

## UNIT V

<b>Subject name</b>	<b>Subject Code</b>	<b>Semester</b>	<b>Prepared By</b>
<b>Financial Management</b>	<b>18BBA31C</b>	<b>III</b>	<b>Dr.K.Karthikai, Assistant Professor in BBA</b>

### **Capital Budgeting**

The finance manager of a firm is responsible to procure the required quantum of funds from different sources and invest the raised funds in various assets in the most profitable way. The investment of funds requires a number of decisions to be taken in a situation in which funds are invested and benefits are expected over a long period. The finance manager is to determine the composition of assets of the firm. The assets of the firm are of two types i.e.. fixed assets and current assets. The aspect of taking the financial decision with regard to fixed assets is called capital budgeting.

### **Meaning of Capital Budgeting**

Capital budgeting means planning the capital expenditure in acquisition of fixed (capital) assets such as land, building, plant or new projects as a whole. It includes replacing and modernising a process. introducing a new product and expansion of the business. It involves the preparation of Detailed Project Report (DPR) and cost and revenue statements indicating the profitability. The project which gives the highest return on investment is to be selected and then investment is to be made in such a project as to maximise the profitability of the firm.

### **Definition of Capital Budgeting**

The term capital budgeting is formally defined as follows :

(i) Charles T. Horngren : Capital budgeting is the long term planning for making and financing proposed capital outlays.

(ii) GC. Philoppatos : 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 streams of expenditure for it.

**Features of Capital budgeting** The following basic features of capital budgeting

(i) Investments : Capital expenditure plans involve a huge investment; fixed assets.  
(ii) Long-term : Capital expenditure, once approved, represents long term, investment that cannot be reversed or withdrawn without sustaining, loss.

(iii) Forecasting : Preparation of capital budget plans involve forecasting, of several years profits in advance in order to judge the profitability projects.

(iv) Serious consequences : In view of the investment of large amount for, fairly long period of time, any error in the evaluation of investment, projects may lead to serious consequences, financially and otherwise and may adversely affect the other future plans of the organisation.

### **Objectives of Capital Budgeting**

The objectives of capital budgeting are summarised as given below :

(i) Capital budget aims at deciding the most profitable among the numerous investment proposals available.

(ii) It decides the most suitable among different sources of finance on the basis of capital market constraints.

(iii) The growth and expansion of the firm and modernisation can be taken care of.

### **Need and significance of Capital Budgeting**

Capital budgeting decision is of paramount importance in financial decision making, Special care should be taken in making these decisions on account of following reasons :

(i) **Substantial expenditure-** Capital budgeting decisions, involve investment of substantial amount of funds. It is therefore a firm to make such decisions after a thoughtful consideration so as to result in the profitable use of its scarce resources. The hasty decision would not only result in huge losses but may also account in the failure of the firm.

(ii) **Long term implications :** The capital budgeting decision has its effect over a long period of time. These decisions not only affect the future benefits and cost of the firm but also influence the rate and direction of growth of the firm.

(iii) **Irreversible decisions ;** The capital budgeting decisions are irreversible and the heavy amount invested cannot be taken back without causing a substantial loss because it is very difficult to find a market for the second hand capital goods and their conversion into other uses may not be financially feasible.

(iv) **Complexity** : The capital budgeting decisions are based on forecasting of future events and inflows. Quantification of future events involves applications of statistical and probabilistic techniques, careful judgement and application of mind is necessary.

(v) **Risk**: The longer the time period of returns, greater is the risk/uncertainty associated with cash flows. Hence capital budgeting decisions should be taken after a careful review of all available information.

(vi) **Surplus** : Funds are raised by the firm at a certain cost (i.e, WACC). Even internally generated funds have an implicit cost. Hence, there is a need to obtain a surplus over and above the cost of funds. Only then, the investment is justified.

