



# Institute of Open and Distance Education

Faculty of Management

## Managerial Economics

Managerial Economics



1MBA3



**Dr. C.V. Raman University**  
Kargi Road, Kota, BILASPUR, (C. G.),  
Ph. : +07753-253801, +07753-253872  
E-mail : info@cvru.ac.in | Website : www.cvru.ac.in



# DR. C.V. RAMAN UNIVERSITY

Chhattisgarh, Bilaspur

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**1MBA3**

**Managerial Economics**

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Compiled, reviewed and edited by Subject Expert team of University

1. Dr. Anshul Shrivastava

(Assistant Professor, Dr. C. V. Raman University)

2. Dr. Abhinav Awasthi

(Assistant Professor, Dr. C. V. Raman University)

3. Dr. Supriya Singh

(Assistant Professor, Dr. C. V. Raman University)

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Dr. C.V. Raman University

Kargi Road, Kota, BILASPUR, (C. G.),

Ph. +07753-253801, 07753-253872

E-mail: info@cvru.ac.in

Website: [www.cvru.ac.in](http://www.cvru.ac.in)

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# Unit 1 Managerial Economics: An Overview

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## Unit Structure

- Introduction
- Nature of Managerial Economics
- Scope of Managerial Economics
- Concepts of Managerial Economics
- Fundamental Nature of Managerial Economics
- Appropriate Definitions
- Basic Characteristics
- Theoretical Concepts of Managerial Economics
- Role of the Managerial Economist
- Summary
- Keywords
- Review Questions
- Further Readings

## Learning Objectives

At the conclusion of this unit, you should be able to:

- Define the term managerial economics
- Discuss the nature, scope and concepts of managerial economics
- Understand the fundamental nature of managerial economics
- Explain the appropriate definitions, basic characteristics of managerial economics.
- Describe the economic analysis and theoretical concepts
- Discuss the role of the managerial economist

## Introduction

It is not from the benevolence of the butcher, the brewer, or the baker that we expect our dinner, but from their regard to their own:

– Adam Smith, *The Wealth of Nations* (1776)

Look for a moment to consider the contradictory words above, penned in 1776 by Adam Smith, the founder of modern economics. The American Declaration of Independence also marked that same year. It is no coincidence that both ideas appeared at the same time. Just as the American revolutionaries were proclaiming freedom from tyranny, Adam Smith was preaching a revolutionary doctrine emancipating trade and industry from the shackles of a feudal aristocracy.

In the last two centuries, most of the world has experienced an era of unimagined prosperity. In the United States and other high-income countries, most people can afford far more

than the bare necessities. Superfast personal computers, high-tech home entertainment centres, and fast air transportation to any part of the globe are examples of an amazing range of goods and services that have become part of everyday life. Developing countries have also seen improvement in their living standards rapidly in recent years.

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But widespread prosperity has not brought economic security. In an average year, 60 million people lose their jobs and almost 3,00,000 businesses go bankrupt. About 34 percent households are designed as poor, as the number is almost 50 percent among households headed by females. Many families worry about the catastrophic financial consequence of illness because they have no health insurance. The prosperous society is a fretful society.

For most of human history, people who experienced economic misfortunes lived on the mercy of their families or friends. A century ago, governments introduced the "welfare state", which provided social insurance and income support to the needy. Gradually, poor people in rich countries got access to minimal levels of income, food, and healthcare. But rising taxes and growing government spending on healthcare and public pensions have produced a revolt of the middle class, which is the taxed class. In 1996, the United States removed its guarantee of income support for poor families. Everywhere, countries are rethinking the boundaries between state and market, trying to balance the growing need for providing public services with the increasing demand for cutting taxes and shrinking government role.

This is the age of the global marketplace. Today, money, goods, and information cross national borders more rapidly than ever before. In the past, we did business with people down the street or in the next town, and we used to buy mainly local goods. But today, we ride in the "world car." Look at this world car or at a fast computer, which incorporates materials, labour, capital, and innovations from around the world. The rise of the global marketplace brings new challenges. Who can best adapt to increased foreign competition? Who can quickly adapt to the information age? The stakes are high. To the winners go the profits, while the losers lag behind.

## Nature of Managerial Economics

Economics is the study of how societies use scarce resources to produce valuable commodities and distribute them among different people for satisfying their wants. This definition highlights two key ideas in economics: first these goods are scarce and second, society must use its resources efficiently. Indeed, economics is an important subject because of the fact of scarcity and the desire for efficiency.

Take scarcity first. If infinite quantities of every good could be produced or if human desires were fully satisfied, what would be the consequences? People would not worry about stretching out their limited incomes because they could have everything they wanted; businesses would not need to fret over the cost of labour or healthcare; governments would not need to struggle over taxes or spending, because nobody would care. Moreover since all of us could have as much as we pleased, no one would be concerned about the distribution of incomes among different people or classes.

In such an Eden of affluence, there would be no economic goods, that is, goods that are scarce or limited in supply. All goods would be freely available like sand in the desert or seawater at the beach. Prices and markets would be irrelevant. Indeed in such a case, economics would no longer be a useful subject.

But no society has reached a utopia of limitless possibilities. Goods are limited, while wants are unlimited. Even after two centuries of rapid economic growth, production in the world is simply not high enough to meet everyone's consumption desires. Our global output would have to be many times larger before the average world could live at the level of the average doctor or lawyer. And in some countries, particularly in Africa and Asia, hundreds of millions of people suffer from hunger and material deprivation.

Given unlimited wants, it is important that an economy makes the best use of its limited resources. That brings us to the critical notion of efficiency. Efficiency denotes the most effective use of a society's resources in satisfying people's wants and needs. More specifically, the economy is producing efficiently when it cannot increase the economic welfare of anyone without making someone else worse off.

The essence of economics is to acknowledge the reality of scarcity and then figure out how to organise society in a way that produces the most efficient use of resources. That is where economics makes its unique contribution.

## **Scope of Managerial Economics**

Adam Smith is usually considered as the father of microeconomics, the branch of economics, which is concerned with the behaviour of individual entities as markets, firms, and households. In his book 'An Enquiry into the Causes of the Wealth of Nations' (1776), Smith considered how individual prices are set, studied the determination of prices of land, labour, and capital, and inquired the strengths and weaknesses of the market mechanism. Most important, he identified the remarkable efficiency properties of markets and saw that economic benefit comes from the self-interested actions of individuals. All these are still important issues today and while the study of microeconomics has surely advanced greatly since Smith's day, he is still cited by politicians and economists alike.

The other major branch of our subject is macroeconomics, which is concerned with the overall performance of the economy. Macroeconomics did not exist in its modern form until 1935, when John Maynard Keynes published his revolutionary book 'The General Theory of Employment, Interest and Money'. At the time, England and the United States were still caught in the Great Depression of the 1930s and over one-quarter of the American labour force was unemployed. In his new theory, Keynes developed an analysis of what causes unemployment and economic downturns, how investment and consumption are determined, how central banks manage money and interest rates and why some nations thrive while others stagnate. Keynes also argued that government had an important role in smoothing out the ups and downs of business cycles. Although macroeconomics has progressed since his first insights, the issues addressed by Keynes still define the study of macroeconomics today.

Two branches – microeconomics and macroeconomics – cover to form modern economics. At one time the boundary between the two areas was quite distinct; more recently, the two sub-disciplines have been merged as economists have applied the tools of microeconomics to such topics as unemployment and inflation.

## **Concepts of Managerial Economics**

Many other industrialized countries have increased considerably particularly since the Great Depression of the 1930s. Central banks took control of the monetary system; labour unions, supported by government legislation gained in influence; regulations about worker safety, anti-discrimination and anti-trust (against big businesses) multiplied; social programs, such as social security, unemployment compensation and subsidies to farmers were deemed necessary; new deal types of government spending (Tennessee Valley Authority) to artificially created jobs became commonplace; and to fund the direct government expenses and the exponentially growing number of government employees, taxes to individuals and businesses increased. Before we delve into the question as to whether the increased role of the government in the United States and other industrialised countries has been beneficial, let us take a look at some fundamental concepts about the economy and the way it works.

United States and other industrialised countries has been beneficial, let us take a look at some fundamental concepts about the economy and the way it works.



1. **Economics:** What is economics about? Many people relate it to anything having to do with money and how to make as much of it as possible. Others claim that it deals with making choices and facing tradeoffs. Still others associate it with government fiscal and monetary policies and how they can best help a country's economic health. The real purpose of economics research is its ability to explain how we can most optimally achieve the highest standard of living. A good definition therefore is: Economics is the study of how we can best increase a country's wealth with the resources that we have available to us. Wealth in this definition includes tangible (cars, houses,) as well as intangible (more leisure time, cleaner air,) products. As you may know, there is quite some disagreement over how a country should go about achieving the optimum amount of wealth. Some economists advocate a great amount of government involvement, price controls and active monetary policy. Others believe that government involvement should be minimal and limited to tasks related to defending individual rights, defense, police and fire protection, etc. And many believe that a combination of moderate government involvement and private initiative is ideal in achieving the highest standard of living. There are also various opinions about the role of profits, consumer spending, saving, capital formation, unions, etc. in our economy. Should we tax profits to more equally distribute the wealth in our country? Should we encourage spending (and discourage saving) to stimulate economic growth? Do unions raise real wages? We will touch on this and other important economic issues here.

2. **Economic Analysis:** Economic analysis is used in many situations. When British Petroleum sets the price for its Alaskan crude oil, it uses an estimated demand model, both for gasoline consumers and also for the refineries to which BP sells. The demand for oil by refineries is governed by a complex economic model used by the refineries and BP estimates the demand by refineries by estimating the economic model used by refineries. Economic analysis was used by experts in the antitrust suit brought by the U. S. Department of Justice; both to understand Microsoft's incentive to foreclose (eliminate from the market) rival Netscape and consumer behaviour in the face of alleged foreclosure. Stock market analysts use economic models to forecast the profits of companies in order to predict the price of their stocks. When the government forecasts the budget deficit or considers a change in environmental regulations, it uses a variety of economic models.

Economic analysis is used for two main purposes. The first is a scientific understanding of how allocations of goods and services – scarce resources – are actually determined. This is a positive analysis, analogous to the study of electromagnetism or molecular biology and involves only the attempt to understand the world around us. The development of this positive theory, however, suggests other uses for economics. Economic analysis suggests how distinct changes in laws, rules and other government interventions in markets will affect people, and in some cases, one can draw a conclusion that a rule change is, on balance, socially beneficial. Such analyses combine positive analysis – predicting the effects of changes in rules – with value judgments, and are known as normative analyses. For instance, a gasoline tax used to build highways harms gasoline buyers (who pay higher prices), but helps drivers (who face fewer potholes and less congestion). Since drivers and gasoline buyers are generally the same people, a normative analysis may suggest that everyone will benefit. This type of outcome, where everyone is made better off by a change, is relatively uncontroversial.

3. **Cost-benefit Analysis:** In contrast, cost-benefit analysis weighs the gains and losses to different individuals and suggests carrying out changes that provide greater benefits than harm. For instance, a property tax used to build a local park creates a benefit to those who use the park, but harms those who own property (although, by increasing property values, even non-users obtain some benefits). Since some of the taxpayers will not use the park, it will not be the case that everyone benefits on balance. Cost-benefit analysis weighs the costs against the benefits. In the case of

the park, the costs are readily monetized (turned into dollars), because the costs to the taxpayers are just the amount of the tax. In contrast, the benefits are much more challenging to estimate. Conceptually, the benefits are the amount the park users would be willing to pay to use the park if the park charged admission. However, if the park does not charge admission, we would have to estimate willingness to pay. In principle, the park provides greater benefits than costs if the benefits to the users exceed the losses to the taxpayers. However, the park also involves transfers from one group to another.

