

## CAPITAL BUDGETING

### Concept of Capital Budgeting:

- Capital budgeting is a planning process that is used to determine the worth of long-term investments of an organization.
- The long-term investments of the organization can be made in purchasing a new machinery, plant, and technology.
- In other words, capital budgeting is a method of identifying, evaluating, and selecting long-term investments.
- The concept of capital budgeting has a great importance in project selection as it helps in planning capital required for completing long-term projects. Selection of a project is a major investment decision for an organization. Therefore, capital budgeting decisions are included in the selection of a project.
- In addition, capital budgeting helps in estimating costs and benefits involved in a particular project. A project is not worth investing, if it does not yield adequate return on invested capital.

### Some of the management experts have defined capital budgeting in the following ways:

**According to Charles T. Homgreen**, “Capital Budgeting is long-term planning for making and financing proposed capital outlays.”

**In the words of G. C. Philipattos**, “Capital budgeting is concerned with the allocation of the firm’s scarce financial resources among the available market opportunities. The consideration of investment opportunities involves the comparison of the expected future streams of earnings from a project; with the immediate and subsequent stream of expenditures for it.”

**According to Joel Dean**, “Capital Budgeting is a kind of thinking that is necessary to design and carry through the systematic programme for investing stockholders’ money.”

### **Importance of Capital Budgeting:**

Capital Budgeting decisions have given the primary importance to financial decision-making since they are the most crucial and critical business decisions as they have significant impact on the profitability aspect of the firm. As the capital budgeting/expenditure decision affects the fixed assets only which are the sources of earning revenue, i.e., the profitability of the firm, special attention must be given to their treatment.

### **Capital budgeting decisions have placed greater emphasis due to:**

#### **(1) Capital Budgeting has long-term implications:**

- The most significant reason for which capital budgeting decisions are taken is that it has long-term implications, i.e. its effects will extend into the future, and will have to be endured for a longer period than the consequences of current operating expenditure.
- Because, a proper investment decision can yield spectacular returns, whereas a wrong investment decision can endanger the very survival of the firm.
- That is why, it may be stated that the capital budgeting decisions determine the future destiny of the firm. Moreover, it also changes the risk complexion of the enterprise.
- When the average benefits of the firm increase as a result of an investment proposal which may cause frequent fluctuations in its earnings that will become a risky situation.

#### **(2) Capital Budgeting requires large amount of funds:**

- Capital investment decisions require large amount of funds which the majority of the firms cannot provide since they have scarce capital resources.
- As a result, the investment decisions must be thoughtful, wise and correct.
- Because, a wrong/incorrect decision would result in losses and the same prevents the firm from earning profits from other investments as well due to scarcity of resources.

**(3) Capital Budgeting is not reversible:**

- Once the capital budgeting decisions are taken, they are not easily reversible.
- The reason is that there may neither be any market for such second-hand capital goods nor there is any possibility of conversion of such capital assets into other usable assets, i.e., the only remedy is to dispose-off the same sustaining a heavy loss to the firm.

**(4) They are actually the most difficult decisions:**

- Capital investment decisions are, no doubt, the most significant since they are very difficult to make.
- It is because of the fact that their assessment depends on the future uncertain events and activities of the firm.
- Similarly, it is practically a difficult task to estimate the accurate future benefits and costs in terms of money as there are economic, political and technological forces which affect the said benefits and costs.

**Capital Budgeting Process:**

**1. Project Identification and Generation:**

The first step towards capital budgeting is to generate a proposal for investments. There could be various reasons for taking up investments in a business. It could be addition of a new product line or expanding the existing one. It could be a proposal to either increase the production or reduce the costs of outputs.

**2. Project Screening and Evaluation:**

This step mainly involves selecting all correct criteria's to judge the desirability of a proposal. This has to match the objective of the firm to maximize its market value. The tool of time value of money comes handy in this step.

Also the estimation of the benefits and the costs needs to be done. The total cash inflow and outflow along with the uncertainties and risks associated with the proposal has to be analyzed thoroughly and appropriate provisioning has to be done for the same.

### **3. Project Selection:**

There is no such defined method for the selection of a proposal for investments as different businesses have different requirements. That is why, the approval of an investment proposal is done based on the selection criteria and screening process which is defined for every firm keeping in mind the objectives of the investment being undertaken.

Once the proposal has been finalized, the different alternatives for raising or acquiring funds have to be explored by the finance team. This is called preparing the capital budget. The average cost of funds has to be reduced. A detailed procedure for periodical reports and tracking the project for the lifetime needs to be streamlined in the initial phase itself. The final approvals are based on profitability, Economic constituents, viability and market conditions.

### **4. Implementation:**

Money is spent and thus proposal is implemented. The different responsibilities like implementing the proposals, completion of the project within the requisite time period and reduction of cost are allotted. The management then takes up the task of monitoring and containing the implementation of the proposals.