### **Advantages of Capital Budgeting**

The main advantages of capital budgeting are as under :

(i) At any given time, numerous investment proposals may be available. Capital budgeting evaluates them and ranks them as per merit. This enables management to decide on implementing appropriate proposals.

(ii) The limited funds available can be most effectively utilised.

(iii) The timing and actual execution of each project can be adjusted to changes in capital market.

(iv) Different sources of finance can be considered and judicious selection of sources can reduce overall cost of capital.

(v) Capital budgeting can take care of the proportion of debt and equity in the capital structure and the resulting capital gearing.

(vi) In tight money situations, capital rationing can be followed not to waste scarce funds available .

### **Capital Budgeting Methods**

#### **Traditional or Non-Discounting Methods :**

a) Payback period b) Accounting or Average rate of method return method

#### **Discounted cash flow (or) Time Adjusted Methods :**

a) Net present value b) Internal rate of return method c) Profitability Index method

### **1. Traditional (or) Non-discounting Methods**

As the name itself suggests, these methods do not discount cash flows to find out their present worth. There are two such methods available i.e., (i) pay back period method, and (ii) the accounting or average rate of return method. These are essentially rules of thumb that intuitively grapple with the trade-off between net investment and operating cash inflows. Both these traditional evaluation criteria are discussed below :

**1. Pay - back Period Method** : This method, sometimes called the pay-out or pay off or replacement period method, determines the length of time required to recover the initial outlay of a project. In other words, it is the period within which the total cash inflows from the project equals the cost of investment in the project. The lower the pay-back period, the better it is since initial investment is recouped faster.

**Suppose a project with an initial investment of Rs, 5 lakh yields a profit of Rs.1 lakh, after writing off depreciation of Rs. 25,000 per annum case, the pay- back period is computed as given below :**

**Pay- back period = Initial investment/ CFAT p.a**

**CFATp.a = Profit after tax + Depreciation**

**= 1,00,000 + 25,000 = Rs. 1,25,000**

**Pay back period = 5,00,000 /1,25,000 =4 years**

**Procedure for computation of pay-back period**

- (i) Ascertain the initial investment (cash outflow) of the project.
- (ii) Ascertain the cash inflows (CFAT) from the project for various years,
- (iii) Calculate the payback period as under :

**(a) In case of uniform CFAT p.a.**

**Payback period = Initial investment /CFAT p.a**

**(b) In case of differential CFAT for various years.**

- (i) Compute cumulative CFAT at the end of each year.
- (ii) Find out the year in which cumulative CFAT exceeds initial investment.

(iii) Payback period = Time at which cumulative CFAT = Initial investment (calculated on time proportion basis).

(iv) Accept if the pay- back period is less than maximum or bench mark period, else reject the project.

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Ex. 1 A project has an initial investment of Rs. 2,00,000. It will produce cash flows after tax of Rs. 50,000 per annum for six years. Compute the payback period for the project.

Solution : Computation of Payback period (Uniform CFAT)

Payback period = Initial investment /CFAT p.a

$$=2,00,000 / 50,000 = 4 \text{ years}$$

Ex 2. Project Y has an initial investment of Rs. 5,00,000. Its cash flows for 5 years are Rs. 1,50,000, Rs. 1,80,000, Rs. 1,50,000, Rs. 1,32,000 and Rs. 1,20,000. Determine the payback period.

Solution : Computation of payback period (Differential CFAT)

Since the cash inflows are not uniform, cumulative cash inflows have to be ascertained to calculate payback period.

Statement showing Cumulative Cash Inflow

Year	CFAT (Rs.)	Cumulative CFAT (Rs.)
1	1,50,000	1,50,000
2	1,80,000	3,30,000
3	1,50,000	4,80,000
4	1,32,000	6,12,000
5	1,20,000	7,32,000

Initial investment is Rs. 5,00,000, Rs. 4,80,000 can be recovered in three years. The remaining amount of Rs. 20,000 is to be recovered in the fourth year.

Time required for earning Rs. 1,32,000 in the fourth year = 12 months.