4. **Welfare Analysis:** Welfare analysis provides another approach to evaluating government intervention into markets. Welfare analysis posits social preferences and goals, like helping the poor. Generally a welfare analysis involves performing a cost-benefit analysis taking account not just of the overall gains and losses but also weighting those gains and losses by their effects on other social goals. For instance, a property tax used to subsidise the opera might provide more value than costs but the bulk of property taxes are paid by the lower and middle-income people, while the majority of opera-goers are rich. Thus, the opera subsidy represents a transfer from relatively low income people to richer people, which is generally not consistent with societal goals of equalisation. In contrast, elimination of sales taxes on basic food items such as, milk and bread generally has a relatively greater benefit to poor, who spend a much larger percentage of their income on food, than to the rich. Thus, such schemes may be considered desirable not so much for their overall effects but for their redistribution effects.
5. **Opportunity Cost:** Economists use the idea of cost in a slightly quirky way that makes sense once you think about it, and we use the term opportunity cost to remind you occasionally of our idiosyncratic notion of cost. For an economist, the cost of something is not just the cash payment but also all of the value given up in the process of acquiring the thing. For instance, the cost of a university education involves tuition and text book purchases and also the wages that would have been earned during the time at university, but were not. Indeed, the value of the time spent in acquiring the education – how much enjoyment was lost – is part of the cost of education. However, some “costs” are not opportunity costs. Room and board would not generally be a cost because, after all, you are going to be living and eating whether you are in university or not. Room and board are part of the cost of an education only in so far as they are more expensive than they would be otherwise. Similarly, the expenditures on things you would have otherwise done – hang-gliding lessons, a trip to Europe – represent savings.

The concept of opportunity cost can be summarised by a definition: The opportunity cost is the value of the next best foregone alternative. This definition captures the idea that the cost of something is not just its monetary cost but also the value of what you did not get. The opportunity cost of spending \$17 on a CD is what you would have done with the \$17 instead and perhaps the value of the time spent shopping. The opportunity cost of a puppy includes not just the purchase price of the puppy but also the food, veterinary bills, carpet cleaning, and the value of the time spent in dealing with the puppy. A puppy is a good example, because often the purchase price is a negligible portion of the total cost of ownership. Yet people acquire puppies all the time, in spite of their high cost of ownership. Why? The economic view of the world is that people acquire puppies because the value they expect to get exceeds the opportunity cost. That is, they acquire a puppy when the value of a puppy is higher than the value of what is foregone by the acquisition of a puppy.

Even though opportunity costs include lots of non-monetary costs, we will often monetise opportunity costs, translating the costs into dollar terms for comparison purposes. Monetising opportunity costs is clearly valuable, because it gives a means of comparison. What is the opportunity cost of 30 days in jail? It used to be that judge's occasionally sentenced convicted defendants to “30 days or 30 dollars,”

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letting the defendant choose the sentence. Conceptually, we can use the same idea to find out the value of 30 days in jail. Suppose you would choose to pay a fine of \$750 to avoid the thirty days in jail, but would not pay \$1,000 and instead would choose time in the slammer. Then the value of the 30 days sentence is somewhere between \$750 and \$1000. In principle, there exists a price where at that price you pay the fine and at a penny more you go to jail. That price at which you are just indifferent to the choice – is the monetised or dollar cost of the jail sentence.

The same idea as choosing the jail sentence or the fine justifies monetising opportunity costs in other contexts. For instance, a gamble has a certainty equivalent, which is the amount of money that makes one indifferent to choosing the gamble versus the certain amount. Indeed, companies buy and sell risk, and much of the field of risk management involves buying or selling risky items to reduce overall risk. In the process, risk is valued, and riskier stocks and assets must sell for a lower price (or, equivalently, earn a higher average return). This differential is known as a risk premium, and it represents a monetisation of the risk portion of a risky gamble.

6. *Ceteris Paribus*: To make any sense at all of the effects of change in economic conditions, it is helpful to divide up the effect into pieces. Thus, we will often look at the effects of a change "other things equal", that is, assuming nothing else changed. This isolates the effect of the change. In some cases, however, a single change can lead to multiple effects. even so, we will still focus on each effect individually. A gobbledegook way of saying "other things equal" is to use Latin and say "ceteris paribus." Part of your job as a student is to learn economic jargon, and that is an example. Fortunately, there isn't too much jargon. We will make a number of assumptions that you may not find very easy to believe. Not all of the assumptions are required for the analysis, and instead merely simplify the analysis. Some, however, are required but deserve an explanation. There is a frequent assumption that the people we will talk about seem exceedingly selfish relative to most people we know. We model the choices that people make, assuming that they make the choice that is best for them. Such people – the people in the models as opposed to real people – are known occasionally as "homo economicus." Real people are indubitably more altruistic than homo economicus, because they couldn't be less: homo economicus is entirely selfish. (The technical term is acting in one's self-interest.)

That doesn't necessarily invalidate the conclusions drawn from the theory. However, people often make decisions as families or households rather than individuals, and it may be sensible to consider the household as the "consumer." That households are fairly selfish is more plausible perhaps than individuals being selfish. Economics is pretty much silent on why consumers want things. You may want to make a lot of money so that you can build a hospital or endow a library, which would be altruistic things to do. Such motives are broadly consistent with self-interested behaviour. Corporations are often required to serve their shareholders by maximising the share value, inducing self-interested behaviour on the part of the corporation. Even if corporations had no legal responsibility to act in the financial interest of their shareholders, capital markets may force them to act in the self-interest of the shareholders in order to raise capital. That is, people choosing investments that generate a high return will tend to force corporations to seek a high return. There are many good, and some not-so-good, consequences of people acting in their own self-interest, which may be another reason to focus on self-interested behaviour.

The way economics is performed by a proliferation of mathematical models and this proliferation is reflected in this book. Economists reason with models. Models help by removing extraneous details from a problem or issue, letting one analyse what remains more readily. In some cases the models are relatively simple, like supply and demand. In other cases, the models are relatively complex. In all cases, those models are simplest which let us understand the question or phenomenon at hand.

The purpose of the model is to illuminate connections between ideas. A typical implication of a model is "when A increases, B falls." This "comparative static" prediction lets us see how A affects B, and why, at least in the context of the model. The real world is always much more complex than the models we use to understand the world. That does not make the model useless, indeed, exactly the opposite. By stripping out extraneous detail, the model represents a lens to isolate and understand aspects of the real world.

7. **Supply and Demand:** Supply and demand are the most fundamental tools of economic analysis. Most applications of economic reasoning involve supply and demand in one form or another. When prices for home heating oil rise in the winter, usually the reason is that the weather is colder than normal and as a result, demand is higher than usual. Similarly, a break in an oil pipeline creates a short-lived gasoline shortage, as occurred in the Midwest in the year 2000, which is a reduction in supply. The price of DRAM, or dynamic random access memory, used in personal computers falls when new manufacturing facilities begin production, increasing the supply of memory.

Eating a French Fry makes most people a little bit happier and we are willing to give up something of value – a small amount of money, a little bit of time – to eat one. What we are willing to give up measures the value – our personal value – of the French Fry. That value, expressed in dollars, is the willingness to pay for French Fries. That is, if you are willing to give up three cents for a single French Fry, your willingness to pay is three cents. If you pay a penny for the French Fry, you've obtained a net of two cents in value. Those two cents – the difference between your willingness to pay and the amount you pay – is known as consumer surplus. Consumer surplus is the value to a consumer of consumption of a good, minus the price paid.

8. **Market Demand:** Individuals with their own supply or demand trade in a market, which is where prices are determined. Markets can be specific or virtual locations – the farmer's market, the New York Stock Exchange, eBay – or may be an informal or more amorphous market, such as the market for restaurant meals in Billings, Montana or the market for roof repair in Schenectady, New York.

Individual demand gives the quantity purchased for each price. Analogously, the market demand gives the quantity purchased by all the market participants – the sum of the individual demands – for each price. This is sometimes called a "horizontal sum" because the summation is over the quantities for each price.

9. **Equilibrium:** Economists use the term equilibrium in the same way as the word is used in physics, to represent a steady state in which opposing forces are balanced, so that the current state of the system tends to persist. In the context of supply and demand, equilibrium refers to a condition where the pressure for higher prices is exactly balanced by a pressure for lower prices, and thus that the current state of exchange between buyers and sellers can be expected to persist.
10. **Surplus and Shortage:** When the price is such that the quantity supplied of a good or service exceeds the quantity demanded, some sellers are unable to sell because fewer units are purchased than are offered. This condition is called a surplus. The sellers who fail to sell have an incentive to offer their good at a slightly lower price – a penny less – in order to succeed in selling. Such price cuts put downward pressure on prices, and prices tend to fall. The fall in prices generally reduces the quantity supplied and increases the quantity demanded, eliminating the surplus. That is, a surplus encourages price cutting, which reduces the surplus, a process that ends only when the quantity supplied equals the quantity demanded.

Similarly, when the price is low enough that the quantity demanded exceeds the quantity supplied, a shortage exists. In this case, some buyers fail to purchase and these buyers have an incentive to accept a slightly higher price in order to be able to

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trade. Sellers are obviously happy to get the higher price as well, which tends to put upward pressure on prices and prices rise. The increase in price tends to reduce the quantity demanded and increase the quantity supplied, thereby eliminating the shortage. Again, the process stops when the quantity supplied equals the quantity demanded.

The equilibrium of supply and demand balances the quantity demanded and the quantity supplied, so that there is no excess of either. Would it be desirable, from a social perspective, to force more trade or to restrain trade below this level?

11. **Production Possibilities:** Production possibilities frontiers provide the basis for a rudimentary theory of international trade. To understand the theory, it is first necessary to consider that there are fixed and mobile factors. Factors of production are jargon for inputs to the production process. Labour is generally considered a fixed factor, because most countries don't have borders wide open to immigration, although of course some labour moves across international borders. Temperature, weather, and land are also fixed – Canada is a high-cost citrus grower because of its weather.

There are other endowments that could be exported but are expensive to export because of transportation costs, including water and coal. Hydropower – electricity generated from the movement of water – is cheap and abundant in the Pacific Northwest, and as a result, a lot of aluminum is smelted there because aluminum smelting requires lots of electricity. Electricity can be transported, but only with losses (higher costs), which gives other regions a disadvantage in the smelting of aluminum. Capital is generally considered a mobile factor, because plants can be built anywhere, although investment is easier in some environments than in others. For example, reliable electricity and other inputs are necessary for most of the factories. Moreover, the presence of a functioning legal system and the enforcement of contracts, and the absence of bribery, is a comparative advantage of some nations, because enforcement of contracts increases the return on investment by increasing the probability the return is not taken by others.

12. **International Trade:** The basic model of international trade was first described by David Ricardo (1772-1823). It suggests that nations, responding to price incentives, will specialise in the production of goods in which they have a comparative advantage, and purchase the goods in which they have a comparative disadvantage. He described England as having a comparative advantage of manufacturing cloth and Portugal for producing wine, and thus gains from trade from the specialisation.

The Ricardian theory suggests that the United States, Canada, Australia and Argentina should export agricultural goods, especially grains that require a large land area for the value generated (they do). It suggests that complex technical goods should be produced in developed nations (they are) and that simpler products and natural resources exported by the lesser developed nations (they are). It also suggests that there should be more trade between developed and underdeveloped nations than between developed and other developed nations. The theory falters on this prediction – the vast majority of trade is between developed nations. There is no consensus for the reasons for this, and politics plays a role – the North American Free Trade Act vastly increased the volume of trade between the United States and Mexico, for instance, suggesting that trade barriers may account for some of the lack of trade between the developed and the underdeveloped world. Trade barriers do not account for the volume of trade between similar nations, which the theory suggests should be unnecessary. Developed nations sell each other mustard and tires and cell phones, exchanging distinct varieties of goods they all produce.

