Capital Budgeting

Introduction:

Capital budgeting decisions are decisions of the firm to invest in long term assets/ fixed assets in expectation of future stream of benefits measured over a series of time period. It therefore relates to fixed assets management and capital expenditure decisions. Capital budgeting decisions are important because –

- They influence firm`s growth in the long term
- They affect the risk of the firm
- They involve commitment of large amount of funds

Such decisions may pertain to expansion or diversification of existing business and even replacement and modernisation decisions. Hence **capital budgeting refers to entire process of generating, evaluating, selecting and following up on capital investment alternatives.** Generally capital expenditure plans are based on criteria of accept-reject decisions, mutually exclusive decisions and capital rationing decisions.

Investment Evaluation Criteria:

Average Rate of Return (ARR) — Average rate of return is expressed by below mentioned formula—

$$\text{ARR} = \frac{\text{Average annual profit after tax (PAT) X 100}}{\text{Average investment over the life of the project}}$$

Average profit after taxes is determined by adding thee after-tax profits expected for each year of the project`s life and dividing the result by number of years. Average investment is determined by dividing the net investments by two. Average investment is computed by dividing net investments by 2.

Average investment = Net Working Capital + Salvage value + ½ (Initial Cost of machine –salvage value).

ARR is to be compared with pre-determined or minimum required rate of return or cut-off rate. Accept the project if actual ARR is higher than minimum desired ARR. ARR easy to compute and understand. However, accounting income is used of cash flows and it does not take into account the time value of money. It does not differentiate between the size of investment of each project.

Payback Method- This method tells us as to how many years it will take for the cash benefits to pay the original cost of an investment, normally disregarding the salvage value.

Payback= Investments / Constant annual cash flow

If the cash flows are uneven, the PB (payback) is calculated by the process of cumulative cash flows till the time cumulative cash flows become equal to the original ; investment outlay. Actual payback is to be compared with pre-determined payback; if the actual payback is less than pre-determined payback and hence the project with the shortest payback period will be selected. Unlike the ARR approach, this method is based on cashflows and not on accounting profits. However, the payback method also does not consider time value of money.

Net Present Value (NPV) or Discounted Cash Flow (DCF) Method- Net present value may be explained as the summation of all present values of future cash proceeds in each year minus summation of present values of cash outflows in each year. In terms of formula, NPV is expressed as under –

$$NPV = \sum_{t=1}^{T} \frac{C_t}{(1+r)^t} - C_o$$

Where,
C_t = net cash inflow during the period
C_o= initial investment
r = discount rate
t = number of time periods

Accept the project if the NPV is positive and reject it if the NPV is negative; note that if NPV is zero, it would mean that the firm is indifferent to accepting or rejecting the project. NPV method recognises time value of money. It is particularly used in selection of mutually exclusive projects. It may be noted if a project has higher NPV, the project may be selected, and however, the project may involve larger initial investment outlay compared to the other project with lower NPV. Such decisions are difficult to make in practice.

Internal Rate of Return (IRR) –Like the NPV method, even IRR approach considers time value of money by discounting cash flows. It must be noted that the basis of discount factor is different in both methods. In case of NPV approach, the discount rate is the required rate of return which is pre-determined rate being cost of capital. The cost of capital is independent of the proposal under consideration. On the other hand, the IRR model is based on facts which are internal to the project proposal. It considers the initial outlay and cash proceeds of the project that is being evaluated for acceptance or rejection. It is the rate of return generated by the project. It equates the sum total of PVs of net cash flow with the aggregate PVs of cash outflows of project and gives the project NPV as zero.

$$0 = (\text{investment}) + \frac{CF_1}{(1+IRR)^1} + \frac{CF_2}{(1+IRR)^2} + \frac{\Sigma CF_t}{(1+IRR)^t}$$

If actual IRR exceeds the required rate of return (hurdle rate or cut-off rate), the project would be accepted, else rejected if actual IRR is less than the hurdle rate / cut-off rate. There are two methods of arriving IRR depending on whether cash flows are annuity or mixed streams—

