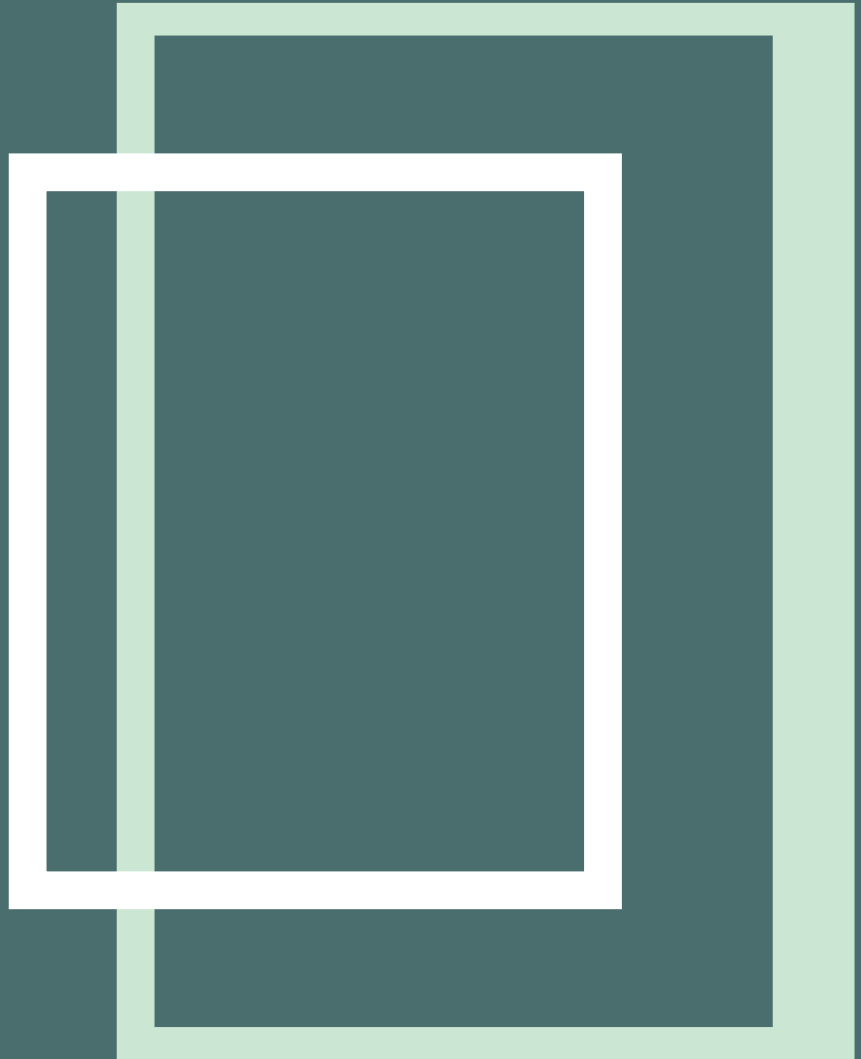# FUNDAMENTALS OF
ENGINEERING ECONOMICS AND COSTING

SHIPRA MEHTA

Fundamentals of Engineering Economics and Costing

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Shipra Mehta

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ENGINEERING ECONOMICS– INTRODUCTION

Engineering Economics – Nature and scope, General concepts on micro & macro economics. The Theory of demand, Demand function, Law of demand and its exceptions, Elasticity of demand, Law of supply and elasticity of supply. Determination of equilibrium price under perfect competition (Simple numerical problems to be solved).Theory of production, Law of variable proportion, Law of returns to scale.

1.1 Engineering Economics - Nature and scope

The nature and scope of economics are related to the study of the wealth or human behaviour or of scarce resources. The scope here is very wide that includes subject matter of economics, whether economics is an art or a science or whether it is positive or a normative science. **Wealth and Welfare Connotations:**

Wealth and welfare connotations are separated into the classical view of Adam Smith and Neo classical view of Marshall.

Classical view and Contemporaries:

The Classical Economist Adam Smith defines Economics as science of Wealth. He defines economics as "nature and cause of wealth of nations" whereby it "proposes to enrich people and sovereign". The classical view is confusing and has serious defects. This view of conception of economics as a science of wealth that laid exclusive stress on the material wealth. Material wealth is the object of wants of man. Wealth was considered to be stop in itself. By stressing on the word "Material Wealth" ,Economist Adam Smith restricted the scope of Economics by excluding all the material activities that are related to production of non-material goods and services like Engineers, Accountants etc. Now after understanding the classical view of Adam Smith in mind, we are going to see the Neo Classical View by Economist Marshall and its contemporaries. **The Neo-Classical View and Contemporaries:**

Alfred Marshall led the Neo-classical school that placed all the economists a reputable position among social science. He highlighted on a man's welfare. Wealth was noticed as the basis of human

welfare not stop by itself but a way to a stop. According to Marshall "The Political Economy or Economics is a study of mankind in the ordinary business of life". It inspects that part of individual and social accomplishment which is most intimately associated with the achievement and with use of the material conditions of the well being. It is on the one side are more significant side a part of study of man and on the other a study of riches. The contemporaries are as follows.It excludes socially disagreeable activities and non-standard persons like thieves, misers and so on. Non-economic activities and activities having dishonorable ends are excluded from the study of economics.

Scarcity definition of Robbins:

According to Robbins,"Economics is the science which studies human behaviour as a relationship between ends and scarce means which have alternative uses." It was Lord Robbins who exposed the rational discrepancy and insufficiencies of other economists' definitions.**Growth Oriented Definition:**

Modern Age is the age of economic development. Its main purpose is to enhance the social wellbeing and progress the standard of living of the people by getting rid of redundancy, poverty, disparity of income and wealth, malnutrition and so on of the realm. Thus the financial development is the essential point of all economic policies.

Scope of Economics:

When discussing the subject-matter and the definition of Economics, we have said something about the scope of Economics too. Yet ,there are a few more things that we need to discuss in taking the scope of Economics. 'Scope' implies the sphere of study. We need to consider what Economics studies and what lies beyond that.

The scope of Economics will be brought out by discussing the following:

(a) Economics is a Social Science.

(b) The subject-matter of Economics.

(c) If Economics is a science whether it is a positive science or a normative science?

Definition of Managerial Economics:

"Business Economics (Managerial Economics) is the integration of economic theory with business practice for the purpose of facilitating decision making and forward planning by management." - Spencer and Seegelman.

"Business Economics consists of the use of economic modes of thought to analyse business situations." - McNair and Meriam

"Managerial Economics is economics applied in decision making. It is a special branch of economics bridging the gap between abstract theory and managerial practice." – Haynes, Mote and Paul.

"Managerial economics is concerned with application of economic concepts and economic analysis to the problems of formulating rational managerial decision." – Mansfield.

Nature of Managerial Economics:

1.The primary function of management executive in a business organization is forward planning and decision making .

2.Decision making and forward planning go hand in hand with each other. Decision making refers to the process of selecting one action from two or more alternative courses of action. Forward planning refers to establishing plans for the future to carry out the decision so taken.

3.The problem of choice arises as resources at the disposal of a business unit (which includes land, labour, capital and managerial capacity) are limited and the firm has to make the most profitable use of these resources.

4.The decision making function is that of the business executive, He takes the decision that will moke sure that most efficient ways of attaining a desired objective like profit maximisation. After taking the decision about the particular output pricing, capital, raw-materials and power etc. are being prepared. Forward planning and decision-making thus go on at the same time.

5. A business manager's task is made difficult by the uncertainty that surrounds business decision-making. Nobody can predict the future course of business conditions. He prepares the best possible plans for the future depending on past experience and future outlook and yet he has to go on revising his plans in the light of new experience to minimize the failure. Managers are hence engaged in a continuous process of decision-making through an uncertain future and the overall problem challenging them is one of adjusting to uncertainty.

6. While fulfilling the function of decision-making an uncertainty framework economic theory may be pressed into service with considerable advantage as it deals with a number of concepts and principles that can be used to solve or at least throw some light upon the problems of business management. E.g profit, demand, cost, pricing, production, competition, business cycles, national income etc. The way economic analysis can be used towards solving business problems constitutes the subject-matter of Managerial Economics.

7.Thus in brief we can say that Managerial Economics is both an art and a science.

Scope of Managerial Economics:

The scope of managerial economics is not yet clearly laid out because it is a developing science. Even then the following fields may be said to generally fall under Managerial Economics:

1.Demand Analysis and Forecasting.

2. Cost and Production Analysis.

3. Pricing Decisions, Policies and Practices.

4. Profit Management.

5. Capital Management.

These divisions of the business economics constitutes its subject matter. Managerial economists have now started making increased use of Operation Research methods such as Linear programming,Games theory, inventory models, queuing up theory etc., have come to be regarded as part of the Managerial Economics.

1.Demand Analysis and Forecasting: A business firm is an economic organisation that is engaged in transforming productive resources into the goods that are to be sold in the market. A major part of managerial decision making depends on the correct estimates of demand. A forecast on future sales serves as a guide to management for preparing the production schedules and employing the resources. It helps the management to maintain or strengthen its market position and the profit base. Also demand analysis identifies a number of other factors influencing the demand for a product. Demand analysis and forecasting occupies a strategic place in the Managerial Economics.

2.Cost and production analysis:

A firm's profitability depends much on its cost of production. A wise manager would prepare cost estimates of a range of output identifies the factors causing are cause variations in the cost estimates and choose cost-minimizing output level taking also into consideration the degree of uncertainty in production and cost calculations. Production processes are under charge of engineers and the business manager is supposed to carry out the analysis of production function in order to avoid wastages of the materials and time. Sound pricing practices depends the most on cost control. The main topics under the cost and the production analysis are: Cost concepts, cost-output relationships, Economics and Diseconomies of scale and cost control.

Pricing decisions, policies and practices:

Pricing is a very important area of Managerial Economics. Actually,price is the genesis of the revenue of a firm and the success of a business firm largely depends on the accuracy of the price decisions taken by it. The important aspects dealt with this area are: Price determination in several market forms, differential pricing, pricing methods,product-line pricing and price forecasting.

Profit management:

Business firms are usually organized for earning the profit and in the long period it is profit that provides the chief measure of success of a firm. Economics tells us that profits are the reward for uncertainty bearing and also risk taking. A successful business manager can form more or less correct estimations of costs and revenues likely to result to the firm at different levels of output. The more successful a manager is in reducing the uncertainty, the higher are the profits earned by

him. Profit-planning and profit measurement constitute the most challenging area of Managerial Economics.

Capital management:

The problems relating to firm's capital investments are the most complex and troublesome. Capital management implies planning and control of the capital expenditure as it involves a large sum and moreover the problems in disposing the capital assets off are so complex .They need considerable time and labour. The main topics that are dealt with under capital management are rate of return ,cost of capital and selection of projects.

1.1.1 General concepts on micro & macro economics

Economics is an art of production and consumption of goods and transfer of wealth in order to produce and obtain those goods. Economics defines how do people interact within markets to get what they need or accomplish the goals. As economics is a driving force of human interaction, studying it often reveals why people and governments behave in specific ways.

There are 2 main types of economics:

1.Macroeconomics

2.Microeconomics.

Microeconomics involves the actions of individuals and industries such as the dynamics between the buyers and sellers, borrowers and lenders.

Macroeconomics on the other hand takes a much broader view by analyzing the economic activity of an whole country or the international marketplace

Micro economics is concerned with:

• Individual consumer behaviour. e.g. Consumer choice theory

• Supply and demand in individual markets

• Externalities arising from production and consumption.

• Individual labour markets – e.g. demand for labour, wage determination

Macro economics is concerned with

• Economic Growth

• Reasons for inflation, and unemployment

• Government borrowing

• International trade and Globalisation

• Monetary or fiscal policy. e.g. what effect does interest rates have on whole economy

• Reasons for differences in living standards and economic growth between countries.

Moving from Micro to Macro

When we look at a simple supply and demand diagram for motor cars. Microeconomics is concerned with issues such as the impact of an increase in demand for cars
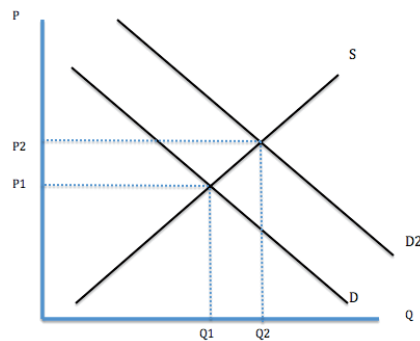
Moving from Micro to Macro

This micro economic analysis reveals that the increased demand leads to higher price, and higher quantity.

Macro economic analysis

This looks at all the goods and services produced in the economy.
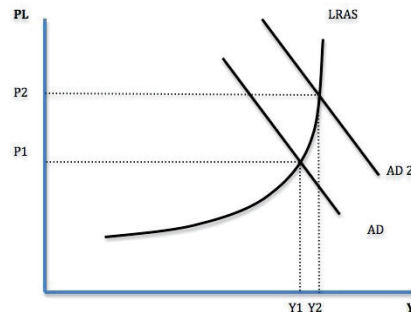
Macro economic analysis

The macro diagram is looking at Real GDP instead of quantity.

Instead of the price of a good, we are looking at the overall price level (PL) for the economy. Inflation measures the annual % change in the aggregate price level.

Macro diagrams are based on same principles as micro diagrams, looking at the Real GDP rather than Quantity and Inflation rather than Price Level (PL)

We may also consider differences between micro and macro economics.

I will summaries the main differences here:

• Macro economics places greater emphasis on empirical data and trying to explain it. Micro economics tends to work from theory first.

• Small segment of economy vs whole aggregate economy.

• There is little debate about the basic principles of micro-economics. Macro economics is more contentious. There are different schools of macro economics offering different explanations (e.g. Keynesian, Monetarist, Austrian, Real Business cycle e.t.c).

• Microeconomics works on principle that markets soon create equilibrium. In macro economics, the economy may be in a state of disequilibrium (boom or recession) for a longer period

Differences Between Microeconomics and Macroeconomics

The main difference is that micro economics looks at small segments, and macro looks at the whole economy. But, there are few other differences.

Equilibrium – Disequilibrium

Classical economic analysis that markets return to equilibrium (S=D). If demand increases faster than supply, this causes price to rise and firms respond by increasing supply. For a long time, it was supposed that the macro economy behaved in the similar way as micro economic analysis. Before, the 1930s, there was not really a separate branch of economics known as macroeconomics.

Great Depression and Birth of Macroeconomics

In the 1930s, economies were clearly not in the equilibrium. There was a high unemployment, output was below the capacity, and there was a state of disequilibrium. Classical economics did not really have an explanation for this disequilibrium, from which a micro perspective, must not occur.

In 1936, J.M.Keynes produced his "The General Theory of Employment, Interest and Money", this examined why depression was lasting for so long. It judged why we can be in a state of disequilibrium in the macro economy. Keynes observed that we may have a negative output gap for a prolonged time. In other words, microeconomic principles of markets clearing, did not necessarily apply to macro economics. Keynes was not the only economist to investigate this new branch of economics. For example, Iriving Fisher examined the role of debt deflation in explaining great

depression. But, Keynes theory was the most wide ranging explanation, and played a large role in creating new branch of macro-economics.

Since 1936, macroeconomics developed as a separate strand within economics. There have been competing explanations for issues such as inflation, recessions and economic growth.

1.2 The Theory of demand

Demand means the various quantities of goods that would be purchased per time period at different prices in a given market.
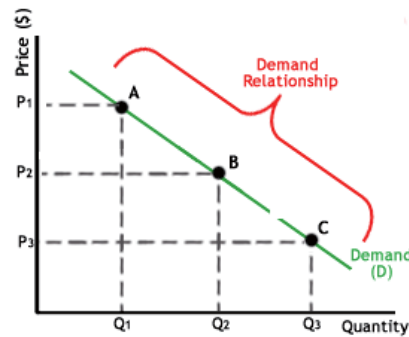
Demand Curve

Since demand curve is only a geometrical representation of the law of demand with 'quantity' on X axis and 'price' on Y axis, the shape of the demand curve has to be necessarily of one sloping downwards showing that more is demanded at a lower prices.

The question that why does demand curve slope downwards is an indirect way of asking why does the law of demand operate. What is the reasons behind the operation of law of demand? Why do people demand more when the price comes down?

Types of demand

The laws of supply and demand drives the market economy. Supply refers to the amount of a good or service which producers are willing to put on the market at a marked price.

Demand is the quantity of goods and services which a consumer is willing to purchase. Producers supply more of a good or service when the price is high.However, as the price rises, consumers demand or buy, less of that good or service.
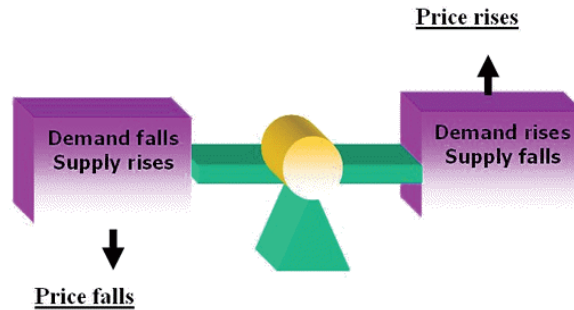
Composite Demand:

Composite demand is defined as a good which has multiple purposes and satisfies various needs.It influences how market allocates a good with number of uses.For example, Building products,automotive,infrastructural,other consumer industrial.
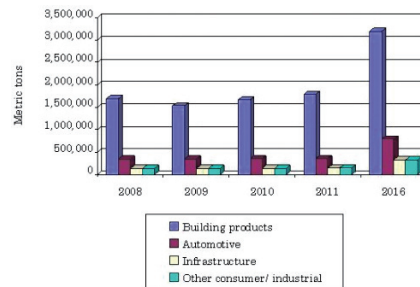
Demand Curves For Different Products

Derived Demand:

Derived demand is defined as the relationship between the resources that are used to produce a good or service, known as factors of production and the finished product or service sold on the market.

The factors of production includes land, labor and capital. As demand for the finished product increases, demand for the resources that are used in producing that good also increases.

However, decreased demand for the final product reduces demand for the factors of production. For example, an increase in the demand for cars increases automobile manufacturers' demand for labor in assembly plants.
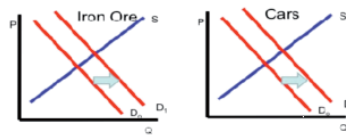
Competitive Demand:

Competitive demand is the demand for the products whcih are competing for sales.People may substitute one competing product for another.If demand for one product increases, the demand for its competitor will decrease correspondingly.
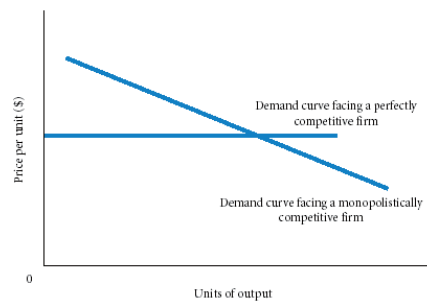
Characteristics Curve For Competitive Demand

Complementary Demand:

Complementary demand, also known as joint demand, happens when two products are needed to meet one demand.

A change in the demand for one of these goods causes a similar change in demand for the other product.For example, tea and sugar. When an increase in the demand for tea ,then it leads to an increase in the demand for the sugar

Determinants of demand

The various demand determinants are:

-Income of the consumer

-Price of the product

-Prices of closely related goods

-Tastes and preference of the consumer

-Consumer's expectation of future prices and future income

-Social, economic and demographic distribution of consumers.

-Population

Determinants of Individual Demand:

Let us discuss the variables which influence the individual demand.

1. Income of the Consumer:

The income of the consumer is another important variable which influences demand. The ability to buy a commodity depends upon the income of the consumer.

When the income of the consumers increases, they buy more and when income falls they buy less. A rich consumer demands more and more goods because his purchasing power is high.

2. Price of the Commodity:

This is the basic factor influencing the demand. There is a close relationship between the quantity demanded and the price of the product.

Normally a larger quantity is demanded at a lower price than at a higher price. There is inverse relationship between the price and quantity demanded. This is called the law of demand.

3. Prices of Related Goods:

The related goods are generally substitutes and complementary goods. The demand for a product is also influenced by the prices of substitutes and complements. When a want can be satisfied by alternative similar goods they are called substitutes, such as coffee and tea.

Whenever the price of one good and the demand for another are inversely related then the goods are said to be complementary, such as car and petrol.

4. Tastes and Preferences:

The demand for a product depends upon tastes and preferences of the consumers. If the consumers develop taste for a commodity they buy whatever may be the price.

A favourable change in consumer preference will cause the demand to increase. Likewise an unfavourable change in consumer preferences will cause the demand to decrease.

5. Consumer's Expectation:

A consumer's expectation about the future changes in price and income may also affect his demand. If a consumer expects a rise in prices he may buy large quantities of that particular commodity.

6. Advertisement and Sales Propaganda:

In modem times, the preferences of consumers can be altered by advertisement and sales propaganda.

Advertisement helps in increasing demand by informing the potential consumers about the availability of the product, by showing the superiority of the product and by influencing consumer choice against the rival products.The demand for products like detergents and cosmetics is mainly caused by advertisement.

Similarly, if he expects its prices to fall in future, he will tend to buy less at present. Similarly, expectation of rising income may induce him to increase his current consumption.

1.2.1 Demand function

A demand function that denotes the behavior of buyers, may be constructed for an individual or a group of buyers in a market. The market demand function is the horizontal summation of the individual demand functions. In models of firm behavior, the demand for a firm's product may be constructed.

The nature of "demand function" depends on nature of the good that is considered and the relationship being modeled. In most cases the demand relationship is based on inverse or negative relationship between price and quantity of a good purchased. The demand for purely competitive firm's output is generally depicted as horizontal (or perfectly elastic). In rare cases, under extreme conditions, a "Giffen good" will result in a positively sloped demand function. These Giffen goods rarely occur.

