 1) current/incomplete projects.
- 2) safety projects & the projects necessary to carry on legislative requirements.
- 3) Projects for maintaining the present efficiency of the firm.
- 4) Projects for supplementing the income, —

5) Projects for expansion of a new product.

substantial cash inflows in later years but not in earlier years. Now, if risk tends to increase with futurity – in general this may be true. The pay back criterion may be helpful in weeding out risky projects.

Demerits:

1. A company can have more favourable short-run effects on earning per share by setting up a shorter 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.
2. The emphasis in pay back is on the early recovery of the investment. Thus, it gives an insight to the liquidity of the project. The funds so released can be put to other uses.
3. The riskiness of the project can be tackled by having a shorter payback period as it may ensure guarantee against loss. Company has to invest in many such projects where the cash inflows and life expectancies are highly uncertain.

Under such circumstances, pay back 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.

2. Accounting Rate of Return Technique (ARR):

Also called as Average Rate of Return method, is primarily based on accounting approach rather than cash flow approach. The accounting rate of return is found out by dividing the average

$$\text{ARR} = \frac{\text{Average income after taxes}}{\text{Average Investment}}$$

or

$$\text{ARR} = \frac{\text{Average income after taxes}}{(\text{Original investment} + \text{Salvage value}) / 2}$$

or

$$\text{ARR} = \frac{\text{Total Profits (after tax \& dep'n)}}{\text{Net Investment in Project} \times \text{No. of Years of Profits}} \times 100$$

$$= \frac{\text{Avg. Annual Profits}}{\text{Net Investment}} \times 100$$

$$\text{Net Investment} = \text{Original Investment} - \text{Scrap value}$$

ARR method can be used as an accept or reject criteria. This method will accept all the projects which have ARR less than the minimum rate. The projects would be rejected one which has highest ARR.

Merits:

ex Pay-back-period -

$$\text{Pay-back-period} = \frac{\text{Initial outlay of the project}}{\text{Annual cash inflow}}$$

- 1) A Project cost Rs. 100,000/- and yields an annual cash inflow of Rs. 20,000 for 8 yrs. Calculate Pay-back period.

$$\frac{100,000}{20,000} = 5 \text{ years.}$$

- 2) There are two projects. Each project requires an investment of Rs. 20,000/-.
Select any one.

Net Profit before Dep. & after Tax

Cumulative

Year	Project X	Project Y
1	1000	2000
2	2000	4000
3	4000	6000
4	5000	8000 ✓
5	8000	9000
Total	<u>20,000</u>	<u>29000</u>

select 'Y'
20,000

1. Net earnings after depreciation are considered under this method and this is of vital importance in the appraisal of investment proposals.
2. It is an easy method to adopt and simple to understand.
3. It considers the earnings over the life span of the project and as such is superior to pay back method.

Demerits:

1. This method, like the pay back method, does not consider the time value of money.
2. It does not differentiate between the sizes of investment required for investment proposals. Investment proposals may have the same ARR but may require different average investments. In such a situation the method is of no use for the firm and the firm cannot precisely decide on the implementation of any specific proposal.
3. ARR uses accounting approach in place of cash flow approach. For this reason, it does not truly reflect the proper timing of the benefits. Thus, it ignores the reinvestment potential of a project.

3. Net Present Value Method (NPV method):

This method is one of the discounted cash flow techniques that take into consideration the time value of money. It recognizes that cash flow streams at different time periods differ in value and can be compared only when they are expressed in terms of common denominator i.e. present values.

Procedure for calculating NPV:

The process of calculating NPV is as follows (Fig. 24.2):

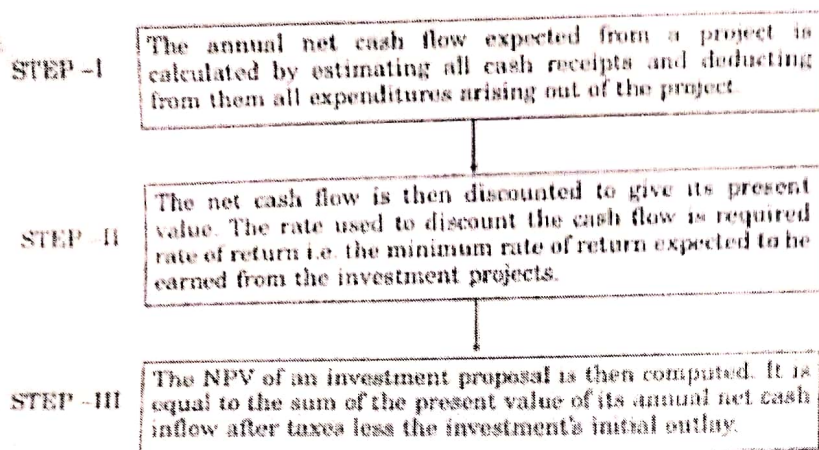


Fig. 24.2. Process of calculating NPV

NPV can be calculated as follows :

$$NPV = \sum_{t=1}^n \frac{CF_t}{(1+r)^t} - C$$

Where, CF_t = net cash inflow in time period t

r = rate of discount

C = Initial cash outlay

n = Project's expected life.