It is fair to say that if factor price equalisation works fully in practice, it works extremely slowly. Differences in taxes, tariffs and other distortions make it a challenge to test the theory across nations. On the other hand, within the United States, where

we have full factor mobility and product mobility, we still have different factor prices – electricity is cheaper in the Pacific Northwest. Nevertheless, nations with a relative abundance of capital and skilled labour export goods that use these intensively, nations with a relative abundance of land export land intensive goods like food, nations with a relative abundance of natural resources export these resources and nations with an abundance of low-skilled labour export goods that make intensive use of this labour. The reduction of trade barriers between such nation's works like Ann and Bob's joint production of party platters: by specialising in the goods in which they have a comparative advantage, there is more for all.

13. **Business Cycle:** An important aspect of the business cycle is that many economic variables move together, or co-vary. Some economic variables vary less with the business cycle than others. Investment varies very strongly with the business cycle, while overall employment varies weakly. Interest rates, inflation, stock prices, unemployment and many other variables also vary systematically over the business cycle. Some economic variables are much more variable than others. For instance, investment, durable goods purchases and utilisation of production capacity vary more dramatically over the business cycle than consumption and employment.
14. **Nominal and Real Values:** When we refer to nominal values, such as nominal prices, earnings, wages or nominal interest rates, we refer to the dollar value of the prices, earnings, wages or the numerical value of the interest rates. A person earning \$10 per hour in today's dollars is said to be earning a nominal wage of \$10. Real values are always values in comparison, or relative, to other related economic variables. Thus, a person earning a nominal wage of \$10 in 1996 may only be earning a real wage of \$5 relative to today's doubled prices since, say, 1986. Applying the concept to interest rates, a 12% nominal interest rate is only a 2% real interest rate if prices are rising by 10%.
15. **Positive and Normative Economics:** Positive economic statements are facts or relationships which can be proven or dis-proven. A normative economic statement is someone's opinion or value judgment about an economic issue. Such a statement can never be proven. Au contraire (as the French would say), a normative statement is one which people commonly argue about. Note that a positive statement does not have to be a true statement; the statement could be dis-proven. It would be a false positive statement. Also keep in mind that predictions, such as "The Orioles should win the World Series this year", or "The skins will be in the Super Bowl again this season", are not considered normative statements, but predictions or hopes (or wishful thinking) unrelated to facts or value judgments.
16. **Cause and Effect:** It is tempting to conclude that if one event occurs after another, that the first occurring event caused the second event. After winning its first three games while you were out with an injury, you conclude that it was your fault that your baseball team lost its fourth game as you regained your position in the starting rotation. Of course, your presence could have something to do with it, but you can not necessarily conclude this. Other variables may have played a role: the weather, the umpire, the opponent and other teammates' performance that day.

Similarly, in economics, people sometimes conclude that if one event follows another, the other must have caused the one. The period following World War II has seen a rising standard of living in industrialized countries around the world. This period has also been accompanied by much greater government involvement in these countries. Can we conclude that greater government involvement causes higher standards of living?

## Fundamental Nature of Managerial Economics

Many firms have used the principles of managerial economics to improve their profitability and market share.

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It uses economic concepts as demand, supply, cost, production, competition, price and profit for solving the real business problems. A strong understanding of these economic concepts, which govern the economic behaviour of firms and individuals, is an important managerial talent. Managerial economics can be used by the experienced and goal oriented manager for solving various business problems.

Economics (from the Greek οἶκος [oikos], 'house', and νόμος [nomos], 'rule', hence "household management") is a social science that studies the production, distribution, trade and consumption of goods and services. Economics is said to be normative when it recommends one choice over another, or when a subjective value judgment is made. Conversely, economics is said to be positive when it tries objectively to predict and explain consequences of choices, given a set of assumptions and/or a set of observations. The choice of which assumptions to make in building a model as well as which observations to highlight is, however, normative.

Economics, which focuses on measurable variables, is broadly divided into two main branches: microeconomics, which deals with individual agents, such as households and businesses, and macroeconomics, which considers the economy as a whole, in which case it considers aggregate supply and demand for money, capital and commodities. Aspects receiving particular attention in economics are resource allocation, production, distribution, trade, and competition. Economic logic is increasingly applied to any problem that involves choice under scarcity or determining economic value.

The mainstream economic theory currently in vogue in the business schools of most industrial countries is neoclassical economics.

Economics is usually divided into two main branches: Microeconomics, which examines the economic behaviour of individual actors such as businesses, households, and individuals, with a view to understand decision-making in the face of scarcity and the consequences of these decisions.

Macroeconomics, which examines an economy as a whole with a view to understanding the interaction between economic aggregates such as national income, employment and inflation. Note that general equilibrium theory combines concepts of a macro-economic view of the economy, but does so from a strictly constructed microeconomic viewpoint.

Attempts to join these two branches or to refute the distinction between them have been important motivators in much of recent economic thought, especially in the late 1970s and early 1980s. Today, the consensus view is arguably that good macroeconomics has solid microeconomic foundations. In other words, its premises ought to have theoretical and evidential support in microeconomics.

Why is managerial economics so valuable to a great diverse group of decision makers? The answer lies in the meaning of the term managerial economics, which refers to the application of economic theory and tools of decision science to find the optimal solution to the managerial decision problems.

## Appropriate Definitions

Over the last 250 years, the study of economics has expanded to include a vast range of topics. What are the major definitions of this growing subject? The important ones are:

1. Economics studies how the prices of labour, capital, and land are set in the economy, and how these prices are used to allocate resources.
2. Economics explores the behaviour of the financial markets, and analyses how they allocate capital to the rest of the economy.
3. Economics examines the distribution of income, and suggests ways by which the poor can be helped without harming the performance of the economy.

4. Economics looks at the impact of government spending, taxes and budget deficits on growth.
5. Economics studies the swings in unemployment and production that make up the business cycle and develops government policies for improving economic growth.
6. Economics examines the patterns of trade among nations, and analyses the impact of trade barriers.
7. Economics looks at growth in developing countries, and proposes ways and means to encourage the efficient use of resources.

This list is a good one, yet you could extend it many times.

## Basic Characteristics

Managerial Economics serves as an association between traditional economics and the decision-making sciences. The most excellent way to get familiar with managerial economics and decision-making is to come face to face with the real world cases.

That doesn't necessarily invalidate the conclusions drawn from the theory. However, people often make decisions as families or households rather than individuals, and it may be sensible to consider the household as the "consumer." That households are fairly selfish is more plausible perhaps than individuals being selfish. Economics is pretty much silent on why consumers want things. You may want to make a lot of money so that you can build a hospital or endow a library, which would be altruistic. Such motives are broadly consistent with self-interested behavior. Corporations are often required to serve their shareholders by maximising the share value, including self-interested behaviour on the part of the corporation. Even if corporations had no legal responsibility to act in the financial interest of their shareholders, capital markets may force them to act in the self-interest of the shareholders in order to raise capital. That is, people choosing investments that generate a high return will tend to force corporations to seek a high return. There are many good and some not-so-good, consequences of people acting in their own self-interest, which may be another reason to focus on self-interest.

Thus, while there are limits to the applicability of the theory of self-interest, it is a reasonable methodology for attempting a science of human behavior. Self-interested behaviour will often be described as "maximising behaviour," where consumers maximise the value they obtain from their purchases, and firms maximise their profits. One objection to the economic methodology is that people rarely carry out the calculations necessary to literally maximise anything. However, that is not a sensible objection to the methodology. People do not carry out the physics calculations to throw a baseball or thread a needle, either, and yet they accomplish these tasks. Economists often consider that people act "as if" they maximise an objective, even though no calculations are carried out.

## Theoretical Concepts of Managerial Economics

### Incremental Concept

Incremental reasoning involves estimating the impact of decision alternatives. The two basic concepts in the incremental analysis are:

1. Incremental Cost (IC)
2. Incremental Revenue (IR)

Incremental cost is defined as the change in total cost as a result of change in the level of output, investment, etc. Incremental revenue is defined as the change in total revenue resulting from a change in the level of output, prices, etc. A manager always determines the worth of a decision on the basis of the criterion i.e. IR is greater than IC.



A decision is profitable if:

1. it increases revenue more than it increases cost
2. it reduces some cost more than it increases others
3. it increases some resources more than it decreases others
4. it decreases costs more than it decreases revenues.

A decision is profitable according to the incremental concept only when it increases revenue more than it increases cost, or reduces costs more than it reduces revenue.

## **Marginalism and Equimarginalism**

### **Marginalism Concepts**

The marginalism or the marginal value of a dependent variable is defined as change in this dependant variable associated with a one unit change in a given independent variable. The two important concepts of marginal analysis are:

1. Marginal Cost (MC)
2. Marginal Revenue (MR)

Marginal cost and revenue are always defined in terms of unit changes in output.

Marginal cost is expressed as the ratio of two absolute changes, change in total cost, and change in output as:

$$MC = \frac{d(TC)}{dQ}$$

Marginal revenue is the ratio between total revenue and change in output and is given as:

$$MR = \frac{d(TR)}{dQ}$$

Marginalism assumes single variable function, for example, either revenue depends on output or costs depend on output.

The decision rule in this case is:

1. To maximize revenue, do not sell output beyond the point where  $MR = 0$
2. To maximize total profit, do not employ a factor beyond a point where  $MP$  (marginal profit) = 0.

### **Comparison between Incremental Concepts and Marginal Concepts**

Incremental concepts are more flexible than marginal concepts. This is because MC and MR are restricted to the effects of changes in output. However, managerial decision-making is not concerned with changed output. A production manager may be faced with the problem of substituting one process of production for another to produce the same output. The problem is of comparing the cost of the first process with that of the alternative. Marginal analysis is not suited for this type of decision. It can compare MC of one process with that of another but not of the MC of the changed process.

Incremental cost may be used to refer to the change in cost brought about by the changes in production process or activity.

## Equi-marginal Concept

The principle of equi-marginalism states that resources should be allocated or hired in such a way that the ratio of marginal returns and marginal costs of various uses of a given resource or of various resources in a given use is the same. For example, a consumer seeking maximum utility (satisfaction) from the consumption basket will allocate the consumption budget on goods and services such that:

$$\frac{MU_1}{MC_1} = \frac{MU_2}{MC_2} = \dots = \frac{MU_n}{MC_n}$$

Where,

$MU_1$  = marginal utility from good 1,  $MC_1$  = marginal cost of good 1, and so on.

Similarly, a producer seeking maximum profit would use that technique of production (input – mix), which would ensure

$$\frac{MRP_1}{MC_1} = \frac{MRP_2}{MC_2} = \dots = \frac{MRP_n}{MC_n}$$

Where,

$MRP_1$  = maximum revenue product of input for example, labor,  $MC_1$  = marginal cost of input, and so on.

If the preceding equations were not true, utility/profit can be increased by reshuffling resources/inputs.

For example, If

$$\frac{MU_1}{MC_1} > \frac{MU_2}{MC_2}$$

As a result, the consumer must buy more of goods 1 and less of goods 2 to increase utility.

The essence of equi-marginal principle is that purchases, activities, or productive resources should be allocated so that the marginal utilities, benefits, or value-added accruing from each purchase, activity or productive resource are identical in all uses.

