Net present value method

Net present value method (also known as **discounted cash flow method**) is a popular capital budgeting technique that takes into account the time value of money. It uses net present value of the investment project as the base to accept or reject a proposed investment in projects like purchase of new equipment, purchase of inventory, expansion or addition of existing plant assets and the installation of new plants etc.

First, I would explain what is net present value and then how it is used to analyze investment projects.

Net present value (NPV):

Net present value is the difference between the present value of cash inflows and the present value of cash outflows that occur as a result of undertaking an investment project. It may be positive, zero or negative. These three possibilities of net present value are briefly explained below:

Positive NPV:

If present value of cash inflows is greater than the present value of the cash outflows, the net present value is said to be positive and the investment proposal is considered to be acceptable.

Zero NPV:

If present value of cash inflow is equal to present value of cash outflow, the net present value is said to be zero and the investment proposal is considered to be acceptable.

Negative NPV:

If present value of cash inflow is less than present value of cash outflow, the net present value is said to be negative and the investment proposal is rejected.

The summary of the concept explained so far is given below:

1. Present value of cash inflow > Present value of cash outflow
   NPV is positive and the project is acceptable

2. Present value of cash inflow = Present value of cash outflow
   NPV is zero and the project is acceptable

3. Present value of cash inflow < Present value of cash outflow
   NPV is negative and the project is not acceptable

The following example illustrates the use of net present value method in analyzing an investment proposal.

Example 1 – cash inflow project:

The management of Fine Electronics Company is considering to purchase an equipment to be attached with the main manufacturing machine. The equipment will cost $6,000 and will increase annual cash inflow by $2,200. The useful life of the equipment is 6 years. After 6 years it will have no salvage value. The management wants a 20% return on all investments.

Required:

1. Compute net present value (NPV) of this investment project.
2. Should the equipment be purchased according to NPV analysis?

Solution:

(1) *Computation of net present value:*

Initial cost	$6,000
Life of the project	6 years
Annul cash inflow	$2,200
Salvage value	0
Required rate of return	20%

Item	Year(s)	Amount of cash flow	20% Factor	Present value of cash flow
Annual cash inflow	1 - 6	$ 2,200	3.326*	$ 7,317
Initial investment	Now	(6,000)	1.000	(6,000)
Net present value				$ 1,317

*Value from "present value of an annuity of $1 in arrears table".

(2) Purchase decision:

Yes, the equipment should be purchased because the net present value is positive ($1,317). Having a positive net present value means the project promises a rate of return that is higher than the minimum rate of return required by management (20% in the above example).

In the above example, the minimum required rate of return is 20%. It means if the equipment is not purchased and the money is invested elsewhere, the company would be able to earn 20% return on its investment. The minimum required rate of return (20% in our example) is used to discount the cash inflow to its present value and is, therefore, also known as *discount rate*.

Investments in assets are usually made with the intention to generate revenue or reduce costs in future. The reduction in cost is considered equivalent to increase in revenues and should, therefore, be treated as cash inflow in capital budgeting computations.

The net present value method is used not only to evaluate investment projects that generate cash inflow but also to evaluate investment projects that reduce costs. The following example illustrates how this capital budgeting method is used to analyze a cost reduction project:

Example 2 – cost reduction project:

Smart Manufacturing Company is planning to reduce its labor costs by automating a critical task that is currently performed manually. The automation requires the installation of a new machine. The cost to purchase and install a new machine is $15,000. The installation of machine can reduce annual labor cost by $4,200. The life of the machine is 15 years. The salvage value of the machine after fifteen years will be zero. The required rate of return of Smart Manufacturing Company is 25%.

Should Smart Manufacturing Company purchase the machine?

Solution:

According to net present value method, Smart Manufacturing Company should purchase the machine because the present value of the cost savings is greater than the present value of the initial cost to purchase and install the machine. The computations are given below:

Initial cost	$15,000
Life of the project	15 years
Annual cost savings	$4,200
Salvage value	0
Required rate of return	25%

Item	Year(s)	Amount of cash flow	25% Factor	Present value of cash flow
Annual cost savings	1 - 15	$ 4,200	3.859*	$ 16,208
Initial investment	Now	(15,000)	1.000	(15,000)
Net present value				$ 1,208

*Value from "present value of an annuity of $1 in arrears table".

Net present value method – uneven cash flow:

Notice that the projects in the above examples generate equal cash inflow in all the periods (the cost saving in example 2 has been treated as cash inflow). Such a flow of cash is known as **even cash flow**. But sometimes projects do not generate equal cash inflows in all the periods. When projects generate different cash inflows in different periods, the flow of cash is known as **uneven cash flow**. To analyze such projects the present value of the inflow of cash is computed for each period separately. It has been illustrated in the following example:

Example 3:

A project requires an initial investment of $225,000 and is expected to generate the following net cash inflows:

Year 1: $95,000

Year 2: $80,000

Year 3: $60,000

Year 4: $55,000

Required: Compute net present value of the project if the minimum desired rate of return is 12%.

Solution:

The cash inflow generated by the project is uneven. Therefore, the present value would be computed for each year separately:

Year	Present value of $1 at 12%	Cash flow	Present value of cash flow
1	0.893*	$95,000	$ 84,835
2	0.797	80,000	63,760
3	0.712	60,000	42,720
4	0.636	55,000	34,980
Total			$ 226,295
Initial investment			(225,000)
Net present value			$ 1,295

*Value from "present value of $1 table".

The project seems attractive because its net present value is positive.

Choosing among several alternative investment proposals:

Sometime a company may have limited funds but several alternative proposals. In such circumstances, if each alternative requires the same amount of investment, the one with the highest net present value is preferred. But if each proposal requires a different amount of investment, then proposals are ranked using an index called **present value index (**or **profitability index)**. The proposal with the highest present value index is considered the best. Present value index is computed using the following *formula*:

Formula of present value or profitability index:

$$\text{Present value/profitability index} = \frac{\text{Present value of cash inflows}}{\text{Investment required}}$$

Example 4:

Choose the most desirable investment proposal from the following alternatives using profitability index method:

	Proposal X	Proposal Y	Proposal Z
Present value of cash inflow	$ 212,000	$ 171,800	$ 185,200
Investment required	(200,000)	(160,000)	(180,000)
Net present value	$ 12,000	$ 11,800	$ 5,200

Solution:

Because each investment proposal requires a different amount of investment, the most desirable investment can be found using present value index. Present value index of all three proposals is computed below:

Proposal X: 212,000/200,000 = 1.06

Proposal Y: 171,800/160,000 = 1.07

Proposal Z: 185,200/180,000 = 1.03

Proposal X has the highest net present value but is not the most desirable investment. The present value indexes show proposal Y as the most desirable investment because it promises to generate 1.07 present value for each dollar invested, which is the highest among three alternatives.

Assumptions:

The net present value method is based on two assumptions. These are:

1. The cash generated by a project is immediately reinvested to generate a return at a rate that is equal to the discount rate used in present value analysis.
2. The inflow and outflow of cash other than initial investment occur at the end of each period.

Advantages and Disadvantages:

The basic advantage of net present value method is that it considers the time value of money. The disadvantage is that it is more complex than other methods that do not consider present value of cash flows. Furthermore, it assumes immediate reinvestment of the cash generated by investment projects. This assumption may not always be reasonable due to changing economic conditions.