It is important to identify the nature of the "demand function"that is being considered

Individual Demand Function

The behavior of a buyer is influenced by numb er of factors; the price of the good,incomes of the buyer, the tastes and preferences of the buyer, the prices of related goods , the period of time and a variety of other possible variables. The quantity that a buyer is willing and able to purchase is a function of these variables.

An individual demand function for a good (Good X) can be written:

P_x = The price of good X

$Q_x = f_x(P_x,$ Prelated goods, income (M), preferences, . . .)

Q_x = The quantity of good X

Income (M) = The income of the buyers

Prelated goods = The prices of compliments or substitutes

Preferences = The preferences or tastes of buyers

The demand function is a model that "explains" the change in the dependent variable "caused" by a change in each of independent variables. As all the independent variable can change at the same time it is useful to isolate effects of a change in each of independent variables. To represent the demand relationship graphically, the effects of a change in P_x on the Q_x are shown here. The other variables, are held constant.The figure shows the graphical representation of demand. As they are held constant, the demand function in the graph shows the relationship between P_x and Q_x in a given unit of time (ut).

Figure III.A.1
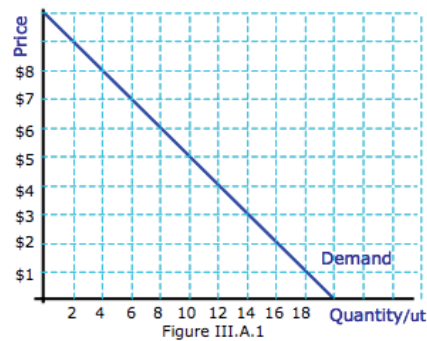
Graphical representation of demand

The demand function may be viewed from one of two perspectives. The demand is generally defined as a schedule of quantities that buyers are willing and able to purchase at a schedule of prices in a given time interval (ut),

$Q_x = f(P_x)$, given incomes, price of related goods, preferences, etc.

Demand can be even perceived as the maximum prices buyers are willing and able to pay for each unit of output

$P_x = f(Q_x)$, given incomes, price of related goods, preferences, etc.

Remember that the demand function is commonly thought of as Q = f(P) but the graph is drawn with the quantity on the X-axis and price on the Y-axis. While demand is frequently stated Q = f(P),it is important to remember that the graph and calculation of total revenue (TR) and marginal revenue (MR) are calculated on the basis of a change in quantity (Q). TR = f(Q) The calculation of "elasticity" is based on change in quantity (Q) that is caused by a change in the price (P). Clarify whether the variable is independent and which is dependent in a particular concept.

Market Demand Function

When property rights are non attenuated the individual's demand functions may be summed horizontally to get the market demand function.
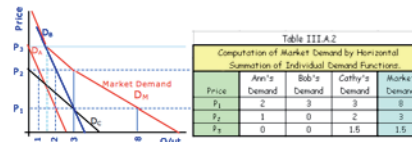
Market Demand Function

Table and figure a market demand function is constructed from the behavior of three people (These people are the participants in a very small market). At a price of P_1, Ann will voluntarily buy 2 units of the good based on her preferences, income and the prices of related goods. Bob and Cathy buys 3 units each. Their demand functions are indicated by D_A, D_B and D_C in the figure. The total amount demanded by these three individuals at P_1 is 8 units (2+3+3). At a higher price each individual buys a smaller quantity.

The demand functions may be summed horizontally if the property rights to the good are exclusive; Ann's consumption of a unit precludes the Bob or Cathy from the consumption of that good. In the case of public goods, the consumption of the national defense by one person does not preclude others from the same good.

The behavior of a buyer was denoted by the function:

$Q_x = f_x(P_x,$ Prelated goods, income (M), $_{preferences, }$ . . .).

For the market the demand function can be represented by adding the number of buyers $Q_x = f_x(P_x,$ Prelated goods, income where #B represents the number of buyers. The market demand may be stated

$Q_x = f(P_x)$, given incomes, price of related goods,

1.2.2 Law of demand and its exceptions

Law Of Demand

The law of demand is a microeconomic law .It states, "all other factors being equal, as the price of a good or service increases, consumer demand for the good or service will decrease and vice versa". The law of demand says that the higher the price, lower the quantity demanded, as consumers' opportunity cost to acquire that good or service increases and they should make more trade offs in order to acquire highly expensive product.

BREAKING DOWN 'Law Of Demand'

The below graph depicts the law of demand using a demand curve, that is always downward sloping. Each point on the curve (A, B, C) reflects a direct correlation between the quantity demanded (Q) and price (P). So, at point A, the quantity demanded will be Q_1 and the price will be P_1,
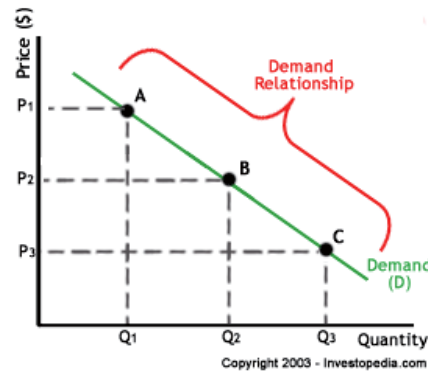
Law Of Demand

The law of demand is so intuitive that we can not even be aware of all the examples around.

When shirts go on sale, we may buy three instead of one. The quantity that we demand increases because the price of shirts has fallen down.

When plane tickets becomes highly expensive, we're less likely to travel by air and more likely to choose less expensive options of driving or staying home. The amount of plane tickets which we demand decreases to zero as the cost have gone up.

The law of demand summarizes the effect price changes have on consumer behavior. For example, a consumer may purchase more pizzas if price of pizza falls. The opposite is true if the price of pizza increases. John might demand 12 pizzas if they cost $10 each, but only 8 pizzas if the price rises to $12 and only 6 pizzas if the price rises to $20.

The law of demand is one of the most fundamental concepts in the economics. It works with the law of supply in order to explain how market economies allocate the resources and determine prices of the goods and services.

Exceptions to Law of Demand:

As a general rule, demand curve slopes downwards, showing the inverse relationship between price and quantity demanded. However, in certain special circumstances, the reverse may occur, i.e. a rise in price may increase the demand. These circumstances are known as 'Exceptions to the Law of Demand'.

Some of the Important Exceptions are:

1. Giffen Goods:

These are special kind of inferior goods on which the consumer spends a large pan of his income and their demand rises with an increase in price and demand falls with decrease in price. for example, in our country, it is often seen that when price of coarse cereals like jowar and bajra falls, the consumers have a tendency to spend less on them and shift over to superior cereals like wheat and rice. This phenomenon, popularly known as' Giffen's Paradox' was first observed by Sir Robert Gillen.

2.Status Symbol Goods or Goods of Ostentation:

The exception relates to certain prestige goods which are used as status symbols. for example, diamonds, gold, antique paintings, etc. are bought due to the prestige they confer upon the possessor. These are wanted by the rich persons for prestige and distinction. The higher the price, the higher be the demand for such goods.

3. Fear of Shortage:

If the consumers expect a shortage or scarcity of a particular commodity in the near future. then they would start buying more and more of that commodity in the current period even if their prices are rising. The consumers demand more due to fear of further rise in prices. for example, during emergencies like war. famines, etc., consumers demand goods even at higher prices due to fear of shortage and general insecurity.

4. Ignorance:

Consumers can buy more of a commodity at a higher price when they are ignorant of the prevailing prices of commodity in market.

5. Fashion related goods:

Goods that are related to fashion does not follow the law of demand and their demand increases even with a rise in their prices. For example. if any particular type of bike is in trend, then the demand for such dress will increase even if its price is rising.

6. Necessities of Life:

Another exception occurs in the use of such commodities, that become necessities of life due to their constant use. For example, commodities such as rice, wheat, salt, medicines, etc. are purchased even if their prices increases.

Change in Weather:

With change in season/weather, demand for certain commodities also changes, irrespective of any change in their prices. For example, the demand for umbrellas increases in rainy season even with

an increase in their prices. It should be noted that in normal conditions and considering the given assumptions, 'Law of Demand' is applicable universally.

1.2.3 Elasticity of demand

It is defined as the rate of responsiveness in demand of a commodity for a given change in any determinant of the demand.

In other words, it explains the extent of change in the quantity demanded because of given change in demand determinant that is in consideration.

Explanation

(a)Perfectly Elastic Demand: When any quantity may be sold at a given price and when there is no need to reduce the price, the demand, is considered to be perfectly elastic. In such a case, even a small increase in price will result in complete face in demand, the below figure reveals that the quantity demand increases from OQ to OQ_1 from OQ to OQ_2 even though there is no change in the price.
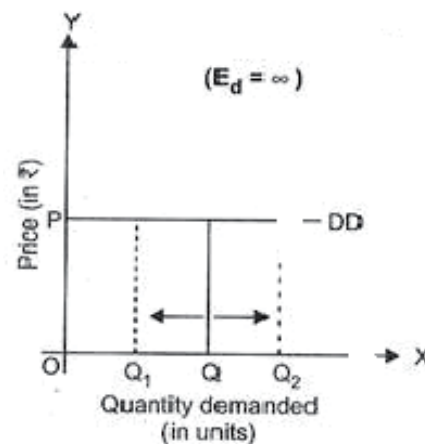
Perfectly Elastic Demand

(b)Perfectly Inelastic Demand:

When significant degree of change in price leads to little change in the quantity demand then the elasticity is said to be perfectly inelastic.

In other words, the demand is said to be perfectly inelastic when there is no change in the quantity ad_1 even though there is a big change in price.

It can be seen in the figure below, that despite the increase in price fromOP_1 to OP_2, the quantity demand remains unchanged.
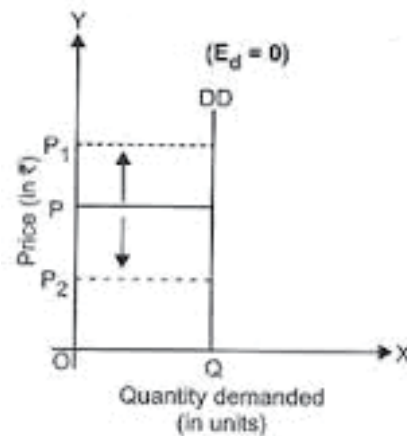
Quantity Demander

Perfectly Inelastic Demand

(c)Relatively Elastic Demand:

The demand is relatively elastic where the change in demand is more than the change in the price. The below figure reveals that the quantity demand increases from Oq_0 to Oq_1 because of a increase in the price from OP_0 to OP_1. The extent of D_{re} in the quantity demand is greater than the extent of face in the price.
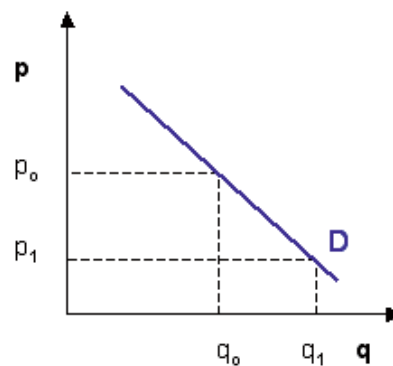
Relatively Elastic Demand

(d)Relatively Inelastic Demand: The demand is relatively inelastic when the change in demand less than the charge in price. The below figure reveals that the quantity demand, increases from OB to ON because of a increase in the price from OA to OC.The extent of increase in quantity demand is less than the extent of all in price.

Relatively Inelastic Demand (eP < 1)
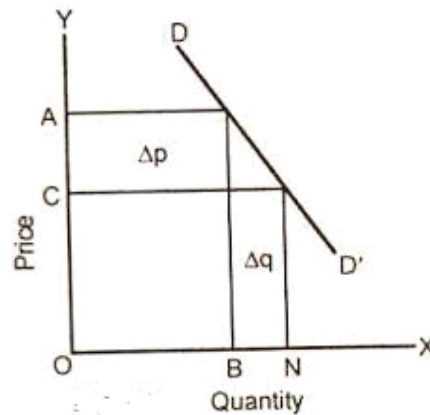
Relatively Inelastic Demand

(e)Unit Elasticity of Demand: The elasticity in demand is said to be in unity when the change in demand is equal to the change in price. The figure below reveals that the quantity demand increase from OQ_1 to OQ_2 because of increase in the price from QP_1 to OP_2. The extent of increase in the quantity demand is equal to extent of fall in the price.

Unit Elasticity of Demand (e_P = 1)
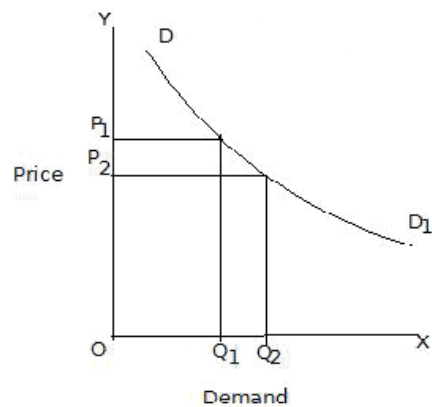
Unit Elasticity of Demand

1.3 Law of supply and elasticity of supply

Supply is the amount of some product, producers are willing and able to sell at a given price all other factors being held constant. Generally, supply is plotted as a supply curve showing the relationship of price to the amount of product business is willing to sell.

Law of supply

According to law of supply, more quantities of a commodity will be offered for sale at the higher prices and less quantity will be offered for sale at lower price. There is a direct relationship between market price and supply.
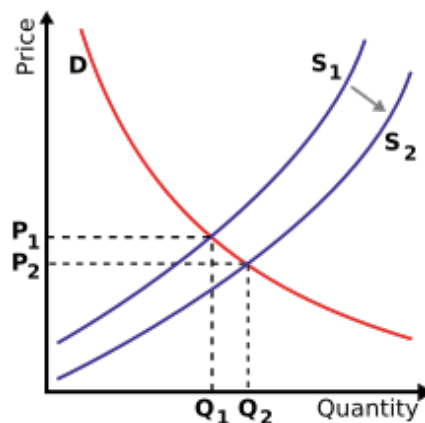
Law of supply

Determinants of Supply

The determinants of supply are as follows:

1.The price of related goods

2.Production costs

3.Number of suppliers.

4.The technology used in production

5.Firm's expectations about future prices

Innumerable factors and circumstances could affect a seller's willingness or ability to produce and sell a good. Some of the more common factors are:

(a)**Goods own price:** The basic supply relationship is between price of a good and quantity supplied. While there is no "Law of Supply", usually, the relationship is positive or direct meaning that an increase in price may induce and increase in the quantity that is supplied.

(b)**Price of related goods:** For the purposes of supply analysis ,related goods are the goods from which inputs are derived .These goods are to be used in the production of the primary good.

For example, a firm that produces leather belts.The firm's managers learns that leather pushes for smart phones are more profitable than belts.

The firm might reduce its production of belts and starts production of the cell phone pouches based on this information. Finally, a change in the price of a joint product will affect the supply.

For example ,beef products and leather are joint products. When a company runs both a beef processing operation and a tannery ,an increase in the price of steaks will mean that more cattle are processed which will increase the supply of leather.

(c)**Conditions of Production:** The most significant factor is the state of technology. When there is a technological advancement in production of goods, then the supply increases.

Other variables also affects the production conditions. For example., for agricultural goods, weather is a crucial as it may affect the production output. A good weather condition will result in increased production of rice or wheat and vice-versa if the weather is not appropriate.

(d)**Expectation:** Sellers expectations concerning the future market condition can directly affect the supply. If the seller believes that demand for his product will increase sharply in the near future ,the firm owner mioght immediately increase the production in prediction of future price increases. He will reduce the supply when he expects that the demand is going to fall.

(e)**Price of Inputs:** Inputs include the land, labor, energy and the raw materials. If the price of inputs increases, then the supply curve will shift in ,as sellers are less willing or able to sell goods at the existing prices. For example, when the price of electricity increases a seller can reduce his supply because of increased costs of production. The seller is likely to raise price the seller charges for each unit of output.

(f)**Number of Suppliers:** The market supply curve is the horizontal summation of the individual curves. Since more firms enter the industry ,the supply will automatically increase by driving down the prices.

(g)**Government Policies and Regulations:** Government intervention may have a significant effect on the supply. Government intervention may take many forms including the environmental and health regulations,taxes, hour and wage laws, electrical and natural gas rates , zoning and land use regulations.

The Supply function

Equilibrium is refers to the price-quantity pair where the quantity demanded is equal to the quantity that is supplied, which is represented by the intersection of the demand and supply curves.

Market Equilibrium:

It is a situation in a market when the price is in a way that the quantity which consumers wish to demand is accurately balanced by the quantity that many firms wish to supply.

Comparative Static Analysis:

It confronts the likely effect on equilibrium of a change in external conditions by affecting the market.

Changes in the Market Equilibrium:

Practical uses of supply and demand analysis often centers on different variables which change the equilibrium price and quantity, denoted as shifts in the respective curves. Comparative statics of this shift traces the effects from the initial equilibrium to the new equilibrium.

Demand Curve Shifts:

When consumers increase the quantity demanded at a given price, it is referred to as an increase in demand. Increased demand may be represented on the graph as the curve being shifted to right. At each price point, a greater quantity is being demanded, as from the initial curve D_1 to new curve D_2 and this raises the equilibrium price from P_1 to the higher $P_2.$ This raises the equilibrium quantity from Q_1 to higher Q_2 .A movement along the curve is described as a "change in the quantity demanded" in order to distinguish it from "change demanded" to distinguish it from a "change in demand",which is a shift of the curve, there has been an increase in the demand that has caused an increase in (equilibrium) quantity.

The increase in demand could also come from changing the tastes and fashions, incomes, price changes in the complementary and substitute goods, market expectations and number of buyers.

This might cause the entire demand curve to shift ,thereby changing the equilibrium price and quantity. Note in the diagram the shift of the demand curve, by causing new equilibrium price to emerge, resulted in the movement along the supply curve from point (Q_1 P_1) to the point ($Q_2 P_2$).

If the demand decreases, then opposite happens: a shift of the curve to the left. If the demand starts at D_2 and decreases to D_1, the decrease in the equilibrium proce and also in the equilibrium quantity.

The quantity supplied at each price is the same as before the demand shift, reflecting the fact that the supply curve has not shifted; but equilibrium quantity and price are different as a result of the change in demand.

The movement of demand curve in response to a change in a non-price determinant of the demand is caused by the change in the X-intercept, the constant term of the demand equation.
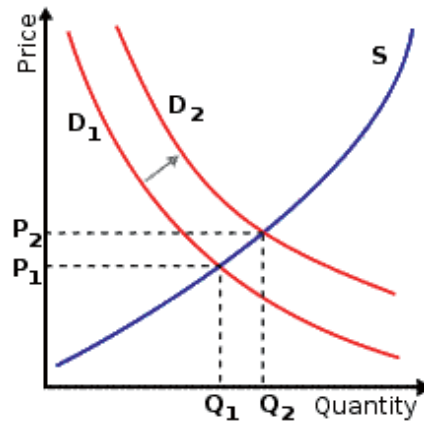
Demand Curve Shift

Supply Curve Shift:

When technological progress occurs, the supply curve shifts.For example, assume that someone invents a better way of growing wheat so that the cost of growing a given quantity of wheat decreases.

In other words,the producers will be willing to supply more wheat at every price and shifts in the supply curve S_1 outward, to S_2 - an increase in the supply.This increase in supply causes equilibrium price to decrease from P_1 to P_2 .The equilibrium quantity increases from Q_1 to Q_2 as the consumers more along the demand curve to new lower price.

As a result of supply curve shift, the price and the quantity move in the opposite directions.If the quantity supplied decreases, then the vice versa happens.

If the supply curve starts at S_2 and shifts leftward to S_1, then the equilibrium price will increase and equilibrium quantity will automatically decrease as the consumers move along the demand curve to new higher price and the associated power quantity demanded.

The quantity demanded at each price is the same as before the supply shift, which reflects the fact that demand curve has not shifted.

Due to the change (shift) in supply, equilibrium quantity and the price have changed. The movement of the supply curve in response to a change in non-price determinant of supply is caused by the change in the Y-intercept, the constant term of supply equation.

The supply curve shifts up and down the Y-axis as non-price determinants of the demand change.
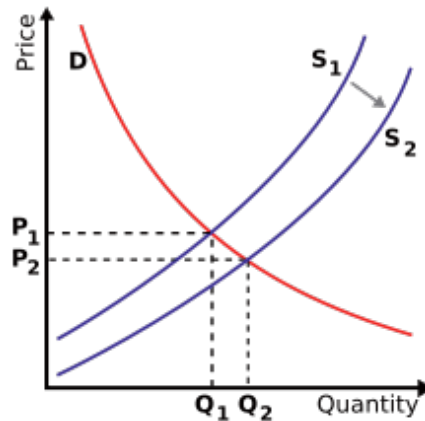
Supply Curve Shift

Supply elasticity

Supply elasticity is defined as the percentage change in the quantity supplied divided by the percentage change in price. It is calculated as per following formula:

$$\text{Supply Elasticity} = \frac{\% \, \Delta \text{ in quantity supplied}}{\% \, \Delta \text{ in price}}$$

Elasticity of Supply

Elasticity of supply is defined as a degree of responsiveness of quantity of commodity supplied for a small charge in its price. It can also be defined as the ratio or percentage changes in quantity supplied of a commodity to the change in price.

Elasticity of SS_1

$$= \frac{\text{Percentage in quantity supplied of commodity } X}{\text{Percentage change in price of commodity } Y} .$$

Price Elasticity of Supply

Price elasticity of supply measures the responsiveness of the quantity that is supplied to change in price, as the percentage change in quantity supplied induced by a one percent change in price.

