CHAPTER-1

ECONOMIC DECISION MAKING

LEARNING OBJECTIVES

- → Economic Decision making-: Overview
- → Scope of Economic Decision for the Engineers / Role of Engineers in Economic Decision Making Process
- → The Environment of Economic Decision Making or Problems in Economic Decision Making Process:
- → Economic Decision Making Process or Steps in Decision Making Process
- → Aids or Techniques of Economic Decision Making:
- → Exercise

ECONOMIC DECISION MAKING-OVERVIEW

Decision making is the pre-planned course of action taken for a particular time period for meeting some specific objectives. Suppose you are a student of engineering which will be completed next year. Hence you are going to take decision whether you should attempt for campus interview and take a job or you should continue your further studies like M.Tech or MBA. Now the next question comes to your mind that if you go for a job what will the amount of salary and your future prospect like promotion and better job opportunity in your life. On the other if you go for further study whether you will pursue M.Tech or go for MBA. That is which one will be better for your life and for this you have to analyze all the pros and cons of these degree and its future prospects in terms of salary, promotion, top placement, job satisfaction and future prospect. These all depends on your personal perception and analytical ability together with your foresightness and ambition for a better future. In every moment some type of decision simple or complex every human being are taking for getting some fruitful objective. This does not mean that every decision in your life will be valuable one and you will get favorable outcome of every decision making process.

The same is true for business decision also. Economic decisions are the future course of action for any economic activity which has a definite outcome in the economy and for the society. If you do not take the opportunity of getting jobs through campus interview for your better life and go for higher study that means you are sacrificing something i.e. a better job which has some opportunity cost. The logic is obviously for a bright future in terms of education, high salary or profit if you are entrepreneur, satisfaction, job enrichment, prestige and so many. This does not mean that even after further study you will get many things in your life what exactly you have decided to forego just after passing your graduate engineering degree. It may so happen that your further study may be useless you have bagged due to bad market situation and recession in the economy. Therefore, your guess and accurate foresightness will definitely help you to do better and for this you have to sacrifice an opportunity in the past. It is difficult to get complete rationality because of uncertainties involved in the future, the limitations to recognize all the available alternatives that might be followed to project a goal. And for this, a person must consider all the barriers and hindrances that may come in the near future while taking a decision and must take all the rational and real data's to reach a conclusion.

The above example has been given for an easy understanding to the students but the examples are

used in a narrow sense. Our discussion will be extend in terms of economic decision every business or firm has to take.

Economic decision making is the process of evaluating various alternative courses of action within the allowable constraints to get valuable result for which economy of a country will get benefited.

SCOPE OF ECONOMIC DECISION FOR THE ENGINEERS / ROLE OF ENGINEERS IN ECONOMIC DECISION MAKING PROCESS:

The role of engineers in economic decision making process is limitless. They are the architect for the economic growth of a country through different economic decision making process which is very valuable for the firms and the society. The role and importance of economic decision making process are discussed below:

The different types of decision an engineer has to take in an economy are

(i) Make or buy decision: Make or buy decision is very important to the management of a company. For this purpose an engineer has to evaluate the cost of manufacturing goods and it has to compare with the suppliers price. If supplier's price is lower than making the goods the company should purchase the goods to increase their profit. While calculating manufacturing cost only variable cost is to be considered.

(ii) Purchase of assets or taken on leases: This is another important decision whether a firm will purchase assets or taken on lease. Many things has to be taken into consideration while taking decision regarding purchase of asset or taken on lease such as cost of finance, discounted value, tax considerations, lease rent, ownership of assets etc.

(iii) Replacement of an asset or heavy repair and maintenance: An engineer has to take part in a very complex decision that is whether the machines and equipment used in a factory is to be replaced immediately or not. The old machines are known as 'Defender' and the new machine are known as 'Challenger'. If as a result of replacement 'Challenger' proves to be most economical in terms of cost, capacity, efficiency, speed technology and many other factors, 'Challenger should be accepted otherwise not.

