# Capital Budgeting

**Introduction :** The capital budgeting decisions involve long-term planning for selection and also financing the investment proposals. Capital budgeting is the process of evaluating the relative worth of long-term investment proposals on the basis of their respective profitability

**Definition :** Charles T Horngren defines capital budgeting as the long-term planning to make and finance proposed capital outlays.

→ Steps in capital Budgeting

* Generating investment proposals
* Estimating cash flows for the proposals
* Evaluating cash flows
* Selection of projects based on an acceptance criteria
* Monitoring and re-evaluating on a continuous basis, the investment projects once they are accepted

**Significance of capital budgeting :**

Capital budgeting decisions assume special significance for the following reasons

1) **Substantial capital Analysis :** Capital budgeting decisions involve substantial capital outlays

2) **Long-term Implications :** Capital budgeting proposals are of longer ~~extension~~ duration and hence have long-term implications for instance the cash flows for next 5 to 15 years have to be forecast

3) **Strategic in nature :** C.B decisions can effect the future of the company significantly as it constitutes the straight determination for the success of a company. A right

investment decisions is the secret of the success of many bussiness enterprises

4) Irreversible:- once the funds are committed to a particular project, we cannot take back the decision. If the decision is to be reversed, we may have to lose a significant portion of the funds already committed. It may involve loss of time and efforts. In other words capital Budgeting decisions are irreversible

Why is capital budgeting Neccessary :??

⇒ capital budgeting decisions can be classified into the following types

→ projects that reduce costs
→ projects that revenues

The following are examples of the capital budgeting decisions

* constructions of a new building or renovation of existing buildings
* Interior decoration of a given building
* Building a production facility
* Building a Bridge
* Buying an airline
* making a new product
* starting a new business
* Buying a new delivery trucks
* Sponsoring a local football (or) cricket team for one (or) more No. of years
* Expansion decisions of existing plant & Equipment
* Advertising for the product or service
* Labour agreements and so on

## Estimation of cash inflows :-

cash in flows refer to cash reciepts. It does not refer to future incomes. It may be calculated for a particular project (or) assest or for the whole business for one year or series of year.

| Particulars | y-1 | y-2 | y-3 | y-4 |
|---|---|---|---|---|
| cash revenues [sales] | xxxx | | | |
| (-) cash expenses [FC+VC] | xxx | | | |
| CFBT (cash flow Before Tax) | xxx | | | |
| (-) Depreciation | xx | | | |
| Taxable income | xxx | | | |
| (-) Tax | xx | | | |
| cash flow after Tax (CFAT) | xxx | | | |
| (+) Depreciation | xx | | | |
| cash inflows ⟹ | xxx | | | |

$$\text{Depreciation} = \frac{[\text{cost of the assest} + \text{installation cost}] - \text{scrap}}{\text{No. of years.}}$$

Example :- ① :-

1) suppose an assest costing Rs. 25,000/- has 5 years of life and expected to yield Rs. 20,000/-, ₹ 30,000/-, ₹ 35,000/- 30,000/- & 25,000/- its operating cash expenses are 40% of the estimated revenue on each year. The assest is subject to 30% of income tax. Estimate the cash inflows for years 1 to 5.?

Ans:

Estimation of cash inflows

| Particulars | Year 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|
| cash revenue | 20,000 | 30,000 | 35,000 | 30,000 | 25,000 |
| (-) cash expenses (40%) | 8,000 | 12,000 | 14,000 | 12,000 | 10,000 |
| cash flow Before Tax [CFBT] | 12,000 | 18,000 | 21,000 | 18,000 | 15000 |
| (-) Depreciation | 5,000 | 5,000 | 5000 | 5,000 | 5,000 |
| Taxable income | 7,000 | 13000 | 16000 | 13000 | 10000 |
| (-) Tax | 2100 | 3900 | 4800 | 3900 | 3000 |
| CFAT | 4900 | 9100 | 11200 | 9100 | 7000 |
| (+) Depriciation | 5000 | 5000 | 5000 | 5000 | 5000 |
| cash inflows | 9900 | 14,100 | 16,200 | 14,100 | 12000 |

Working note:

$$\text{Depreciation} = \frac{[\text{Cost of the Assest} + \text{Installation cost}] - \text{Scrap Value}}{\text{No. of life in year}}$$

$$\text{Depreciation} = \frac{[25000 + 0] - 0}{5}$$

$$\text{Depreciation} = 5000$$

# Capital Budgeting Methods

## Traditional Methods

→ Pay back Periods
→ Average Rate of Return (ARR)

## Discount Cashflow Methods

→ Net Present Value (NPV) Method
→ Profitability Index Method
→ Internal Rate of return (IRR) Method

* **Pay back periods :-**

It is also called pay off periods It refers to the periods within its the original cost of the project is recovered