It is calculated for the discrete changes as $(\Delta Q/\Delta P) \times P/Q$ and for the smooth changes of differentiable supply functions as $(\delta Q/\delta P) \times P/Q$.

As supply is usually increasing in price, the price elasticity of supply is generally positive. For example if the PES for a good is 0.67 a 1% rise in price will persuade a two-thirds increase in the quantity supplied.

Determinants of Price Elasticity of Supply

(a)*Reaction Time:* The price elasticity of the supply coefficient will be obtained by how quickly producers react to the price changes by increasing (decreasing) production and delivering (cutting the deliveries of) goods to the market.

(b)*Complexity of Production:* Depends much on the complexity of the production process. Textile production is relatively simple.

The labor is largely unskilled and the production facilities are little more than buildings - no special structures are required. Hence the PES for textiles is elastic.On the other hand, the PES for the particular types of motor vehicles is relatively inelastic.

Auto manufacturing is a multi-stage process which requires the specialized equipment, skilled labor, a large suppliers network and a large R&D costs.

(c)*Time to Respond:* The more time a producer need to respond to price changes ,the more elastic the supply. For example, a cotton farmer may not immediately respond to an increase in the price of the corn.

(d)*Excess Capacity:* A producer who has the unused capacity may quickly respond to the price changes in his market assuming that variable factors are available readily .

(e)*Inventories:* A producer who has a supply of goods or available storage capacity may quickly respond to the price changes.

Non-Price Elasticities of Supply

Other **elasticities** may be calculated for non-price determinants of supply.

Input Elasticity of Supply

The percentage change ,the amount of good supplied caused by a percent increase in the price of a related good is an input elasticity of supply when the related good is an input in the production process. For example ,the change in the supply for sweets caused by a one percent increase in sugar price.

Perfectly Inelastic Supply (Vertical Supply Curve)
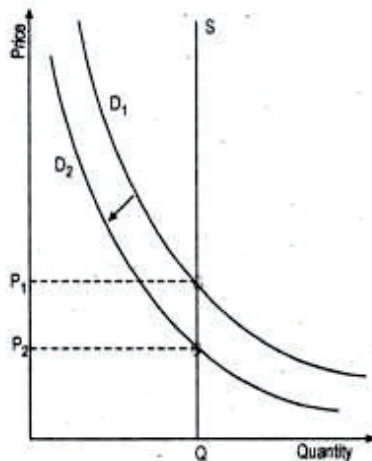
Perfectly Inelastic Supply

When the quantity supplied is fixed (Q) in very short run no matter what the price, supply curve (S) is a vertical line and supply is known as perfectly inelastic. Economists also distinguish the short-run market supply curve from long-run market supply curve.

Two things are assumed as constant by definition of the short run in this context: the availability of one or more fixed inputs and the number of firms in industry.

In the long run, firms have a chance to adjust their holdings of physical capital, enabling them to adjust their quantity supplied at any given price.

Moreover, in the long run potential competitors enter or exit the industry in response to the market conditions.For both of these reasons, long-run market supply curves are flatter than the short-run counterparts.

1.3.1 Determination of equilibrium price under perfect competition (Simple numerical problems to be solved)

Perfect competition is defined as a market situation where there are large number of buyers and sellers dealing in homogeneous products.

Moreover, under perfect competition, there are no legal, social or technological barriers on the entry or exit of the organizations.

In the perfect competition, sellers and buyers are fully aware about the current market price of a product. Therefore, none of them sell or buy at a higher rate. As a result of this , the same price prevails in the market under perfect competition condition.

Under perfect competition condition, buyers and sellers cannot influence the market price by increasing or decreasing their purchases or output, respectively. The market price of the products in perfect competition is determined by industry. This means that in perfect competition condition, the market price of the products is found by taking two market forces into account, named as the market demand and the market supply.

According to Marshall, "Both the elements of demand and supply are required for the determination of price of a commodity in the same manner as both the blades of scissors are required to cut a cloth." ,Market demand is defined as a sum of the quantity demanded by each individual organizations in the industry.

On the other hand,the market supply refers to the sum of quantity that is supplied by individual organizations in the industry. In perfect competition, price of a product is determined at a point at which the demand and supply curve intersect each other. This point is called as equilibrium point as well as the price is called as the equilibrium price. Additionally, at this point, the quantity demanded and supplied is known as equilibrium quantity.

Demand under Perfect Competition:

Demand refers to the quantity of a product that consumers are willing to purchase at a particular price, while other factors remain constant. A consumer demands more quantity at lower price and less quantity at higher price. Therefore, the demand varies at different prices.
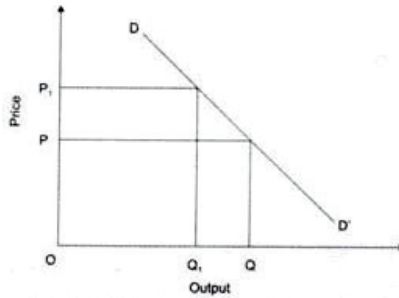
(a) Demand Curve under Perfect Competition

As shown in Figure(a) when price is OP, the quantity demanded is OQ. On the other hand, when price increases to OP_1, the quantity demanded reduces to OQ_1. Therefore, under perfect competition, the demand curve (DD') slopes downward.

Supply under Perfect Competition: Supply refers to quantity of a product which producers are willing to supply at a particular price. Basically, the supply of a product increases at high price and decreases at a low price.
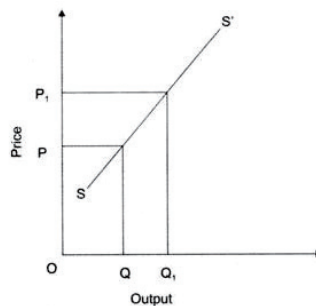
(b) Supply curve under perfect competition

In the above figure,the quantity supplied is OQ at price OP. When price increases to Oh, the quantity supplied increases to $0Q_1$. This is because the producers are able to earn large profits by supplying the products at a higher price. Hence, under perfect competition, the supply curves (SS') slopes upward.

Equilibrium under Perfect Competition:

In a perfect competition, the price of a product is found at a point at which demand and supply curve intersect each other. This point is called as the equilibrium point. At this point, the quantity demanded and supplied is known as equilibrium quantity.
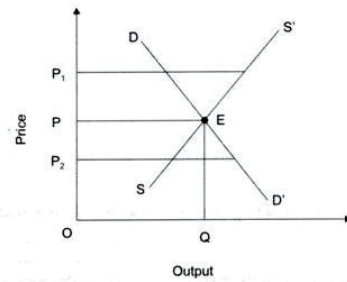
Price and output determiner under perfect competition

In the above figure,it can be seen that at price OP_1., supply is more than demand. Hence , prices will fall down to OP. Similarly, at price OP_2, demand is more than the supply. Similarly, in such a case, the prices will rise to OP. Thus, E is the equilibrium at which equilibrium price is OP and equilibrium quantity is OQ.

Equilibrium of the firm under perfect competition

In short run: In the short run, the firm will have temporary equilibrium where MR=MC and AR=AC. At this point,the equilibrium output and price is determined. The short run price is known as a sub-normal price and it is not a stable price.

In the short run, firm will not be in the position to cover its fixed costs but it should recover short run variable costs for its survival in the market. Short run price must be at least equal to the minimum AVC .
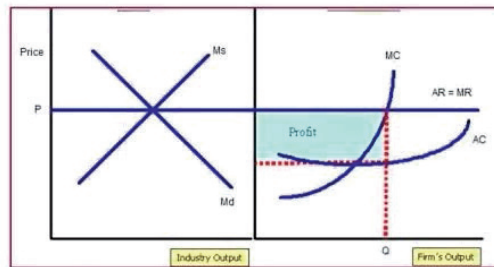
Firm is a price-taker where if the price is more than AC, then firm will attain supernormal profit. In this situation, MC=MR but AC<AR
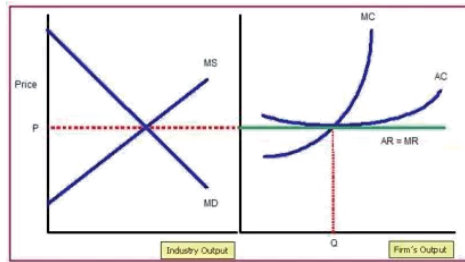
if AC is equal to price, then the firm will attain normal profit. In this condition AC=MC=AR=MR=P
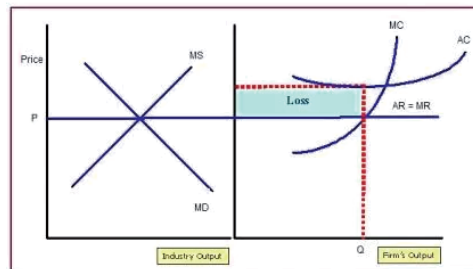
If AC is greater than price, there will be losses. In this situation, MC=MR but AC>AR

Thus, in short run, a firm can either incur losses or earn supernormal profit or normal profit.

The main reason for this is that the firm does not get adequate time to make all kinds of adjustments to avoid losses in the short run.

In long run, a firm will attain only normal profit where P=AR=AC=MR=MC.

If AR is greater than AC, then the firm will earn supernatural profit and it will lead to the entry of new firms, as a result, increase in the total number of the firms and finally increase in supply and fall in price and ratio of profits. This process will continue till supernatural profits are reduced to zero. On the other hand, if AR is less than AC, loss will occur and this will lead to the exit of old firms, decrease in the number of the firms, decrease in supply and rise in price and finally the rise in the ratio of profits. Such process will continue until the firm reaches to the equilibrium position where AC =AR.
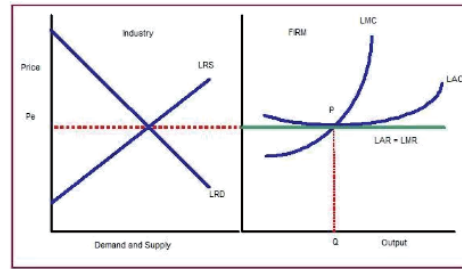
Long run equilibrium will be where , LMC=LMR=LAC=LAR=P

In the long run, a competitive firm should be at the minimum point of the LAC curve in order to avoid losses.

In short run, demand plays an important role in the determination of price while in long run, supply is important than demand in price determination.

Problem:

1. Complete the following table when each unit of a commodity can be sold at Rs.5.

Quality sold	TR	MR	AR
1			
2			
3			
4			
5			
6			
7			

Solution:

It is case of perfect competition because price of a commodity is fixed at Rs.5

Quality sold	Price or AR (Rs)	TR= (Px Q) (Rs)	MR(ΔTR/(ΔQ) (Rs)
1	5	5	5
2	5	10	5
3	5	15	5
4	5	20	5
5	5	25	5
6	5	30	5
7	5	35	5

2. Following information is given about a firm. Find out producer's equilibrium or profit maximising output, using MR- MC approach.

Output (units)	Price (Rs)	Total Cost (Rt)
1	10	30
2	10	35
3	10	39

4	10	41
5	10	44
6	10	49
7	10	56
8	10	66
9	10	80
10	10	95

Solution:

Marginal profit is the difference between the marginal revenue and the marginal cost. To maximize its profits, marginal profit (= MR - MC) the firm chooses that level of output at which difference between MR and MC is zero.

Output (Q) (units)	Price (Rs)	Total Cost (Rs)	MC	Total Revenue (TR)=PxQ	MR	Addition to Profit = MR - MC (RS)
1	10	30	--	10	10	--
2	10	35	5	20	10	+5
3	10	39	4	30	10	+6

4	10	41	2	40	10	+8
5	10	44	3	50	10	+7
6	10	49	5	60	10	+5
7	10	56	7	70	10	+3
8	10	66	10	80	10	0
9	10	80	14	90	10	-4
10	10	95	15	100	10	-5

At Q= 8, it can maximize the profit. In other words, the firm is certain that addition to profit (Mli - MC) has stopped rising.

3. The following table shows the total cost schedule of a competitive firm. It is given that the price of the good is Rs 10. Find the profit maximising level of output.

Quantity:	0	1	2	3	4	5	6	7	8	9	10
Total cost (Rs)	5	15	22	27	31	38	49	63	81	101	123

Quantity (units)	Price (Rs)	Total Revenue (Rs)	Total Cost (Rs)	Profit (Rs)
0	--	0	5	-5

1	10	10	15	-5
2	10	20	22	-2
3	10	30	27	+3
4	10	40	31	+9
5	10	50	38	+12
6	10	60	49	+11
7	10	70	63	+7
8	10	80	81	-1
9	10	90	101	-11
10	10	100	123	-23

At 5 unit of output, profit is maximum, that is, Rs 12. Thus, profit maximising output level is 5 unit.

1.4 Theory of production, Law of variable proportion, Law of returns to scale.

The production function expresses a functional relationship between the quantities of inputs and outputs. It shows how the output changes and also to what extent output changes with variations in inputs during a specified period of time. According to Stigler, "The production function is the name that is given to the relationship between the rates of input of productive services and the rate of output of the product.

It is the economist's summary of technical knowledge." Basically, the production function is a technological or engineering concept which can be expressed in the form of a table, graph and equation showing the amount of output obtained from various combinations of inputs used in production, given the state of technology. Algebraically, it can be expressed in the form of an equation as ,

$Q = f (L, M, N, K, T)$. (1)

where Q stands for the output of a good per unit of time, L for labour, M for management, N for land, K for capital and T for the given technology and it refers to the functional relationship.

The production function with many inputs may not be depicted on a diagram. Moreover, given the specific values of the various inputs, it becomes difficult to solve such production function mathematically. Economists, thus, use a two-input production function. If we take two inputs, labour and capital, the production function assumes the form

$Q = f (L, K)$ ....(2)

The production function as determined by technical conditions of production is of two types:

It can be rigid ox flexible. The former relates to the short run and the latter relates to the long run.

In short run, the technical conditions of production are rigid so that various inputs used to produce a given output are in fixed proportions. But, in the short run, it is possible to increase the quantities of one input while keeping the quantities of other inputs constant in order to have more output. This aspect of production function is called as the Law of Variable Proportions.

The short run production function in the case of two inputs, labour and capital, with capital as fixed and labour as the variable input may be expressed as

$Q = f(L,K)$

where K refers to the fixed input.
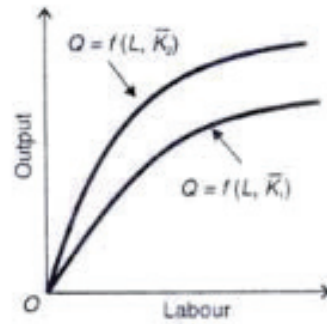
(a)

This production function is depicted in Figure(a) where the slope of curve shows the marginal product of labour. A movement along production function shows the increase in output as labour increases, given the amount of capital employed K. If the amount of capital increases to K at a point of time,the production function Q = f(L.K1) shifts upwards to Q = f(L.K2) as shown in the figure.

On the other hand, if labour is taken as a fixed input and capital as the variable input the production function takes the form Q =f(U.)

This production function is depicted in Figure(b) where the slope of curve denoted the marginal product of the capital. A movement along the production function shows the increase in output as capital increases, given the quantity of labour employed,L2 If the quantity of labour increases to L2 at a point of time, the production function Q = f(L.K2) shifts upwards to Q= f(KL2)
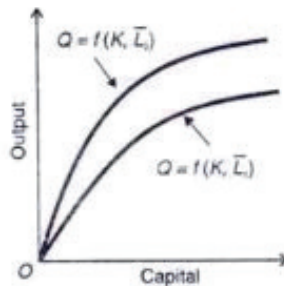
(b)

The Long-Run Production Function:

In the long run, all are variable inputs. Production may be increased by changing one or more of the inputs. The firm may change its plants or scale of production. Given the level of technology, a combination of the quantities of labour and capital produces a specified level of output.

The long-run production function is depicted in figure where the combination of OK of the capital and OL of labour produces 100 Q. With the increase in inputs of capital and labour to OK_1 and OL_1, the output increases to 200 Q. The long-run production function is shown in terms of the isoquant like 100 Q.
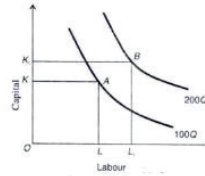
In the long run, it is possible for a firm to change all the inputs up or down in accordance with scale. This is called as returns to scale. The returns to scale are constant when the output increases in the same proportion as the increase in the input quantities. The returns to scale are increasing when increase in output is more than proportional to the increase in inputs. They are decreasing if the increase in output is less than proportional to the increase in the inputs.

Let us illustrate the case of constant returns to scale with the help of our production function.

Q= (L, M, N, K, 1)

Given T if the quantities of all inputs L, M, N, K are increased n-fold, the output Q also increases H-fold. Then the production function becomes nQ -f (nL, nM, nN, nK).

This is known as linear and homogeneous production function or a homogeneous function of the first degree. If the homogeneous function is of the Kth degree, the production function is nk.Q = f (nL, nM, nN, nK) it is a case of constant returns to scale; if it is greater than 1, it is a case of increasing returns of scale; and if it is less than 1, it is a case of decreasing returns to scale.

Three Stages of Law of Variable Proportion

The law of variable proportion operates in three stages. These three stages are illustrated in Figure The features of each stages are discussed below:

Three Stages of Production
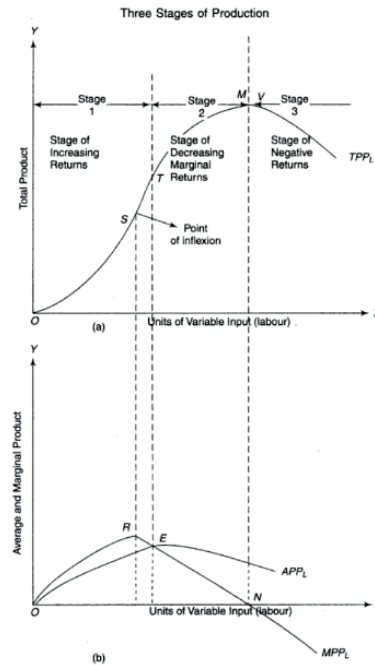
Representation of total ,average and marginal production

Stage I Stage of Increasing Returns

Initially, as more and more units of variable factor (labour) are employed, fixed capital is utilised better and more efficiently. As a result marginal productivity of additional labour rises. Therefore both MI' and AP increases. AP rises fill its optimum (at point R) where MP and AP are equal. TP increases at an increasing rate. From point S to T, TP continues to rise at a diminishing rate. This stage begins from the point where total physical product is zero and ends at the point where average physical product is maximum.

Stage 2 Stage of Diminishing Returns

After point T, new labour finds the fixed capital inadequate, therefore, TP continues to increase but at a diminishing rate. In this stage both MP and AP are diminishing but they remain positive. At the end of stage, MP of variable factor is zero, that is corresponding to the optimum point of TP curve. This stage is called as the `stage of diminishing returns' as both AP and MP are falling. It is an ideal stage for rational producer because he can maximizes the total physical product in it. This stage begins from the point where AP is maximum and ends at the point where TP is maximum.

Stage 3 Stage of Negative Returns

In this stage, TP starts to decline and MP becomes negative. Because labour input become so crowded that there is no work for the new labour and so they disturb the earlier labour from carrying out their work. Point V, where TP is maximum, is known as point of saturation indicating that given amount of fixed inputs, there is no further positive use for more variable input. It

indicates that we have entered the region of negative marginal returns. Which stage is an Ideal for a rational producer? All three stages of production are illustrated in Figure. shown by vertical dotted lines.

The first stage of production occurs when the AP is rising. In the second stage of production, both APPS and MPP_L is falling but remains positive. The third stage of production occurs when the MPP_L becomes negative. Stage III is obviously out, because additional labour in this stage actually reduce output, their MPP_L is negative. As a result, a firm will get less revenues and thus profit. Therefore a rational producer will never entertain stage III.

In Practice,Stage first is short. In this stage, marginal physical product of labours (MPPL) is maximum but marginal physical product of capital (MPPK) is actually negative. In stage second, marginal products of both the productive resources are positive. Marginal returns to an input is positive but at the same time,diminishing. In this stage, producer may increase output by using the optimal number of workers and can maximize profit. Thus, stage II, diminishing returns to factor is an ideal stage for a rational producer.

EVALUATION METHODS

Time value of money – Simple and compound interest, Cash flow diagram, Principle of economic equivalence. Evaluation of engineering projects – Present worth method, Future worth method, Annual worth method, internal rate of return method, Cost-benefit analysis in public projects. Depreciation policy,Depreciation of capital assets, Causes of depreciation, Straight line method and declining balance method.

2.1 Time value of money – Simple and compound interest

Time value of money - It denotes the growth of capital per unit period. The period can be a month, a quarter, semi-annual or a year.

An interest rate 15% compounded annually implies that for every hundred rupees invested now ,an amount of Rs. 15 will be added to the account at the end of first year. So the total amount at the end of the first year will be Rs. 115.

At the end of the second year, again 15% of Rs. 115, i.e. Rs. 17.25 will be added to the account.

Thus,the total amount at the end of the second year will be Rs. 132.25. The process will continue thus till the specified number of years.

If an investor invests a sum of Rs. 100 in a fixed deposit for five years with an interest rate of 15% compounded annually the accumulated amount at the end of every year will be as shown in table.

Compound amounts

Amount of deposit = Rs.100.00

Tear end	Interest (Rs)	Compound amount (Rs)
0		100
1	15.00	115

2	17.25	132.25
3	19.84	152.09
4	22.81	174.90
5	26.24	201.14

The formula to find the future worth in the third column is

$$F = P \quad (1 + i)^n$$

where

P = Principal amount invested at time 0.

F = Future amount.

i = Interest rate compounded annually.

n = Period of deposit.

The maturity value at the end of the fifth year is Rs. 201.14. This means that the amount Rs. 201.14 at the end of the fifth year is equivalent to Rs. 100.00 at time 0 . This explanation assumes that the inflation is at zero percentage.