(iv) Depreciation on the basis of historical cost or on the basis of current market price: There is an inflationary effect on the goods and services in any economy. Depreciation is a provision made for replacement of assets in the near future. The question is if depreciation is provided on the basis of historical cost only there will be shortages of provision for depreciation and the firm has to face problem of cash at the time of replacement of assets. Hence an analyst should consider this adverse situation and should calculate depreciation on the basis of current market price of assets.

(v) Time value of cash inflows: This is the most practical approach and scientific method for evaluating investment proposals. Money has a time value. This method recognizes this and converts the expected future cash inflows into their present value. Net present value is determined by discounting all cash inflows and cash outflows of a project or for the projects by choosing a minimum required rate of return. Initial investment is deducted from the total present value to find out NPV. If the NPV is positive then the project is acceptable. An engineer should take into consideration the time value of cash flows while evaluating a project.

(vi) The effect of inflation on the assets and profitability of the company: Inflation is a part of day-to-day life now. Almost every country of the world suffers from the limitations of inflationary pressure. India is no exception. Even double digit inflation erodes purchasing power of the peoples of our country. Hence before appraisal any project the effect of inflation must have to be considered. This is required for the following reasons:

(a) A project generally have long period of time say five to ten years.

(b) Discounting of cash flow at cost of capital rate is not only the benchmark for selection of a project.

(c) During inflationary conditions, the cost of project is bound to increase on all heads viz materials, labour cost and overheads.

The above effect of inflation on all heads should be seriously considered while evaluating a project.

(vii) Pay-back period of a machine or project: Machine pay-back period is also one of the important

factors for replacement of machine. Pay-back period calculates the time of recovery of original cost of an asset or of a project. Under this method various alternative projects are evaluated and ranked according to the earlier pay-back period of recovering original investment.

(viii) Cash flow pattern of a project: Cash flow statement may be defined as a logical and systematic statement which shows the changes in cash position by considering and analyzing the various sources of cash inflows and various areas of cash outflows. The cash flow statement shows the effect of all cash transactions over a period of time. It highlights the causes of changes in cash balance between two balance sheet dates. Cash flow statement shows the various sources of inflow of cash and also shows the areas where the cash outflow has been made.

(a) Cash flow is required for project's rate of return such as internal rate of return and net present value.

(b) To determine the liquidity of business. Because profitability and liquidity is not same thing. Profitability does not mean that there is liquidity. A company may have huge shortage of cash even if there is high profitability.

(c) Many company measures profit on accrual basis and determined its net profit but in reality generating little operational cash. In such case, the company may be forced to finance its cash by taking loans or by issuing shares.

(ix) Ratio analysis, Break-even-analysis, Fund Flow and Cash Flow Statement, Simulation techniques and Decision theory: Different analytical tools are being used for evaluation of a project. These are:

(a) Accounting Ratio Analysis: Accounting ratio is the quantitative and qualitative relationship between any two accounting figure expressed in different ways such as times, months, days, percentage, proportion etc. In business different analysis is required for judging strength and weaknesses in different areas with the help of ratios. For this purpose, different financial statement is prepared like Fund Flow Statement, Cash Flow Statement, Balance Sheet, Profit and Loss A/c etc. Ratio analysis is made on the basis of different financial information expressed in financial statements. On the basis of ratio analysis, different valuable decision is taken by the management.

(b) Break-even Analysis: The Break-even point is that point of sales volume (in unit or in money value), where totals cost of a particular level of output is exactly equal with total sales revenue. In other words this is a point where neither profit nor loss arises. At this point of output level contribution is such an amount which is just sufficient to recover the total fixed cost. In many situation determination of break-even analysis gives some valuable information to the management for taking important decision.

(c) Fund Flow Statement: Fund flow statement is a statement which is prepared in a systematic, logical and analytical way to reflect the changes in financial resources of an entity for a definite period of time. In a fund flow statement a detailed analysis is made regarding the sources and application of funds. Funds which come in the firm are inflow and funds utilized by the firm are outflow of funds.