**Formulaes :-**

(i) When cash inflows are even pay back period is

$$\text{Pay back period} = \frac{\text{Cost of the project}}{\text{Annual cash inflows}}$$

(ii) When cash inflows are uneven cost of project

$$\text{Pay back period} = \text{Lower year} + \frac{\text{~~Lower year~~} \text{ Cost of project} - \text{AACI of Lower year}}{\text{AACI ~~cash inflow~~ of Next year} - \text{AACI of lower year}}$$

**Advantages :-**

* The calculations of pay back periods is easy and understandable their is no complications
* It Emphasis on ~~cash~~ more liquidity It means its avoids risk
* It is a reliable technique in volatile business condition

**Disadvantages :-**

* Pay back period method ignores the earnings after the

Pay back Period. It Means ignores the total life of the project and the total profitability of the investment

* This method doesn't consider the time value of money concept
* The liquidity of the proposal is over emphasised by choosing only cash inflows.

Example:

1) The cost of the project is 5 lakh rupees the annual cash inflows for the NXt 10 yrs are one lakh rupees what is the pay back period?

A)
$$PBP = \frac{\text{cost of project}}{\text{Annual cost inflows}}$$

$$PBP = \frac{5,00,000}{1,00,000}$$

PBP = 5 years

2) The cost of the project is one lakh rupees which has an expected life of eight years, the cash inflows are ₹25,000, 30,000, 35,000, 40,000, 45,000, 50,000, 50,000 and 45,000 respectively determine pay back period?

A)
$$PBP = LY + \frac{\text{Cost of Project} - \text{AACI of lower year}}{\text{AACI} - \text{AACI of lower years}}$$

| Year | cash inflows | AACI |
|---|---|---|
| 1 | 25,000 | 25000 |
| 2 | 30,000 | 55000 |
| 3 | 35,000 | 90000 |
| 4 | 40,000 | 130000 |
| 5 | 45000 | 175000 |
| 6 | 50000 | 2,25000 |
| 7 | 50000 | 2,75000 |
| 8 | 55000 | 3,20000 |

$$PBP = 3 + \frac{100000 - 90000}{130000 - 90000}$$

PBP = 3 - 2 years

3) Determine PBP from below data
→ cost of project is one lakh
→ The Annual cash inflows are 20000; 30000; 35000; 40,000 45,000 respectively

A)

| Year | Cash inflows | AACI |
|---|---|---|
| 1 | 20000 | 20000 |
| 2 | 30000 | 50000 |
| 3 | 35000 | 85000 |
| 4 | 40000 | 125000 |
| 5 | 45000 | 170000 |

$$PBP = 3 + \frac{100000 - 85000}{125000 - 85000} \Rightarrow PBP = 3.375 \text{ years}$$

4) From the following information your requested to calculate Pay Back period initial Investment ₹50,000 ; ₹ 15000, ₹20,000 ₹ 25000 ; ₹30,000 The CF are 15,000

A)

| Year | Cash inflows | AACI |
|---|---|---|
| 1 | 15000 | 15000 |
| 2 | 15000 | 30000 |
| 3 | 20000 | 50000 |
| 4 | 25000 | 25000 |
| 5 | 30000 | 150000 |

Here 3 is Exactly equal to Investment

## Average rate of return (ARR):

This method takes account the earnings expected from the investment over the entire life of the asset this is calculated based on according profits. It is also called as accounting rate of return

$$ARR = \frac{\text{Average Annual earnings}}{\text{Avg. Investment}} \times 100$$

$$\text{Avg. Annual Earnings} = \frac{\text{Total of anticipated earning after depreciation \& Tax}}{\text{NO. of years}}$$

Avg. Investment = $\frac{1}{2}$ [Investment - Scrap value] + Scrap value
+ Additional working capital

DECISION CRITERIA :-

In case of more than one ~~project~~ Project) higher the ARR is preferable

Advantages :-

* It considers all the years involved in the life of a project rather only the payback years
* It applies accounting profits as a criteria of measurement and not cash flow
* It is simple to understand and use

Disadvantages :-

* It applies profit as a yardstick
* Not cash flows
* The time value of money is ignored under this Method
* Yearly profit determination may be a difficult task
* It doesnot consider the length of life's of the project

Discount cash flow technique :-

Payback period and ARR methods do not take time value of money. The discount cash inflow Methods are based on the concept that a rupee earned to day is more worth than a rupee earned tomorrow

Net present value Method :-

The NPV takes into consideration the time value of money. The cash flow of different years are valued differently & mad comparable in terms of present value