Single-payment compound amount - Here the objective is to find the single future sum (F) of the initial payment (P) made at time 0 after n periods at an interest rate i compounded every period.
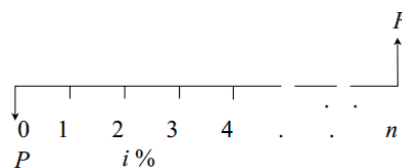
Cash flow diagram of single-payment compound amount

The formula to determine the single-payment compound amount is

$$F = P(1 + i)^n = P(F/P, i, n)$$

Where (F/P, i, n) is known as single-payment compound amount factor.

Single-payment present worth amount - Here the objective is to find the present worth amount (P) of a single future sum (F) which will be received after n periods at an interest rate of i compounded at the end of every interest period.
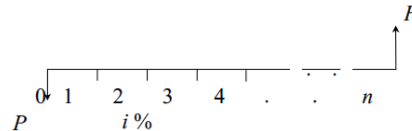
Cash flow diagram of single-payment present worth amount

The formula to obtain the present worth is

$$P = \frac{F}{(1 + i)^n} = F(P/F, i, n)$$

Where

(P/F, i, n) is termed as single-payment present worth factor .

Equal-payment series sinking fund:

In this type of investment mode, the objective is to find the equivalent amount (A) that must be deposited at the end of every interest period for n interest periods to realize a future sum (F) at the end of the nth interest period at an interest rate of i.
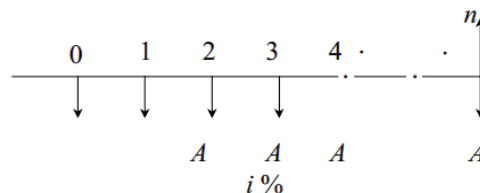
n = No. of interest periods.

F = Single future amount at the end of the nth period.

A = Equal amount to be deposited at the end of each interest period.

i = Rate of interest.

The formula to get F is

$$A = F \frac{i}{(1 + i)^n - 1} = F(A/F, i, n)$$

Where (A/F, i, n) is known as equal-payment series sinking fund factor.

Equal-payment series present worth amount :

The objective of this mode of investment is to find the present worth of an equal payment made at the end of every interest period for n interest periods at an interest rate of i compounded at the end of every interest period.

The corresponding cash flow diagram is shown in the figure.Here,

i = Interest rate.

P = Present worth.

n = No. of interest periods.

A = Annual equivalent payment.

The formula to compute P is

$$P = A \frac{(1 + i)^n - 1}{i(1 + i)^n} = A(P/A, i, n)$$

Where (P/A, i, n) is called equal-payment series present worth factor.

2.1.1 Cash flow diagram

An examination of cash inflows of a company and the outflows during a specific period. The analysis starts with a starting balance and generates an ending balance after accounting for all cash receipts and the paid expenses during the period. Often ,the cash flow analysis is used for the financial reporting purposes.

Let us see the cash-flow statement

A cash flow statement, also called as statement of cash flows or funds flow statement, is a financial statement that shows how the changes in balance sheet accounts and income affect the cash and cash equivalents and breaks the analysis down to investing,operating and financing activities.

The cash flow statement is partitioned into three segments, such as:

1)Cash flow resulting from financing activities.

2)Cash flow resulting from investing activities.

3)Cash flow resulting from operating activities.

Operating Activities

Operating activities includes the production, sales and delivery of the company's product as well as collecting payment from its customers. This also include purchasing raw materials, building inventory, advertising, advertising and shipping the product.

Operating cash flows include:

•Payments to employees or on behalf of employees.

•Receipts for the sale of loans, debt or equity instruments in a trading portfolio.

•Receipts from the sale of goods or services.

•Payments to suppliers for goods and services.

•Interest received on loans.

•Interest payments.

Investing Activities

Examples of Investing activities are,

•Payments related to mergers and acquisitions.

•Loans made to suppliers or received from customers.

•Purchase or Sale of an asset

Financing Activities

Financing activities include the inflow of cash from the **investors** like **banks** and **shareholders,** as well as the outflow of cash to shareholders as **dividends** as the company generates income.

•Repayment of debt principal, including capital leases.

•Payments of dividends.

•For non-profit organizations, receipts of donor-restricted cash that is limited to long-term purposes.

•Proceeds from issuing short-term or long-term debt.

•Payments for repurchase of company shares.

Sample cash flow statement using the direct method

Cash flows from operating activities

Cash receipts from customers9,500

Cash paid to suppliers and employees(2,000)

Cash generated from operations (**sum**)**7,500**

Interest paid(2,000)

Income taxes paid(3,000)

Net cash flows from operating activities2,500

Cash flows from (used in) investing activities

Dividends received3,000

Proceeds from the sale of equipment7,500

Net cash flows from investing activities10,500

Cash flows from (used in) financing activities

Dividends paid(2,500)

Cash and cash equivalents, beginning of year1,000

Net cash flows used in financing activities(2,500)

Cash and cash equivalents, end of yearRs. 11,500.

Net increase in cash and cash equivalents10,500

Let us solve the problem based on the given information and determine whether the purchase of the machine is worth or not.

Year	Cash Flow	P.V @10%	Present value
1	50,000	0.909	45,450
2	50,000	0.826	41,300
3	50,000	0.751	37,550
4	50,000	0.682	34,150
5	50,000	0.621	31,050
		P.V. of future cash flow	1,89,500
		Initial Investment	1,50,00
		NPV	39,500

Since it is positive net present value, machine can be purchased.

2.1.2 Principle of economic equivalence

The observation that money has a time value results us to an important question: If receiving $100 today is not the same thing as receiving $100 at any future point, how do we measure and compare various cash flows? How do we know, for example, whether we should prefer to have $20,000 today and $50,000 ten years from now or $8000 each year for the next ten years? In this section, we describe the basic analytical techniques for making such comparisons. we will use these techniques in order to develop a series of formulae that may greatly simplify our calculations.

The central question in deciding among the alternative cash flows involves comparing their economic worth. This will be a simple matter if, in the comparison, we don't need to consider the time value of money: We can simply add the individual payments within a cash flow, treating receipts as positive cash flows and payments as negative cash flows. The fact that money has a time value, makes our calculations even more complicated. We have to know more than just size of a payment in order to determine its economic effect completely.

•The direction of the payment: Is it a receipt or a disbursement?

•The magnitude of the payment.

•The timing of the payment: When is it made?

•The interest rate in operation during the period under consideration.

It follows that, to assess the economic impact of series of payments, we should consider the impact of each payment individually.

Calculations for determining the economic effects of one or more cash flows are based on the concept of the economic equivalence. Economic equivalence exists between the cash flows that have the same economic effect and can thus be traded for one another in the financial marketplace, which we assume to exist.

Economic equivalence refers to fact that a cash flow whether a single payment or a series of payments can be converted to an equivalent cash flow at any point in time. For example, we can find the equivalent future value for a present amount Pat interest rate i at period n; or we can determine the equivalent present value P of N equal payments A.

The preceding strict concept of equivalence, that limits us to convert a cash flow into another equivalent cash flow, can be extended to include the comparison of alternatives. For example, we can compare the value of two proposals by finding the equivalent value of each at any common point in time. If financial proposals which appear to be quite different turn out to have the same monetary value, then we may be economically in different to choose between them: In terms of economic effect, one could be an even exchange for the other, so no reason exists to prefer one over the other in terms of their economic value.

A way to see the concepts of equivalence and economic indifference at work in the real world is to notice the variety of payment plans offered by the lending institutions for consumer loans. The table extends the example we developed earlier in order to include the three different repayment plans for a loan of $20,000 for five years at 9% interest. We will notice that , perhaps , that the three plans needs significantly different repayment patterns and different total amounts of repayment. Because money has a time value, these plans are equivalent and economically, the bank is indifferent to a consumer's choice of plan.

2.2 Evaluation of engineering projects – Present worth method

Executives will be forced to select best alternative from a set of competing alternatives.Assume that an organization has a huge sum of money for the potential investment and there are three different projects whose initial outlay and the annual revenues during their lives are known. Executive has to select the best alternative among these three competing projects.

In the real world,majority of the engineering economic analysis problems have alternative comparisons. In these problems, mutually exclusive two or more investments compete for the limited funds. Variety of methods exists for selecting superior alternative from a group of proposals. Each method has its own merits and applications. There are various bases for comparing the worthiness of the projects. These bases are as follows:

1. Future worth method

2. Rate of return method

3. Present worth method

4. Annual equivalent method

Present worth method

In this method of comparison, the cash flows of each alternative is reduced to time zero by assuming the interest rate i. Then, depending on the type of decision, the best alternative will be selected by comparing present worth amounts of alternatives. In a cost dominated cashflow diagram, the costs will be assigned with positive sign and the profit, revenue, salvage value, etc. Is assigned with the negative sign. In a revenue/profit dominated cashflow diagram, the profit, revenue, salvage value is assigned with the positive sign. The costs is assigned with the negative sign.

When two or more alternatives are capable of performing the same functions, the economically superior alternative have the largest present worth. The present worth method is restricted to evaluating the alternatives which are mutually exclusive and that have the same lives. This method is most suitable for ranking the desirability of the alternatives.

Comparison by present worth method:

First, the comparison of equal life span mutually exclusive alternatives by present worth method will be illustrated followed by comparison of different life span alternatives. The following examples are formulated only to demonstrate the use of different methods for comparison of alternatives. The values of different cost and incomes mentioned in the examples are not the actual ones pertaining to a particular item. In addition, it may also be noted here that the cash flow diagrams have been drawn not to the scale. These are merely the graphical representations.

Problem:

1. There are two alternatives for purchasing concrete mixer. Both alternatives have the same useful life. The cash flow details of alternatives are as follows.

Alternative-1:

Initial purchase cost = Rs.3,00,000, Annual operating and maintenance cost = Rs.20,000, Expected salvage value = Rs.1,25,000, Useful life = 5 years.

Alternative-2:

Initial purchase cost = Rs.2,00,000, Annual operating and maintenance cost = Rs.35,000, Expected salvage value = Rs.70,000, Useful life = 5 years.

By using present worth method, determine which alternative should be selected, if the rate of interest is 10% per year.

Solution:

As both the alternatives have same life span i.e., 5years, the present worth of the alternatives will be compared over a period of 5 years. The cash flow diagram of Alternative-1 is depicted in the below figure.

The cash outflows i.e. costs or expenditures are denoted by vertically downward arrows whereas the cash inflows i.e. revenue or income are represented by vertically upward arrows. The same convention is being adopted here.
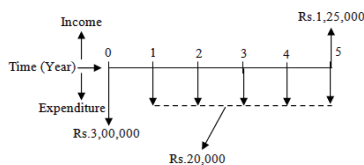
Cash flow diagram of Alternative-1

The equivalent present worth of Alternative-1

i.e. PW1 is calculated as follows:

The initial cost, P = Rs.3,00,000 (cash outflow)

Annual operating and maintenance cost, A = Rs.20,000 (cash outflow)

Salvage value, F = Rs.1,25,000 (cash inflow)

PW1 = - 3,00,000 - 20,000(P/A, i, n) + 1,25,000(P/F, i, n)

PW1 = - 3,00,000 - 20,000(P/A, 10%, 5) + 1,25,000(P/F, 10%, 5)

Now putting the mathematical expressions of different compound interest factors in the above expression for PW1 (in Rs.) results in the following:

PW1 = - 3,00,000 -75,816 + 77,613

PW1= - Rs.2,98,203

The cash flow diagram of Alternative-2 is shown in the below figure.
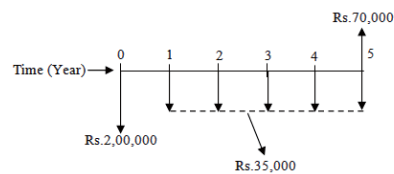
Cash flow diagram of Alternative-2

Revenue-Dominated Cash Flow Diagram:

A generalized revenue dominated cash flow diagram in order to demonstrate the present worth method of comparison is presented in the given figure.
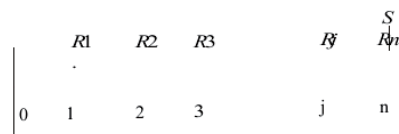
To determine the present worth of the above cashflow diagram for a given interest rate, the formula is represented as,

$$PW(i) = -P + R1[1/(1+i)^1] + R2[1/(1+i)^2] + \dots + Rj\,[1/(1+i)^j] + Rn[1/(1+i)^n] + S[1/(1+i)^n]$$

Cost-Dominated Cash Flow Diagram:

A generalized cost dominated cashflow diagram in order to demonstrate the present worth method of comparison is presented in the below figure.
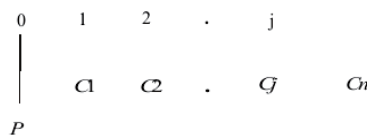
To compute the present worth amount of the above cashflow diagram for a given interest rate i, we have formula,

$$PW(i) = P + C1[1/(1 + i)^1] + C2[1/(1 + i)^2] + \ldots + Cj[1/(1 + i)^j]$$
$$+ Cn[1/(1 + i)^n] - S[1/(1 + i)^n]$$

2.2.1 Future worth method

Comparison by the future worth method

In the future worth method for the comparison of mutually exclusive alternatives, the equivalent future worth of all expenditures and incomes occurring at different periods of time are found at the given interest rate per interest period. The cash flow of the mutually exclusive alternatives consist of the expenditures and incomes in different forms. Therefore the equivalent future worth of these expenditures and incomes will be obtained using different compound interest factors such as single payment compound amount factor, uniform series compound amount factor and future worth factors for arithmetic and geometric gradient series etc.

The use of future worth method for the comparison of mutually exclusive alternatives can be illustrated in the following examples. Similar to the present worth method, first comparison of equal life span alternatives by the future worth method can be illustrated followed by comparison of different life span alternatives. The future worth method in addition to some of the other examples.

In the following example, comparison of three mutually exclusive alternatives by future worth method will be illustrated.

A construction contractor consist of three options to purchase the dump truck for transportation and also dumping of earth at a construction site. All the alternatives has same useful life. The cash flow details of all alternatives are presented as follows:

Option-1:

Initial purchase price = Rs.2500000, Annual operating cost Rs.45000 at end of 1 st year and increasing by Rs.3000 in the forthcoming years till the end of useful life, Annual income = Rs.120000, Salvage value = Rs.550000, Useful life = 10 years.

Option-2:

Initial purchase price = Rs.3000000, Annual operating cost = Rs.30000, Annual income Rs.150000 for the first three years and increasing by Rs.5000 in the forthcoming years till the end of useful life, Salvage value = Rs.800000, Useful life = 10 years.

Option-3:

Initial purchase price = Rs.2700000, Annual operating cost Rs.35000 for the first 5 years and increasing by Rs.2000 in successive years till the end of useful life, Annual income = Rs.140000, Expected salvage value = Rs.650000, Useful life = 10 years.

By using future worth method, determine which alternative must be selected, if the rate of interest is 8% per year.

Solution:

The cash flow diagram of Option-1 is shown here again for ready reference.
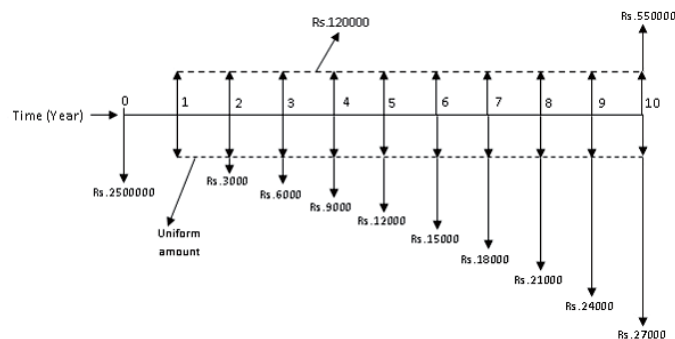
Cash flow diagram of Option-1 with annual operating cost split into uniform base amount and gradient amount. The equivalent future worth of Option-1 is found as follows;

$$FW_1 = -2500000(F/P,8\%,10) - 45000(F/A,8\%,10) - 3000(F/G,8\%,10) + 120000(F/A,8\%,10) + 550000$$

$$FW_1 = -2500000(F/P,8\%,10) + (120000-45000)(F/A,8\%,10) - 3000(F/G,8\%,10) + 550000$$

Now by putting the values of different compound interest factors in the above expression for FW1 results in the following;

$$FW_1 = -2500000 \times 2.1589 + 75000 \times 14.4866 - 3000 \times 56.0820 + 550000$$

$$FW_1 = -5397250 + 1086495 - 168246 + 550000$$

FW1 = - Rs.3929001

In the future worth method of comparison of alternatives, the future worth of several alternatives will be computed. Then, the alternatives with maximum future worth of net revenue or with the minimum future worth of net cost would be selected as the best alternative for implementation.

Revenue-Dominated Cash Flow Diagram:

A generalized revenue dominated cashflow diagram in order to demonstrate the future worth method of comparison is presented in the figure below.
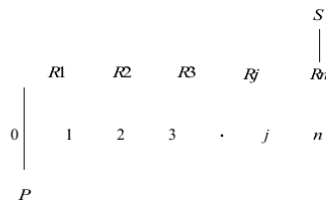

Revenue dominated cashflow

P represents an initial investment, R_j the net revenue at the end of the jth year and S, the salvage value at the end of the nth year. The formula for the future worth of the above cash flow diagram for a given interest rate, i is given by

$$FW(i) = -P(1 + i)^n + R1(1 + i)^{n-1} + R2(1 + i)^{n-2} + ...$$

$$+ Rj(1 + i)^{n-j} + ... + Rn + S$$

In the above mentioned formula, the expenditure is assigned with negative sign and the revenues are assigned with the positive sign.

Cost-Dominated Cash Flow Diagram:

A generalized cost dominated cash flow diagram in order to demonstrate the future worth method of comparison is given in the figure.
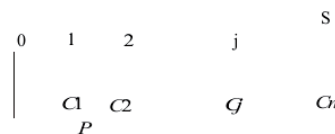
Cost dominated cashflow

In the figure below, P represents an initial investment, C_j the net cost of operation and maintenance at the end of the jth year and S, the salvage value at the end of the nth year. The formula for future worth of the above cashflow diagram for a given interest rate, i is

$$FW(i) = P(1 + i)^n + C1(1 + i)^{n-1} + C2(1 + i)^{n-2} + ...$$

$$+ Cj(1 + i)^{n-j} + ... + Cn - S$$

2.2.2 Annual worth method

Comparison of alternatives by annual worth method:

In this method, the mutually exclusive alternatives are compared on the basis of the equivalent uniform annual worth. The equivalent uniform annual worth represents the annual equivalent value of all the cash inflows and cash outflows of the alternatives at the given rate of interest per interest period.

The equivalent uniform annual worth of all the expenditures and incomes of the alternatives are found using the different compound interest factors such as capital recovery factor, sinking fund factor and annual worth factors for the arithmetic and geometric gradient series etc. As the equivalent uniform annual worth of the alternatives over the useful life are obtained, same procedure is followed irrespective of the life spans of the alternatives i.e. whether it is the comparison of equal life span alternatives or that of different life span alternatives.

In case of comparison of different life span alternatives by the annual worth method, the comparison is not made over least common multiple of the life spans as it is done in case of the present worth and the future worth method. The reason is that even if the comparison is made over the least common multiple of years, the equivalent uniform annual worth of alternative for more than one cycle of cash flow would be exactly same as that of the first cycle provided the cash flow i.e. the costs and incomes of the alternative in successive cycles is exactly the same as that in the first cycle. Therefore, the comparison is made only for one cycle of cash flow of the alternatives. This serves as one of the greatest advantages of using this method over other methods of comparison of the alternatives. But,if cash flows of the alternatives in the successive cycles are not same as that in first cycle, then a study period is selected and then the equivalent uniform annual worth of the cash flows of the alternatives are computed over study period.

Problems

There are two alternatives for purchasing a concrete mixer and the cash flow details are as follows.

Alternative-1:

Initial purchase cost = Rs.300000, Annual operating and maintenance cost = Rs.20000, Expected salvage value = Rs.125000, Useful life = 5 years.

Alternative-2:

Initial purchase cost = Rs.200000, Annual operating and maintenance cost = Rs.35000, Expected salvage value = Rs.70000, Useful life = 5 years.

The annual revenue to be generated from production of concrete (by concrete mixer) from Alternative-1 and Alternative-2 are Rs.50000 and Rs.45000 respectively. Let us compute the equivalent uniform annual worth of the alternatives at the interest rate of 10% per year and find out the economical alternative.

Solution:

The cash flow diagram of Alternative-1 is depicted here again for the ready reference.
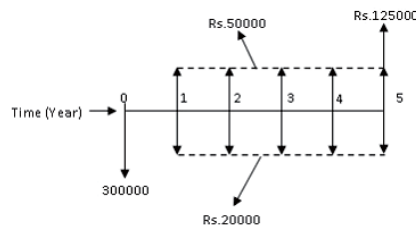
Cash flow of Alternative -1

The equivalent uniform annual worth of Alternative-1 i.e. AW1 is computed as follows:

$$AW_1 = -300000(A/P, i, n) - 20000 + 50000 + 125000(A/F, i, n)$$

$$AW_1 = -300000(A/P, 10\%, 5) - 20000 + 50000 + 125000(A/F, 10\%, 5)$$

Here Rs.20000 and Rs.50000 are annual amounts.

Now by putting the values of different compound interest factors,

$$AW_1 = -300000 \times 0.2638 + (50000 - 20000) + 125000 \times 0.1638$$

$$AW_1 = -79140 + 30000 + 20475$$

AW1= - Rs.28665

In annual equivalent method of comparison, first annual equivalent cost or the revenue of each alternative is computed. Then alternative with the maximum annual equivalent revenue in the case of revenue-based comparison or with the minimum annual equivalent cost in the case of cost based comparison is selected as the best alternative.