### **5. Performance Review:**

The final stage of capital budgeting involves comparison of actual results with the standard ones. The unfavorable results are identified and removing the various difficulties of the projects helps for future selection and execution of the proposals.

### **Factors Affecting Capital Budgeting:**

Availability of Funds	Working Capital
Structure of Capital	Capital Return
Management decisions	Need of the project
Accounting methods	Government policy
Taxation policy	Earnings
Lending terms of financial institutions	Economic value of the project

### **Principles of Capital Budgeting Process**

The capital budgeting process is based on the following five principles:

- All the capital budgeting decisions are based on the **incremental cash flows** of the project, and not on the accounting income generated by it. **Sunk costs are not considered in the analysis.**
- The external factors that can impact the implementation of the project and eventually the cash flow of company has to be fully considered while preparing / planning the capital budgeting.
- All the cash flows of the project should be based on the **opportunity costs**. Opportunity costs account for the money that the company will lose by implementing the project under analysis. These are the existing cash flows already generated by an asset of the company that will be forgone if the project under analysis is undertaken.
- The timing of the receipt of the cash flows is important. As per the **time value of money concept**, cash flows of the project received earlier has more value than the cash flows received later.
- All the cash flows from the project should be analyzed on an **after-tax basis**. The company should evaluate only those cash flows that they will keep, not those that they will pay to the government.
- The financing costs pertaining to a project should not be considered while evaluating incremental cash flows. These costs are already reflected in the project's required rate of return.

## **Evaluation Techniques in Capital Budgeting**

- I. Non-Discounted Cash Flow Technique
- II. Discounted Cash Flow Technique

### **I. Non-Discounted Cash Flow Technique (NDCF)**

1. Payback period
2. Accounting Rate of Return method

### **II. Discounted Cash Flow Technique (DCF)**

1. Net present value method
2. Internal Rate of Return Method
3. Profitability index.

### **I. Non-Discounted Cash Flow Technique**

#### **1. Payback Period:**

- The payback (or payout) period is one of the 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 a project.
- If the project generates **constant annual cash inflows**, the payback period can be computed dividing cash outlay by the annual cash inflow.

$$\text{Payback Period (PBP)} = \text{Cash Outlay (Investment)} / \text{Annual cash inflow} = C / A$$

**Accept-Reject Criteria: The projects with the lesser payback are preferred.**

#### **Merits of Payback Period**

1. It is very simple to calculate and easy to understand.
2. This method is helpful to analyze risk, i.e. to determine how long the investments will be at risk.

3. It is beneficial for the industries where the investments become obsolete very quickly.
4. It measures the liquidity of the projects.

### **Demerits of Payback Period**

1. The major drawback of this method is that it ignores the **Time Value of Money**.
2. It does not take into consideration the cash flows that occur after the payback period.
3. It does not show the liquidity position of the company, but only tells the ability of a project to return the initial outlay.
4. It does not measure the profitability of the entire project since it only focuses on the time required to recover the initial investment cost.
5. This method does not consider the life-span of investment, what if the life of an asset gets over very much before the initial investment cost is realized.

Thus, the payback period is the simplest method to assess the risk associated with the investment and the time required to get the initial outlay recovered.

### **2. Accounting Rate of Return method:**

The Accounting rate of return (ARR) method uses accounting information, as revealed by financial statements, to measure the profit abilities of the investment proposals. The accounting rate of return is found out by dividing the average income after taxes by the average investment.

$$\text{ARR} = \text{Average income} / \text{Average Investment}$$

Where,

**Average Income = Average of post-tax operating profit**

**Average Investment = (Book value of investment in the beginning + book value of investments at the end) / 2**

**Accept-Reject Criteria: The projects having the rate of return higher than the minimum desired returns are accepted.**

### **Merits of Average Rate of Return**

1. It is very simple to calculate and easy to understand
2. It measures the profitability of the entire project since it considers the cash flows throughout the life of the project.
3. It is based on the accounting information which is readily available and easily understood by the businessmen.

### **Demerits of Average Rate of Return**

1. It is based on the accounting information and not on the actual cash flows since the cash flow approach is considered superior to the accounting approach.
2. It does not take into consideration, the **Time Value of Money**.
3. It is inadequate to differentiate between the projects on the basis of amounts required for the investment, in case the proposals have the same rate of return.

Thus, this is the only method that uses the firm's financial data to assess the profitability of the project undertaken and do not rely on the future cash flows.