Time required to earn Rs. 20,000 in the fourth year  $(12/132000) * 20000$

$$= 1.81 \text{ months (or) 2 months ,}$$

Payback period = 3 years, 2 month

Ex 3. A project costs R 20 lakh and yields annually a profit of Rs. 3 lakh after depreciation at 12 and  $\frac{1}{2}$  % but before tax at 50%. Calculate payback period.

Solution: For calculation of payback period, CFAT (cash inflow before depreciation, after tax) has to be found out.

Statement showing CFAT

Profit after depreciation before tax	Rs 3,00,000
Less : Tax @ 50%	Rs.1,50,000

	Rs.1,50,000
	Rs.2,50,000
Add : Depreciation (20,00,000 x 12.5%)	Rs. 4,00,000
CFAT	Rs. 4,00,000

Payback Period= Initial investment/ CFAT  
= 20,00,000/4,00,000 = 5 Years

## 2. Accounting or Average Rate of Return (ARR) Method

ARR is the annualised net income earned on the average funds invested in a project. It is a measure based on the accounting profit (profit after depreciation and tax) rather than the cash flows and is very similar to the measure of rate of return on capital employed, which is generally used to measure the overall profitability of the firm. The alternative formula for calculating the ARR is as follows :

### (a) Annual return or Original Investment Method

$$\text{ARR} = (\text{Annual average net earnings/savings} / \text{Initial investment}) * 100$$

where, Annual average net earnings = Average of the earnings (savings) after depreciation and tax over the whole of the economic life of the project.

Investment = Capital cost of the equipment minus salvage value of the old equipment

### (b) Annual return on average investment method

$$\text{ARR} = (\text{Annual average net earnings} / \text{Average investment}) / 100$$

The amount of 'Average investment' can be computed in any of the following methods :

(i) Average investment = Initial investment / 2

(ii) Average investment = ( Initial investment -Scrap value of the asset ) / 2

(iii) Average investment = (Initial investment + Scrap value of the asset)/ 2

(iv) Average investment = (Original investment -Scrap value )/2+(Additional net working capital + Scrap value )

## Procedure for computation of ARR

- (i) Determine the average investment as given above.
- (ii) Determine the profit after tax for each year:  $PAT = CFAT$  less depreciation.
- (iii) Calculate the total PAT for N years, where N = project life.
- (iv) Calculate average PAT per annum (Total PAT of all years / N years)
- (v)  $ARR = (\text{Average PAT p.a} / \text{Average investment}) \times 100$

Ex 4. Compute ARR from the following data: Cost of asset : Rs. 4,00,000 Useful life : 5 years  
Cash flow after tax(CFAT) Rs. 1,72,000 pa.

Solution : Since CFAT (profit before depreciation, after tax) is given profit after depreciation and tax has to be found out to calculate ARR.

CFAT	Rs. 1,72,000
Less : Depreciation (400000/5 )years	Rs. 80,000
	-----
Profit after dep. & tax	Rs. 92,000
	-----

Accounting rate of return (ARR) = (Profit after dep.& tax/ Original investment )100  
=  $(92,000/4,00,000) \times 100 = 23\%$

Ex 5. Project K requires an investment of Rs. 20 lakh and yields profits after tax and depreciation as follows :

Year	1	2	3	4	5
Profits after tax & /Depreciation (Rs.)	1,00,000	1,50,000	2,50,000	2,60,000	1,60,000

At the end of 5<sup>th</sup> year, the plant can be sold for Rs. 1,60,000. You are required to calculate ARR.