Alternatives which accomplish the same purpose but that have unequal lives should be compared by annual cost method. The annual cost method assumes that each alternative can be replaced by the identical twin at the end of its useful life (i.e., infinite renewal). This method, that can also be used to rank the alternatives according to their desirability is also known as the **annual return**

method. The alternatives should be mutually exclusive and repeatedly renewed upto the duration of the longest-lived alternative. The calculated annual cost is termed as the **equivalent uniform annual cost (EUAC) or equivalent annual cost (EAC).** Cost is a positive number when the expenses exceed income.

Revenue Dominated Cash Flow Diagram:

A generalized revenue dominated cashflow diagram in order to demonstrate annual equivalent method of comparison is presented in the figure below.
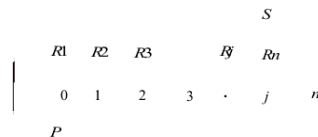
Revenue dominated cashflow

In the figure above, P indiacates an initial investment, R_j the net revenue at the end of the jth year and S the salvage value at the end of the nth year. The first step is to find the net present worth of the cashflow diagram using following expression for a given interest rate, i.

$$PW(i) = -P + R1/(1 + i)^1 + R2/(1 + i)^2 + \dots$$

$$+ Rj/(1 + i)^j + \dots + Rn/(1 + i)^n + S/(1 + i)^n$$

In the above formula, the expenditure is assigned with negative sign and the revenues are assigned with positive sign.

Cost Dominated Cash Flow Diagram:

A generalized cost dominated cashflow diagram to demonstrate the annual equivalent method of comparison is illustrated in the figure below.
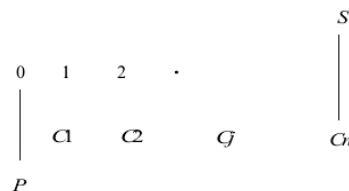
P represents an initial investment, C_j the net cost of the operation and maintenance at the end of the jth year and S is the salvage value at the end of the nth year. The first step is to find the net present worth of the cashflow diagram using the following relation for a given interest rate, i.

$$PW(i) = P + C1/(1 + i)^1 + C2/(1 + i)^2 + \dots$$

$$+ Cj/(1 + i)^j + \dots + Cn/(1 + i)^n - S/(1 + i)^n$$

2.2.3 Internal rate of return method

The rate of return technique is one of the methods that are used in selecting the alternative for a project. In this method, the interest rate per interest period may be determined, that equates the equivalent worth of cash outflows to that of cash inflows of an alternative. The rate of return is also called by other names namely internal rate of return (IRR), profitability index etc. It is usually the interest rate on the unrecovered balance of an investment that becomes zero at the end of the useful life or the study period. The rate of return is represented by "ir".

Using present worth method, equation for the rate of return maybe written as follows:

PWc = PW1 ...(1)

Where,

PWc = Present worth of cash outflows (cost or expenditure)

PWi = Present worth of cash inflows (income or revenue)

Cost or expenditures are taken as the negative cash flows whereas the income or revenues are taken as the positive cash flows.

Equation (1) may be rewritten as,

0 = − PWc + PW1 ...(2)

The net present worth in the above equation is zero.

Now putting the expressions for the present worth of cash outflows and that of cash inflows in equation (1) results in the following expression.

$$P_o + F_c(P/F, i_r, n) + A_c(P/A, i_r, n) = F_I(P/F, i_r, n) + A_I(P/A, i_r, n) \quad \dots(3)$$

On left hand side of the above equation, P_o is the initial cost at time zero and F_c (single amount) and A_c (uniform amount series) are the expenditures occurring at future period of time. Similarly on the right hand side of the equation, F_I (single amount) and A_I (uniform amount series) are the incomes or revenues occurring at future period of time. The value of interest period 'n' will vary depending upon the occurrence of the future amounts (either expenditure or income).

$$0 = -[P_o + F_c(P/F, i_r, n) + A_c(P/A, i_r, n)] + [F_I(P/F, i_r, n) + A_I(P/A, i_r, n)] \quad \dots(4)$$

The value of rate of return 'ir' can be calculated by solving the above equation. The equation (4) can be solved either manually through the trial and error process or using Microsoft Excel spreadsheet.

The first method is the trial and error process for the determination of the rate of return eats more time whereas the second method is faster. But , the trial and error method gives clear understanding of the analysis of calculation for rate of return. Same like its equivalent present worth, the rate of return may also be determined by finding out interest rate at which the net future worth or net annual worth is zero.

After the determination of the rate of return for a given alternative, it is compared with the minimum attractive rate of return (MARR) to determine the acceptability of this alternative for the project. If the rate of return i.e. "ir" is larger than or equal to MARR, then alternative will be selected or else it won't be selected.

The MARR is the minimum rate of return from investment, which is acceptable. It is the minimum rate of return below which investment alternatives are not economically acceptable. The minimum attractive rate of return (MARR) serves as important criteria while selecting the single alternative or comparing the mutually exclusive alternatives whenever the investments are made.

For an organization, it is governed by various parameters namely the availability of the financially viable projects, amount of fund available for investment with the associated risk and type of organization.

An intuitive definition of the rate of return (ROR) is the effective annual interest rate at which an investment accrues income. That is, the rate of return of an investment is the interest rate which yield the identical profits if all money was invested at that rate. Although this definition is correct, it does not provide the method of determining the rate of return. The present worth of a $100 investment invested at 5% is zero, when i = 5% is used to determine the equivalence. Therefore, a working definition of rate of return would be the effective annual interest rate that makes the present worth of the investment zero. Alternatively, the rate of return could be defined as the effective annual interest rate that makes the benefits and costs equal.

A company may not know what the effective interest rate, i, to use in the engineering economic analysis. In such a case, the company can establish a minimum level of economic performance that it would like to realize on all the investments. This criterion is termed as the minimum attractive rate of return or MARR.

Once a rate of return for an investment is known, it may be compared with the minimum attractive rate of return. If the rate of return is equal to or exceeds the minimum attractive rate of return, the investment is qualified. This is basis for rate of return method of alternative viability analysis.

If rate of return is used to select among two or more investments, an incremental analysis should be performed. An incremental analysis starts by ranking the alternatives in order of increasing initial investment. Then, cash flows for the investment with lower initial cost are subtracted from the cash flows for the higher-priced alternative on year-by-year basis. This produces the third alternative representing the costs and benefits of added investment. The added expense of higher-priced

investment is not warranted unless the rate of return of this third alternative exceeds the minimum attractive rate of return.

The alternative with the higher initial investment is superior if the incremental rate of return exceeds the minimum attractive rate of return. Finding the rate of return may be a long, iterative process, requiring either the interpolation or trial and error. The actual numerical value of rate of return is sometimes not needed; it is sufficient to know whether or not the rate of return exceeds the minimum attractive rate of return analysis may be accomplished without calculating the rate of returns simp1y by finding the present worth of the investment using minimum attractive rate of return as effective interest rate .

If the present worth is zero or positive, the investment is qualified. If the present worth is negative, the rate of return is less than the minimum attractive rate of return and the additional investment is not warranted. The present worth, annual cost and the rate of return methods of comparing the alternatives yield equivalent results, but they are distinctly different approaches.

Both present worth and annual cost methods can use either the effective interest rates or the minimum attractive rate of return to rank the alternatives or compare them to MARR. If the incremental rate of return of pairs of alternatives are compared with MARR, the analysis is taken as a rate of return analysis.

The rate of return of the cashflow pattern is the interest rate at which present worth of that cashflow pattern reduces to zero. The rate of return for each alternative can be computed by this method of comparison. Then, the alternative that has the highest rate of return is selected as the best.

Generalized cashflow

In the cashflow diagram above , P represents an initial investment, R_j the net revenue at the end of the jth year and S is salvage value at end of the nth year. The first step is to find net present worth of cashflow diagram using following expression at a given interest rate, i.

$$PW(i) = -P + R1/(1 + i)^1 + R2/(1 + i)^2 + ...$$

$$+ Rj/(1 + i)^j + ... + Rn/(1 + i)^n + S/(1 + i)^n$$

Period	0	1	2	3	4	5

Cashflow (Rs.)	-1,00,000	30,000	30,000	30,000	30,000	30,000

```
          30,000   30,000   30,000   30,000   30,000
        |0    1      2       3       4       5
1,00,000
```
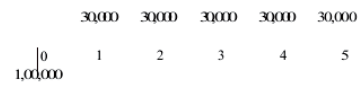
Cashflow diagram

2.2.4 Cost-benefit analysis in public projects

Cost-Benefit Analysis (CBA) is an analytical tool for judging economic advantages or disadvantages of an investment decision by assessing its costs and benefits in order to assess welfare change attributable to it.

The analytical framework of CBA refers to a list of underlying concepts which is as follows:

• **Opportunity cost.** The opportunity cost of a good or service refers to the potential gain from best alternative forgone.

When a choice requires to be made between several mutually exclusive alternatives. The rationale of CBA lies in the observation

That investment decisions taken on the basis of profit motivations and price mechanisms lead, in some circumstances (e.g.market failures such as asymmetry of information, externalities, public goods, etc.), to socially undesirable outcomes.

On the contrary,when input, output and external effects of an investment project are valued at their social opportunity costs, the return obtained is a proper measure of the project's contribution to social welfare.

• **Long-term perspective.** A long-term outlook is followed, ranging from a minimum of 10 to a maximum of 30 years or more, depending on sector of intervention. Thus it is necessary to:

Take into account uncertainty by assessing the project's risks.

Forecast future costs and benefits (looking forward);

Set a proper time horizon;

Adopt appropriate discount rates to calculate the present value of future costs and benefits;

The main application is for project appraisal in the ex-ante phase, CBA can also be used for in medias res and ex post evaluation.

• **Calculation of economic performance indicators expressed in monetary terms.**

CBA is based on a set of predetermined project objectives, giving a monetary value to all the positive (benefits) and negative (costs) welfare effects of the intervention. These values are discounted and then total in order to calculate a net total benefit. The project overall performance is measured by indicators, namely the Economic Net Present Value (ENPV), expressed in monetary values and the Economic Rate of Return (ERR), allowing comparability and ranking for competing projects or alternatives.

• **Microeconomic approach.** CBA is typically a microeconomic approach enabling the assessment of the project's impact on society as a whole via the calculation of economic performance indicators, thereby providing an assessment of expected welfare changes. While direct employment or external environmental effects realised by the project are reflected in the ENPV, indirect (i.e. on secondary markets) and wider effects (i.e. on public funds, employment, regional growth, etc.) should be excluded. This is for two main reasons:

Most indirect and wider effects are usually transformed, redistributed and capitalised forms of direct effects, thus, the need to limit the potential for benefits double-counting.

There remains little practice on how to translate them into robust techniques for project appraisal, thus the need to avoid the analysis relies on assumptions whose reliability is difficult to check.

It is recommended, however, to provide a qualitative description of these impacts to better explain the contribution of the project to the EU regional policy goals.

• **Incremental approach.** CBA compares a scenario with-the-project with a counterfactual baseline scenario without-the-project. The incremental approach requires that: A counterfactual scenario is defined as what would happen in the absence of the project. For this scenario, projections

are made of all cash flows related to the operations in the project area for each year during the project lifetime. In cases where a project consists of a completely new asset, e.g. there is no pre-existing service or infrastructure, the without the project scenario is one with no operations. In cases of investments aimed at improving an already existing facility, it should include the costs and the revenues/benefits to operate and maintain the service at a level that it is still operable (Business As Usual (BAU)) or even small adaptation investments that were programmed to take place anyway. In particular, it is recommended to carry out an analysis of the promoter's historical cash-flows as a basis for projections, where relevant. The choice between BAU or do-minimum as counterfactual should be made case by case, on the basis of the evidence about the most feasible and likely, situation.

If uncertainty exists, the BAU scenario shall be adopted as a rule of thumb. If do-minimum is used as counterfactual, this scenario should be both feasible and credible and not cause undue and unrealistic additional benefits or costs. As illustrated in the box below the choice made may have important implications on the results of the analysis;

Secondly, projections of cash-flows are made for the situation with the proposed project. This takes into account all the investment, financial and economic costs and benefits resulting from the project. In cases of pre-existing infrastructure, it is recommended to carry out an analysis of historical costs and revenues of the beneficiary (at least three previous years) as a basis for the financial projections of the with-project scenario and as a reference for the without-project scenario, otherwise the incremental analysis is very vulnerable to manipulation;

Finally, the CBA only considers the difference between the cash flows in the with-the-project and the counterfactual scenarios. The financial and economic performance indicators are calculated on the incremental cash flows only.

The rest of the presents conceptual framework of a standard CBA15, i.e. the 'steps' for project appraisal, enriched with focuses, didactical examples or shortcuts, presented in boxes, to support the comprehension and practical application of the steps proposed. At the end of each section, a review of good practices and common mistakes drawn from empirical literature, ex-post evaluations and experience gained from major projects funded during the 2007-13 programming period, is also illustrated.

Identification Of The Project

The presented the legal basis for the definition of a project. Here, some analytical issues involved in project identification are developed. In particular, a project is clearly identified when:

• The physical elements and the activities that will be implemented to provide a given good or service and to achieve a well-defined set of objectives, consist of a self-sufficient unit of analysis;

• The body responsible for implementation (often referred to as 'project promoter' or 'beneficiary') is identified and its technical, financial and institutional capacities analysed; and

• The impact area, the final beneficiaries and all relevant stakeholders are duly identified **Physical elements and activities**

A project is defined as 'as a series of works, activities or services intended in itself to accomplish an indivisible task of a precise economic or technical nature which has clearly identified goals' (Article 100 (Content) of Regulation (EU) No 1303/2013). These works, activities or services should be instrumental in the achievement of the previously defined objectives.

A description of the type of infrastructure (railway line, power plant, broadband, waste water treatment plant, etc.), type of intervention (new construction, rehabilitation, upgrade, etc.), service provided (cargo traffic, urban solid waste management, access to broadband for businesses, cultural activities, etc.) and location should be provided in order to define the project activities

In this regard, the key aspect is that appraisal needs to focus on the whole project as a self-sufficient unit of analysis, which is to say that no essential feature or component is left outside the scope of the appraisal (under-scaling). For example, if there are no connecting roads for waste delivery, a new landfill will not be operational. In that case, both the landfill and the connecting roads are to be considered as a unique project.

In general, a project can be defined as technically self-sufficient if it is possible to produce a functionally complete infrastructure and put a service into operation without dependence on other new investments. At the same time, including components in the project that are not essential to provide the service under consideration should be avoided (over-scaling).

The Body Responsible For Project Implementation

The project owner, i.e. the body responsible for project implementation, should be identified and described in terms of its technical, financial and institutional capacity. The technical capacity refers

to the relevant staff resources and staff expertise available within the organisation of the project promoter and allocated to the project to manage its implementation and subsequent operation. In the case of the need to recruit additional staff, evidence should be provided that no constraints exist to find the necessary skills on the local labour market. The financial capacity refers to the financial standing of the body,

which should demonstrate that it is able to guarantee adequate funding both during implementation and operations. This is particularly important when the project is expected to require substantial cash inflow for working capital or other financial imbalances (e.g. medium-long term loan, clearing cycle of VAT, etc.).

The institutional capacity refers to all the institutional arrangements needed to implement and operate the project [e.g. set up of a Project Implementation Unit (PIU)] including the legal and contractual issues for project licensing. Where necessary, special external technical assistance may need to be foreseen and included in the project. When the infrastructure owner and its operator are different, a description of the operating company or agency who will manage the infrastructure (if already known) and its legal status, the criteria used for its selection and the contractual arrangements foreseen between the partners, including the funding mechanisms (e.g. collection of tariffs and service fees, presence of government subsides), should be provided.

2.3 Depreciation policy

Now-a-days, a big amount is spent for acquiring the modem machines. For the purpose of these acquisition, the management should have to take some concrete decision.

Hence , the policy must include the following:

(1) To select appropriate method of depreciation.

(2) To review the current provision for the depreciation whether there is any under provision for the depreciation or over provision for depreciation.

(3) To evaluate existing policy of depreciation from the stand point of tax consideration

(4) To constitute committee for the "Depreciation Policy"

(5) To ascertain the proper amount of depreciation and its recording procedure

(6) To disclose policy of depreciation in published annual report for benefit of shareholders, outsiders etc.

The depreciation policy to be followed in an organization is decided at the peak level. Depreciation policy relates to the choice of method of depreciation and its suitability for the organization. Various methods may be evaluated in the light of many factors like effect of obsolescence, repairs and the maintenance, future operating efficiency of asset in use, service cost of asset, etc.

Objectives of Depreciation Policy:

The management has to consider the following objectives while framing a proper depreciation policy:

(a) To determine the correct profit.

(b) Creating funds to replace the asset in future.

(c) Sometimes to create a source of fund for working capital.

(d)To recover the cost of fixed assets before its effective life.

(e) Following a uniform rate of return.

(f) To take advantages of tax benefit.

Any equipment which is purchased today will not work for ever. This may be due to the wear and tear of the equipment of technology. Hence, it can be replaced at the proper time for continuance of any business.

The replacement of the equipment at the end of its life involves money. This must be internally generated from the earnings of the equipment.

The recovery of the money from the earnings of an equipment for its replacement purpose is known as depreciation fund since we make an assumption that the value of the equipment decreases with the passage of the time. Hence, the word depreciation means decrease in the value of any physical asset with the passage of time.

There are several methods of accounting depreciation fund. These are as follows:

1. Straight line method of depreciation

2. Declining balance method of depreciation

3. Sum of the years -digits method of depreciation

4. Sinking-fund method of depreciation

5. Service output method of depreciation

2.3.1 Depreciation of capital assets

Depreciation is the systematic reduction in the recorded cost of a fixed asset. Examples of fixed assets that can be depreciated are buildings, furniture, leasehold improvements and office equipment. The only exception is land, which is not depreciated (since land is not depleted over time, with the exception of natural resources). The reason for using depreciation is to match a portion of the cost of a fixed asset to the revenue that it generates; this is mandated under the matching principle, where we record revenues with their associated expenses in the same reporting period in order to give a complete picture of the results of a revenue-generating transaction. The net effect of depreciation is a gradual decline in the reported carrying amount of fixed assets on the balance sheet.

It is very difficult to directly link a fixed asset with a revenue-generating activity, so we do not try - instead, we incur a steady amount of depreciation over the useful life of each fixed asset, so that the remaining cost of the asset on the company's records at the end of its useful life is only its salvage value.

Inputs to Depreciation Accounting

There are three factors to take when we calculate depreciation.They are.,:

Useful life: This is the time period over which the company expects that asset will be productive. It is no longer cost-effective to continue operating the asset, so it is expected that the company will dispose of asset. Depreciation is remembered over the useful life of an asset.

Salvage value: When a company eventually disposes of an asset, it can able to sell it for some reduced amount, which is salvage value. Depreciation is calculated based on the asset cost, less any estimated salvage value. If the salvage value is expected to be quite small, then it is basically ignored for the purpose of calculating the depreciation.

Depreciation method.

We may calculate depreciation expense using an accelerated depreciation method or evenly over the useful life of the asset. The advantage of using an accelerated method is that we may recognize more depreciation early in the life of a fixed asset, that postpones some income tax expense recognition into a later period. The advantage of using a steady depreciation rate is the ease of calculation. Examples of the accelerated depreciation methods are declining balance and sum-of-the-years digits methods. The primary method for the steady depreciation is the straight-line method. The units of production method is available if we want to depreciate an asset based on its actual usage level, as is commonly done with the airplane engines that have specific life spans tied to their usage levels.

If, midway through useful life of an asset, we expect its useful life or the salvage value to change, we must incorporate the alteration into the calculation of depreciation over the remaining life of the asset; looking back does not change any depreciation which has already been recorded

Depreciation Journal Entries

When we record depreciation, it is a debit to the Depreciation Expense account and a credit to the Accumulated Depreciation account. The Accumulated Depreciation account is a contra account, which implies that it appears on the balance sheet as a deduction from original purchase price of an asset.

Once we dispose of an asset, we credit the Fixed Asset account where the asset was originally recorded and debit the Accumulated Depreciation account, thereby flushing asset out of the balance sheet. If an asset was not fully depreciated at the time of its disposal, it may also be required to record a loss on undepreciated portion. This loss might be reduced by any proceeds from the sale of asset.

Other Depreciation Issues

The market value of a fixed asset may vary considerably from the net cost of the asset at any given time.

Depreciation is a major issue in the calculation of a company's cash flows, as it is included in the calculation of net income, but does not involve any cash flow. Therefore, a cash flow analysis calls

for the inclusion of net income, with an add-back for any depreciation recognized as the expense during the period.

2.3.2 Causes of depreciation

1. Wear And Tear

Wear and tear refer to a decline in the efficiency of asset due to its constant use. When an asset losses its efficiency, its value goes down and depreciation arises. This is true in case of tangible assets like plant and machinery, furniture, building, tools and equipment used in the factory.

2. Effusion Of Time

The value of asset may decrease due to passage of time even if it is not in use. There are some intangible fixed assets like copyright, patent right and lease hold premises that decrease its value as time elapse.

3. Exhaustion

An asset may sometimes lose its value because of exhaustion too. This is the case with wasting assets like mines, quarries, oil-wells and forest-stand. On account of continuous extraction, a stage will come where the mines and oil-wells gets completely exhausted.

4. Obsolescence

Changes in fashion are the external factors that are responsible for throwing out of assets even if those are in good condition. For example black and white televisions have become outdated with the introduction of color TVs, the users have discarded black and white TVs even when they are in good condition. Such as loss on account of new invention or changed fashions is termed as obsolescence.

5. Other Causes

Market value and accident of an asset are other causes of depreciation which decrease in the value of assets.