## The Discounting Principle

If a decision affects both costs and revenue at future dates, it is essential to discount these costs and revenues to make them comparable to some present value before a valid comparison of alternatives is made. A simple example will make clear the rationale of discounting. If you are offered to choose between a gift of ₹5,000 today or ₹5,000 to be received after one year, you would surely prefer the former. This is because in a world where the rate of interest is not zero, there is a scope for investing ₹5,000 at the market value of interest and accumulate interest on the principle.

As there is risk and uncertainty about the future, the return in future is less attractive than the same return today. The future, therefore, has to be discounted for risk and time.

**Example:** How much money today would be equivalent to ₹1000 a year from now if the rate of interest is 10 percent?

**Solution:** The present value of ₹1000 to be received after one year is

$$\begin{aligned} PV &= ₹ 1000 / 1 + i \\ &= 1000 / 1.10 \\ &= ₹ 909.09 \end{aligned}$$

Where,

PV = present value, I = rate of interest.

₹ 909.09 plus the interest on it will accumulate to an amount exactly equal to ₹1000.

Notes

The same analysis can be extended to any number of periods. A sum of ₹1000 to years from now is given as:

$$\begin{aligned} PV &= ₹1000 / (1 + i)^2 \\ &= ₹1000 / (1.10)^2 \\ &= ₹1000 / 1.21 \\ &= ₹826.45 \end{aligned}$$

In general, the present value of a sum to be received at any future date can be found by the following formula:

$$PV = R^n / (1 + i)^n$$

R = amount to be received in future

i = rate of interest

n = number of years lapsing between the receipt of R

If the receipts are made available over a number of years, the formula becomes:

$$PV = R^1 / (1 + i) + R^2 / (1 + i)^2 + R^3 / (1 + i)^3 + \dots + R^n / (1 + i)^n$$

$$\text{Or } PV = \sum_{k=1}^n \frac{R_k}{(1 + i)^k}$$

Where,

K = 1, 2, 3, .....n.

R = amount to be received in future

i = rate of interest

n = number of years lapsing between the receipt of R

### The Opportunity Cost Principle

The opportunity costs or alternative costs are the returns from the second best use of the firm's resources, which the firm forgoes in order to avail itself of the returns from the best use of the resources.

The opportunity cost of anything is the next best alternative that could be produced instead, by the same factors and costing the same amount of money. Opportunity costs are therefore, the costs of sacrificed alternatives.

*Points to remember:*

1. All decisions, which involve choice, must involve opportunity cost calculation.
2. The opportunity cost may be either:
  - (a) real or monetary
  - (b) implicit or explicit
  - (c) non-quantifiable or quantifiable.

Opportunity costs' relevance is not limited to individual decisions. Opportunity costs are also relevant to government's decisions, which affect everyone in society.

## The Invisible Hand

Adam Smith, the father of modern economics believed that there existed an "invisible hand" which ruled over the economic system. According to him, the economic system, left to itself, is self-regulating. The basic driving force in such a system is trying to enhance its own economic well being. However, the actions of each unit, acting according to its own self-interest, are also in the interests of the economy as a whole. Producers are led by the profit motive to produce those goods and services, which the consumers want. This is done at the minimum possible cost in order to maximize their profits. Moreover, if there is competition among a number of producers, they will try to keep the price of their product low in order to attract consumers. The commodities produced are made available in the market by traders. They also act in their own self-interest. However, in a self-regulating economy, there is rarely any shortage of goods and services.

In a self-regulating economy, decisions to save and invest are taken by individual economic units. For example, households save some of their income and deposit part of it in the banks, or invest it in shares and debentures. The producers borrow from the banking system and also issue shares and debentures to finance their investment. In turn, they reinvest a part of their profit.

In addition, in a self-regulating economy, all the economic functions have been carried out by individuals acting in isolation. There is no government or centralized authority to determine who should produce what and in what quantity, and where it should be made available. Yet, there is seldom a shortage of goods and services. Practically everything you want to buy is available in the market. According to Adam Smith, the economic system is guided by the "invisible hand". In other words, the basic economic problems in a society are solved by the operation of market forces.

## Concept of Profit

Business decisions take into account two important concepts of profit:

### Accounting Profit

The profit of a firm is expressed in simple terms is:

$$\text{Profit} = \text{Total Revenue} - \text{Total Costs}$$

$$\Pi = TR - TC$$

In the preceding formula, TR is defined similarly by both accountants and economists groups. The differences arise in the measurement of total cost.

The accounting concept of profit is:

$$\text{Profit} = \text{Total Revenue} - \text{Explicit Costs}$$

Total revenue is the total income of the firm in an accounting period. Explicit costs include wages and salaries, rent, interest, taxes, and the cost of all raw materials, intermediate goods, and services purchased by the firm. Therefore, explicit costs include payments for all inputs except management. When total revenue is subtracted from the explicit costs, the result is accounting profit.

### Economic Profit

The economic profit is also defined, as  $TR - TC$ . However, the cost includes explicit costs and the wages of management. In addition, economists also consider any implicit costs involved. These costs include allowances for the owner's own factors of production, such as labour, land, or capital.

## Role of the Managerial Economist

### Notes

Economic life is an enormously complicated hive of activity, with people buying, selling, bargaining, investing, persuading, and threatening. Managerial economics can be used by the goal oriented manager in two ways. First, given an existing economic environment, the principles of managerial economics provide a framework for evaluating whether resources are being allocated efficiently within a firm. Second, these principles help the manager to respond to various economic signals. Thus, the working knowledge of the principles of managerial economics can increase the value of both the firm and the manager.

Economists use the scientific approach to understand economic life. This involves observing economic affairs and drawing upon statistics and the historical record. For complex phenomena like the impact of budget deficits or the causes of inflation, historical research has provided valuable insights. Often, economics relies upon analyses and theories. Theoretical approaches allow economists to make broad generalisations, such as those concerning the advantages of international trade and specialisation or the disadvantages of tariffs and quotas.

A final approach is the use of statistical analyses. Economists have developed a specialised technique known as econometrics, which applies the tools of statistics to economic problems. Using econometrics, economists can sift through mountains of data to extract simple relationships. For example, in recent years, people have argued about the impact of a higher minimum wage on employment. From numerous studies, economists have concluded that it is likely that raising the minimum wage will reduce employment of low-wage workers. This knowledge is essential to policymakers who are struggling with the question of how high to set the minimum wage.

Budding economists must also be alert to common fallacies in economic reasoning. Because economic relationships are often complex, involving many different variables, it is easily confused about the exact reason behind events or the impact of policies on the economy. The following are some of the common fallacies encountered in economic reasoning:

1. **The post hoc fallacy.** The first fallacy involves the inference of causality. The post hoc fallacy occurs when we assume that because one event occurred before other events, the first event caused the second. An example of this syndrome occurred in the Great Depression of the 1930s in the United States. People had observed that periods of business expansions were preceded or accompanied by rising prices. From this, they concluded that the appropriate remedy for depression was to raise wages and prices. This idea led to a host of legislation and regulations to prop up wages and prices in an inefficient manner. Did these measures promote economic recovery? Almost surely not. Indeed, they probably slowed recovery, which did not occur until total spending began to rise as the government increased military spending in preparation for World War II.
2. **Failure to hold other things constant.** A second pitfall is failure to hold other things constant when thinking about an issue. For instance, we might want to know whether raising tax rates will rise or lower tax revenues. Some people have put forth the seductive argument that we can eat our cake and have it too. They argue that cutting tax rates will at the same time raise government revenues and lower the budget deficit. They point to the Kennedy-Johnson tax cuts of 1964, which lowered tax rates sharply and were followed by an increase in government revenues in 1965. Ergo, they argue, lower tax rates produce higher revenues.

What is wrong with this reasoning? This argument overlooks the fact that the economy grew from 1964 to 1965. Because people's incomes grew during that period, government revenues also grew, even though tax rates were lower. Careful studies indicate that revenues would have been even higher in 1965 had tax rates not been lowered in 1964. Hence this analysis fails to hold other things (namely, total incomes) constant.

Remember to hold other things constant when you are analysing the impact of a variable on the economic system.

3. **The fallacy of composition.** Sometimes we assume that what holds true for part of a system also holds true for the whole. In economics, however, we often find that the whole is different from the sum of the parts. When you assume that what is true for the part is also true for the whole, you are committing the fallacy of composition.

Here are some true statements that might surprise you if you ignore the fallacy of composition (1) If one farmer has a bumper crop, she has a higher income; if all farmers produce a record crop, farm incomes will fall. (2) If one person receives a great deal more money, that person will be better off; if everyone receives a great deal more money, the society is likely to be worse. (3) If a high tariff is put on the product of a particular industry, the producers in that industry are likely to get profit; if high tariffs are put on all industries, most producers and consumers will be worse. (4) When teachers grade on a curve, grades are a "zero-sum game": if one student performs well, he will raise his grade; if all students perform well, the average grade is unchanged.

These examples contain no tricks or magic. Rather they are the results of systems of interacting individuals. When individuals interact, often the behaviour of the aggregate looks very different from the behaviour of the individual.

We state these fallacies only briefly in this lesson. Later, as we introduce the tools of economics, we will reinforce this discussion and provide examples of how fallacy to the logic of economics can lead you to false and sometimes costly errors. When you reach the end of this subject, you can look back to see why these paradoxical examples are true.

### **Case: Decision-making at Asian Paints**

In economic systems what takes place in one sector has impacts on another.

Decision-making the vision of Asian paints (India) Ltd., is to become one of the top five Decorative coatings companies worldwide by leveraging its expertise in the higher growth emerging markets. simultaneously, the company intends to build long term value in the Industrial coatings business through alliances with established global partners.

Asian paints is India's largest paint company and ranks among the top ten decorative coatings companies in the world today, with a turnover of ₹ 20.67 billion (USD 435 million) and an enviable reputation in the Indian corporate world for Professionalism, Fast Track Growth, and Building Shareholder Equity.

The October ' 2002 issue of Forbes Global magazine USA ranked Asian Paints among the 200 Best Small Companies in the World for 2002 and presented the 'Best under Billion' award, to the company. One of the country's leading business magazines "Business Today" in Feb 2001 ranked Asian Paints as the Ninth Best Employer in India. A survey carried out by 'Economic Times' In January 2000, ranked Asian Paints as the Fourth most admired company across industries in India.

Among its various other achievements, Asian Paints is the only company in India to have won the prestigious Economic Times - Harvard Business School Association of India award on two separate occasions, once in the category of "Mini-Giants" and the other in "Private sector giants"

The major decisions taken by the company which helped it to achieve the set goals were:

- **Consumer Focus:** The company has come a long way since its small beginnings in 1942. Four friends who were willing to take on one of the world's biggest,

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most famous paint companies operating in India at that time set it up as a partnership firm. Over the course of 25 years Asian Paints became a corporate force and India's leading paints company. Driven by its strong consumer-focus and innovative spirit, the company has been the market leader in paints since 1938. Today it is double the size of any other paint company in India.

- **Wide Range of Products:** Asian Paints manufactures a wide range of paints for Decorative and Industrial use. Vertical integration has seen it diversify into Speciality products such as Phthalic Anhydride and Pentaerythritol. Not only does Asian Paints offer customers a wide range of Decorative and Industrial paints, it even Custom-creates products to meet specific requirements.
- **International Tie-ups:** To keep abreast of world technology and to protect its competitive edge, Asian Paints has from time to time entered into technology alliances with world leaders in the paint industry. It has a 50:50 joint venture with Pittsburgh Paints & Glass Industries (PPG) of USA, the world leader in Automotive coatings, to meet the increasing demand of the Indian automotive industry.