(d) Cash Flow Statement: Cash flow statement may be defined as a logical and systematic statement which shows the changes in cash position by considering and analyzing the various sources of cash inflows and various areas of cash outflows. The cash flow statement shows the effect of all cash transactions over a period of time. It highlights the causes of changes in cash balance between two balance sheet dates. Cash flow statement shows the various sources of inflow of cash and also shows the areas where the cash outflow has been made.

(e) Simulation: It is a quantitative technique that utilizes a computerized mathematical model in order to represent actual decision making under conditions of uncertainty for evaluating alternative courses of action based upon facts and assumptions.

Simulation provides a trial and error movement towards the optimal solution. The decision maker selects an alternative, experiences the effect of the selection and then improves the selection. In this way, the selection is adjusted until it approximates the optimal solution. The use of simulation enables a manager to provide insights into certain managerial problems where analytical solution of a model is not possible or where the actual environment is difficult to observe. For example, simulation is widely used in space flight or the charting of satellite.

(f) Decision Tree: Decision Tree is a pictorial representation shown in tree forms which are used for taking decision making in risky capital project. It shows chronologically all the expected outcomes of an

vestment by showing sequential cash flow and NPV of the expected project, probability and inter-relationship of all possible outcomes. An analyst should consider all the probable outcomes of a project by assigning probabilities while taking a decision for choosing a project.

(x) Risk and uncertainty of a project: Risk is the variability of returns which may accrue in future periods and is uncertain, depends on future happenings and may change unfavorably with the actual returns.

Whatever may be the nature of your business, risk is to be undertaken. Risk is inherent to any business activity and return i.e. profit is the outcome of the degree of risk taken by that entity. More risk more gain, no risk no gain and moderate risk moderate gain is true for almost every business activity.

Now, in today's competitive business world it is the most important duty of a Financial Manager to predict the risk carefully and should strike a balance between risk and profitability. If he is supposed to take a high risk to earn maximum profit rather it will be better to say to maximize the wealth of the shareholders, he will get maximum credit for this success. But if he fails to do so, he will have to take blame for that. So, up to what level you should take risk as a Financial manager depends on many factors such as nature of the business, demand, rate of interest on debt, future profitability, liquidity, volume of sales, utilization of production capacity etc. An analyst should consider the different methods of measuring risk and uncertainty such as standard deviation co-efficient of variation, Certainty equivalent, sensitivity analysis etc.

THE ENVIRONMENT OF ECONOMIC DECISION MAKING / PROBLEMS IN ECONOMIC DECISION MAKING PROCESS:

Economic decision making is not an easy task. For accurate decision making many important factors are to be considered such as certainty, uncertain situations, risk factors and output of the decision. An analyst has to face many problems while evaluating a project.

Project appraisal decision is a very important task for any business firm because of substantial investment and complexity. Any wrong decision regarding capital expenditure endangers and fatal for the company and even may out of existence. For this a financial manager must have an analytical ability, has to give focus on long term risk and return, time value etc. The importance and need of capital budgeting are discussed under the following points. A financial manager has to take decision regarding:

(i) Whether the company should invest in long term projects such as setting up a new industry, purchase of plant and machinery.

(ii) Replacement of plant and machinery, building etc.

(iii) Modernization, diversification, expansion and increase in capacity of the firm.

(iv) To make a choice out of many alternatives so that the firm can get maximum financial benefit

In an economic decision making environment a firm has to face many problems which an analyst has to take with serious concern. Besides, some economic decisions can be made on the basis of certain factors. These are discussed below:

(i) **Certainty:** Certainty in any economic decision making means the positive outcomes which can be projected with certainty and must occur. In other words for taking economic decision all the relevant and complete information is available in all respects. The decision maker has complete information regarding all the available alternatives and has a position to choose the best alternative. For example a firm is certain about demand of one of its product and only decision is to be taken whether the firm should purchase it from the market or manufactures it and for which all the relevant and complete information are available. After analyzing the alternatives the firm should choose any one of the alternative which will be best for the firm in monetary terms.

(ii) **Uncertainty:** Uncertainty is one of the important limitations for analyzing alternatives for taking any economic decision. Uncertainty in economic decision making arises if relevant and complete information's are not fully available for getting outcomes of each alternative. In these circumstances, an analyst tries to evaluate on the basis of his or her experience and personal expertise. Hence judgment is made in an individualized manner.