Accountants rightly do not differentiate between the physical deterioration and the obsolescence and are not interested in identifying specific causes of depreciation for determining the amount of depreciation. These and other causes are only helpful in estimating an asset's useful life in which the accountants are interested because the useful life of an asset is used to measure amount of depreciation.

2.3.3 Straight line method and declining balance method

Straight line method of depreciation

In this method of depreciation, a fixed sum is charged as the depreciation amount throughout the lifetime of an asset such that the accumulated sum at the end of the life of the asset is exactly equal to the purchase value of the asset.

We make an important assumption that inflation is absent.

F = Salvage value of the asset

P = First cost of the asset

n = life of the asset

D_t = Depreciation amount for the period t.

B_t = Book value of the asset at the end of the period t

The formula for depreciation and book value are as follows:

$$D_t = (P - F)/n$$

$$B_t = B_{t-1} - D_t = P - t \quad [(P - F)/n$$

Problem

A company has purchased an equipment whose first cost is Rs.1,00,000with an Estimated life of eight years. The estimated salvage value of the equipment at the end of its lifetime is Rs.20,000. Let us determine the depreciation charge and book value at the end of various years using the straight line method of depreciation.

Solution:

F = Rs.20,000

P = Rs.1,00,000

n = 8years

D_t = (P − F)/n = (1,00,000 −20,000)/8

= Rs. 10,000

In this method of depreciation, the value of D_t Is the same for all the years. The calculations pertaining to B_t for different values of t are summarized in Table .

D_t and B_t Values under Straight line Method of Depreciation.

End of year (t)	Depreciation (D_t)	Book value ($B_t = B_{t-1} - D_t$)
0		1,00,000
1	10,000	90,000
2	10,000	80,000
3	10,000	70,000
4	10,000	60,000
5	10,000	50,000
6	10,000	40,000
7	10,000	30,000
8	10,000	20,000

If we are interested in computing D_t and B_t for a specific period (t), the formula can be used. In this approach, it should be noted that the depreciation is the same for all the periods.

2. Let us compute the depreciation and the book value for period 5.

$$P = \text{Rs. } 1,00,000$$
$$F = \text{Rs. } 20,000$$
$$n = 8 \text{ years}$$
$$D_5 = (P - F)/n$$
$$= (1,00,000 - 20,000)/8$$
$$= \text{Rs. } 10,000 \text{ (This is independent of the time period.)}$$
$$B_t = P - t \quad (P - F)/n$$
$$B_5 = 1,00,000 - 5 \quad (1,00,000 - 20,000)/8$$
$$= \text{Rs. } 50,000$$

Solution:

Declining balance method of depreciation

In this method of depreciation, a constant percentage of the book value of the previous period of the asset will be charged as the depreciation amount for the current period. This approach is a

realistic approach, since the depreciation charge decreases with the life of the asset which matches with the earning potential of the asset. The book value at the end of the life of the asset may not be exactly equal to the salvage value of the asset. This is the major limitation of this approach.

Let,

P = First cost of the asset

F = Salvage value of the asset

n = Life of the asset

B_t = Book value of the asset at the end of the period t

K = A fixed percentage

D_t = Depreciation amount at the end of the period t

The formula for depreciation and its book value are as follows:

$$D_t = K \quad B_{t\text{-}1}$$
$$B_t = B_{t-1} - D_t = B_{t-1} - K \quad B_{t-1}$$
$$= (1 - K) \quad B_{t-1}$$

The formula for depreciation and the book value in terms of P are as follows:

$$D_t = K(1 - K)^{t-1}$$
$$P \, B_t = (1 - K)^t$$
$$P$$

While availing income-tax exception for the depreciation amount paid in each year, the rate K is limited to 2/n. If this rate is used, then the corresponding approach is termed as the double declining balance method of depreciation.

The demonstrate the calculations of the declining balance method of depreciation by assuming 0.2 for K.

Solution:

P = Rs.1,00,000

F = Rs.20,000

n = 8years

K = 0.2

The calculations pertaining to D_t and B_t for different values of t are summarized in Table using the following formula:

$$D_t = K \quad B_{t-1}$$
$$B_t = B_{t-1} - D_t$$

Table D_t and B_t according to Declining Balance Method of Depreciation

End of year (n)	Depreciation (D_t)	Book value (B_t)
0		1,00,000.00
1	20,000.00	80,000.00
2	16,000.00	64,000.00
3	12,800.00	51,200.00
4	10,240.00	40,960.00
5	8,192.00	32,768.00
6	6,553.60	26,214.40
7	5,242.88	20,971.52
8	4,194.30	16,777.22

If we are interested in computing D_t and B_t for a specific period t, its respective formula can be used.

COST CONCEPTS AND BREAK-EVEN ANALYSIS

Cost concepts, Elements of costs, Preparation of cost sheet, Segregation of costs into fixed and variable costs. Break-even analysis-Linear approach. (Simple numerical problems to be solved) Banking: Meaning and functions of commercial banks; functions of Reserve Bank of India. Overview of Indian Financial system.

3.1 Cost concepts

Various Cost Concepts:

Objectives;

Understand and Identify various cost concepts that are associated or related to various stages of business operations and market situations.

Private Cost and Social Cost

Money Cost and Real Cost

Fixed Cost, Variable Cost, Average Cost and Marginal Cost

Opportunity Cost

Accounting Cost and Economic Cost

Opportunity Cost:

The resources of any firm operating in market are limited and investment options are many.

The firm has to decide or select only those investment opportunities or options that provide the firm with best return or best income on investment.

This means that if a firm invest money or resources only in one investment option then the firm selects that investment option that promises best return on investment to the firm.

In other words while doing so the firm gives up/rejects the next best option for investing the funds. The opportunity cost of a company is hence this income or return that the firm could have earned on the next best investment alternative.

This may also be understood by a simple example -

One job offer is promising him a salary of Rs. 30, 000 per month but the other job offer will ensure salary of Rs. 25, 000 per month.

If the job profile and other factors related to the job offers are more or less same then it may be easily expected that the individual will select the job offer that will provide him with higher salary that is salary of Rs. 30, 000 per month.

Therefore,the opportunity cost is the return involved in the next best alternative i.e; Salary of Rs. 25, 000 in the next best job offer. Concept of opportunity cost is closely related to the concept of Economic profit or Economic Rent.

A firm earns or makes Economic profit only when besides covering several costs of operation, a firm is able to earn more than its opportunity cost .

The basic formula for opportunity cost is;

What we are sacrificing or What we are gaining = Opportunity cost

Opportunity Cost is known as the Implicit Cost.

Economic Profit is therefore earned only when the following is true for the Firm:

Income of a Firm > Various Costs of Operations + Opportunity Cost

OR

Economic Profit = Earnings or Revenue of Firm - Economic Costs. Here Economic Cost is various expenses of the business plus opportunity cost

Money Cost and Real Cost:

Money Cost of production is actual monetary expenditure made by company in the production process. Money cost includes all the business expenses that involve outlay of money to support the business operations.

For example the monetary expenditure on purchase of raw material, payment of wages and salaries, payment of rent and other charges of business etc may be termed as the Money Cost.

Real Cost of production or business operation on the other hand include all those expenses/costs of business that may or may not involve the actual monetary expenditure.

For example if the owner of a business venture uses his personal land and building for running the business venture and he does not charge any rent for the same then those head will not be considered/included while computing the Money Cost but this head would be part of Real Cost computation.

The cost involved is the Opportunity Cost of the land and building.If the promoter of the company had not used the land and building for the business venture then land and building could have been used elsewhere for some other ensure and could have generated some income for the promoter.

This income/rent which could have been earned under the next best investment option is the opportunity cost which needs to be considered while calculating the Real Cost for the firm.

Accounting Cost and Economic Cost:

Accounting Cost include all business expenses that are recorded in the book of accounts of a business firm as acceptable business expenses.

Such expenses includes expenses like Cost of Raw Material, Depreciation, Wages and Salaries, Various Direct and Indirect business Overheads,Taxes etc.

When those business expenses or accounting expenses are deducted from Sales income of any firm the accounting profit is determined. Such Accounting/Business expenses or costs are also known as the Explicit Costs.

Accounting Cost: Several allowed business expenses. Such as Cost of Raw Material, Salaries and Wages, Electricity Bill, Telephone Charges, Various Administrative Expenses, Selling and Distribution Expenses, Production Overhead Expenses, Other Indirect Overhead Expenses etc.

Accounting Profit = Sales Income - Accounting Cost

Economic Cost includes all accounting expenses as well as Opportunity cost of a business firm. Economic Cost and Economic Profit is calculated as follows:

Economic Cost = Accounting Cost (Explicit Costs) + Opportunity Cost

Economic Profit = Total Revenues - (Accounting Cost + Opportunity Cost)

Private Cost and Social Cost:

The actual expenses of individuals/ firms that are borne or paid out by the individual or a firm can be termed as Private Cost.

Business firm includes expenses such as Cost of Raw Material, Salaries and Wages, Rent, Various Overhead Expenses etc.

Private Cost for an individual will be his /her private expenses such as expense on food, rent of house, expenses on clothing, expenses on travel, expenses on entertainment etc.

Social Cost includes Private Cost and also this costs that are not borne by the firm but by the society at large.

Ex: the cost of damage or disutility caused by operations of a firm in an economy can not be borne by the firm in question but it impacts the society greatly and thus this cost is added to the Private Cost to find the Social Cost of producing the product.

Such Cost is also known as External Cost. Another example of external cost may be the cost of giving the basic infrastructure facilities such as good roads, sewage system or network, street lights etc.

Cost of such facilities is not borne by business firm even though the firm is benefits from such facilities. Such costs are hence added to the Private Cost to find Social Cost of producing a product or a good.

If a Tannery firm releases its toxic wastes in river flowing nearby its factory surrounding then this act of the Tannery firm causes water pollution and the environmental damage.

The Cost of such damage/loss is added to private costs of the tannery firm to obtain fair idea of Social cost involved in production of product in question.

Social Cost of an individual includes his private cost and the cost of damage on account of his actions.

Fixed Cost, Variable Cost, Average Cost and Marginal Cost:

Fixed Cost is a cost that does not change irrespective of whether the firm is operating or not

Ex: On account of Strike on account of Lockout in Maruti-Suzuki's Manesar plant the production process stands still.

Even when the plant is not operating the Firm should still has to bear those expenses that are indirect in nature.

Ex:Rent of the factory premises, Wages of administrative employees etc. In other Fixed cost is not related direct production/manufacturing expenses.

Variable Cost is directly proportional to the production operations.As size of production at any business grows, with that grow the variable expenses.

The variable expenses vary with business operations. hence the firm is not operating on account of Strike/Lockout etc, then variable cost of firm is Zero Average Cost,which is the cost that is obtained after dividing the Total Cost with number of units produced.

For ex:
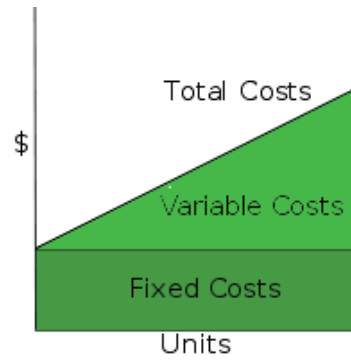
Total Cost = Fixed Cost + Variable Cost

Average Cost = Total Cost / Units of Good produced

Marginal Cost is the change in the Total cost when additional unit of good is produced. Marginal Cost is the difference between the total Cost of producing 'N + 1' units of good and 'N' units of good.

Marginal Cost = TC (n+1) - TC(n)

3.1.1 Elements of costs

Cost function

The cost function is a function of input prices and output quantity. Its value is the cost of making that output given those input prices. There are three types of cost functions such as linear, quadratic and cubic.

Cost sheet

Cost sheet is a statement showing the total cost under proper classification in a logical order. It provides cost per unit in different stages and helps in comparison anti-control of cost. It also acts as a basis of fixation of selling price.

Types of cost

When cost is expressed in terms of money, it is known as the money cost. It relates to money outlays by a firm on several factor inputs in order to produce a commodity.

The cost of producing a good or service, which includes the cost of all resources used and the cost of not employing those resources in alternative uses.

Let us see the implicit and explicit cost

Implicit cost or opportunity cost: examples - any cost that results from using an asset instead of renting, selling or lending it.

Explicit cost: examples - wage expense, rent or lease costs and the cost of materials that go into the production of goods.

Cost of Determinants

The cost of production of goods and services depends on a number of factors; these factors may differ from firm to firm within an industry and from one industry to another. The important cost determinants are as under:

1.Level of Output

The larger the output, the greater will be the production cost. For there will be larger use of various factors of production who shall get larger payments. Thus, total cost varies directly with output.

2.Prices of Input Factors

A rise in factor prices also increases total production cost. The various factors of production viz., land, labour, capital and organization get rent, wages, interest and salary respectively as their

reward. Obviously larger payments will have to be made for the factors of production when their prices go up. Thus, the cost of production varies directly with the prices of factors of production.

3.Productivities of Factors of Production

Productivity of a factor of production refers to the output per unit of that factor. The higher the productivity of a factor of production, the lower the cost per unit of the input factor. Thus, an increase in factor productivities would reduce the total production cost for producing a given output.

Productivity and efficiency are synonymous. Factor efficiency can increase in several ways such as increasing the machine spent, raising the number of hours per day and/or month the machine is operated and so on. Given a certain output, an increase in efficiency brings down the total production costs.

4.Size of Plant

Plant size is yet another important cost determinant. Production costs are generally lower in case of bigger plant than in smaller plants. This is because of economies of large scale production. Notably, with a bigger size, although initial fixed costs are high variable cost tend to be low compared with a small with sized plant.

5.Output Stability

Stability of output also leads to savings in various kinds of hidden costs of interruption and learning. Overall costs are generally lower where output is stable and constant over a period of time. Production by sudden breaks and disruption is bound to be costly.

6.Lot size

Lot size also affects production costs. Lot size here means the size of a single production job. In case where the installation costs of machinery are considerable, the economy of large lots is significant. Moreover, if it is possible to process a bigger lot at one time, the total cost of operation and thereby the unit cost will be lower compared with a processes in which only smaller lot sizes are produced.

7.Laws of Returns

In case the law diminishing return is operating, the cost will show a tendency to rise. The reverse will be the case when the law of increasing returns operates.

8.Level of Capacity Utilization

In the short run, level of capacity utilization determines the cost. This especially affects the per unit fixed cost. Thus, with higher capacity utilization, fixed cost per unit of output is bound.

9.Period under Consideration

If one considers the short period, the cost curve will rise steeply. However in case of long period, cost would not increase that steeply.

10.Technology

Technology is an important cost determinant. Technological progress or improvement leads to an increase in the efficiency or productivity of factors of production. This in turn leads to a reduction in the cost of production. In other words, cost varies inversely with technological progress. Also, most technological innovations aim at reducing costs.

A knowledge of the relationship between cost and technological progress is essential to forecast the cost. The change in technology generally changes the equipment, the size of the plant and plant flexibility to output changes.

A forecast of technology is also essential for the purpose of tacking the problem of equipment replacement. Here one has to determine the degree of obsolescence of the old machine to be replaced.

11.Learning Effect

Learning effect means that in many activities cost decline as the activity is repeated an increasing number of times. As workers and management becomes more familiar with production process or a particular product, there will be cost reductions. If there are substantial learning effects, there will be first most advantages by virtue of being the first to undertake an activity as against late comers.

12.Breadth of Product Range

Costs are determined by the breadth of product range. Such cost advantages cost occur when the processing of different goods can share inputs or where distributed and promotion can take place jointly.

13.Degree of Vertical Integration

Cost advantages can be achieved by increasing the degree of vertical integration with the firm, moving closer to the final customer (forward vertical integration) or to sources of supply (backward vertical integration).

14.Geographical Location

Costs may be affected by geographical location when factor prices, tax regimes and government incentives vary from place to place.

15.Institutional Factors

Institutional factors like unionization, local content/indigenization rules and tariffs also affect costs.

16.Firm's Discretionary Policies

Costs also depend upon a wide range of firm's discretionary policies.

The examples are:

(1)Nature and design of the product being manufactured,

(2)Level of services provided to customers,

(3)Package of human resources policies adopted regarding pay, incentive schemes, employees benefits, training etc.

Cost-plus Pricing

It is a pricing method used by companies to maximize their profits.The firms accomplish their objective of profit maximization by increasing their production until marginal revenue equals marginal cost. and then charging a price which is determined by the demand curve. However, in practice, most firms use cost-plus pricing, also known as **markup pricing**.

Cost-plus pricing is specially useful in the following cases:

1.Public-utility Pricing

2. Finding out the design of the product when the selling price is predetermined. i.e., product tailoring.

3. By working back from this price, the product and the permissible cost is decided upon. This means that market realities are taken into account as this approach considers the viewpoint of the buyer in terms of what he wants and what he will pay.

Pricing products that are designed to the specification of a single buyer-,he basis of pricing is the estimated cost plus gross margin that the firm could have got by using facilities otherwise.

Cost-plus pricing is useful in cases like 'Monopsony Buying' here, the buyers have enough knowledge about suppliers' costs. Thus, they may make the product themselves if they do not comply with the offered prices. So, relevant cost would be the cost which a buying company would incur if it made the product itself.

LIMITATIONS;

•Provides incentive for inefficiency.

•Tends to ignore the role of consumers.

•Tends to ignore the role of competitors.

•Uses historical rather than replacement value.

•Uses "normal" or "standard" output level to allocate fixed costs

•Includes sunk costs rather than just using incremental costs.

•Ignores opportunity cost.

3.1.2 Preparation of cost sheet

Step 1

Note the material costs on a ledger that shows every expenditure on materials or supplies used for a particular job. Transfer all material costs listed on the ledger to a cost sheet when the project is finished.

Step 2

Keep a log of all labour hours used to perform a job. Make a note of pay rates and hours for each employee who works on the project. Transfer project labour hours to the job cost sheet after the work is done.

Step 3

Calculate the overhead cost for a job after all work is completed. Find the overhead cost figure by multiplying the overhead for a given number of employee hours or by multiplying the number of days spent on the project by the daily overhead cost for a manufacturing facility.

Step 4

List the individual costs for labor and time spent on the project. Note total costs for all separate materials. List the overhead as indirect labor and material costs. Show the total costs for labor, materials and overhead in a separate column. Add these three totals for an overall bottom line total cost. Prepare cost sheets showing these expenditures for all department heads and clients.

Cost sheet – format

Particulars	Amount	Amount
Opening Stock of Raw Material	***	
Add: Purchase of Raw materials	***	
Add: Purchase Expenses	***	
Less: Closing stock of Raw Materials	***	
Raw Materials Consumed	***	
Direct Wages (Labour)	***	

Direct Charges	***	
Prime cost (1)		***
Add :- Factory Over Heads:		
Factory Rent	***	
Factory Power	***	
Indirect Material	***	
Indirect Wages	***	
Supervisor Salary	***	
Drawing Office Salary	***	
Factory Insurance	***	
Factory Asset Depreciation	***	
Works cost Incurred		***
Add: Opening Stock of WIP	***	
Less: Closing Stock of WIP	***	
Works cost (2)		***
Add:- Administration Over Heads:-		
Office Rent	***	
Asset Depreciation	***	
General Charges	***	
Audit Fees	***	
Bank Charges	***	

|		
Counting house Salary	***	
Other Office Expenses	***	
Cost of Production (3)		***
Add: Opening stock of Finished Goods	***	
Less: Closing stock of Finished Goods	***	
Cost of Goods Sold		***
Add:- Selling and Distribution OH:-		
Sales man salary	***	
Sales man Commission	***	
Traveling Expenses	***	
Advertisement	***	
Delivery man expenses	***	
Bad Debts	***	
Sales Tax	***	
Cost of Sales (5)		***
Profit (balancing figure)		***
Sales		***

It is important to note that:

2) Administration Over Heads, Selling and Distribution Overheads are recovered as a percentage of works cost.

1) Factory Over Heads are recovered as a percentage of direct wages

3.1.3 Segregation of costs into fixed and variable costs

In order to segregate semi variable cost into the fixed cost and the variable cost is needed because with this, we may add fixed cost proportion in total fixed cost and the variable cost proportion in total variable cost. So, with following method, we can calculate this .

1.Graphical Method With graphical method, we draw the graphic line of semi variable cost by taking output on x' axis and total semi variable cost at y' axis. After this, we do the judgement and select a point where will be our fixed cost in semi variable cost. After this, we draw the line of the best fit. This line shows fixed cost that will not be changed after changing the output.
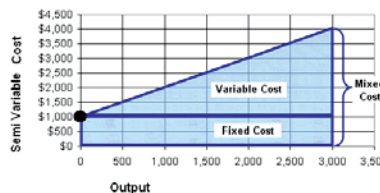
Graphical Method chart

2.High Points and Low Points Method Under this method, we determine total sale and total cost at the highest level of production. We then calculate total sale and total cost at the lowest level of production. Because, semi variable cost consist of both variable and fixed cost. First,we calculate variable rate with the following formula := Excess of total cost / Excess Sale X 100This rate shows the variable cost of the sale value. By using this rate, we calculate also the variable cost of sale at the highest level. The same variable cost will now be deducted from the total cost at the highest level of production. Reminder will be the fixed cost.

