

CHAPTER 2: Capital Budgeting

Capital Budgeting deals with committing funds on a long term basis. While doing this various alternatives of investments are analysed keeping in view the strategic objectives and goals of the organisation. Analysis includes, considering risk return aspects, social cost benefit aspects, probabilities, inflationary conditions, option methods, sensitivity analysis, etc. Even replacement decisions involving large outflows fall under this category.

To select project(s) among alternatives, the following factors are looked into:

Market Feasibility: Factors like, Economic Indicators, Demand Estimation, End User Profile, Influencing Factors, Market Potential, Infrastructure Facility, Demand Forecasting, Supply Estimation, Competition, Critical Success Factors, Demand Supply Gap, etc. are looked into.

Financial Feasibility: Factors like, Projected Prices of Products, Product Life Cycle, Financing Alternatives, ROI, DSCR, NWC, NPV, IRR, D / E Ratio, Projected Cashflows, Profits, Balance Sheets, Working Capital, Risk Assessment, etc. are looked into.

Technical feasibility: Factors like, Suitability of Technology, Nearness and Easy Availability of Raw Materials, Ability to Absorb Technological Innovations, Technical Knowhow, Logistics, Plant Layouts, Production Processes, Labour Availability, Environmental and Pollution Control Issues, Effluent Disposal Methods, etc. are looked into.

Contents of a Project Report: A project report includes the following:

- a. Promoters;
- b. Industry Analysis;
- c. Economic Analysis;
- d. Technical Analysis,
- e. Financial Analysis;
- f. Social Cost Benefit Analysis;
- g. SWOT Analysis;
- h. Project Implementation Schedule

Post Completion Audit: Post-completion audit evaluates actual performance with projected performance of **both revenues and costs**. Post completion audit is the most neglected aspect of capital budgeting, reasons being:

- a. Difficulty to identify and segregate cashflows;

- b. Apprehension among project team members that such audit will be used to initiate punitive measures on them.

First problem can be overcome by using estimates where correct figures are not available and for second members are to be educated on such practice as it improves in learning.

The **advantages** of conducting a post completion audit are:

- a. Experience gained is highly valuable and is very helpful in executing future projects.
- b. Individuals with superior abilities in planning and forecasting can be identified.
- c. It serves as a useful training ground for promising executives needing experience in a variety of activities during project execution stage
- d. It helps in discovering biases in judgment.
- e. It induces healthy caution among the sponsors of projects as projects sponsors make over-optimistic projections for their proposals.

As post completion audit involves time and cost, it should be selectively used for large projects.

Post completion audit can be started either at the time of starting the project or during the course of the project or after the completion of the project. Doing simultaneously as project progresses helps in taking corrective actions at an early date.

To avoid bias and maintain independence, post audit should be done by persons not connected with project.

Project Cost Accounting: This is an activity which supports the project management. Utilisation statements are prepared on a regular basis to know the status of the project. Further, important cash outflows headwise and party wise and cost to completion statements are also prepared along with summaries to ascertain the status of project at a glance.

This starts with budget (cost of the project) as benchmark. Importance is given more to timely presentation of information rather than accuracy of the statement. Very often a Couple of days delay in tabling the statement has more adverse impact than an error of a couple of lacs in the statement.

Social Cost Benefit Analysis (SCB): S C B analysis is an evaluation of projects from the point of view of society as a whole. S C B sometimes changes the very outlook of a project as it brings elements of study which are unconventional yet very relevant. It assesses gains / losses to society as a whole from the acceptance of a particular project rather than the usual NPV, IRR etc. Methods. A project with substantial negative NPV could also be

accepted, if it causes more social benefits in the interest of society (eg. An infrastructure road project, construction of dam etc.). Similarly a project may be discarded even though it has acceptable IRR and very good positive NPV if it causes harm to environment or generates high pollution. UNIDO (United Nations Industrial Development Organisation) advocates aggregate consumption as unit of measurement whereas, OECD (Organisation for Economic Cooperation and Development) advocates uncommitted social income in the hands of the government as yardstick of measurement.

Commercial evaluation of projects is not enough to justify commitment of funds to a project especially when the project belongs to public utility and irrespective of its financial viability it needs to be implemented in the interest of the society as a whole. Huge amount of funds are committed every year to various public projects of all types—industrial, commercial and those providing basic infrastructure facilities. Analysis of these sorts of projects is done on social cost benefit basis. These sorts of projects are mostly undertaken by Government.

S C B is also important for private corporations who have a moral responsibility to undertake socially desirable projects, use scarce natural resources in the best interests of society, generate employment and revenues to the national exchequer.

Indicators of the social contribution include:

- a. Employment potential criterion;
- b. Capital output ratio – that is the output per unit of capital;
- c. Value added per unit of capital;
- d. Foreign exchange benefit ratio.