(iii) **Risk:** You almost cannot imagine a financial situation where an income from investment is risk free. Risk and return is like a twin and run almost in the same direction. Risk is the uncertain future probable events

which you may have to face at the time of actual happenings of the financial events. Greater is the risk more is the expected return or vice versa.

We are always facing risk. If you want to purchase a house after 2 years from now there is a risk of increasing prices. If you want to invest a part of your income after 2 years there is a risk of interest rate. If you import one machine from a foreign country and settle your bill after 3 months from now there is foreign exchange rate risk.

Like the same way each business entity are facing some risk for their future decision which is to be taken at present. Risk is the variability of returns which may accrue in future periods and is uncertain, depends on future happenings and may change unfavorably with the actual returns.

Now, in today's competitive business world it is the most important duty of a Financial Manager together with other functional managers to predict the risk carefully and should strike a balance between risk and profitability. So, up to what level a firm should take risk depends on many factors such as nature of the business, demand, rate of interest on debt, future profitability, liquidity, volume of sales, utilization of production capacity, technology etc.

(iv) **Scarcity of Resources:** Every firm has to face scarcity of resources be it human resources or cash or capital assets or any other factors. Technical feasibility, commercial and economic viability and managerial ability of the proposed project should have to take care of while evaluating a project. Hence within these constraints a firm has to plan and have to take decisions so that they can maximize their value.

ECONOMIC DECISION MAKING PROCESS OR STEPS IN DECISION MAKING PROCESS:

The decision making process is not an easy task for an analyst. For this he or she has to consider may things such as available resources, valuable data's, limiting factors or constraints, cost and benefit, time value, inflationary factors and so many. The steps for an economic decision making process is discussed below:

(i) Identify the Problem: First the decision making process starts with the identification of a problem which requires decision. There are different economic problems in an organization such as replacement of machinery or not, leasing or purchase of assets, taking a new project, expansion of a factory, expansion of market and so many. Hence the function of decision making is to recognize the problem accurately.

(ii) Analyze the Problem: After recognizing the problems, these are to be analyzed. For this purpose the real causes of the problem should have to be identified. For example, why should the firm replace the machinery? Is it becomes obsolete or working efficiency has decreased or for any other reasons. Why should the firm expand its factory? Is it due to increased demand of the market or for installing latest technology or any other reasons?

(iii) Develop Alternatives: Next part of an economic decision making process for an analyst to find out the different alternatives to make a solution be it make or buy or replacement of machine or repair, leasing or purchase of a machine, taking a new project or not etc. For this purpose he or she has to collect relevant projected data's and also have to consider all the limiting factors to judge a situation. For example, for expansion of a factory the analyst must consider all the limiting factors such as raising of finance, technical and feasible viability, cost-benefit analysis, availability of quality human resources, demand of the industry, availability of raw materials and even the tax effect and so many.

(iv) Evaluation of Alternatives: After getting available alternatives the next step is to evaluate the alternatives by using the following methods:

(a) Quantitative Factors: This are the factors which can be measured in numerical terms such as hypothesis definition, experiment, conceptions, assumptions, rationality, logical explanations, predictions and a trade-off among alternatives. Some of the techniques such as Linear Programming, Simulation, probability and decision making approach, marginal costing, ratio analysis, cash flow statement analysis, Network analysis, Replacement theory are to be thoroughly reviewed (discussed in detailed in different chapters).

(b) Qualitative Factors: Qualitative factors that are difficult to measure in numerical terms such as

goodwill, brand value, good labour relations etc. Utmost care should be taken to evaluate the intangible factors also to reach a concrete decision.

(c) Cost Effective Analysis: After evaluation of alternatives as discussed above the analyst should evaluate all the selected alternatives in terms of cost and benefit. While analyzing cost and benefit in monetary terms the effect of time value of money and inflation are to be considered. The alternatives which give highest net benefit or give least cost are to be selected.

(d) Marginal Analysis: This is a very important technique for comparison of additional revenue from additional costs for a project. Profits are maximized when additional revenues are equals with additional costs.