Average rate of return (ARR) = (Average profit / Average investment )x 100

Average profit =  $(1,00,000 + 1,50,000 + 2,50,000 + 2,60,000 + 1,60,000) / 5$  years



$$=9,20,000 / 5 = \text{Rs. } 1,84,000$$

Average investment = (Original investment-Scrap value)

$$= (20,00,000 - 1,60,000)/2 = \text{Rs. } 9,20,000$$

Hence, ARR =  $(1,84,000 / 9,50,000) \times 100 = 20\%$

### **Discounted Cash Flow (DCF) Methods or Time Adjusted Methods(or)Present Value Methods**

The pay-back period and ARR methods discussed above did not recognise the time value of money i.e., a rupee today is considered more valuable than the one receivable after a year or two. Discounted cash flow methods take into account the time value of money. The basic feature of discounted cash flow methods is that they are based on discounted cash flows. Both cash inflows and cash outflows are discounted at a predetermined discounting rate to ascertain their present values. Usually, the discounting rate is the cost of capital rate of the firm. But it can be any other rate also. Discounting factors can be obtained from present value tables, They can also be ascertained by using the following formula :

**Discount (PV) factor =  $1/(1+r)^n$**

**where, r = Discount rate ,n= No.of years**

The DCF methods are becoming increasingly popular day by day. Following are the discounted cash flow methods :

- (1). Net Present Value (NPV) Method
- (2). Internal Rate of Return (IRR) Method
- (3). Profitability Index (PI)

**1. Net Present Value (NPV) Method :** It is one of DCF methods in which both future cash inflows and outflows from a project are discounted at a cost of capital rate. This gives present value of cash inflows and outflows. The difference between present value of cash inflows and outflows is called Net Present Value (NPV).

#### **Procedure for computation of NPV**

- (i) Ascertain the total cash inflows of the project and the time periods in which they arise.
- (ii) Calculate the present value of cash inflows i.e., CFAT x PV factor

- (iii) Ascertain the total cash outflows of the project and the time periods in which they occur.
- (iv) Calculate the present value of cash outflows i.e., cash outflows x PV factor.
- (v) Calculate NPV = Present value of cash inflows - Present value of cash outflows
- (vi) Accept project if NPV is positive, else reject. If two projects are mutually exclusive, the project with higher NPV should be preferred.

**Merits of NPV Method** (i) It recognises the time value of money. (ii) It uses the discount rate which is the firm's cost of capital. (iii) It considers all cash flows over the entire life of the project. (iv) NPV constitutes addition to the wealth of shareholders and thus focuses on the basic objective of financial management. (v) Since all cash flows are converted into present value (current rupees), different projects can be compared on NPV basis, thus, each project can be evaluated independent of others on its own merit.

**Limitations of NPV Method** (i) This method assumes that the discount rate i.e., firm's cost of capital is known. But the cost of capital is difficult to understand and measure in practice. (ii) It may not give reliable answers while dealing with alternative projects under the conditions of unequal lives of projects. (iii) Decisions arrived at may not be satisfactory when projects being compared involve different amounts of investment.

Ex 6. An investment of Rs. 10,000 (having scrap value of Rs. 500) yields the following

Year	1	2	3	4	5
CFAT	4000	4,000	3,000	3000	2500

The cost of capital is 10%. Is the investment desirable? Discuss it according to NPV method assuming the P. V. factors for 1st, 2nd, 3rd, 4th and 5th . (0.909, 0.826, 0.751, 0.683 and 0.620 respectively)

Statement showing Net Present Value

Year	CFAT (Rs.)	P.V factor @ 10%	Present value (Rs.)
(1)	(2)	(3)	4=(2*3)
1	4000	0.909	3,636
2	4000	0.826	3,304
3	3000	0.751	2,253
4	3000	0.683	2,049
5	2500	0.620	1,550
	500(Scrap)	0.620	310
Total present value of cash inflows			13,102
Less: Present value of cash outflow (10,000 x 1)			10,000
Net present value (NPV)			3,102

Note:

- (i) The scrap value is taken as an additional inflow at the end of the 5<sup>th</sup> year.

(i) In case of differential CFAT, use P.V. factors .

Analysis : Since NPV is positive, the investment is desirable.