NPV & IRR Methods: These are the two most important methods of evaluating capex proposals. NPV and IRR methods differ and in certain cases they give contradictory results on acceptance of capex proposals. If the NPV method finds one proposal acceptable, IRR may favour another and vice versa. The different rankings given by the NPV and IRR methods could be due to size disparity, time disparity, unequal expected lives etc.

The net present value is expressed in financial values whereas internal rate of return (IRR) is expressed in percentage terms.

IRR is the rate at which the present value of cash outflows equals the present value of cash inflows thus making the NPV zero. The higher the rate, the better it is (as in case of NPV) and projects with higher IRR are accepted in priority to projects with lower IRR.

In net present value cash flows are assumed to be re-invested at cost of capital rate, whereas, In IRR re-investment is assumed to be made at IRR rates.

IRR is also known as Economic Rate of Return (ERR) or Discounted Cashflow Rate of Return (DCFRoR)

NPV Vs. Standard Deviation Vs. Coefficient of Variation: When two or more projects have same NPV, then projects are selected on the basis of their standard deviations. Project with least S D is ranked one and so on. In case Coefficient of Variation is calculated and if the result of Coefficient of Variation contradicts the result of S D, then, project ranking is done on the basis of NPV method. This is because under NPV method wealth maximisation is considered on the basis of time value.

Present Value of Perpetual Annuity: In case of perpetual annuity the true value of the stream of cash flows cannot be ascertained as such stream goes to infinity. However, the present value of a perpetual annuity can be calculated as the present of value of the annuity, receivable after several years will be very very low and tends to zero eventually. The formula is:

$$\text{Present Value (P V)} = \text{Annuity (A)} / \text{Cost of Capital (K)}$$

Coefficient of Variation is calculated by the formula:

$$\text{Coefficient of Variation} = \text{S D} / \text{Expected NPV}$$

Profitability Index (PI): This is the ratio of payoff to investment of a proposed project. This is a useful tool for ranking projects because it quantifies the amount of value created per unit of investment. Project is accepted if P I is greater than one and vice versa. Higher the P I, the more better it is. This calculated by the formula:

$$\text{P I} = \text{P V of Future cash Inflows} / \text{Initial Investment}$$

Types of IRR: IRR is calculated under various methods depending on requirements.

- a. **Project IRR:** This indicates the rate of return required to earn back the invested amount. In this case, whether the funds invested are equity funds or debt funds is not considered. i.e. it ignores the pattern of financing of the project. So, total outflow of funds in respective years and total inflows relating to such outflows are considered for calculating IRR.

- b. **Equity IRR:** In this case, equity cash outflows and cash inflows relating to equity holders in respective years are considered to work the IRR.
- c. **Accounting IRR:** In this case, cash outflows (both debt and equity) and cash inflows of the project worked on the principles of accounting are considered to calculate the IRR. Cash inflows are calculated by the method of PAT + Depn. – Loans repaid etc.

While evaluating a foreign proposal, following issues are to be looked into:

A. Taxes:

- a. Many countries rely heavily on indirect taxes such as excise duty; value added tax and turnover taxes etc.
- b. Definition of taxable income differs from country to country and also some allowances e.g. rates allowed for depreciation etc.
- c. Some countries allow tax exemption or reduced taxation on income from certain “desirable” investment projects in the form of tax holidays, exemption from import and export duties and extra depreciation on plant and machinery etc.
- d. Tax treaties entered into with different countries e.g. DTAAs’ etc.
- e. Offer of tax havens in the form of low or zero corporate tax rates.

B. Political risks: The extreme risks of doing business in overseas countries can be seizure of property / nationalisation of industry without paying full compensation. There are other ways of interferences in the operations of foreign subsidiary e.g. levy of additional taxes on profits or exchange control regulations may block the flow of funds, repatriation, restrictions on employment of foreign managerial / technical personnel, restrictions on imports of raw materials / supplies, regulations requiring majority ownership vetting within the host country.

Economic risks: The two principal economic risks which influence the success of a project are exchange rate changes and inflation. The impact of exchange rate changes and inflation upon incremental revenue and upon each element of incremental cost needs to be computed.

Capital Budgeting Under Risk and Uncertainty: Risk indicates variability of possible outcomes from the expected. Risk is measured by calculating the variance and / or standard deviation.

In case there are several projection of cashflows for each period with multiple probabilities, then there will be several NPVs’ and IRRs’. In such case NPV is calculated by the formula,

Where,

A_t^- is the expected cashflow in period t and R_f is risk free rate of interest. Standard deviation (when correlation of cashflows is not specified) is calculated by the formula:

Where,

Standard deviation of possible net cashflows in period t.