Problem: Sale at highest level of production 140000Sale at lowest level of production 80000

Excess sales = 60000

Total cost at highest level of production 72000Total cost at lowest level of production 60000

Excess cost = 12000

Variable cost rate = 12000/60000 X 100 = 20% of sale Variable cost at the highest level of production = 140000 X 20% = 28000Fixed cost = Rs. 72000 - Rs. 28000Fixed cost= Rs. 44000

3.Analytical Method Cost accountant does some analysis for the division of semi variable cost into fixed cost and variable cost in this method. After this, he calculates the fixed cost on that rate which

is analyzed. Assume, a cost accountant says that in the total semi variable cost, there can be 30% fixed cost and 70% variable cost. Now the total semi variable cost will be divided in this basis. If production level increases, variable cost's proportion will also increase with the same rate. But the fixed cost will not change. **4. Level of Activity Method** In this method, we compare the two level of production with amount of expenses in these levels. Variable cost will be calculated with following method:Change in semi variable cost / Change in production volume**5. Least Square Method**This is a statistical method where we use this method for calculating a line of best fit. This method is based on the linear equation ,y = mx +c , y is the total cost, x is the volume of output and c is the total fixed cost. By solving this equation mathematically, we may calculate the variable cost(M) at different level of production.

Fixed Cost And Variable Cost

Fixed CostA fixed cost is a cost that does not vary in the short term, irrespective of the changes in production or the sales levels or other measures of activity. A fixed cost is a basic operating expense of a business which may not be avoided, such as a rent payment. The concept is used in financial analysis to find the break even point of a business, as well as to find the product pricing.

In order to continue the example of a fixed cost, the rent on a building will not change until lease runs out or is renegotiated, irrespective of level of business activity within that building.

Ex: Insurance, depreciation and property taxes. Fixed costs tend to be incurred on a regular basis and so are considered periodic costs. The amount charged to expense tends to change little from period to period.

When a company has a large fixed cost component, it must generate a significant amount of sales volume in order to have sufficient contribution margin to offset the fixed cost. Once that sales level has been reached, however, this type of business generally has a relatively low variable cost per unit and so can generate outsized profits above the breakeven level. An example of this situation is an oil refinery, which has massive fixed costs related to its refining capability. If the cost of a barrel of oil drops below a certain amount, the refinery loses money. However, the refinery can be wildly profitable if the price of oil increases beyond a certain amount.

Conversely, if a company has low fixed costs, it probably has a high variable cost per unit. In this case, a business can earn a profit at very low volume levels, but does not earn outsized profits as sales increase. For example, a consulting business has few fixed costs, while most of its labor costs are variable.

Fixed costs are allocated under the absorption basis of cost accounting. Under this arrangement, fixed manufacturing overhead costs are proportionally assigned to the units produced in a reporting period and so are recorded as assets. Once the units are sold, the costs are charged to the cost of goods sold. Thus, there can be a delay in the recognition of those fixed costs that are allocated to inventory.

Variable CostA variable cost is a cost that varies in relation to changes in the volume of activity. The variable cost concept can be used to model the future financial performance of a business, as well as to set minimum price points. The most common variable costs are:

1.Direct materials, since the cost of materials are charged to expense when the associated products are sold.

2.Commissions, since the sales staff earns commissions when sales transactions are completed.

3.Billable labor, since wages associated with billable hours are charged to expense when the associated sales transactions are completed.

4.Piece rate labor, where employees are paid based on the number of units produced.

5.Credit card fees, where a fee is not incurred unless a customer uses a credit card to pay for a purchase.

6.Direct labor may not be a variable cost if labor is not added to or subtracted from the production process as production volumes change. This situation arises when a production line must be staffed, irrespective of the amount of production volume.

7.Overhead is not a variable cost, since overhead costs will be incurred, irrespective of production levels. For example, both rent and machine depreciation, which are overhead costs, will be incurred even if there is no production activity.

8.A company with a high proportion of variable costs can usually generate a profit at a relatively low sales level, since there are few fixed costs that must also be paid for in each accounting period.

Problem:

The following are maintenance cost incurred in a machine shop for the six month with corresponding machine hours.

Month Machine Hours Maintenace Costs t January 2,000 3,00,000 February March April 2,400 3,40,000 May 1,800 2,80,000 June 1,900 2,90,000 Total : 12,000 18,00,000

Month	Machine	Maintenance cost
January	2,000	3,00,000
February	2,200	3,20,000

March	1,700	2,70,000
April	2,400	3,40,000
May	1,800	2,80,000
June	1,900	2,90,000
Total	**12,000**	**18,00,000**

Analyses the maintenance cost which is semi- variable inti fixed and variable element.

Solution:

Computation of variable cost and fixed cost has been done according to range method

Machine Hours Maintenance Cost

Highest point, April 2,400 3,40,000

Lowest point, March 1,700 2,70,000

 Total 700 70,000

Variable Cost per Machine hour = Change in Maintenance Costs /Change in Hours

Rs =70,000/700 = 100

Total Variable Cost for 2,400 machine hours will be

2,400 x 100 = 2,40,000

Hence, Fixed Cost is (7 3,40,000 — 2,40,000) = 1,00,000

Analysis of Maintenance Cost into Fixed and Variable Element

Month	Machine	Maintenance cost	Fixed cost	Variable cost
January	2,000	3,00,000	1,00,000	2,00,000
February	2,200	3,20,000	1,00,000	220,000
March	1,700	2,70,000	1,00,000	1,70,000
April	2,400	3,40,000	1,00,000	2,40,000
May	1,800	2,80,000	1,00,000	1,80,000
June	1,900	2,90,000	1,00,000	1,90,000

3.2 Break-even analysis-Linear approach. (Simple numerical problems to be solved)

An analysis to determine the point at which revenue received equals the costs associated with receiving the revenue. Break-even analysis calculates what is known as a margin of safety, the amount that revenues exceed the break-even point. This is the amount that revenues can fall while still staying above the break-even point.

BREAK-EVENANALYSIS ASSUMPTIONS:

• All costs are categorized as either fixed or variable. If not impossible or impractical, by dividing costs into variable and fixed cost elements is an extremely hard job. This is attributable to the inherent nature or characteristic of cost perse.

• Fixed costs remain constant within relevant range. Fixed costs remains unchanged at any level of activity within relevant range, even at zero level.

• The behavior of the total revenues and total costs would be linear over relevant range, i.e. appears as a straight line on BE chart. This is based on idea that variable costs vary in proportion to the volume; fixed costs remains unchanged, thus drawn as a straight horizontal line on graph within the relevant range and that selling price is constant.

• In case of multiple product companies, selling prices, costs and proportion of units sold will never change. This cannot be correct always. Sales mix ratio can be due to the change in the consuming habits of customers. Selling prices of the individual products can likewise change due to the competition, popularity and salability of products, etc.

• There is no significant change in inventory levels during period under the review. Stated in another way, production volume is assumed to be almost equal to sales volume, that causes an immaterial difference between beginning and the ending inventories.

The Break-Even Chart

In its simplest form, break-even chart is a graphical representation of costs at various levels of activity that shown on the same chart as the variation of income with the same variation in activity. The point at which neither profit nor loss is made is termed as "break-even point" and is denoted on the chart below by the intersection of the two lines:
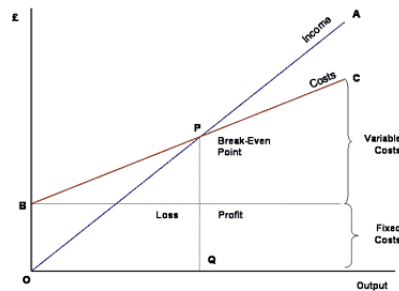
The Break-Even Chart

In the diagram above, the line OA represents variation of income at varying levels of production activity. OB denotes the total fixed costs in the business. As the output increases, variable costs are incurred, which implies that total costs also increases. At low levels of output, Costs are greater than the Income. At the point of intersection, P, costs are exactly equal to income and thus neither profit nor loss is made.

Managerial Uses of Break-Even Analysis:

To the management, utility of break-even analysis lies in the fact that it presents a microscopic image of the profit structure of business enterprise. The break-even analysis not only emphasizes the area of economic strength and weakness in the firm but also sharpens the focus on certain holds that may be operated upon to enhance its profitability. It leads the management to take effective decision in context of changes in government policies of taxation and subsidies.

Terminology In Break-Even Analysis:

Fixed cost (FC): It doesn't change with production volume or output. For example: cost of land and buildings, salaries of top management, insurance, depreciation, taxes on property, equipment, etc.

Variable cost (VC):

It changes depending on the output volume. For example: cost of raw materials, labour, transportation charges, packaging cost, etc. If s is the selling price per unit, v is the variable cost per unit, FC is the fixed cost per period, Q is the volume of production, then,

Total Sales Revenue (sales) of the firm, S = s.Q in Rupees.

Total cost (TC): It is the sum of Fixed cost (FC) and variable cost (VC).

TC = Total variable cost + Fixed cost = v.Q + FC

Profit = Total Sales Revenue – Total Cost = Total Sales Revenue – (Fixed cost + Variable cost) i.e. Profit = s.Q – (FC + v.Q)

Break-even Quantity, $Q_{B.E.P}$ = Fixed cost/ (selling price per unit – Variable cost per unit) $Q_{B.E.P}$ (in units) = FC/s-v

Break-even sales revenue =[Fixed cost/(selling price/unit – Variable cost/unit)]. (Selling price/unit) $S_{B.E.P}$ (in Rs) = [FC/s-v].s

Profit/Volume ratio (P/V Ratio):

It is the ratio of contribution to the total sales revenue or turnover of the company. It is used to measure profitability of different products. Naturally, higher the P/V ratio, higher is the profit.

P/V ratio = [Contribution/ total sales revenue] .100

= [(total sales revenue – total variable costs)/total sales revenue].100 Also,

Break-even point (BEP) = Fixed cost/(P/V ratio)

Margin of safety = Profit/(P/V ratio)

Managerial Uses of Break-Even Analysis:

The break-even analysis may be used for the following purposes:

(i) Safety Margin:

The break-even chart helps the management to know at a glance profits generated at the various levels of sales. The safety margin is the extent to which the firm may afford a decline before it starts incurring the losses. The formula to find the sales safety margin is given as follows:

Safety Margin= (Sales – BEP)/ Sales x 100

From numerical example at the level of 250 units of output and sales, the firm is earning profit, the safety margin may be found out by applying the formula

Safety Margin = 250- 150 / 250 x 100 =40%

This implies that the firm which is now selling 250 units of product may afford to decline sales upto 40 per cent. The margin of safety can be negative as well, if the firm is incurring any loss. In that case, percentage tells the extent of sales that must be increased in order to reach the point where there is no loss.

(ii) Target

Profit:

The break-even analysis may be utilized for the purpose of calculating volume of sales needed to achieve a target profit. When a firm has some target profit, this analysis helps in finding out the extent of increase in sales by using following formula:

Target Sales Volume = Fixed Cost + Target Profit / Contribution Margin per unit

For example: We can take Table 1 given above. Suppose the firm fixes the profit as Rs.100, then the volume of output and sales should be 250 units. Only at this level, it gets a profit of Rs. 100. By using formula, same result will be obtained.

(iii) Change

In Price:

The management is often faced with problem of whether to reduce the prices or not. Before taking a decision on this question, the management has to consider a profit. A reduction in price leads to a reduction in contribution margin. This implies that the volume of sales will have to be increased even to maintain previous level of profit. The higher the reduction in the contribution margin, the higher is the increase in sales required to ensure previous profit.

Problem:

1. A company manufactures and sells a telephone answering machine. The company's contribution format income statement for the most recent year is given below: all value dollar rate

	Total	Per unit	Present of sale
Sales	1,200,000	60	100%
Less variable expenses	900000	45	%
	-	-	-
Contribution margin	300000	15	%
Less fixed expenses	240000	-	-
	-		

Net operation income	60000		
	-		

Calculate break even point both in units and sales dollars. Use the equation method

Solution:

Sales = Variable expenses + Fixed expenses +Profit

$60Q = $45Q + $240,000 + $0

$15Q = $240,000

Q = $240,000 / 15 per unit

Q = 16,000 units; or at $60 per unit, $960,000

Alternative solution:

X = 0.75X + 240,000 + $0

0.25X = $240,000

X = $240,000 / 0.25

X = $960,000; or at $60 per unit, 16,000 units

2. A concrete mixer has the following cash flow details;

Initial purchase price = Rs.750000,

Annual operating and maintenance cost = Rs.45000

Salvage value = Rs.210000,

Useful life = 10 years

In addition one operator is required to operate the concrete mixer at cost of Rs.30 per hour. The production (preparation) rate of concrete of the mixer is 0.1 m^3 per hour. The revenue to be generated from production of 1 m^3 of concrete is Rs.1000. The interest rate is 11% per year. How many 'm^{3}' of concrete need to be produced per year so that the revenue generated break evens with the expenditure?

Solution:

In order to find out the break-even value of the concrete volume (in 'm³') per year, the equivalent uniform annual worth of expenditure will be equated to that of revenue.

Let 'x' m³ is the volume of concrete produced by the concrete mixer per year.

The operator cost is Rs.30 per hour.

The operator cost (Rs.) per year is given by;

$$\frac{Rs.30}{1 hour} \times \frac{1 hour}{0.1 m^3} \times \frac{x\, m^3}{year} = Rs.300x$$

Now the equivalent uniform annual worth (Rs.) of expenditure is given by;

$$AW_e = 750000(A/P, i, n) + 45000 + 300x$$
$$AW_e = 750000(A/P, 11\%, 10) + 45000 + 300x$$
$$AW_e = 750000 \times 0.1698 + 45000 + 300x = 172350 + 300x$$

The equivalent uniform annual worth (Rs.) of revenue is calculated as follows;

$$AW_r = 210000(A/F, i, n) + 1000x$$
$$AW_r = 210000(A/F, 11\%, 10) + 1000x$$
$$AW_r = 210000 \times 0.0598 + 1000x = 12558 + 1000x$$

Now equating equivalent uniform annual worth of expenditure with that of revenue;

$$AW_e = AW_r$$
$$172350 + 300x = 12558 + 1000x$$
$$x = 228.274\, m^3$$

Thus the volume of concrete to be produced by the concrete mixer per year i.e. the break-even quantity at which the expenditure incurred is equal to the revenue generated is 228.274 m³. If the volume of concrete produced per year is different from the break-even value, then there will change in the net cash flow as shown below;

If x is equal to 200 m³ (i.e. less than break-even value), the equivalent uniform annual worth of expenditure and revenue are given by;

Expenditure

$$AW_e = 750000(A/P,11\%,10) + 45000 + 300x$$

$$AW_e = 750000 \times 0.1698 + 45000 + 300 \times 200 = Rs.232350$$

Revenue

$$AW_r = 210000(A/F,11\%,10) + 1000x$$

$$AW_r = 210000 \times 0.0598 + 1000 \times 200 = Rs.212558$$

$$AW_e > AW_r$$

If x is equal to 250 m³ (i.e. greater than break-even value), the equivalent uniform annual worth of expenditure and revenue are given by;

Expenditure

$$AW_e = 750000(A/P,11\%,10) + 45000 + 300x$$

$$AW_e = 750000 \times 0.1698 + 45000 + 300 \times 250 = Rs.247350$$

Revenue

$$AW_r = 210000(A/F,11\%,10) + 1000x$$

$$AW_r = 210000 \times 0.0598 + 1000 \times 250 = Rs.262558$$

$$AW_r > AW_e$$

Thus from above calculations it is observed that, equivalent annual worth of revenue is less than that of expenditure, when the volume of concrete produced per year is less than the break-even value and on the other hand, equivalent annual worth of revenue is more than that of expenditure, when the volume of concrete produced per year is greater than the break-even value.
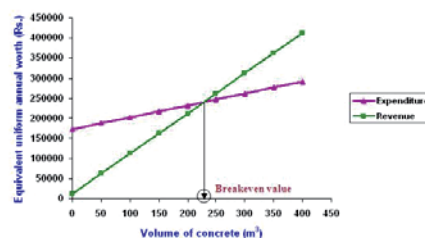
The break-even point is also graphically

The equivalent uniform annual worth of expenditure and revenue are calculated at different values of volume of concrete produced per year using the respective expressions as mentioned earlier and are shown in the above figure.

The break-even point can also be calculated by equating the equivalent present worth of expenditures to that of revenues as shown below.

Present worth of expenditure:

$$PW_e = 750000 + 45000(P/A, i, n) + 300x(P/A, i, n)$$
$$PW_e = 750000 + 45000(P/A, 11\%, 10) + 300x(P/A, 11\%, 10)$$
$$PW_e = 750000 + 45000 \times 5.8892 + 5.8892 \times 300x = 1015014 + 1766.76x$$

Present worth of revenue:

$$PW_r = 210000(P/F, i, n) + 1000x(P/A, i, n)$$
$$PW_r = 210000(P/F, 11\%, 10) + 1000x(P/A, 11\%, 10)$$
$$PW_r = 210000 \times 0.3522 + 5.8892 \times 1000x = 73962 + 5889.2x$$

Now equating equivalent present worth of expenditure with that of revenue;

$$PW_e = PW_r$$
$$1015014 + 1766.76x = 73962 + 5889.2x$$
$$x = 228.275 m^3$$

Thus the break-even value of volume of concrete to be produced by the concrete mixer per year is 228.275 m^3 which is same as the value obtained by annual worth method stated earlier.
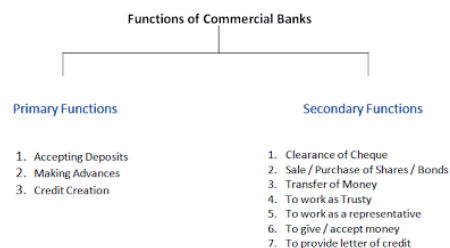
3.3 Banking: Meaning and functions of commercial banks

Meaning

A commercial bank is a financial institution that performs the functions of accepting deposits from the general public and giving loans for the investment with the aim of earning profit.

Actually,commercial banks, are profit-seeking institutions, i.e., they do banking business to earn more profit.

They basically finance trade and commerce with short-term loans. They charge high rate of interest from borrowers but pay much less rate of Interest to their depositors with the result that difference between the two rates of interest becomes the main source of profit for the banks. Most Indian joint stock Banks are Commercial Banks like Punjab National Bank, Allahabad Bank, Canara Bank, Andhra Bank, Bank of Baroda, etc.

Functions of Commercial Banks

Primary Functions

1. Accepting Deposits
2. Making Advances
3. Credit Creation

Secondary Functions

1. Clearance of Cheque
2. Sale / Purchase of Shares / Bonds
3. Transfer of Money
4. To work as Trusty
5. To work as a representative
6. To give / accept money
7. To provide letter of credit

PRIMARY FUNCTION

a)Accepting deposits

The most important activity of a commercial bank is to mobilize deposits from public. People who have surplus income and savings find this convenient to deposit the amounts with banks.Depending upon the nature of deposits, funds deposited with bank also earns interest. Therefore, deposits with the bank grow along with the interest earned. If the rate of interest is higher, public are motivated to deposit more funds with the bank. There is also safety of funds deposited with bank.

b)Grant of loans and advances

The second important function of a commercial bank is to grant loans and also advances. These loans and advances are given to members of the public and also to the business community at a higher rate of interest than it is allowed by banks on various deposit accounts.The rate of interest charged on loans and advances changes depending upon purpose, period and the mode of repayment.The difference between rate of interest allowed on deposits and the rate charged on the Loans is main source of a bank's in come.

i)Loans

A loan is granted over a particular time period. Usually,commercial banks grant short-term loans. But term loans,which means , loan for more than a year, may also be granted.The borrower may withdraw the entire amount in lump sum or also in installments. However, interest is charged on full amount of the loan. Loans are basically granted against security of some assets. A loan can be repaid either in lump sum or also in installments.

ii)Advances

An advance is a credit facility provided by the bank to its customers. It changes from loan in the sense that loans can be granted for longer period, but advances are normally granted for a short period of time. Moreover,the purpose of granting advances is to meet the day to day needs of the business. The rate of interest charged on the advances changes from bank to bank. Interest is charged only on amount withdrawn and not on sanctioned amount

Modes of short-term financial assistance

Banks grant short-term financial assistance by way of cash credit,overdraft and also the bill discounting.

a)Cash Credit

Cash credit is an arrangement where the bank allows the borrower to draw amounts upto a particular limit. The amount is credited to the account of customer. The customer may withdraw this amount as and when required. Interest is charged on amount actually withdrawn. Cash Credit is granted as per agreed terms and conditions with customers.

b)Overdraft

Overdraft is a credit facility granted by the bank. A customer who has a current account with the bank is allowed to with draw more than amount of credit balance in his own account. It is a temporary arrangement. Overdraft facility with a specified limit is allowed either on the security of assets or on personal security,or both.

c)Discounting of Bills

Banks provide short-term finance by discounting bills, that is,making payment of the amount before the due date of the bills after deducting a certain rate of discount. The party gets the funds without waiting for the date of maturity of the bills. In case any bill is dishonoured on the due date, the bank can recover the amount from the customer.

SECONDARY FUNCTIONS

• Agency services

• General utility services

Agency Services:

The customers may give standing instruction to the banks to accept or make payments on their behalf. The relationship between the banker and customer is that of Principal and Agent. The following agency services are provided by bankers:

1. insurance premium,installments on hire purchase, Payment of rent,telephone bills, etc. The payments are generally made from the account of customer. The banks can also collect these receipts on behalf of the customer.

2. The bank collects drafts,cheque and bills on behalf of customer.

3. The banks may exchange domestic currency for the foreign currencies as per regulations.

4. The banks may act as trustees / executors to their customers. For example, banks may execute the will after death of their clients.

General Utility Services:

The commercial banks provide also several general utility services to their customers. Some of these services are as follows:

Safeguarding money and valuables: People feel safe and secured when depositing their money and valuables in safe care of the commercial banks. Many banks look after the valuable documents such as house deeds ,property and jewellery items.

Transferring money: Money may be transferred from one place to another. Likewise, banks collect funds of their customers from other banks and credit the same in the account of customer.

Merchant banking: Most of the commercial banks provide merchant banking services to investors and firms. The merchant banking activity includes the project advisory services and loan syndication, corporate advisory services like advice on mergers and the acquisitions, disinvestment, equity valuation, identification of joint venture partners ,etc.