(e) Differential Analysis: Under this approach total cost and revenue are taken instead of marginal costs and revenue. This is known as incremental benefit and differential cost analysis. Under this analysis that alternative is chosen which gives highest net gain (Revenue minus cost).

(v) Select the best Alternative: After considering all the selected alternatives that alternative is chosen which will maximize the result under given conditions. The best alternative is chosen on the basis of experimentation, past experience, research and analysis of the alternatives.

(vi) Implementation and Follow up: After choosing the best alternative, it needs to be implemented. For this purpose the steps requires that (a) decision should be communicated to all levels of management those who are responsible for the execution of the project (b) Acceptance of the project should be secured from the top level i.e. who will authorize this (c) There should be flexibility for implementing the decision and for this purpose authority should be given for any change or alteration.(d) Constant monitoring and follow-up should be made for implementation of the decision and if there is any problem that should be immediately solved. For example, labour agitation for implementing a new project should be properly and immediately solved. Hence any problem during implementing stage should be immediately taken care of.

AIDS OR TECHNIQUES OF ECONOMIC DECISION MAKING:

There are different techniques of evaluating economic decision making. Some of the important techniques are discussed below:

(i) Probability Theory:

Probability is the chances of happenings of any future certain events. Suppose the chances of getting Rs 60,000 at the end of first year are 70% and at the end of second year is 30%. The probability cannot be more than 1. Probability always lies between 0 and 1.

Example:

Following are the expected cash inflows of a company.

Details	Project P	Assigned Probability
Cash Outflows (Investment)	40,000	
Estimated Cash Inflows p.a.		
First Year	23,000	0.40
Second Year	46,000	0.50
Third Year	38,000	0.10

Ans:

Year	Cash Flows (Rs)	Probabilities	Expected Cash Flows (Rs)
1	23,000	0.40	9,200
2	46,000	0.50	23,000
3	38,000	0.10	3,800
			36,000

From the above analysis it is seen that assignment of probability gives a certain estimate regarding cash flows. As total cash inflow is lower than cash outflows, the project should not be accepted.

(ii) Sensitivity Analyses:

Sensitivity analysis is a technique for judging risk and return, to get a clear view about the variability of different outcomes. Under sensitivity analysis different possible information are collected (input variables) such as selling price, discount rate, economic life of the project, expected cash flows etc. As future is unpredictable there must be some estimation errors. Hence to reduce the estimation errors different possible outcomes regarding future return of a particular project are estimated. This estimate tries to reduce the variability of outcomes. The greater the difference between pessimistic and optimistic cash flows, the more risky is the project and vice-versa.

Under Sensitivity Analysis different cash flows are estimated by considering three assumptions i.e.

(i) The pessimistic (the worst)

(ii) The most likely (the expected)

(iii) The optimistic (the best)

Any project is measured by the above three possible outcomes. Under each outcome NPV is determined to measure the risk of the project. The range of NPV is found out by differentiating between pessimistic outcomes and optimistic outcomes. The project risk can be measured by the range of net present value (NPV). The range is found by substituting the pessimistic outcomes from the optimistic outcomes. The higher the range, the project is more risky or vice versa.

(iii) Decision Tree

Decision Tree is a pictorial representation shown in tree forms which are used for taking decision making in risky capital project. It shows chronologically all the expected outcomes of an investment by showing sequential cash flow and NPV of the expected project, probability and inter-relationship of all possible outcomes.

According to Osteryoung J.S. "It is pictorial representations in tree forms which indicates the magnitude, probability and inter relationship of all possible outcomes".

(iv) Replacement Analysis

The question comes to our mind that should the machines and equipment used in a factory is to be replaced immediately or not. The old machines are known as 'Defender' and the new machine are known as 'Challenger'. If as a result of replacement 'Challenger' proves to be most economical in terms of cost, capacity, efficiency, speed technology and many other factors, 'Challenger should be accepted otherwise not.

Example:

The following data's gives the running cost per year and resale value of a certain machine whose purchase price is Rs 1,95,000. Determine the optimal replacement period.