Thus, the NPV method is the process of calculating the present value of cash flow (inflows and outflows) of an investment proposal, using the opportunity cost of capital as the appropriate discounting rate, and finding out the net present value by subtracting out the present value of cash outflows from the present value of cash inflows.

Features of NPV method:

1. The NPV of simple project decreases as the discount rate increases. The decrease in the NPV, however, is at a decreasing rate.
2. The NPV method is based on the assumption that the intermediate cash inflows of the project are re-invested at a rate of return equal to the firm's cost of capital.

NPV method can be used to accept/reject the project. The project would be accepted if the NPV is positive and reject if NPV is negative.

Merits:

1. It considers the cash flow streams in its entirety.

2. The net present value of various projects measured as they are in today's money value can be added. For example, the net present value of a package consisting of two projects, A and B will simply be the sum of the net present value.

3. It takes into account the time value of money.

4. It squares neatly with the financial objective of maximisation of the wealth of stockholders. The net present value represents the contribution of the wealth of stockholders.

Demerits:

1. The major limitation of this method is that it requires detailed long term forecasts (estimates) of the incremental benefits and costs. There may also arise difficulty in deciding the appropriate rate of discount for finding the values of the cash flows coming in over the project's life. The relative desirability of an investment proposal may change with a change in the discount rate.

2. Another shortcoming of this method is that it may not give dependable results in case of projects involving different outlays or having different effective lives. In spite of these limitations, NPV method is theoretically considered as the most correct criterion and is frequently used in practice.

4. Internal Rate of Return (IRR) Method:

It is another Discounted Cash Flow Technique which takes into account the time value of money. This technique is also known as Yield on Investment, Marginal Productivity of Capital, Time Adjusted Rate of Return, Marginal Efficiency of Capital, Rate of Return etc.

This internal rate of return is usually the rate of return that a project earns. It is defined as the discount rate (r) which equates the aggregate present value of net cash inflows with the aggregate present value of cash outflows of a project. It is the rate which gives the project $NPV = 0$.

$$\sum_{t=1}^n \frac{CF_t}{(1+r)^t} = C$$

$$\sum_{t=1}^n \frac{CF_t}{(1+r)^t} - C = 0$$

CF_t = net cash inflow in time period t

C = cash outlay

n = The project's expected life

1. Possibility of multiple IRRs remains in same situation which reduces the utility of this method.
2. It requires detailed long term forecasts of incremental benefits and costs.
3. Underlying assumption of varying reinvestment rates is another limitation of IRR method. In other words, IRR method implies that reinvestment rates are contingent on the individual projects. This is very much unrealistic.
4. It involves tedious calculations.

5. Profitability Index (PI):

Also known as Benefit/Cost Ratio is the ratio of the present value of the future net cash flows to the initial cash outlay of the project. The index provides a relative measure for judging desirability and evaluating the worth of an investment proposal. It can be calculated as follows:

$$\text{Profitability Index} = \frac{\text{NPV of cash inflows}}{\text{Initial investment in the project}}$$

$$PI = \frac{\sum_{t=1}^n \frac{CF_t}{(1+r)^t}}{C}$$

Where,

CF_t = net cash inflow in time period t

r = rate of discount

n = Project's expected life

C = Initial cash outlay.

It is used as an accept/reject criteria for the project. If $PI > 1$ then accept the project and if $PI < 1$, reject the project.

Merits:

1. It is consistent with the goal of maximising the shareholders wealth.
 2. It uses cash flows.
 3. It recognizes the time value of money.
- Demerit:

r = Internal rate of return

IRR for uneven cash flow is determined by a trial and error approach. We first determine the present value of the future net cash flows using an arbitrary discount rate. If the present value of future cash flows at this discount rate is larger than the initial outlay (i.e. NPV is positive), the discount rate is increased till the NPV results in a negative figure.

If at the first arbitrary rate of discount, the NPV happens to be a negative figure, then the discount rate is lowered till the NPV is a positive figure. Finally, the IRR is determined with the help of interpolation as under:

$$IRR = R_L (NPV / \Delta NPV) \times \Delta r$$

Where,

R_L = Lower of the two rates of discount

NPV = Net present value of project at R_L

ΔNPV = Difference between NPV's at R_L and R_H

Δ = Difference between R_H and R_L

(R_H being the higher of the two discount rates)

As an accept-reject criterion, a comparison of the actual IRR with the required rate of return that is cut off rate is to be made. The project would be accepted if the IRR exceeds the cut off rate and rejected if IRR is less than the cut off rate.

Merits:

1. It recognises the time value of money.
2. It is consistent with the objective of maximising shareholders' wealth.
3. It does not use the concept of the cost of capital but itself provides a rate of return which is indicative of the profitability of the investment proposal.
4. IRR method is easier to understand. Business executives and non-technical people will understand the investment proposal with relative ease if told that IRR of a given project is say 20% and the discount factor is 10% rather than being told about the NPV of the said project.
5. It takes into account the total cash inflows and outflows.

Demerits:

The main demerit of this method is that it requires detailed long term forecasts of the incremental benefits and costs. It also poses difficulty in determining appropriate discount rate.

