# Finance Management

## Module 4: Capital Budgeting

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# Capital Budgeting

- Capital budgeting is a strategic asset allocation.
- It is capital expenditure (or capital investment or capital project) that involves a current outlay and/or future outlays of funds in the expectation of a stream of benefits extending far into future.
- Capital budgeting can be defined as a process of evaluating investments and huge expenses in order to obtain the best returns on investment.
- For example, expenditure which is always in asset side, in the form of investment in a new plant or a major R&D or computerization/updating the plant etc. comes under capital budgeting.
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## Importance of Capital Budgeting

- Capital budgeting is a process that helps in planning the investment projects of an organization in long run.
- It is very important for any business as it impacts the growth & prosperity of the business in the long term.
- It also creates accountability & measurability.
- It takes all possible consideration into account so that the company can evaluate the profitability of the project.
- It is useful for evaluating capital investment project such as purchasing equipment, the rebuilding of equipment etc.
- The benefit from an investment may be in form of a reduction in cost or in form of increased revenue.
- Importance of capital budgeting can be understood from its impact on the business.

- **Projects (or subsidiarys) perspective.**
  - *Initial cash flow*, which is the sum of initial investment and net working capital (NWC).
  - *Free annual cash flow* from operations is the sum of Operating earnings After Tax (OEAT) and Depreciation (D) less Increase in NWC. i.e. it is (OEAT+D-Increase in NWC).
  - *Project life and Salvage value*. It suggests that how many years would the project produce cash flows. While Salvage value is estimated book value of an asset after depreciation is complete.
  - *The required rate of return*, which can be computed using Weighted Average Cost of Capital (WACC).
- Parent Company's Perspective
  - Initial cash flow.
  - Net annual cash flows to the parent from the subsidiary.
  - After tax salvage value and recovery of NWC.
  - Required rate of return from parents perspective.

# Net Present Value(NPV)
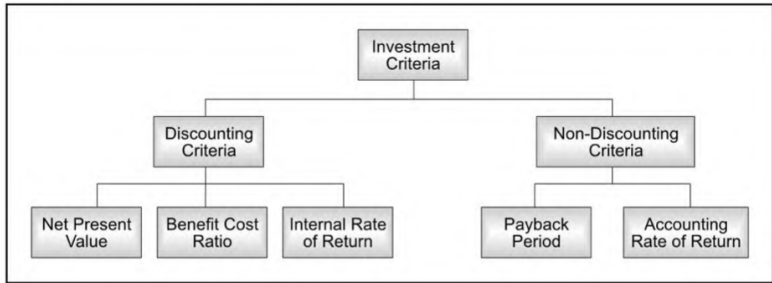
- It is used to evaluate investment and financing decisions that involve cash flows occurring over multiple periods.
- The net present value (NPV) of a project is the sum of the present values of all the cash flows (in and out) that are expected to occur over the life of the project.
- NPV ¿ 0 indicates the project can be considered for investment, while NPV ¡ 0 is unworthy project.
- The general formula of NPV is,

$$NPV = \sum_{t=1}^{n} \frac{C_t}{(1+r)^t} - \text{Initial investment}$$

Where, $C_t$ is the cash flow at the end of year $t$, $n$ is the life of the project and $r$ is the discount rate.

- Consider a project which has the following cash flow stream,

| Year | Cash flow |
|------|-----------|
| 0 | Rs.(1,000,000) |
| 1 | 200,000 |
| 2 | 200,000 |
| 3 | 300,000 |
| 4 | 300,000 |
| 5 | 350,000 |

- discount rate is 10%.

$$\text{NPV} = \frac{200,000}{(1.10)^1} + \frac{200,000}{(1.10)^2} + \frac{300,000}{(1.10)^3} + \frac{300,000}{(1.10)^4} + \frac{350,000}{(1.10)^5} - 1,000,000 = -5,272$$

**Net Present Values are Additive** The net present value of a package of projects is simply the sum of the net present values of individual projects included in the package. It has following implications

- The value of a firm can be expressed as, Value of the firm $=\sum$ sum of present value of projects$+\sum$ NPV ofexpected future projects.
- When a firm terminates an existing project which has a negative NPV based on its expected future cash flows, the value of the firm increases by that amount.
- Likewise, when a firm undertakes a new project that has a negative NPV, the value of the firm decreases by that amount.
- When a firm divests itself of an existing project, the price at which the project is divested affects the value of the firm. If the price is greater/lesser than the present value of the anticipated cash flows of the project, the value of the firm will increase/decrease with the divestiture.
- When a firm makes an acquisition and pays a price in excess of the present value of the expected cash flows from the acquisition it is like taking on a negative NPV project and hence will diminish the value of the firm.

- **Intermediate Cash Flows Are Invested at the Cost of Capital** i.e. The NPV rule assumes that the intermediate cash flows of a project i.e. cash flows that occur between the initiation and the termination of the projects are reinvested at a rate of return equal to the cost of capital.

- **NPV Calculation Permits Time Varying Discount Rates**.

$$NPV = \sum_{t=1}^{n} \frac{C_t}{\prod_1^t (1 + r_t)} - \text{Initial investment}$$

where $r_t$ is the discount rate for the year $t$.