For annuities—

1. Determine payback period of proposed investment
2. From the PV of an annuity, look for payback period which is equal to or closest to the life of project
3. In year row, find two values or discount factors closest to PB (payback), which is higher and smaller than the PB.

$$\textbf{IRR} = r - \left(\frac{PB - DFr}{DFrl - DFrh} \right)$$

PB = Payback period; DFr = Discount factor for interest r
DF rl= Discount factor for lower interest r
DF rh = Discount factor for higher interest r

Alternatively,

$$IRR = r - \left\{ \frac{PVCO - PVCFAT}{\triangle PV} \right\} X \triangle r$$

Where,
PV Co= Present value of cash outlay
PV CFAT = Present value of cash inflows
r= Either of the two interest rates used in the formula
$\triangle$ PV = Difference in computed PVs of inflows

For a mixed stream of cash flows—

1. Compute average annual cash flow to arrive at fake payback period
2. Determine fake payback period (dividing initial outlay by average annual CFAT) arrived in step 1.
3. Look for factor in PV of annuity table closest to fake payback period as what was done in IRR under annuity method. This will be an approximation of the IRR based on the assumption that mixed stream of cash flows
4. Adjust the IRR obtained in step 3 by comparing the pattern of average annual cash flows as per step 1 to actual mixed stream of cash flows. If the actual cash flows happens to be higher in the initial years than average stream, adjust the IRR a few percentage points upwards
5. Find out PV of mixed stream of cash flow, taking the IRR as discount rate as estimated in step 4
6. Compute the PV, using discount rate. If the PV of CFAT equals initial outlay, that is NPV is zero, it is the IRR. Otherwise repeat step 5.

Profitability Index

This is similar to the NPV approach. It measures the PV of returns per rupee invested while the NPV is based on the difference between PV of future cash inflows and PV of cash outlays. The project will be accepted if its PI exceeds 1; however if the PI is equal to 1, then the firm is indifferent to the project.

Profitability Index (PI) = PV of cash inflows / PV of cash outflows

Problem 1- Excel Engineering is considering an investment proposal to install a new machinery at a cost of Rs.50,000. Machinery has a life expectancy of 5 years and no salvage value. Tax rate is 35%. The company uses straight line method of depreciation. The estimated profit before tax and depreciation is given below –

Year	PBDT (Rs)
1	10,000
2	10,692
3	12,769
4	13,462
5	20,385

Calculate a) Payback period b) ARR c) NPV (at 10%) d) IRR e) PI (at 10% discount rate)

Problem 2- Following is the data relating to two machines A and B.
Compute – a) ARR b)Payback period c) NPV (Discount rate 10%) d) NPV

	Machine A	**Machine B**
Cost (Rs)	56,125	56,125
Estimated income after depreciation and tax		
Year 1	3,375	11,375
Year 2	5,375	9,375
Year 3	7,375	7,375
Year 4	9,375	5,375
Year 5	11,375	3,375
Estimated Life	5	5
Estimated Salvage Value (Rs)	3,000	3,000

Problem 3- A project costing Rs.5.60 lakhs is expected to produce annual cash benefits of Rs.80,000 over 15 years. Estimate IRR.

Problem 4- Raj Textile Co. is considering two mutually exclusive investment proposals for its expansion program. Project A requires an initial investment of Rs.7.5 lakhs and yearly operating costs of Rs.50,000. Proposal B requires initial investment of Rs.5 lakhs and yearly operating costs of Rs.1 lakh. Life of the equipment used in both investment proposals will be 12 years with no salvage value. Depreciation is on straight line basis. Anticipated increase in revenue is Rs.1.5 lakh for both projects. Tax rate is 35% and cost of capital is 15%. Which investment proposal should be selected by the company?

Problem 5- Pheonix Industries Ltd does few jobs using manual labour which has a cost of Rs. 46,000 per annum. It is proposed to install a machine to undertake these jobs which involve an investment of Rs.80,000 and annual operating cost of Rs.10,000. The machine can be written off in 5 years on SLM basis of depreciation. Analyze the investment proposal using IRR method assuming tax rate of 55% and cost of capital of 12%.