When Cash flows are **perfectly correlated** over time, i.e. when cash flows of period t depend on the cashflows of period t-1, then, standard deviation is calculated by the formula:

In case cashflows are **moderately correlated** then standard deviation is calculated by the formula,

Where NPV is the net present value for series t of net cash flows covering all periods, NPV^- is the mean net present value of the proposal and P_t is the probability of occurrence of that specific series.

Risk in capital budgeting is essentially dealt in the following ways:

- a. **Risk adjusted discount rate method:** This is based on the concept that as risk increases, the return expected by investors also increases. Hence required rate of return will be risk free rate + normal risk rate + additional rate for special risk to offset the special risk being undertaken. However, it is difficult to ascertain the rate that needs to be included to offset different types of risks.
- b. **Certainty equivalent method:** In this method, risk free cashflows are compared with the expected cashflows of the project. Steps involved under this method are:
 - i. Removing risk from risky cash flows and ascertaining certain cashflows. This is done by multiplying each risky cash flow by the appropriate α_t value (CE coefficient)
 - ii. Ascertaining Discounted cash flows by applying risk less rate of interest.
 - iii. Applying normal capital budgeting methods except in case of IRR method, where IRR is compared with risk free rate of interest rather than the firm's required rate of return.
- c. **Sensitivity analysis:** Sensitivity analysis is a process through which the end results of the project are studied by changing the input variables one at a time. For instance, how NPV, IRR, payback period etc. change if the sale price falls by 10% than assumed or how the end indicators change if

the raw material prices fall by 5% etc. This sort of study is made by changing input variables one at a time in the positive and negative directions and the changes in end indicators are recorded and compared. These types of observations help in studying the risk factors that are involved in the project. This sort of analysis can be applied in several operating functions apart from capital budgeting decisions. This analysis is also known as “What if” analysis.

Sensitivity analysis helps significantly when the projects are associated with risk and uncertainty. This method only helps in measuring the risk and uncertainty but does not remove it. Sensitivity analysis involves three steps:

- i. Identification of variables having an influence on the project’s NPV or IRR.
- ii. Definition of relationship among the variables.
- iii. Analysis of the impact of the changes in each of the variables on the NPV / IRR of the project.

Advantages:

- i. Identifying Critical Variables and studying their impact on end results provides better insight into the project.
- ii. Simple to use and apply.

Disadvantages:

- i. Assumes that variables are independent in their behaviour which is rarely the case.
 - ii. Ignores the probability of the changes in variables.
- d. **Scenario analysis:** In this analysis probability distributions are considered and multiple variables are changed at a time and the outcomes are studied. The outcomes are studied in different scenes such as optimistic scene, Most likely scene and pessimistic scene and other variant scenes between optimistic and pessimistic scenes. This analysis begins with base case or most likely set of values for the input variables. Then, go for worst case scenario (low unit sales, low sale price, high variable cost and so on) and best case scenario.

In other words, scenario analysis answers the question “How bad could the project look” or “how best the project could look” and the intermediate scenarios. As this analysis gives the best, worst and the intermediate scenarios, it gives the whole range of the possible outcomes of the project.

e. Simulation: In this method a model of the project is prepared and key factors affecting the project and their inter relationships are studied. This involves the following steps.

- i. Modelling the project- The model shows the relationship of N.P.V. with parameters and exogenous variables. [Parameters are input variables specified by decision maker and held constant over all simulation runs. Exogenous variables are input variables, which are stochastic (i.e. Random, say number of customers visiting a store etc.) in nature and outside the control of the decision maker].
- ii. Specify values of parameters and probability distributions of exogenous variables.
- iii. Select a value at random from probability distribution of each of the exogenous variables.
- iv. Determine N.P.V. corresponding to the randomly generated value of exogenous variables and pre-specified parameter variables.
- v. Repeat steps (iii) & (iv) a large number of times to get a large number of simulated NPVs.
- vi. Plot probability distribution of NPVs and compute a mean and Standard Deviation of returns to gauge the project's level of risk.

f. Decision tree analysis: This type of analysis is used when a sequence of decisions is to be taken in a project and each decision has got alternatives at every stage. At every stage of decision making, the alternatives are plotted like a tree and evaluated considering the probabilities of occurrence of such activities and end results are arrived. This involves the following steps:

- i. Defining investment: Whether or not to launch a new product,
- ii. Identification of Decision Alternatives: Whether the product is to be launched locally, nationally or internationally etc.
- iii. Drawing a decision tree: After identifying decision alternatives, all the relevant data such as the projected cash flows, probability distribution, expected present value etc. should be put in diagrammatic form called decision tree.
- iv. Evaluating the alternatives: After drawing the decision tree, alternatives are to be evaluated.