Ex 7. Nisha Metals Ltd. is considering two different investment proposal X and Y. The details are as under :

	Proposal X Rs.	Proposal Y Rs.
Investment cost	1,90,000	4,00,000
CFAT (cash inflows before dep. and after tax) – Year 1	80,000	1,60,000
Year 2	80,000	1,60,000
Year 3	90,000	2,40,000

Suggest the most attractive proposal on the basis of NPV method considering that the future incomes are discounted at 12%.

Solution : Statement showing Net Present Value (NPV)

Year	CFAT (Rs.) X	CFAT (Rs.) Y	PV. Factor @12%	Present value X	Present value Y
1	80,000	1,60,000	0.893	71,440	142880
2	80,000	1,60,000	0.797	63,760	127520
3	90,000	2,40,000	0.712	64,080	170880
Total present value of cash inflows				1,99,280	441280
Less : Present value of cash outflow(1,90,000 x 1) (4,00,000 x 1)				1,90,000	4,00,000
			NPV	9,280	41,280

Analysis : NPV is more in proposal Y and therefore, it should be accepted.

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

IRR is the rate of return at which the sum of discounted cash inflows equal the sum of discounted cash outflows. It is the rate at which the NPV of the investment is zero. It is called internal rate because it depends mainly on the outlay and proceeds associated with the project and not on any rate determined outside the investment. This method is also known as

marginal rate of return method or time adjusted rate of return method. This method is generally employed when cost of investment and annual cash inflows are known, while the unknown rate of return (i.e., rate of cost of capital) is to be ascertained.

### **Procedure for computation of IRR**

IRR is calculated according to two methods on the basis tabular values.

(a) **When cash inflows are uniform for all the years** : In this case, the IRR is determined with the help of annuity table showing the present value of Re.1 received annually over 'n' years by adopting the following two steps :

**Step (i)** The factors to be located in the relevant annuity table is calculated by using simple equation:

**$F = I / C$  where, F = Factors to be located I = Initial investment C = Cash inflow per year**

**Step (ii)** : The factor, thus, calculated is located in annuity table on the line representing number of year corresponding to the estimated useful life of the assets and the relevant percentage of the discount which represents IRR.

(b) **When cash inflows are not uniform** : In this case, IRR is to be ascertained by trial and error process. In this process, cash inflows are to be discounted by a number of trial rates. Just to start, the average cash inflows of different year are to be found. Original investment is to be divided by this average cash inflows. This may be taken as present value factor. The rate can be ascertained from PV table for this factor and at this rate, the PV of cash inflows of several years are to be calculated , then total PV of cash inflows are compared with the original investment. If the calculated PV of cash inflows is less than the original investment, the further interpolation be carried on at lower rate. On the other hand, a higher rate should be tried if the PV of cash inflows is higher than the original investment. This process continues till the PV of cash inflows and the original investment are equal or nearly equal. However, the exact rate of return can be ascertained with the help of the following formula :

**$IRR = \text{Lower rate} + (\text{Positive NPV} / \text{Difference in calculated present values}) \times \text{Difference in rate}$**

### **Accept or Reject criterion**

Accept the project if the IRR is higher than or equal to minimum required rate of return. The minimum required rate of return is also known as cut off rate of firm's cost of capital. While evaluating two or more projects, project giving a higher IRR should be preferred.

**Merits of IRR Method** (i) All cash inflows of the project, arising at a different points of time are considered. (ii) Time value of money is taken into account. (iii) Decisions are immediately taken by comparing IRR with the cost of capital. (iv) It helps in achieving the basic objective

of maximisation of shareholders wealth. All projects having IRR above the cost of capital will be automatically accepted.

### **Limitations of IRR Method**

(i) Computation of IRR is quite tedious and it is difficult to understand.  
(ii) Both NPV and IRR assume that the cash inflows can be reinvested at the discounting rate in the new projects. However, reinvestment of funds at the cut-off rate is more appropriate than at the IRR. Hence NPV method is more reliable than IRR for ranking two or more projects.