## **II. Discounted Cash Flow Technique**

### **1. Net Present Value Method (NPV):**

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

The equation for the net present value, assuming that all cash outflows are made in the initial year (t), will be:



$$\begin{aligned} \text{NPV} &= \left[ \frac{A_1}{(1+k)^1} + \frac{A_2}{(1+k)^2} + \frac{A_3}{(1+k)^3} + \dots + \frac{A_n}{(1+k)^n} \right] - C \\ &= \sum_{t=1}^n \frac{A_t}{(1+k)^t} - C \\ &= t=1 \end{aligned}$$

Where  $A_1, A_2, \dots$  represent cash inflows,  $K$  is the firm's cost of capital,  $C$  is the cost of the investment proposal and  $n$  is the expected life of the proposal. It should be noted that the cost of capital,  $K$ , is assumed to be known, otherwise the net present value cannot be known.

$$\text{Net Present Value (NPV)} = \sum_{t=1}^n C_t / (1+r)^t - C_0$$

Where,

$C_t$  = cash inflow at the end of year  $t$

$n$  = life of the project

$r$  = discount rate or the cost of capital

$C_0$  = cash outflow

#### Accept – Reject Criteria:

- **NPV > 0 (NPV is Positive)** - **Accept**
- **NPV < 0 (Negative)** - **Reject**
- **NPV = 0** - **May Accept or Reject**

#### Merits of Net Present Value

1. It takes into consideration the **Time Value of Money**.
2. It measures the profitability of the entire project by considering the profits throughout its life.
3. It is easy to alter the discount rate, by just changing the value of the denominator.
4. This method is particularly suitable for the mutually exclusive projects.
5. It is consistent with the objective of maximizing the net wealth of the company.

### **Demerits of Net Present Value**

1. The forecasting of cash flows is difficult because of several uncertainties involved in the operations of the firm.
2. It is difficult to compute the discount rate precisely. And this is one of the crucial factors in the computation of net present value as with the change in the discount factor the NPV results also changes.
3. Another problem is that it is an absolute measure, it accepts or rejects the projects only on the basis of its higher value irrespective of the cost of initial outlay.

Thus, to compute the Net Present value, a firm should determine the cash inflows and the outflows along with the discount rate or a rate of return that firm desires during the lifetime of the project.

### **2. Internal Rate of Return Method (IRR):**

- The **Internal Rate of Return or IRR** is a rate that makes the net present value of any project equal to zero.
- In other words, the interest rate that equates the present value of cash inflow with the present value of cash outflow of any project is called as Internal Rate of Return.
- The internal rate of return (IRR) equates the present value cash inflows with the present value of cash outflows of an investment.
- It is called internal rate because it depends solely on the outlay and proceeds associated with the project and not any rate determined outside the investment, it can be determined by solving the following equation:

$$C = \frac{A_1}{(1+r)^1} + \frac{A_2}{(1+r)^2} + \frac{A_3}{(1+r)^3} + \dots + \frac{A_n}{(1+r)^n}$$
$$C = \sum_{i=1}^n \frac{A_i}{(1+r)^i} \neq C$$
$$0 = \sum_{i=1}^n \frac{A_i}{(1+r)^i} - C$$

Unlike the Net present value method where we assume that the discount rate is known, in the case of Internal rate of return method, we put the value of NPV zero and then find out the discount rate that satisfies this condition.

The formula to calculate IRR is:

$$CF_0 = \sum_{t=1}^n C_t / (1+r)^t$$

Where,

$CF_0$  = Investment

$C_t$  = Cash flow at the end of year t

r = internal rate of return

n = life of the project

**Accept- Reject criteria:**

<b>IRR &gt; Cost of Capital</b>	<b>Accept</b>
<b>IRR &lt; Cost of Capital</b>	<b>Reject</b>
<b>IRR = Cost of Capital</b>	<b>Accept or Reject</b>

**Merits of Internal Rate of Return**

1. IRR takes into account the **Time Value of Money**.
2. It considers the cash flows over the entire life of the project.
3. IRR is consistent with the goal of wealth maximization.
4. While computing the NPV the discount rate taken is normally the cost of capital, but in the case of IRR, there is no need for the cost of capital because the rate of return generated by the project itself is used to evaluate the efficiency of the project. Thus, the rate is internal to the project.

**Demerits of Internal Rate of Return**

1. It is quite difficult and involves tedious calculations.
2. IRR produces multiple discount rates, which might be confusing.

3. While evaluating the mutually exclusive proposals, the project having the highest value is chosen over the other that may not be necessarily the most profitable or be in line with the objectives of the firm of wealth maximization.
4. It is assumed that the cash flows are reinvested at an internal rate of return.

The internal rate of return is usually the rate of return that a project earns. It is often called as the yield on investment, the marginal efficiency of capital, the marginal productivity of capital, rate of return and time adjusted rate of return.

### **3. Modified Internal Rate of Return (MIRR)**

- The **Modified Internal Rate of Return or MIRR** is a distinct improvement over the internal rate of return that assumes the cash flows generated from the project are reinvested at the firm's cost of capital rather than at the company's internal rate of return.