For example,

| Discount rate | 14% | | 15% | | 16% | | 18% | | 20% | |
|---|---|---|---|---|---|---|---|---|---|---|
| Investment | – 12000 | | | | | | | | | |
| Cash flow | | | 4,000 | | 5,000 | | 7,000 | | 6,000 | | 5,000 |

The present value of the cash flows can be calculated as follows:

| | | |
|---|---|---|
| PV of $C_1$ | = 4,000/1.14 | = 3509 |
| PV of $C_2$ | = 5,000 / (1.14 * 1.15) | = 3814 |
| PV of $C_3$ | = 7,000 / (1.14 * 1.15 * 1.16) | = 4603 |
| PV of $C_4$ | = 6,000 / (1.14 * 1.15 * 1.16 * 1.18) | = 3344 |

PV of $C_5$  = 5,000 / (1.14 * 1.15 * 1.16 * 1.18 * 1.20)  = 2322

NPV of project = 3509 + 3814 + 4603 + 3344 + 2322 – 12000 = Rs.5592

Despite its advantages and a direct linkage to the objective of value maximization, it has got certain limitations such as,

- The NPV is expressed in absolute terms rather than relative terms and hence does not factor in the scale of investment. e.g. A project-A has an NPV of Rs.5,000 and project-B has an NPV of Rs.2,500, but project A may require an investment of Rs.50,000 where as project B may require an investment of just Rs.10,000.

- The NPV rule does not consider the life of the project. Hence, when mutually exclusive projects with different lives are being considered, the NPV rule is biased in favour of the longer term project.

- It is given by,

$$BCR = \frac{PVB}{I}$$

- Net benefit cost ratio (NBCR) is given by,

$$BCR = \frac{PVB - I}{I} = BCR - 1$$

  where, $PVB$ is the present value of benefits and $I$ is the initial investment.

- If $BCR > 1$ ($NBCR > 0$) then accept the project else reject.

- For instance, consider a project which is being evaluated by a firm that has a cost of capital of 12 percent and;

| Initial investment: | | Rs.100,000 |
|---|---|---|
| Benefits: | Year 1 | 25,000 |
| | Year 2 | 40,000 |
| | Year 3 | 40,000 |
| | Year 4 | 50,000 |

$$\text{BCR} = \cfrac{\cfrac{25,000}{(1.12)} + \cfrac{40,000}{(1.12)^2} + \cfrac{40,000}{(1.12)^3} + \cfrac{50,000}{(1.12)^4}}{100,000} = 1.145$$

$$\text{NBCR} = \text{BCR} - 1 = 0.145$$

- Advantage: The proponents of benefit-cost ratio argue that since this criterion measures NPV per rupee of outlay, it can discriminate better between large and small investments and hence is preferable to the net present value criterion.

- The internal rate of return (IRR) of a project is the discount rate which makes its NPV equal to zero.
- i.e. It is $r$ when $NPV = 0$ or PVB=Initial Investment.
- So we can compute it from,

$$I = \sum_{t=1}^{n} \frac{C_t}{(1 + r_t)^t}$$

- Accept :If the IRR is greater than the cost of capital (required returns).
- Reject :If the IRR is less than the cost of capital.

| Year | 0 | 1 | 2 | 3 | 4 |
|------|---|---|---|---|---|
| Cash flow | (100,000) | 30,000 | 30,000 | 40,000 | 45,000 |

The IRR is the value of $r$ which satisfies the following equation:

$$100,000 = \frac{30,000}{(1+r)^1} + \frac{30,000}{(1+r)^2} + \frac{40,000}{(1+r)^3} + \frac{45,000}{(1+r)^4}$$

try $r = 15$ percent. This makes the right-hand side equal to:

$$\frac{30,000}{(1.15)^1} + \frac{30,000}{(1.15)^2} + \frac{40,000}{(1.15)^3} + \frac{45,000}{(1.15)^4} = 100,802$$

$$\frac{30,000}{(1.16)^1} + \frac{30,000}{(1.16)^2} + \frac{40,000}{(1.16)^3} + \frac{45,000}{(1.16)^4} = 98,641$$

Since this value is now less than 100,000, we conclude that the value of $r$ lies between 15 percent and 16 percent. For most of the purposes this indication suffices.

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- To overcome the shortcomings of the IRR, IRR can be modified as follows,

$$PVC = \frac{TV}{1 + MIRR}^n$$

Where, PVC is present value of the cost given by

$$PVC = \sum \frac{CashOutflow^t}{1 + r}$$

and *TV* is terminal value of the cash in flows expected from the project, given by

$$PVC = \sum(\text{Cash inflow for } t^{th} \text{ period})(1 + r)^{n-t}$$

| Year | 0 | 1 | 2 | 3 | 4 | 5 | 6 |
|------|-----|-----|-----|-----|-----|-----|-----|
| Cash flow | −120 | − 80 | 20 | 60 | 80 | 100 | 120 |

The cost of capital for Pentagon is 15 percent. The present value of costs is:

$$120 + \frac{80}{(1.15)} = 189.6$$

The terminal value of cash inflows is:

$$20(1.15)^4 + 60(1.15)^3 + 80(1.15)^2 + 100(1.15) + 120$$

$$= 34.98 + 91.26 + 105.76 + 115 + 120 = 467$$

The MIRR is obtained as follows:

$$189.6 = \frac{467}{(1+\text{MIRR})^6}$$

$$(1 + \text{MIRR})^6 = 2.463$$

$$1 + \text{MIRR} = 2.463^{1/6} = 1.162$$

$$\text{MIRR} = 1.162 - 1 = 0.162 \text{ or } 16.2 \text{ percent}$$

- MIRR is better than the regular IRR in measuring the true rate of return.
- However, for mutually exclusive projects of different size, NPV is a better alternative in measuring the contribution of each project to the value of the firm.

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End of Module 4