∴ NPV = present value of cash inflow - Investment

$$\text{Present value} = \frac{CF}{(1+r)^n}$$

Where

CF = cash inflows

r = discount rates

n = years

$$NPV = \frac{CF_1}{(1+r)^1} + \frac{CF_2}{(1+r)^2} + \cdots + \frac{CF_n}{(1+r)^n} - \text{Investment}$$

Example :- ①

⇒ calculate the net present value of the two projects & suggests which of the 2 projects should be accepted assuming a discount rate of 10%.

| | Project A | Project B |
|---|---|---|
| Initial Investment | 40,000/- | 60,000/- |
| Estimated life | 5 years | 5 years |
| Scrap value | 2000/- | 4000/- |

| Clash Inflow | Project A | Project B |
|---|---|---|
| 1st yr | 12000 | 35000 |
| 2nd yr | 18000 | 25000 |
| 3rd yr | 7000 | 12000 |
| 4th yr | 5000 | 4000 |
| 5th yr | 4000 | 4000 |

Solution :-

Project A :-

| Year | Cash inflows | Present value Re. 1 at 10% | Present value of cash inflow |
|---|---|---|---|
| 1 | 12000 | 0.909 | 10908 |
| 2 | 18000 | 0.826 | 14868 |
| 3 | 7000 | 0.751 | 5257 |
| 4 | 5000 | 0.621 | 3415 |
| 5 | 4000 | 0.621 | 2484 |
| 5 (Scrap) | 2000 | 0.621 | 1242 |

Present Total value of cash inflow = 38,174/-

NPV = Present value of C.I - Investment

= 38,174 - 40,000

NPV = -1,826

Project B :-

| year | cash inflows | present value of Re.1 at 10% | present value of C.I |
|---|---|---|---|
| 1 | 35000 | 0.909 | 31,815 |
| 2 | 25000 | 0.826 | 20,650 |
| 3 | 12000 | 0.751 | 9012 |
| 4 | 4000 | 0.683 | 2732 |
| 5 | 4000 | 0.621 | 2484 |
| 5(Scrap) | 4000 | 0.621 | 2484 |
| | | | 69,177 |

NPV = present value of C.I - Investment

= 69,177 - 60,000

NPV = 9,177/-

Note :- Since Project B only gives positive NPV so, It is to be selected

Example :(2) :-

| Years | cash outflows | cash inflows |
|---|---|---|
| 0 → | 2,00,000 → | 30,000 |
| 1 → | 50,000 → | 50,000 |
| 2 | ---- | 70,000 |
| 3 | ---- | 1120,000 |
| 4 | ---- | 80,000 |

the salvage value at the end of the 5 years is 30,000 the cost of capital is 12%. calculate the NPV.? 14

Sol:-

NPV = Present value of cash inflow - Present value of Investment

Present value of Investment = 2,00,000 + 44,650

(+)

Additional Investment (50,000 x 0.893) = 44650

Cash inflows

| Year | cash inflows | Discount rate at 12% | Present value of cash inflows |
|---|---|---|---|
| 1 | 30,000 | 0.893 | 26,790 |
| 2 | 50,000 | 0.797 | 39,850 |
| 3 | 70,000 | 0.712 | 49,840 |
| 4 | 1,20,000 | 0.635 | 76,200 |
| 5 | 80,000 | 0.567 | 45,360 |
| 5(Scrap) | 30,000 | 0.567 | 17,010 |
| | | | 2,55,050 |

NPV = 2,55,050 - 2,44,650

NPV = 10,400

Profitability ~~of income~~ Index :-

Profitability ~~of income~~ Index is also called as Benefit cost ratio. This method is the single modification of the NPV

$$P.I = \frac{\text{Present value of cash inflows}}{\text{Present value of cash outflows}}$$

Acceptance rule :-

PI > 1 :- Proposal is accepted, otherwise rejected

Advantages :

1) It recognises the time value of money
2) For calculations, when compared with IRR methods, It requires less time
3) It helps in ranking the project for Investment decisions
4) It can be used to choose blw mutually exclusive projects
5) It considers all cash flows
6) It consistently with the share holders wealth maximization objectives.

Dis-advantages :

1) It is similar to NPV approach
2) It measured the present value of return per rupee invested, whereas NPV depends on the difference blw PV of NCF and PV of cash out flows

Internal rate of return :

The IRR form of Investment proposal is that discount rate which equates the present value of cash inflows with the present value of cash outflows of an investment. It is a trial and error method

$$IRR = L + \frac{P_1 - Q}{P_1 - P_2} \times D$$

Where

L = Lower discount rate

$P_1$ = present value of earnings at lower rate

$P_2$ = present value of earnings at higher rate

Q = Annual Investment

D = difference in the rate of return

Decision criteria:

If IRR greater than cost of capital accept the proposal else reject the proposal

Advantages:

(1) IRR is based on time value of money

(2) It is based on the earnings of all the years of the projects

(3) It is a valuable tool to compare the projects with different cash inflows and different life span

(4) It is dependent of cost of capital

(5) such projects with higher IRR are reccommended Hence it directly contributes to the wealth maximisation goal of the finance manager

Disadvantages:

(1) It is difficult to understand and tedious to calculate IRR by even trail and error

(2) It is based on certain assumptions, one of which is that are intermediate cash inflows and reinvested at IRR where the company has more than one project with different IRR's this assumptions may not hold good

(3) There could be cases of non-conventional projects with multiple IRR's, which are difficult to understand

(4) there are cases where higher IRR does not neccesarily contribute to wealth maximization (particullarly in the case of mutualy exclusive projects where NPV method is better

Example :(1):

Q) A firm has an investment oppurtunity involving 50,000/-. The cost of capital is 10%. the details given below. find out the Internal rate of return

and see whether the project is acceptable / not

| cash flow | | |
|---|---|---|
| | year 1 | 50,000/- |
| | year 2 | 10,000/- |
| | year 3 | 151000/- |
| | year 4 | 851000/- |
| | year 5 | 301000/- |

Sol:

| year | cash inflows | P.V factors at 15% | discount cash inflows | P.V factor of 20% | discount cash inflows |
|---|---|---|---|---|---|
| 1 | 5,000 | 0.870 | 4,350 | 0.833 | 4,165 |
| 2 | 101000 | 0.756 | 7,560 | 0.694 | 6,940 |
| 3 | 151000 | 0.658 | 9,870 | 0.579 | 8,685 |
| 4 | 25,000 | 0.572 | 14,300 | 0.482 | 12,050 |
| 5 | 30,000 | 0.497 | 14,910 | 0.402 | 12,060 |
| | Total | ⇒ | 50,990 | | 43,900 |

$$IRR = L + \frac{P_1 - Q}{P_1 - P_2} \times D$$

$$IRR = 15 + \frac{59990 - 50,000}{50,990 - 43,900} \times 5$$

$$IRR = 15 + \frac{990}{7090} \times 5$$

$$IRR = 15.7\%$$

Note: As the Internal rate of return (15.7%) is above the cost of capital (10%) the project is acceptable.

Ex2- The cost of the project is ₹500,000/-. The annual cash flows after the depreciation and before tax are ₹80,000/-. The project is in 50% tax bract. The life of the project is 10 years.

Pb. 1. A Machine can reduce annual cost by 40,000$ the cost of the machine is 2,23,000$ and the useful life is 15 years with zero rescheduled value.

Required 1. Compute Internal rate return of the machine

2. Is it acceptable Investment if cost of capital is 16%

Sol:

$$\text{Factor} = \frac{\text{Project cost}}{\text{C.I}} = \frac{2,23,000\$}{40,000\$} = 5.575$$

$$\text{Annuty table value} = \frac{1-(1+r)^n}{r}$$

Where $r$ = rate of return

$n$ = year number = 15

$$\text{Annuty at } 15\% = \frac{1-(1+0.15)^{-15}}{0.15} = 5.847$$

$$\text{Annuty at } 20\% = \frac{1-(1+0.20)^{-15}}{0.20} = 4.675$$

$$IRR = L + \frac{P_1 - Q}{P_1 - P_2} \times D$$

L = lower rate = 15%

Q = Investment = $ 2,23,000/-

$P_1$ = PV at lower rate [5.847 x $ 40,000] = $ 2,33,880

$P_2$ = PV at higher rate [4.675 x $ 40,000] = $ 1,87,000

Difference = 5 [15-20]

$$IRR = 15\% + \frac{233,880 - 223,000}{233,880 - 1,87,000} \times 5$$

$= 16.16\%$

The IRR of the form is 16.16%. It is more than the cost of capital of 16%. So I choose the project.

Pb.2 A Project cost 1,44,000/- The average annual cash in flows are likely to be 45,000. For a period 5 years. Calculate the IRR for the project.

Sol: Factor $= \frac{\text{Project cost}}{\text{cost inflow}}$

$= \frac{1,44,000}{45,000} = 3.2$

Annuty table value $= \frac{1-(1+r)^{-n}}{r}$

where r = rate of return

n = year number = 5

Annuty at 15% $= \frac{1-(1+0.15)^{-5}}{0.15}$

$= 3.352$

Annuty at 19% $= \frac{1-(1+0.19)^{-5}}{0.19}$

$= 3.057$

$IRR = L + \frac{P_1 - Q}{P_1 - P_2} \times D$

L = lower rate = 15%

Q = Investment = ₹ 1,44,000

$P_1$ = PV at lower rate (3.352 × 45000) = 1,50,840

$P_2$ = PV at higher rate (3.057 × 45000) = 1,37,565