Table 1: Tata's Group Profile 2

In %	Group	Top 10	Top 20	Last 10
SALES	100	78	90	0.35
PAT	100	76	93	0.20
TOTAL ASSETS	100	72	87	0.80
NET WORTH	100	71	90	0.90

Table 2: Ratios

In %	Group	Top 10	Top 20	Last 10
RONW	17.8	18.9	18.3	4.2
ROCE	7.4	7.7	7.8	1.9
PAT/SALES	8.9	8.7	9.2	5.5
ASSETS				

- **Latest Technology:** It has also drawn on the world's latest technology for its manufacturing capabilities in areas like powder coatings and high-tech resins – thus ensuring that its product quality lives up to exacting international standards, even in the most sophisticated product categories.
- **Emphasis is on R&D:** The company places strong emphasis on its own in-house R&D, creating new opportunities by effectively harnessing indigenous creativity. The Asian Paints Research & Development Center in Mumbai has acquired the reputation of being one of the finest in South Asia. With its team of over 125 qualified scientists, it has been responsible for pioneering a number of new products and creating new categories of paints. The entire decorative range of the company has been developed by the R&D team.
- **State of the Art Plants:** The company boasts of state-of-the-art manufacturing plants at Bhandup in the state of Maharashtra; at Ankleshwar in the state of Gujarat; at Patancheru in the state of Andhra Pradesh; and at Kasna in the state of Uttar Pradesh. All the company's plants have been certified for ISO 9001 – the quality accreditation. All the company's plants have also received the ISO 14001 certificate for Environment Management Standard. The Phthalic Anhydride plant has been certified for ISO 9002 and ISO 14001 whereas the Penta plant has been certified for ISO 14001. The Penta plant will shortly receive its ISO 9002 certification.

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- **Environment Friendly:** In June 2002, Asian Paints plant in Patancheru was conferred "The Golden Peacock" award by the World Environment Foundation and the award for 'Excellence in Environment Management' by the Government of Andhra Pradesh.
- **Emphasis on IT:** Asian Paints was one of the first companies in India to extensively computerize its operations. In addition to computerized manufacturing, computers are used widely in the areas of distribution, inventory control and sophisticated MIS to derive benefits of faster market analysis for better decision-making. It is a continuously evolving company deriving its cutting edge from the use of innovative IT solutions. All the locations of the company are integrated through the ERP solution.
- **World Wide Presence:** Asian Paints operates in 23 countries across the world. It has manufacturing facilities in each of these countries and is the largest paints company in nine overseas markets. It is also India's largest exporter of paints, exporting to over 15 markets in the Asia-Pacific region, the Middle East and Africa. In 12 markets it operates through its subsidiary, Berger International Limited and in Egypt through SCIB Chemical SAE.

Further decisions that the company may consider are:

- more focus on industrial paints, especially the automotive paints division
- manage the chemicals business more efficiently
- better marketing strategies to adopt top line growth in international operations
- reduce the input costs of production
- consolidate on the 'colourworld' and 'home solutions' initiatives to consolidate the leadership position in decorative paints segment.

**Question**

How does economics play a role in decision-making at Asian Paints?

**Student Activity**

Hold a group discussion on "different tools of economic analysis and their uses in decision-making process."

**Summary**

It is hard to identify the reasons why some businesses fail and why some succeed. Each possible factor (luck, market share, first to the market, etc.) has its own constituency of advocates. Yet, no one thing stands out across the population of firms. What does stand out, however, is that all business managers must take decisions and solve problems. Economics offers a framework for managers to better understand human behavior and as such, analyse business issues. Thus, economics is a way to think. One of the basic foundations of economic thinking is that all decisions have costs. When one thing is selected, another thing is given up. The reason for this is that business resources are limited. This is to say, economic analysis encourages business managers to think in terms of alternatives when addressing business issues.

Economics is the study of how societies choose to use scarce productive resources that have alternative uses, to produce commodities of various kinds, and to distribute them among different groups. We study economics to understand not only the world we live in but also the many potential worlds that reformers are constantly proposing to us. Goods are scarce because people desire much more than the economy can produce. Economic goods are scarce, not free and society must choose among the limited goods that can be produced with its available resources. Microeconomics is concerned with the behavior of



individual entities such as markets, firms and households. Macroeconomics views the performance of the economy as a whole. Through all economics, beware of the fallacy of composition and the post hoc fallacy. Remember to keep other things constant.

A business manager must understand various economic concepts in the corrective perspective. A proper understanding of these economic concepts is essential for taking business decision in this changing economic scenario. The prime objective of an economist is to provide the economic logic and reasoning in integrating economic theory with the practical economic problems so that proper solutions may be provided to the various issues relating to the business strategy and policy. The analysis of the economic concepts discussed in this unit helps in developing skills and economic wisdom in the applications of managerial economics. The theory of international trade explains the basis of global trade and distribution of its benefits among the trading countries. Likewise, economic growth of an economy is followed by business cycle. So, the sound understanding of these concepts is really like to know how to use a weapon in war.

## Keywords

**Economics:** Economics is the study of how societies use scarce resources to produce valuable commodities and distribute them among different people for satisfying their wants.

**Efficiency:** Efficiency denotes the most effective use of a society's resources in satisfying people's wants and needs.

**Microeconomics:** It is the branch of economics, which is concerned with the behaviour of individual entities as markets, firms, and households.

**Macroeconomics:** It is concerned with the overall performance of the economy.

**Economic Analysis:** Economic analysis suggests how distinct changes in laws, rules and other government interventions in markets will affect people.

**Normative Analyses:** Positive analysis – predicting the effects of changes in rules – with value judgments, and are known as normative analyses.

**Cost-benefit Analysis:** Cost-benefit analysis weighs the gains and losses to different individuals and suggests carrying out changes that provide greater benefits than harm.

**Welfare Analysis:** Welfare analysis provides another approach to evaluating government intervention into markets.

**Opportunity Cost:** The opportunity cost is the value of the next best foregone alternative.

## Review Questions

1. Define managerial economics. Discuss the significance of managerial economics in modern times.
2. "Scarcity and efficiency go hand to hand in a society". Discuss the statement in the light of the twin themes of economics.
3. Discuss and differentiate between microeconomics and macroeconomics. Which economics is more useful to the nation?
4. Discuss and illustrate the different tools of economic analysis that are essential in decision-making process.
5. "The objective of economic analysis is not merely to discover the truth but also to assist in the solution of concrete problems." Comment.
6. "The use of Internet has been increasing in the study of economics but the necessary precautions are more important". Discuss.

7. "Managerial Economics may be defined as the study of the allocation of scarce resources among competing ends." Examine the statement.
8. Discuss and illustrate the different tools of managerial economics that are essential in decision-making process.
9. "The objective of managerial economics is not merely to discover the truth but also to assist in the solution of concrete problems." Comment.
10. "Economics may be defined as the study of the allocation of scarce resources among competing ends." Examine the statement.

Notes

## **Further Readings**

Karam Pal and Surrender Kumar, *Managerial Economics*, Excel Books

Samuelson, Stephen G. Marks, William, *Managerial Economics* (Hardcover -- Dec 29, 2008)

Christopher R. Thomas and S. Charles Maurice , *Managerial Economics* (Hardcover - Mar 7, 2007)

Christopher R. Thomas and S. Charles Maurice, *Managerial Economics* (Hardcover -- Jan 27, 2010)

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# Unit 2 Demand Analysis

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## Unit Structure

- Introduction
- Concept of Demand
- Elasticity: Meaning
- Elasticities in Managerial Decision-making
- Demand Forecasting
- Summary
- Keywords
- Review Questions
- Further Readings

## Learning Objectives

**At the conclusion of this unit, you should be able to:**

- Define the term **demand**
- Explain the concept of **demand**
- Understand the various types of **demand**
- Describe the **demand function and demand curve**
- Discuss the **demand elasticities (and demand forecasting)**

## Introduction

Business firms may have different objectives like profit maximisation, sales maximisation, output maximization, security of profits, satisfaction maximisation, utility maximisation, growth maximisation or satisfying particular stakeholders. But the basic business activity of all firms is same – they all produce and sell goods and services that are in “demand”. Demand is the basis of all productive activities, rightly termed as “mother of production”. It is, therefore, necessary for business managers to have clear understanding of the following:

1. What are the sources of demand?
2. What are the determinants of demand?
3. How do buyers decide the quantity of a product to be purchased?
4. How do buyers respond to the change in a product price; their income; prices of other goods or services; and change in other determinants of demand?
5. How can total or market demand for a product be assessed or forecast?

In a market economy it is the price-mechanism that settles its fundamental problems of what, how and for whom to produce. The price of any commodity in the market is determined by the general interaction of the forces of demand and supply. In this unit we will deal with the concepts of demand. Before proceeding further, we may define the term ‘commodity’ and ‘market’.

A **commodity** is any good or service produced for sale in the market. By this definition, food produced in the home kitchen for consumption of the family is not a commodity. But the same food prepared by a hotel for its customers' consumption is a commodity.

**Market** in Economics is more than a geographical area or a 'mandi' where goods are bought and sold. It means all the areas in which buyers and sellers are in contact with each other for the purchase and sale of the commodity. A commodity may have a local market, a regional market, a national market or even an international market. Thus, the basic ingredients of the market are:

1. Commodity or service which is transacted;
2. Existence of buyers and sellers who demand and supply respectively; and
3. The price at which the transaction is carried out.

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## Concept of Demand

The term 'demand' in itself does not convey the meaning. It must be qualified with the price, the quantity demanded at that price and the period during which demanded. 'Demand', in microeconomics, means the quantity of a good one is willing to buy at a given price during a period of time. 'How much quantity' is determined by a large number of factors. The main factors are the extent of liking, the purchasing power, the price, the market for substitute and complementary goods, the future trend of the market, the future income, etc.

Economists use the term 'demand' to signify

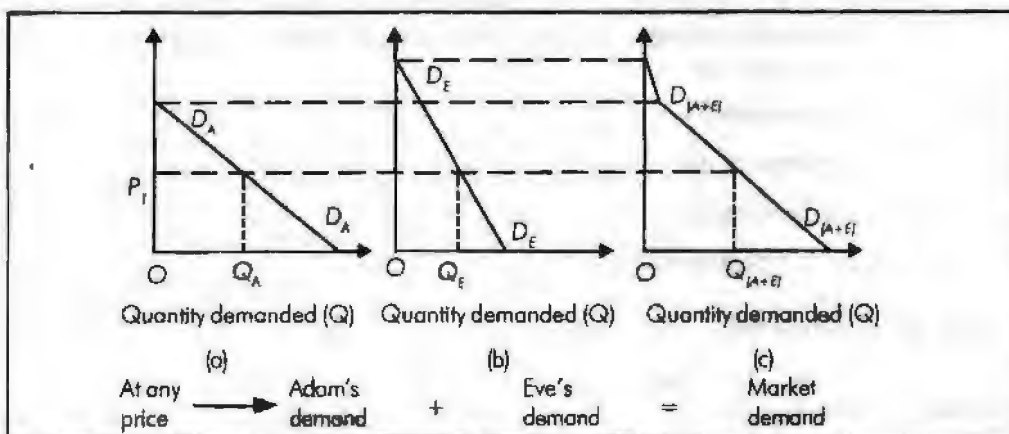
- (a) Need to have possession, and
- (b) Readiness to pay for that possession

Demand is thus reflected in terms of the amount the consumers are willing to buy at a given price over a given period of time. Demand, in the economist's sense, does not mean the wants, desire or need of people since these may not be backed up by the ability to pay. At any given time and for any goods or services, it is possible to perceive a consumer's demand curve which relates the amount a consumer is willing to buy to each conceivable price for the product.