The formula to calculate the Modified Internal Rate of Return is:

$$\text{Modified Internal rate of return} = \sqrt[n]{\frac{\text{Terminal Value of Cash inflows}}{\text{Present value of Cash Outflows}} - 1}$$

Where, n= no. of periods

Terminal value is the future net cash inflows that are reinvested at the cost of capital.

#### **Accept- Reject criteria:**

- MIRR > Cost of Capital - Accept**
- MIRR < Cost of Capital - Reject**
- MIRR = Cost of Capital - Accept or Reject**

### **Merits of Modified Internal Rate of Return**

1. It takes into consideration the **Time Value of Money**.
2. The entire profitability of the project is taken into the consideration.
3. The real project's profitability can be determined since the cash generated is reinvested at the cost of capital.
4. The MIRR gives the same results as that of NPV when the projects are mutually exclusive and are of the same size.

### **Demerits of Modified Internal Rate of Return**

1. It is difficult and involves tedious calculations.
2. In the case of mutually exclusive projects of different sizes, the conflict may arise.

Thus, the modified internal rate of return gives more realistic and correct picture of the project's profitability as the cost of capital is more realistic than the IRR rate.

### **4. Profitability Index (PI):**

- The **Profitability Index** measures the present value of returns derived from per rupee invested. It shows the relationship between the benefits and cost of the project and therefore, it is also called as, **Benefit-Cost Ratio**. It is the ratio of the present value of future cash benefits, 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 profitability index (PI) or benefit cost (BC) ratio is as follows.

**PI = Present value of future cash inflows / Present value of cash outflows**

**PI = PV cash inflows / Initial cash outlay C,**

$$= \frac{\sum_{t=1}^n \frac{A_t}{(1+k)^t}}{C}$$

The profitability Index helps in giving ranks to the projects on the basis of its value, the higher the value the top rank the project gets. Therefore, this method helps in the **Capital Rationing**.

**Accept – Reject Criteria:**

- **PI > 1 (NPV is Positive) - Accept**
- **PI < 1 (Negative) - Reject**
- **PI = 1 - May Accept or Reject**

**Merits of Profitability Index**

1. It takes into consideration, the **Time Value of Money**.
2. The profits are considered throughout the life of the project.
3. This method helps in giving the ranks to the projects.
4. It helps in assessing the risk involved in cash inflows through the cost of capital.
5. It also helps in assessing the increase or decrease in the firm's value due to the investments.

**Demerits of profitability Index**

1. Unlike the NPV, the Profitability Index may sometimes do not offer the correct decision with respect to the mutually exclusive projects.
  2. The cost of capital is must to compute this ratio.
- It is a modernized version of Net Present Value that shows the present value of future cash inflows over the present value of cash outlay. Whereas the NPV shows the difference between the present value of future cash inflows and the present value of cash outlay.
  - Also, the NPV is an absolute measure, whereas the Profitability Index is a relative measure.

**Comparison of NPV and IRR:**

Both NPV and IRR will give the same results (i.e. acceptance or rejections) regarding an investment proposal in following two situations.

1. When the project under consideration involve conventional cash flow. i.e. when an initial cash outlays is followed by a series of cash inflows.
2. When the projects are independent of one another i.e., proposals the acceptance of which does not preclude the acceptance of others and if the firm is not facing a problem of funds constraint.

- The reasons for similarity in results in the above cases are simple. In NPV method a proposal is accepted if NPV is positive.
- NPV will be positive only when the actual rate of return on investment is more than the cut off rate.
- In case of IRR method a proposal is accepted only when the IRR is higher than the cut off rate.
- Thus, both methods will give consistent results since the acceptance or rejection of the proposal under both of them is based on the actual return being higher than the required rate i.e.
  - NPV will be positive only if  $r > k$ ,
  - NPV will be negative only if  $r < k$ ,
  - NPV would be zero only if  $r = k$

### **Comparison of MIRR and IRR:**

MIRR is superior to the regular IRR in two ways.

1. MIRR assumes that project cash flows are reinvested at the cost of capital whereas the regular IRR assumes that project cash flows are reinvested at the project's own IRR. Since reinvestment at cost of capital (or some other explicit rate) is more realistic than reinvestment at IRR, MIRR reflects better the true profitability of a project.
2. The problem of multiple rates does not exist with MIRR.

Thus, MIRR is a distinct improvement over the regular IRR but we need to take note of the following:

- If the mutually exclusive projects are of the same size, NPV and MIRR lead to the same decision irrespective of variations in life.

- If the mutually exclusive projects differ in size, there may be a possibility of conflict between NPV and IRR. MIRR is better than the regular IRR in measuring true rate of return. However, for choosing among mutually

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