Rules for drawing Decision Tree:

- i. Decision Tree is drawn from left to right.
- ii. Decision point is represented by square. This place indicates the place where the manager intends to take or not to take the particular course of action. Values and probabilities of each branch are incorporated.

- iii. Outcome of an action is represented by circle. Outcome of an action is dependent on chance process, along with the probabilities thereof, and monetary value associated with them.
- iv. Calculations are made from right to left and at each decision point, best value is considered and rest are ignored. This is done till the start point is reached.
- v. The path which gives highest value is selected.

Capital Budgeting Under Capital Rationing

When there is a scarcity of funds, capital rationing is resorted to. Capital rationing means the utilization of existing funds in most profitable manner by selecting the acceptable projects in the descending order of ranking with limited available funds. The firm must be able to maximize the profits by combining the most profitable proposals. Capital rationing may arise due to:

- i. High rates of interest;
- ii. Non availability of funds due to adverse Debt-Equity Ratio;
- iii. Internal Constraints Imposed by management; etc.

IRR or NPV are the best basis of evaluation even under Capital Rationing situations. The objective is to select those projects which have maximum and positive NPV. Preference should be given to interdependent projects. Projects are to be ranked in the order of NPV. Where there is multi-period Capital Rationing, Linear Programming Technique should be used to maximize NPV. In times of Capital Rationing, the investment policy of the company may not be the optimal one.

Capital Budgeting Under Inflation:

Project Appraisal normally involves feasibility evaluation from technical, commercial, economic and financial aspects. The project cash outflows usually occur initially and inflows come in the future.

During inflationary conditions, the project cost increases on all heads viz. labour, raw material, fixed assets such as equipments, plant and machinery, building material, remuneration of technicians and managerial personnel etc. Besides this, inflationary conditions erode purchasing power of consumers and affect the demand pattern. Thus, not only cost of production but also the projected statement of profitability and cash flows are affected by the change in demand pattern. Even financial institutions and banks may revise their lending rates resulting in escalation in financing cost during inflationary conditions. Under such circumstances, project appraisal has to be done generally keeping in view the following guidelines which are usually followed by government agencies, banks and financial institutions:

- i. Provisions for cost escalation on all heads of cost, keeping in view the rate of inflation likely during the period of delay in project implementation are to be made.
- ii. The various sources of finance should be scrutinised with reference to future rates of interest by the lenders.
- iii. Adjustments should be made in profitability and cash flow projections to take care of the inflationary pressures affecting future projections.
- iv. It is also advisable to examine the financial viability of the project at the revised rates and assess the same with reference to economic justification of the project. The appropriate measure for this aspect is the economic rate of return for the project which will equate the present value of capital expenditures to net cash flows over the life of the projects.
- v. The rate of return which takes into account rate of inflation also should be accepted.
- vi. Projects having early payback periods should be preferred because projects with long payback period are more risky.

Capital Asset Pricing Model Approach to Capital Budgeting:

The Capital Asset Pricing Model is based on the presumption that total risk of an investment (represented by variance) consists of two components (1) Systematic risk (2) Unsystematic risk. Systematic risk arises due to economic factors e.g. inflation, governmental expenditure, money supply, having a bearing on the existence of every firm although the level of effect vary from firm to firm. Systematic risk cannot be overcome by diversification. Unsystematic risk arises from factors which are specific to a firm: development of a new process, plant breakdown, access to market, etc. It can be eliminated by diversification.

Ascertaining the Beta of a project consists of finding the regression relationship between the series of one period return on the security and the series of one period return on the market index.

Zero Date of a Project:

Zero Date of a Project means a date that is fixed to indicate the start of a project. It is a starting point of incurring cost. The project completion period is counted from the zero date. The pre-project activities that should be completed before zero date are:

- a. Identification of project / product;
- b. Determination of plant capacity;

- c. Selection of technical help / collaboration;
- d. Selection of site;
- e. Selection of survey of soil / plot etc.;
- f. Manpower planning and recruiting key personnel;
- g. Cost and finance scheduling; etc.

Questions:

- a. What are the issues that need to be considered by an Indian investor and incorporated within the Net Present Value (NPV) model for the evaluation of foreign investment proposals?
- b. Distinguish between Net Present-value and Internal Rate of Return.
- c. Write short note on Certainty Equivalent Approach.
- d. What is the sensitivity analysis in Capital Budgeting?
- e. Write short note on Social Cost Benefit analysis.
- f. Comment briefly on the social cost benefit analysis in relation to evaluation of an Industrial project.
- g. Write a brief note on project appraisal under inflationary conditions.
- h. What is Capital rationing?
- i. Explain the concept 'Zero date of a Project' in project management.
- j. What are the steps for simulation analysis?