Automatic Teller Machines (ATM): The ATMs are machines for the quick withdrawal of cash. In the last 10 years, all the banks have introduced ATM facilities in metropolitan and also in semi-urban areas. The account holders as well as the credit card holders may withdraw cash from ATMs.

Traveler's cheque: A traveler's cheque is a printed cheque of a particular denomination. The cheque can be purchased by a person from the bank after making the necessary payments. The customer may carry the traveler's cheque while travelling. The traveler's cheques are accepted in banks, hotels and other establishments.

Credit Cards: Credit cards are another important ways of making payments. The Visa and Master Cards are being operated by the commercial banks. A person may use a credit card in order to withdraw cash from the ATMs as well as to make payments to trade establishments.

3.3.1 Functions of Reserve Bank of India

The Reserve Bank of India executes several traditional central banking functions as well as undertakes different promotional and developmental measures in order to meet dynamic requirements of country.

The broad objectives of the Reserve Bank are:

(a) developing the financial structure of the country on sound lines consistent with the national socioeconomic objectives and policies. Main functions of the Reserve Bank are described below:

(b) keeping the foreign exchange reserves of the country

(c) Regulating the issue of currency in India;

(d) establishing the monetary stability in the country

1. Note Issue:

The Reserve Bank has monopoly of note issue in the country. It has sole right to issue the currency notes of all denominations except one-rupee notes. One-rupee notes are issued by the Ministry of Finance of Government of India. The Reserve Bank acts as the only source of legal tender because even one-rupee notes are circulated through it. The Reserve Bank has a separate Issue Department, that is entrusted with job of issuing the currency notes. The Reserve Bank has adopted minimum reserve system of note issue. Since 1957, this maintains gold and foreign exchange reserves of Rs. 200 crore, of which at least Rs. 115 crore has to be in gold.

2. Banker to Government:

The Reserve Bank acts as the banker, agent and adviser to Government of India:

(a) It collects and makes payments on behalf of the government,

(b) It maintains and operates government deposits,

(c) It undertakes foreign exchange transactions on behalf of the Central Government,

(d) It sells for the Central Government treasury bills of 91 days duration,

(e) It makes 'Ways and Means' advances to the Central and State Governments for periods not exceeding three months,

(f) It helps the government to float new loans and manages the public debt,

(g) It provides development finance to the government for carrying out five year plans,

(h) It acts as agent of Government of India in the latter's dealings with the International Monetary Fund (IMF), the World Bank and other international financial institutions, (i) It advises the government on all financial matters such as loan operations, investments, agricultural and industrial finance, banking, planning, economic development, etc.

3. Banker's Bank:

The Reserve Bank acts as the banker's bank in the following discipline:

Every Bank is under statutory obligation to keep certain minimum of cash reserves with Reserve Bank. The purpose of such reserves is to enable Reserve Bank in order to extend the financial assistance to scheduled banks in times of emergency and hence to act as the lender of last resort. According to the Banking Regulation Act, 1949, all the scheduled banks are needed to maintain with Reserve Bank minimum cash reserves of 5% of their demand liabilities and 2% of their time liabilities.

The Reserve Bank (Amendment) Act, 1956 empowered Reserve Bank to raise cash reserve ratio to 20% in case of demand deposits and to 8% in case of time deposits. Due to difficulty of categorizing deposits into demand and time categories, amendment to the Banking Regulation Act in September 1972 changed the provision of reserves to 3% of aggregate deposit liabilities, that can be raised to 15% if Reserve Bank considers it to be necessary.

(b) The Reserve Bank provides financial assistance to scheduled banks by discounting their eligible bilk through various loans and advances against the approved securities.

(c) Under Banking Regulation Act,1949 and its several amendments, the Reserve Bank has now been given extensive powers of supervision and the control over the banking system. These regulatory powers relates to the licensing of banks and their branch expansion; liquidity of assets of the banks; management and methods of working of the banks; amalgamation, reconstruction and liquidation of banks; inspection of banks; etc.

4. Custodian of Exchange Reserves:

The Reserve Bank is the custodian of India's foreign exchange reserves. It maintains and stabilisers the external value of the rupee, administers exchange controls and other restrictions imposed by government and manages foreign exchange reserves. Initially, the stability of THE exchange rate was maintained through the process of selling and purchasing sterling at fixed rates. But after India became a member of international Monetary Fund (IMF) in 1947, the rupee was delinked with the sterling and became multilaterally convertible currency. Thus the Reserve Bank now sells and buys foreign currencies and not sterling alone, to achieve the objective of exchange stability. The Reserve Bank fixes the selling and buying the rates of foreign currencies. All Indian remittances to foreign countries and foreign remittances to India are made through Reserve Bank.

5. Controller of Credit:

As the central bank of the country, the Reserve Bank undertakes the responsibility of controlling credit in order to ensure internal price stability and promote economic growth. Through this function, the Reserve Bank attempts to achieve price stability in the country and avoids inflationary and deflationary tendencies in the country. Price stability is essential for economic development. The Reserve Bank regulates money supply in accordance with changing needs of the economy. The Reserve Bank makes large use of various quantitative and qualitative techniques to control effectively and regulate the credit in country.

6. Ordinary Banking Functions:

The Reserve Bank performs various ordinary banking functions:

(a) It buys and sells the securities of the Government of India and the foreign securities,

(b) It buys, sells and the rediscounts bills of exchange and promissory notes of scheduled banks without any restrictions

(c) It accepts deposits from the central government, state governments and even the private individuals without interest

(d) It grants loans and advances to central government, state governments, local authorities, scheduled banks and state cooperative banks, repayable within 90 days

(e) It accepts valuables, securities, etc., for keeping them in safe custody.

(f) It buys from and sells to scheduled banks foreign exchange for a minimum amount of Rs. 1 lakh

(g) It buys and sells gold and silver.

(h) It can open an account in the World Bank or in some foreign central bank.

(i) It may borrow from any scheduled bank in India or from any foreign bank

7. Miscellaneous Functions:

In addition to the central banking and the ordinary banking functions, Reserve Bank performs following miscellaneous functions:

(a) Banker's Training College has been set up to extend the training facilities to supervisory staff of commercial banks. Arrangements have been made to impart training lo cooperative personnel

(b) The Reserve Bank collects and publishes the statistical information which are related to currency, banking, credit, finance, agricultural and industrial production, etc. Also it publishes the results of various studies and review of economic situation of the country in its monthly bulletins and periodicals.

8. Forbidden Business:

Being the central bank of the country, the Reserve Bank:

(a) should keep its assets in liquid form to meet any situation of economic crisis.

(b) Should not compete with member banks and

Thus , the Reserve Bank has been forbidden to do some types of business:

(a) It can neither buy its own shares not those of other banks or commercial and industrial undertakings,

(b) It can neither participate in, nor directly provide financial assistance to any business, trade or industry,

(c) It cannot give interest on deposits.

(d) It cannot grant unsecured loans and advances,

(e) It cannot draw or accept bills not payable on demand,

(f) It cannot give loans against mortgage security,

(g) It cannot purchase immovable property except for its own offices.

9. Promotional and Developmental Functions:

Besides the traditional central banking functions, the Reserve Bank also performs a variety of promotional and developmental functions:

(a) By encouraging the commercial banks to expand their branches in semi-urban and rural areas, the Reserve Bank helps (i) in reducing the dependence of the people in these areas on the defective unorganized sector of indigenous bankers and money lenders and (ii) in developing the banking habits of people

(b) By establishing the Deposit Insurance Corporation, the Reserve Bank helps in develop the banking system of the country, instills confidence of the depositors and avoids bank failures,

(c) Through the institutions like Unit Trust of India, the (Reserve Bank helps to mobilise savings in the country,

(d) Since its inception, the Reserve Bank has been mating efforts to promote institutional agricultural credit by developing cooperative credit institutions.

(e) The Reserve Bank also helps to promote the process of industrialisation in the country by setting up specialised institutions for industrial finance,

(f) it also undertakes measures for developing bill market in the country.

With the routine traditional functions, the central banks especially in developing country such as India need to perform numerous functions. These functions are country specific functions and may change according to the needs of that country. The RBI has been performing as a promoter of the financial system from its inception. Some of the major development functions of the RBI are maintained below.

1. Development of the Financial System:

The financial system comprises of the financial markets ,financial institutions,and financial instruments. The sound and efficient financial system is a precondition of rapid economic development of the nation. The RBI encouraged the establishment of main banking and non-banking institutions in order to cater the credit requirements of the diverse sectors of the economy.

2. Development of Agriculture :

In an agricultural economy like India , the RBI has to give special attention for credit need of agriculture and allied activities. It has successfully furnished service in this direction by increasing the flow of credit to this sector. Earlier ,It has the Agriculture Refinance and Development Corporation (ARDC) to look after the credit, National Bank for Agriculture and Rural Development (NABARD) and the Regional Rural Banks (RRBs).

3. Provision of Industrial Finance :

Rapid industrial growth is main for the faster economic development. In this regard, the adequate and timely availability of credit to small, medium and large industry is very significant. The RBI has always been instrumental in setting up the special financial institutions like ICICI Ltd. IDBI, SIDBI and EXIM BANK etc.

4. Provisions of Training :

The RBI has always tried in order to provide essential training to the staff of the banking industry. The RBI has set up the bankers training colleges at various places. National Institute of Bank Management , Bankers Staff College i.e BSC and College of Agriculture Banking are few of them to mention

5. Collection of Data :

Being the top monetary authority of the country, RBI collects process and spread statistical data on several topics. This includes interest rate, inflation, savings and investments etc. This data proves to be pretty useful for researchers and policy makers.

Publication of the Reports :

The Reserve Bank has its separate publication division. This division collects and publishes the data on various sectors of the economy. The reports and bulletins are periodically published by RBI. This

includes RBI weekly reports, RBI Annual Report, Report on Trend and Progress of Commercial Banks India and so on. This is made available to the public also at cheaper rates.

7. Promotion of Banking Habits :

As a peak organization, the RBI always tries to promote banking habits in the country. It institutionalizes savings and takes measures for an expansion of the banking network. It has set up many institutions like the Deposit Insurance Corporation-1962, UTI-1964, IDBI-1964, NABARD-1982, NHB-1988, etc. Such organizations develop and promote the banking habits among people. During economic reforms it has taken number of initiatives for encouraging and promoting the banking in India.

8. Promotion of Export through Refinance :

The RBI always tries to encourage the facilities for providing finance for foreign trade especially exports from India. The Export-Import Bank of India and the Export Credit Guarantee Corporation of India are supported by refinancing their lending for export purpose.

SUPERVISORY FUNCTIONS OF RBI

The reserve bank also performs number of supervisory functions. It has authority to regulate and administer the entire banking and financial system. Some of its supervisory functions are given below.

Granting license to banks:

The RBI grants license to banks for carrying its business. License is also given for opening the extension counters, new branches, even to close down existing branches.

Bank Inspection:

The RBI grants license to banks working as per the directives and in a prudent manner without undue risk. In addition to this it can ask for periodical information from banks on various components of assets and liabilities.

Control over NBFIs:

The Non-Bank Financial Institutions are not influenced by working of a monitory policy. However RBI has a right to issue the directives to the NBFIs from time to time regarding their functioning. Through periodic inspection, this can control the NBFIs.

Implementation of the Deposit Insurance Scheme:

The RBI has set up Deposit Insurance Guarantee Corporation in order to protect deposits of tiny depositors. All bank deposits below Rs. One lakh are insured with this corporation. The RBI work to implement the Deposit Insurance Scheme in case of a bank failure.

Reserve Bank of India's Credit Policy

The Reserve Bank of India has a credit policy that aims at pursuing higher growth with pricing stability. Higher economic growth implies ,to produce more quantity of goods and services in different sectors of an economy; Price stability does not mean no change in general price level but to control inflation.

The credit policy aims at increasing finance for agriculture and industrial activities. When credit policy is being implemented, the role of other commercial banks is highly important. Commercial banks flow of credit to different sectors of economy depends on the actual cost of credit and arability of funds in the economy.

3.3.2 Overview of Indian Financial system

The Indian financial system can be broadly classified into the formal (organized) financial system and the informal (unorganized) financial system. The formal financial system comes under the purview of the Ministry of Finance (MOF) Reserve Bank of India (RBI), Securities Exchange Board of India (SEBI) and other regulatory bodies. The informal financial system consists of:

i) Individual money lenders such as neighbors, relatives, land lords, traders, store owners and so on.

(ii) Groups of persons operating as funds or 'associations'. These groups function under a system of their own rules.

(iii) Partnership firms consisting of local brokers, pawn brokers and non banking financial intermediaries such as finance, investment, chit fund companies.

Savings and Investment Saving is abstaining from present consumption for a future use. Savings are sometimes autonomous coming from households as a matter of habit but the bulk of the savings come for specific objectives like interest on income, future needs, contingencies, precautionary purposes, growth in future wealth, leading to rise in the standard of living etc. Investment is the exchange of the money or cash for a future claim on money or the purchase of a security or a promise to pay at a later date along with a regular income as in the case of a share, bond, debenture etc.

Also investment is a service like construction,consultancy, hospital or hotel and services in future as in case of consumer durables. Securities purchases are investment for economy and some investments are distanced by corresponding disinvestments. Gross investments are total investments that is made from all the sources by an economy or a single economic unit and net investment are those which are gross investment minus disinvestments for economic unit. Gross Assets and Investments minus Depreciation for economy or corporate sector or a company or government sector is net investment, which is known as the capital formation.

Changes or fluctuations in economic activity occur when the investment spending is greater or smaller than the savings at a particular level of income. The resources going into the productive process, i.e. capital formation,can have direct relationship with economic growth. All economic activities agricultural, industrial or services – depend upon the availability of financial resources. The amount of financial resources and volume of capital formation depends upon the intensity and efficiency with which the savings are gathered, encourage and directed towards the investment.

Investment purpose:

The investment purpose of public may be set out in terms of their savings for:

(i) Speculative or asset purposes (for capital gains and building of assets).

(ii) Precautionary purposes (for contingencies or special needs)

(iii) Transactions purpose (for daily needs or regular payments)

Investment for the Consumption and Business: The income is divided into two components ,that is ,Consumption and Investment. The amounts which are not consumed are saved and invested. Also investments are useful for the present and future consumption in the case of consumer durables, cars, gold and silver etc. Generally investments promote larger consumption in future as they lead to more income and larger capital appreciation in the forthcoming years.

Investment and speculation

Purchases of assets such as shares and securities may be for either investment or speculation or for both. Investment is long term in nature but speculation is short term. All investments are risky to some extent but speculation is most risky as it involves buying, short term trading and selling that may lead to profits sometimes and losses at other times.

Investment avenues: There is large number of investment avenues for the savers in India. Some of them are marketable and liquid but others are more risky and they are less safe. Risk and return are the major characteristics that an investor has to face and handle. The investor has to choose the proper avenues among them depending on his objectives, preferences, needs and abilities to take minimum risk and maximize returns.

Return

Return ,being prime mover .to induce investment and probably is the one to sustain it. Market participants are tempted to always look out for better investment alternatives for the purpose of higher yield or return. But the measurement of investment return has an uphill task with investment literature because the presence of idiosyncratic variables with regard to periodicity of return measurement and performance return horizon. If the two coincides the measurement criteria become very simple and straight forward(but it never happens).

Risk

Corresponding to investment objectives risks distracts investment flows with the added agility. Conservatism is embedded in investors psychological texture while making investment decisions. Portfolio investment is primarily designed to mitigate the risk through diversification.

Risk and Return Relationship

Risk and returns are positively related variables. These go along in the investment process.A higher return is always accompanied with larger risk so that the lower risk yields lesser return. Under these circumstances investors face the dilemma as to preference for one and distraction for the other. Therefore one is destined to face drama orchestrated by the risk return duo. Priority for one over the other finds the outline of investment philosophy that is followed by the investors and also fund managers.

A conservative investor preempts the risk reduction over return magnifications and hence search for those investments alternatives commensurate with the given level of risk tolerance. On the other hand ,Aggressive investors pays more weight to return the magnification and readily been the risk accompanied hence look out for investment alternatives corresponding on this risk return tolerance and preference. The investor has to choose the proper avenues among them depending on the objectives, priorities, requirements and the abilities to take minimum risk and maximum returns.

The financial investment avenues are categorized under the following heads:

1.Bank Deposits and Schemes

2.PSU Shares and Bonds.

3.UTI and Mutual Fund Schemes.

4.Government and Semi-Government Bonds/Securities

5.Post Office Deposits/Certificates, etc

6.Corporate Shares, Debentures, Deposits,

Recent Trends In Indian Securities Market

Transfer of resources from those with the surplus resources to others who has a productive requirement for them efficiently achieved through the securities markets. Securities market gives channels for the allocation of savings to investment and thereby to decouple these two activities. As a result, savers and investors are not restricted by their individual abilities, but by the abilities of economy to invest and save respectively, which invest ably amplifies the savings and investments in the economy. Securities markets channel the savings to the most productive investments that increases the rate of return on investments.

Hence the securities market fosters economic growth by augmenting the quantities of real savings and the capital formation from any given level of national income and also by raising the productivity of investments by improving the allocation of investable funds. The securities market has two interdependent and inseparable segments, the new issues and the stock markets. The primary market channel for scale of new securities while the secondary market deals in securities that are previously issued. The prime signals, that include all the information about issuer and his business with the associated risk, generated in secondary market, help the primary market in allocation of funds.

The issuers of new securities in the primary market in order to raise the funds for investment or to discharge some obligation. They do this either through public issue or through private placement. It is a public issue when any body and every body may subscribe for the securities. If the issue is made to select people, it is private placement. If the securities are issued exclusively to the existing shareholders it is called 'rights issue'. If a public issue of the offer is made to public at large.

There are two major types of issuers of securities. The corporate entities issue mainly debt and equity instruments while the governments issue debt securities.

The securities market has essentially three categories of participants, namely the issuers of securities, the investors in securities and the intermediaries. The issuers and the investors are the consumers of services rendered by the intermediaries while the investors are consumers of securities issued by the issuers.

Those who receive funds in exchange of securities and those who receive securities in exchange for funds often need the reassurance that it is safe to do so. This reassurance is provided by law and custom often enforced by the regulator. The regulator ensures a high standard of service from the intermediaries and supply of quality securities and non manipulated demand for them. In the Indian context the regulators have an additional responsibility of developing the market and also the responsibility of protecting the interest of investors in securities.

Stock Market Growth

The number of stock exchanges in India increased from 11 in 1990 to 23 now. All exchanges are fully computerized and they offer 100% on line trading. 9359 companies were available for trading on stock exchanges at the end of March 2004. The trading platform of the stock exchanges was accessible to 9368 stock brokers 829 derivative brokers and 12815 sub brokers from over 400 cities on the same time.

The market capitalization grew ten fold between 1990-91 and 1999-2000. It declined thereafter following major market misconduct. It however picked up in 2003-2004 to Rs.13, 77, 612 crores which indicates the size of the market increased sharply to 60% by March 2000. Traditionally manufacturing companies and financial services sector accounted for a major share in market capitalization. However in the recent past, the importance of these traditional sectors has declined and new sectors like information technology, pharmaceuticals and fast moving consumer goods have picked up. The trading volumes on exchanges have been witnessing phenomenal growth during 1990s.

The average daily turnover grew from about Rs.150 crore in 1990 to Rs.12000 crore in 2000. The turnover ratio which reflects the volume of trading in relation to the size of the market has been increasing by leaps and bounds after the advent of screen based trading system by the NSE. The turnover ratio for the year 2000-01 increased to 448 but fell substantially to 118 during 2003-04. The average trade size in the equity segments of the changes was about Rs.27000 during 2003-04. NSE is the market leader with over 89% of the total turnover in 2003-04.

Globalization and Capital Market Reforms in India

Globalization aided by rapid absorption of technology has integrated financial markets as never before. Equity culture has therefore to address global issues as well. As it was impossible to leave and operate efficiently in the past without being literate i.e., knowing how to read and write, so it is very hard to live and operate efficiently today without financially literate. Given the complexity of the current financial instruments and the financial decision needed in every day life from comparing

the credit card offerings to choosing the methods of payments in deciding how much to save, when to invest and how to obtain the best loan, individuals has to know how to read and write financially.

Thus , financial literacy need to play an important role for balanced growth of the Indian stock market in the forthcoming days. Foreign institutional investors in Indian stock market are to imagine both positive as well as negative effects. On the positive side ,they help in gaining a higher degree of liquidity by increasing price earnings ratio. On the negative side they are highly unreliable and create severe market fluctuations. They commonly depend on short term games and withdraw funds as soon as they feel any slightest trouble that may shake the entire domestic economy and also result in currency crisis.

South Asian Financial crisis, Mexico crisis are the best examples. However,China's economy is less risky and percentage of domestic savings in the capital market amounts to more proportion compared to India. To maintain a stable growth of stock market excessive dependence of foreign institutional investors has to be reduced. The flow of investments of FIIs is extremely volatile compared to other forms of capital force. Often,Investors pull back their portfolio investment whenever they loose confidence in the host economy.

Exchange Management

Stock exchanges located in Mumbai, Ahamedabad, Madhya Pradesh are organized in the form of 'Association of Persons while the balance 20 are organized as companies either limited by the guarantee or by its shares. Except NSE all exchanges are not for the profit organizations. Most of the stock exchanges in the country are organized as 'Mutuals' that was considered beneficial in terms of tax benefits and matters of compliance.

The trading members who provide brokering services also own, control and manage the exchanges. In demutualization exchange, ownership and the management and trading membership are segregated and vested generally with different set of persons. The exchanges have been mandated by the securities laws Act 2004 to demutualized and corporative themselves by an appointed date.