An aggregate of individual demand curves yield a market demand curve. To derive the

market demand curve  $\sum_{i=1}^n D_i$  we sum up individual demand curves,  $d_1 \dots d_n$ , of consumers

horizontally, as illustrated below, where  $i = 1 \& 2$ . The negative slope of these normal demand curves suggests an inverse relationship between price and quantity demanded.



Note:  $OQ_A + OQ_E = OQ_{(A+E)}$

Figure 2.1: Derivation of Market Demand Curve

At the moment, it is important to note that demand and consumption are organically related. Consumption is an economic activity whereby the use value of item consumed exhausts. It is towards this consumption, either final or intermediate that the consumers demand items which contains utility (i.e., overall satisfaction from their limited budget spent on their acquisition). A household consumer demands the items of goods for final consumption; an intermediate consumer like a factory owner demands the item of services from factors of production like land, raw materials and labour; these are required towards processing inputs into fiscal output. It is observed that all consumers have limited budget and therefore, while demanding items they are careful to get the best return on their resources spent – and that is rationality.

It is also important to note at this stage that demand reflects consumer's behaviour – a combination of rationality and optimality. By way of an optimal choice, a consumer tends to maximise satisfaction (e.g., utility-content of goods and services) subject to constraints imposed by factors like limited budget of given tastes and preferences. Preferences indicate ordering of items in the choice-set of a consumer. The feasibility of choice, given the preferences is taken care of by demand, i.e., placing an order at a price. Sometimes, choice may be strongly ordered, indicating tastes and preferences are more dictating than the price income factors.

The sum up, economist's concept of demand is not the same thing as desire (wishing it were so!), or need or choice or preference or order. Real world confusion may arise when in business practice, these terms are used interchangeably.

### **Demand for a Commodity**

In any market, there are a vast number of individual purchasers of a commodity. The basic unit of consumption being the individual household, "how much of a commodity would an individual household be willing to buy?" – is the demand for the commodity. We may define:

The demand for a commodity of the individual household is the quantity of the commodity that he is willing to buy in the market in a given period of time at a given price.

Thus, a want with three attributes – 'desire to buy', 'willingness to pay' and 'ability to pay' – becomes effective demand. Demand for a commodity has always a reference to 'a price', 'a period of time' and 'a place'. For this reason, "demand for apples is 5" – carries no meaning for a business decision.

### **Determinants of Individual Demand**

Knowledge of different factors and forces that determine the demand for a commodity and the nature of relationship between the demand and its determinants are very helpful in analysing and estimating demand. The demand for a commodity of the individual household depends upon a number of factors, some are quantifiable while some are not quantifiable. These factors are:

1. Price of the commodity
2. The money income of the individual household
3. The tastes and preferences of the individual household
4. The prices of other commodities

### **Types of Demand**

Some contrasting types of demand may be listed, because such listing helps us in analysing consumer's behaviour.

- (i) Individual vs. Market demand

- (ii) Market segment vs Total market demand
- (iii) Company vs. Industry demand
- (iv) Domestic vs. National demand
- (v) Direct vs. Derived demand
- (vi) Autonomous vs. Induced demand
- (vii) New vs. Replacement demand
- (viii) Short run vs. Long run demand
- (ix) Household vs. Corporate vs. Government demand.

Notes

Just as the aggregate of individual's, demand from high income, middle income and low income group yields the market demand for a common item of consumption, in the same way, an aggregate of various company's demand yields the industry's demand, e.g., the demand for engineers. An aggregate of various market segments (North, South, East and West; or local, domestic and export) yields the total market demand for any item or industrial raw materials, e.g., ceiling fans, marine products, turnkey projects, etc.

The demand for an item (of goods) in response to its own price is called 'direct demand', whereas the demand for an item (of services from a factor) is called 'derived demand'. The demand for labour in response to the wage rate is direct, but the demand for same labour in response to the price of electronic goods where labour enters as an input is derived demand.

$$D_x = D(P_x) \quad \Rightarrow \quad \text{Direct Demand}$$

$$D_x = D[S_y(P_y)] \quad \Rightarrow \quad \text{Derived Demand}$$

The demand for goods or services in response to explicit factors like price, income, etc., is induced demand, but the same demand where the impact of implicit factors are not stated, is called autonomous demand.

$$D_x = D_0 - d_1 P_x \Rightarrow D_0 = \text{Autonomous, and } -d_1 P_x = \text{Induced}$$

Sometimes, because of interdependence or relatedness of goods and/or services, the demand for an item may be induced by the supply or price of its substitutes and complementary items.  $D_x = D(P_y)$  is Cross Demand, where  $x$  and  $y$  are related.

There is a contrast between the users and between the uses. As such the household demand (say, for furniture) may be contrasted to the corporate demand (by a furnishing and decorator company) and government demand (by Directorate General of Supplies and Disposables).

In the same way, the use of an item (say, refrigerator or coal) may be for domestic use or for chemist shop or a factory such that there is contrast between domestic demand and industrial demand.

Sometimes we draw a line of contrast between new demand and replacement demand, e.g., when a machinery is purchased or installed new, compared to when it is repaired and replaced by some parts or accessories. Similarly, we contrast between original demand and additional or supplementary demand; or final demand and intermediate demand.

## Demand Function

A function is a symbolic statement of relationship between the dependent and the independent variables, that is,

$$\text{Dependent Variable} = f(\text{Independent Variables})$$

Thus, the relationship of quantity demanded of a commodity to the factors that determine it may be expressed in the form of a function that is called demand function.

Notes

So Demand =  $f(\text{Determinants of the Demand})$

Or  $Qd_x = f(P_x, P_1, \dots, P_n, I, T)$

Where  $Qd_x$  is the individual household's demand for commodity X,

$P_x$  is the price of the commodity X,

$P_1, \dots, P_n$  are the prices of all other commodities (other than X),

$I$  is the income of the household, and

$T$  stands for tastes and preferences of the members of the household.

This unit is concerned with the relationship between quantity demanded of a commodity and its price, while all the other determinants of demand are assumed to remain unchanged. In real life they do change. Before we discuss the relationship between the price of a commodity and the quantity demanded of it, let us first have some rudimentary idea of how the other variables affect demand for a commodity.

1. **Income of the Household:** Demands for goods of different nature have different kinds of relationship with income of different categories of consumers (see Figure 2.2).

- (i) In case of normal goods, a rise in income is generally associated with increase in their demand, and a fall in income with a decrease in their demand. In other words, both income and demand for commodities move in the same direction.

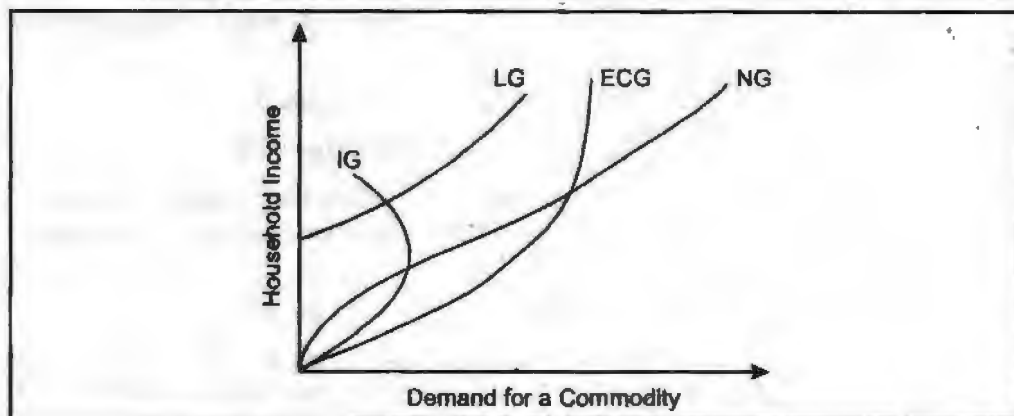


Figure 2.2: Household Income and Demand for a Commodity

- (ii) In case of essential consumer goods, an increase in income may have no effect on their demand. For instance, in case of salt, even with a rise in income, the demand for salt is likely to remain unaffected.
  - (iii) In case of inferior goods, a rise in income may actually lead to a decrease in their demand. For instance, the household may be consuming toned milk. A rise in income may induce it to consume whole milk and its demand for toned milk may go down.
  - (iv) In case of luxury and prestige goods, their demand starts after a particular level of income and may have positive relationship with income after that level.
2. **Prices of Other Commodities:** The relationship between the demand for a commodity and prices of other commodities can be one of the following types:
- (i) The relationship may be the positive one. In other words, a fall (rise) in the price of other commodities reduces (increases) the household demand for a particular commodity. This is the case of substitute goods. If tea and coffee are substitutes, the individual household's demand for tea, among other things, depend upon the price of tea. A fall in the price of coffee would divert demand from tea to coffee and a rise in the price of coffee would divert demand from coffee to tea and increase the demand for tea (see Figure 2.3).

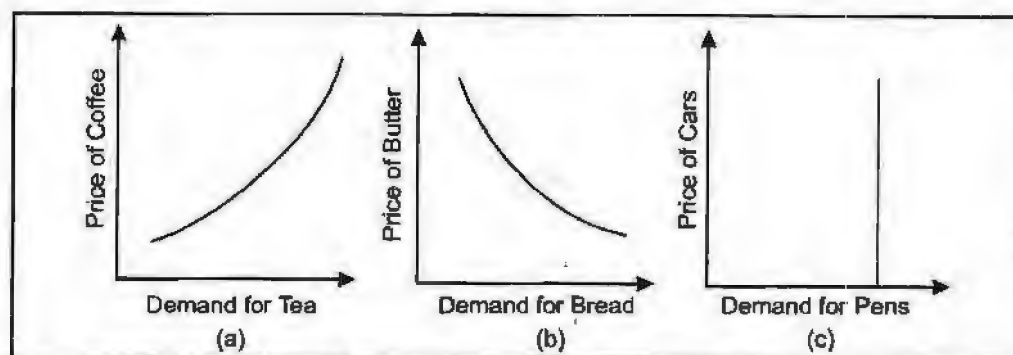


Figure 2.3: Prices of Other Commodities and Demand for a Commodity

- (ii) The relationship may be the inverse one. In other words, a fall (rise) in the price of other commodities increases (reduces) the household demand for a particular commodity. This is the case of complementary goods. If bread and butter go together, a fall in the price of butter may expand its demand and increase the demand of bread (see Figure 2.3b).
- (iii) There may be no relationship. This is the case of unrelated goods. A fall or rise in the price of cars may leave the demand for ball pens unaffected (see Figure 2.3c).
3. **Taste or Preferences of the Household:** Tastes and preferences of individual households influence their demand for a commodity. Tastes and preferences generally depend on the changing life-style, fashion, social customs, religious value, habit, the general level of the living of the society and age. If tastes and preferences change in response to these factors, or as a result of advertisement, or are simply the desire to imitate neighbours, demand for commodities may change. Households may reduce or give up consumption of some goods and add new ones in their consumption pattern. For instance, advertisement may induce households to change the preference for a particular brand of soap.

## Demand Curve

An individual household's demand refers to the quantities of a commodity demanded by him at various prices, other things remaining unchanged. An individual household's demand for a commodity is shown on the demand schedule and on the demand curve. A demand schedule is a list of prices and corresponding quantities demanded and its graphic representation is a demand curve.

## The Law of Demand

When all factors affecting the demand for a commodity, other than its price, are assumed to remain unchanged, the demand for a commodity is the function of its price.

$$Q_{dx} = f(P_x, P_1, P_2, \dots, P_n, T)$$

The relationship between demand and price may be expressed in the form of the Law of Demand in the following words:

The quantity demanded of a commodity varies inversely with its price, other determinants of demand remaining unchanged.