(iii) It may give results inconsistent with NPV method. This is especially true in case of mutually exclusive projects i.e., projects where acceptance of one would result in the rejection of the other.

Such conflict of results arise due to the following :

a) Differences in cash outlays (b) Unequal lives of projects c) Different pattern of cash flows.

### **Computation of Internal Rate of Return (IRR)**

**Present value factor= Initial investment/ CFAT**

Ex 8. (Uniform CFAT)

Initial outlay Rs. 1,00,000 ; Life of the asset 6 years; Estimated cash inflow Rs. 20,000. You are required to calculate internal rate of return (IRR).

$$= 1,00,000 / 20,000 = 5$$

The present value factor is to be found out in the present value annuity table in the column of 6 years (life of the asset). The figure 4.917 (nearer to 5) is found in the row of 6%. Therefore, the IRR is 6%.

Ex 9. A job which is presently done entirely by manual method has a labour cost of Rs.46,000 a year. It is proposed to install a machine to do a job which involves an investment of Rs. 80,000 and an annual operating cost of Rs. 10,000. Assume that the machine can be written off in 5 years on straight line depreciation basis for tax purposes. Salvage value at the end of its economic life is zero. The tax rate is 55%. Analyse the economic implications of the proposal by the IRR method.

<b>Solution</b> : Statement showing Cash Inflow (CFAT)	Rs.
Cost savings (lower running expenses i.e., 46,000 -10,000)	36000
Less : Tax @ 55%	19800
	-----
	16200
Tax advantage on depreciation 80,000/5 =16,000 x 55% )	8800
	-----
CFAT (1-5 Years)	25000
	-----

### Computation of Internal Rate of Return (IRR )

P.V. Factor = Initial investment /CFAT = 80,000/ 25,000 =3.2

PV Annuity table shows the closest factor to 3.2 is 3.199 at 17%, rate of discount against 5 years. Thus the IRR is 17%.

Economic Implications: The Proposal Should be accepted only when the firms cost of capital is less than 17%. Otherwise, the present method of doing work manually should continue.

Ex 10. Calculate IRR from the following data:

Initial investment Rs. 1 20,000 ; Life of the asset 4 Years;

Estimated net annual cash flows

Year 1- Rs, 30,000; Year 2 = R. 40,000; Year 3 Rs. 60,000;Year 4 Rs. 40,000.

Solution : Since the annual cash inflows are not uniform, the P.V factor will have to be located for determining IRR.

P.V. factor =Initial investment/Average cash inflow per year

Average cash inflow=1,70,000/4 years=Rs. 42 500

P.V. factor = 1,20,000/ 42500 = 2.8235

Closest present values to 2.8235 from Annuity Table II for 4 years are 2.914 14% and 2.855 at 15%. So, the IRR can be interpolated by trial and error process using discount rates of 14% and 15%.

Statement showing NPV

Year	CFAT	PVFactor @ 14%	Present value	PVFactor @ 15%	Present value Rs.
1	30,000	0.877	26,310	0,869	26,070
2	40,000	0.769	30,760	0.756	30,240
3	60,000	0.674	40,440,	0.657	39,420
4	40,000	0.592	23,680	0. 571	22,840
Total P.V. of cash inflows			121,190		1,18,570
Less : P.V. of cash outflow (1,20,000 x 1)			1,20,000		1,20,000
NPV			1,190		- (1430)

At IRR, total present value of cash inflows should be equal to present value outflow. Initial investment is Rs, 1,20,000. Hence the IRR must be in between 14% and 15%.

The exact IRR is calculated as follows :

**IRR = Lower rate + (Positive NPV/ Difference in calculated present values) x Difference in rate**

$$= 14\% + (1,190 / (1,21,190 - 118570)) * (15\% - 14\%)$$

$$= 14\% + (1,190 / 2620) * 1\% = 14.45\%$$

$$= 14\% + 0.45 \times 1\% = 14.45\%$$