The inverse relationship between quantity demanded and price may be of

1. Linear form:  $Q_{dx} = a - bP_x$  or (see Figure 2.4a).
2. Non-linear or Curvilinear form: The most common form of a non-linear demand function is  $Q_{dx} = a P_x^{-b}$  (see Figure 2.4b).



Notes

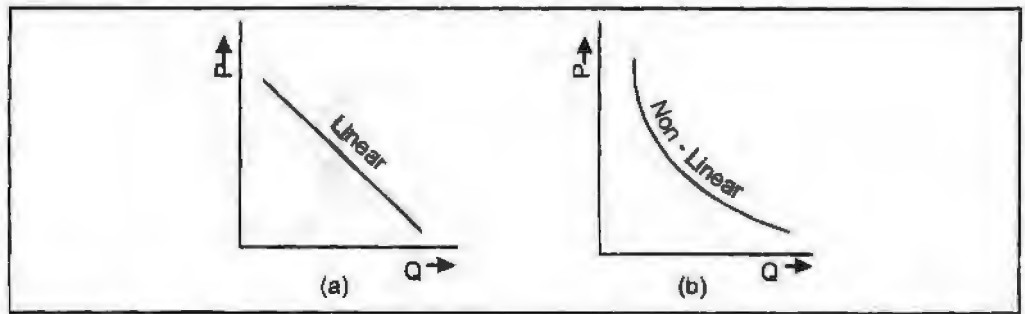


Figure 2.4: Demand curves: (a) Linear (b) Non-linear or Curvilinear

Let us illustrate the law of demand by drawing a hypothetical household demand function  $Q_d = 65 - \frac{1}{5}P_e$  for eggs. The demand schedule is shown in Table 2.1. In the first column are given alternate prices per egg and in the second column against each price is shown quantity demanded of eggs, during, say a week.

Table 2.1: Individual Household Demand Schedule of Eggs

Price per Egg (Paise)	Quantity Demanded of Eggs
300	5
250	15
200	25
150	35
100	45
50	55

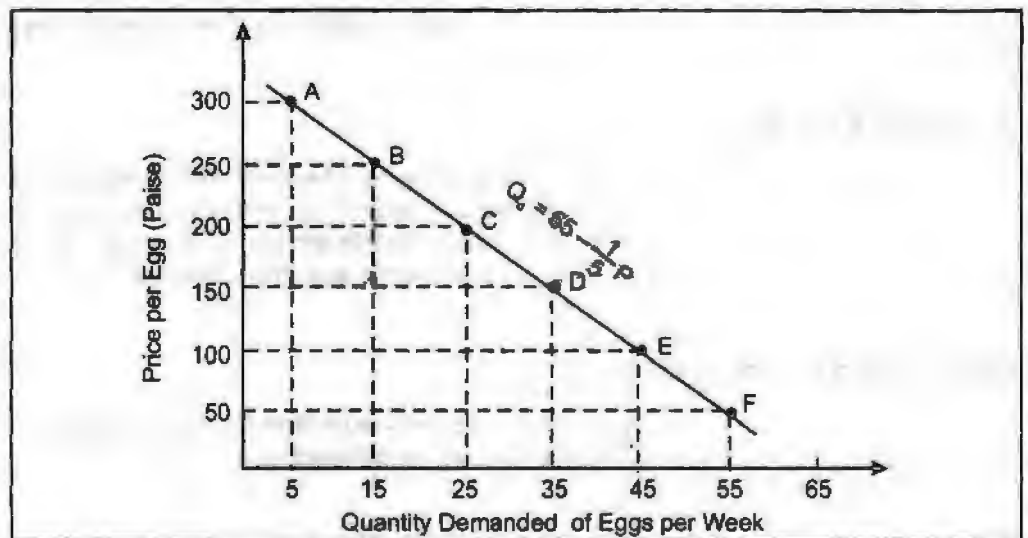


Figure 2.5: Individual Household Demand Curve for Eggs

The demand schedule represented on a graph gives the demand curve for eggs of the household. On the Y-axis is shown the independent variable, price per egg and on the X-axis is given the dependent variable, the quantity of eggs demanded at each price.

Each point A, B, C, D, E, and F represents a pair of values; price of an egg and the demand for egg of the household at that price. By joining these points, we get the demand curve AF for eggs of the household, for the given period.

The demand curve depicts the relationship between the price of the commodity and an estimate of the quantity demanded of it for the given period at any point of time. The

demand curve slopes downward from left to right. A demand curve sloping downward from left to right is also called a negatively sloped demand curve because the rate of change in Q in response to change in P is denoted by negative value i.e.  $\frac{dQ}{dP}$  is negative.

Notes

**Why the Demand Curve Slopes Downward:** It is a matter of empirical observation that households behave in this fashion for most of the commodities. They buy more of the goods at lower prices than at higher prices. But the question is why do they behave in this fashion? An explanation of this may be found in the theories of consumer behaviour: the Marginal Utility Theory of Professor Marshall, the Indifference Curves Approach of Professor Hicks, and the theory of Revealed Preferences of Professor Samuelson. The reason for the negative slope of demand curve can be found in income and substitution effects of the price change:

1. **Income Effect:** When the price of commodity falls, less has to be spent on the purchase of the same quantity of the commodity. This has the effect of increasing the purchasing power of the given money. This is the income effect of a fall in the price of the commodity. With this increase in real income, the household buys more of the commodity in question. The effects operate in reverse when the price of the commodity rises.
2. **Substitution Effect:** When the price of a commodity falls, it becomes cheaper relative to other commodities. This leads to substitution of other commodities (which are now relatively more expensive). This is called the substitution effect and the demand for the cheaper commodity rises in consequence. When the price of the commodity rises, this effect operates in reverse.

Thus, Income effect and substitution effect together explain the behaviour of individual household in the form of law of demand.

**Giffen Paradox: The Positively Sloped Demand Curve:** If the commodity in question is an inferior good, the increase in real income resulting from the reduction in its price will lead the consumer to purchase less, not more, of the commodity. Thus, the income effect will be negative while the substitution effect continues to be positive to lead the consumer to purchase more of the commodity when its price falls. For most of the inferior goods, the positive substitution effect will be more than offset the negative income effect so that the demand curve is negatively sloped.

However, in the very rare case when the consumer spends so much on the inferior commodity that the strong negative income effect overwhelms the positive substitution effect the quantity demanded of the commodity will fall when its price falls and rise when its price rises. In other words, the demand curve in this case will be positively sloped. The commodity in question is then called a Giffen goods, after the 19th century English economist Robert Giffen, who first discussed it. This is what is called Giffen Paradox that makes the demand curve to have a positive slope.

## Elasticity: Meaning

The term 'elasticity' refers to the rate of change or simply the degree of response. Elasticity of demand then refers to the degree of response of demand. Similarly, the elasticity of supply.

Demand for a good responds to the own price of the good, the prices of the related goods, the income of the consumer and tastes of the consumer. When we measure the degree of response of demand of a good with respect to the 'own price' of the good only, it is called *price elasticity of demand*. Similarly, the degree of response with respect to price of the related good, it is *cross price elasticity of demand*. With respect to income, it is *income elasticity of demand*. We do not measure elasticity in terms of tastes because taste cannot be expressed in numerical terms.

Elasticity of demand is thus defined as the rate of change of demand with respect to a factor influencing demand.

## Notes

### Elastic vs. Inelastic Demand

The demand is said to be *elastic* if the percentage change in demand is greater than the percentage change in price; *inelastic*, if the percentage change in demand is less; and *unitary elastic*, if the percentage change in demand is the same as the percentage change in price. Let us denote 'price elasticity of demand'  $E_p$ . Then, numerically

if  $E_p > 1$ , demand is elastic

if  $E_p = 1$ , the demand is unitary elastic

if  $E_p < 1$ , the demand is inelastic.

Inelastic demand should not be interpreted as zero elasticity.  $E_p = -0.9$  is also inelastic demand. The extreme downward limit of  $E_p$  is zero which is called '*perfectly inelastic demand*'. The extreme upward limit is infinity which is called '*perfectly elastic demand*'. The basic categories remain only three: elastic, unitary elastic and inelastic.

### Demand Elasticities

Demand is a function of its determinants. It changes in response to any change in any of its determinants. However, knowing alone the nature of relationship between demand and its determinants is not sufficient. What is more important is to know the extent of relationship or how responsive the demand is to the changes in its determinants. The concept of elasticity of demand is extremely useful in this reference. It plays an important role in business decision-making. For instance 'raising the price' of the product will prove beneficial or not depends on:

1. The price elasticity of demand for the product and
2. The price elasticity of demand for its substitutes.

Therefore, it is obvious that the understanding of different elasticities of demand is the basic prerequisite whenever a business manager is considering "price change" for his or her product. In general terms, the elasticity of demand is a measure of the responsiveness or sensitiveness of demand for a commodity to the change in its determinants. There are as many elasticities of the demand as its determinants. The most important of these elasticities are (a) price elasticity, (b) income elasticity, and (c) cross elasticity of demand. In this unit after discussing these elasticities of demand in detail, we will understand their use in managerial decision-making.

### Price Elasticity of Demand

Consider the two demand curves A and B, given in the Figure 2.6. Curve A represents the demand for goods in market A. Curve B represent the demand for the same goods in market B. At price  $P_1$ , the demand in market A is  $OQ_A$ ; while in market B, it is  $OQ_B$ . When the price falls from  $P_1$  to  $P_2$ , the demand in market A expands from  $OQ_A$  to  $OQ_A'$ , that is, by  $Q_A Q_A'$ . In case of market B, the same fall in price leads to an expansion of demand by  $Q_B Q_B'$ . The expansion of demand in market B is greater than in market A. We describe this situation roughly by saying that the price elasticity of demand for the goods in market B is greater than that in market A.

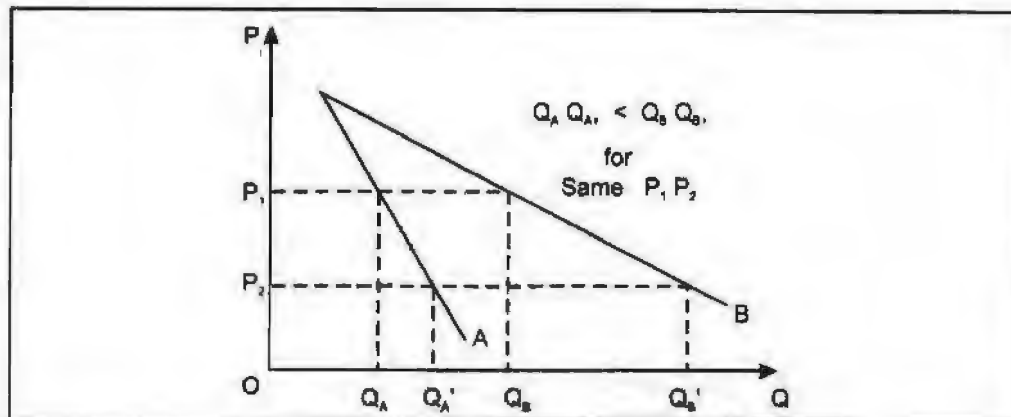


Figure 2.6: Demand Curves with Different Price Elasticities

Therefore, price elasticity of demand is the measure of the degree of responsiveness of the demand for the commodity to the changes in its own price. It measures the percentage change in the quantity demanded as a result of one percent change in its price, holding constant all other variables in the demand function. That is:

$$\begin{aligned}
 e_p &= \frac{\% \Delta Q}{\% \Delta P} && \text{ceteris paribus} \\
 &= \frac{\frac{\Delta Q}{Q} \times 100}{\frac{\Delta P}{P} \times 100} \\
 &= \frac{\Delta Q}{\Delta P} \cdot \frac{P}{Q} && \dots(2.1)
 \end{aligned}$$

Where  $P$  and  $Q$  are initial price and quantity demanded respectively.  $\Delta P$  and  $\Delta Q$  refer, respectively, to the change in price and change in quantity.

$\frac{\Delta Q}{\Delta P}$  is negative, making the price elasticity always negative. This is because of inverse relationship between  $P$  and  $Q$  implied by the Law of Demand. However, we generally omit the negative sign when writing the formula of the elasticity. We can measure the price elasticity of demand.

1. On a point on demand curve, and call it point price elasticity of demand
2. Between two points on a demand curve, and call it arc price elasticity of demand

**Point Price Elasticity of Demand:** When the changes in price are very small, we use the point elasticity of demand as a measure of the responsiveness of demand. Thus, point elasticity of demand is defined as the proportionate change in the quantity demanded resulting from a very small proportionate change in price.

If we consider very small changes in  $P$  and  $Q$ , then and

That 
$$e_p = \frac{\partial Q}{\partial P} \cdot \frac{P}{Q} \quad \dots(2.2)$$

If the demand curve is linear

$$Q = a - bP$$

Then  $\frac{\partial Q}{\partial P} = b$ , so we have

Notes

$$e_p = b \cdot \frac{P}{Q} \quad \dots(2.3)$$

Here  $b$  is the reciprocal of the slope of the demand curve.

Eq. (2.2) and Eq. (2.3) imply that the point price elasticity changes at the various points of the linear demand curve. This is because of the change in  $P/Q$  along the demand curve.

**Point Price elasticity on a Curvilinear Demand Curve**

For a curvilinear (non-linear) demand curve, we draw a tangent to the demand curve at the point  $a$  which we want to measure the elasticity and then proceed as if we were dealing with a linear demand curve.

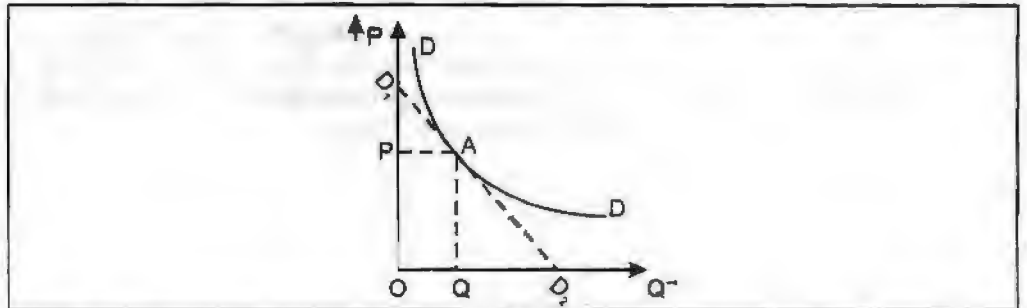


Figure 2.7: Point Price Elasticity on a Curvilinear Demand Curve

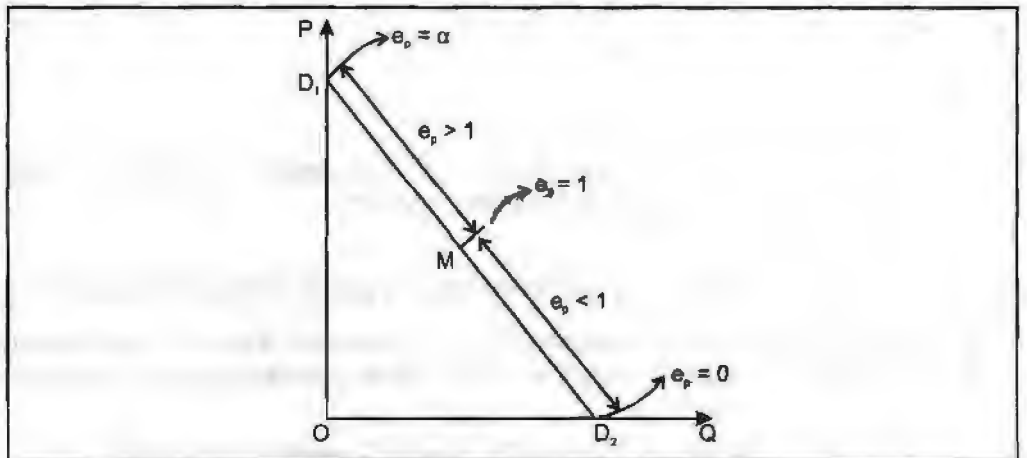


Figure 2.8: Point Price Elasticity

From the graphical measurement of the point price elasticity of demand, it is obvious that at mid-point of the linear demand curve  $e_p = 1$  (point M in Figure 2.8). At any point to the right of M,  $e_p < 1$ ; and at any point to the left of M,  $e_p > 1$ . At point  $D_1$  the  $e_p = \alpha$ , while at point  $D_2$  the  $e_p = 0$ .

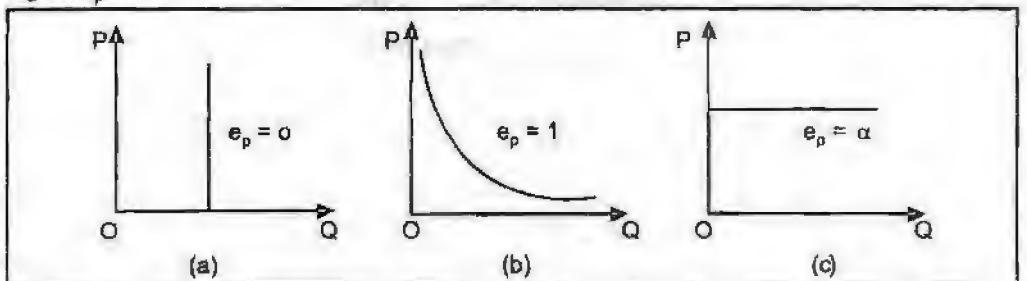


Figure 2.9: Demand Curves with different Price Elasticities

Thus, the range of values of the elasticity is

$$0 \leq e_p \leq \alpha$$

1. If  $e_p = 0$ , the demand is perfectly inelastic (Figure 2.9a).
2. If  $e_p = 1$ , the demand has unitary elasticity (Figure 2.9b).
3. If  $e_p = \alpha$ , the demand is perfectly elastic (Figure 2.9c).
4. If  $0 < e_p < 1$ , we say that the demand is inelastic.
5. If  $1 < e_p < \alpha$ , we say that the demand is elastic.

**Arc Price Elasticity of Demand:** When the changes in price are not small, we use the arc elasticity of demand as a measure of the responsiveness of demand. Arc elasticity measures the elasticity of demand between two points on the demand curve. However, if we use the

Eq.(2.1) i.e.  $e_p = \frac{\Delta Q}{\Delta P} \cdot \frac{P}{Q}$ , we will get different results depending on whether the price rose

or fell. This is because of the different values of the initial price (P) and initial quantity (Q) for the rise and fall of the price. Therefore, we use the average of the two prices and the average of the two quantities in the calculations and use the following formula for the arc price elasticity of demand:

$$e_p = \frac{\Delta Q}{\Delta P} \cdot \frac{\frac{P_1 + P_2}{2}}{\frac{Q_1 + Q_2}{2}} \quad \text{ceteris paribus}$$

$$= \frac{Q_2 - Q_1}{P_2 - P_1} \cdot \frac{P_1 + P_2}{Q_1 + Q_2} \quad \dots(2.4)$$

Where the subscripts 1 and 2 refer to the original and to the new values, respectively, of price and quantity.

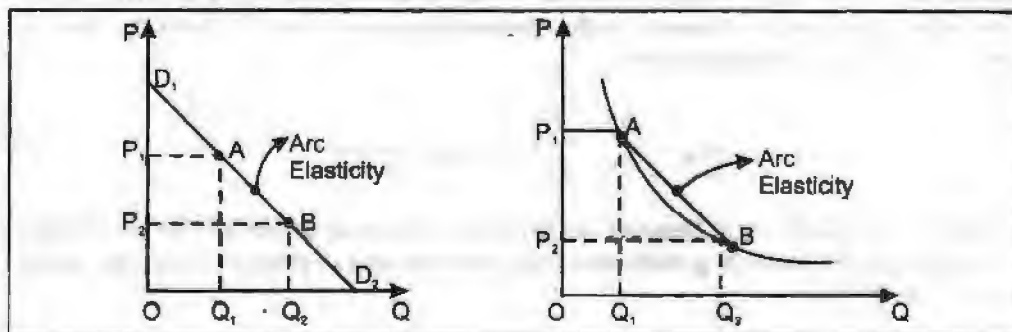


Figure 2.10: Arc Elasticity

**Factors Affecting the Price Elasticity of Demand:** The basic determinants of the price elasticity of demand for a commodity are:

1. **Availability and closeness of substitutes:** demand for a commodity is more elastic if there are close substitutes for it.
2. **Nature of the commodity:** in general the demand for necessities is less elastic, for comforts are moderately elastic and for luxuries is more elastic. Demand for prestige goods is price inelastic. Also the demand for durables is more price elastic than that for non-durables.
3. **Time frame of analysis:** demand is more elastic in the long run than in short run.
4. **Variety of uses of the commodity:** the more the possible uses of a commodity the greater its price elasticity will be.

Notes

Notes

5. **Price expectations:** the future expectations about the price of any commodity also influence the price elasticity of demand. If the price of a commodity is expected to increase, the small fall in its present price would induce a reasonable increase in the demand.
6. **The proportion of income spent:** in general the demand for commodities, which entail a large proportion of the income of the consumer, is more elastic than that of commodities with a small proportion of income.
7. **Level of prices:** the demand for commodities is elastic when price level is high and is less elastic when price level is low.

**Cross Price Elasticity of Demand**

The demand for a commodity also depends on the price of other commodities, and changes in response to any change in the price of other commodities. The cross price elasticity of demand measures the responsiveness of the demand for commodity X to a change in the price of commodity Y. Thus, cross-price elasticity of demand is the ratio of the percentage change in the demand for commodity X to the percentage change in the price of commodity Y, assuming all other factors influencing demand remain unchanged

i.e.

$$e_{xy} = \frac{\% \Delta Q_x}{\% \Delta P_y} \quad \text{ceteris paribus}$$

$$= \frac{\frac{\Delta Q_x}{Q_x} \times 100}{\frac{\Delta P_y}{P_y} \times 100}$$

$$= \frac{\Delta Q_x}{\Delta P_y} \cdot \frac{P_y}{Q_x} \quad \dots(2.5)$$

**Point Cross-price Elasticity of Demand:** Point cross-price elasticity of demand for commodity X provides a measure of the responsiveness at a specific point  $P_y$  over the demand function. It is measured as:

$$e_{xy} = \frac{\partial Q_x}{\partial P_y} \cdot \frac{P_y}{Q_x} \quad \text{ceteris paribus} \quad \dots(2.6)$$

**Arc Cross-price Elasticity of Demand:** Arc cross-price elasticity of demand for commodity X is a technique for computing cross-price elasticity between two price levels of commodity Y. It is measured as:

$$e_{xy} = \frac{\Delta Q_x}{\Delta P_y} \cdot \frac{\frac{P_y^2 + P_y^1}{2}}{\frac{Q_x^2 + Q_x^1}{2}}$$

$$= \frac{Q_x^2 - Q_x^1}{P_y^2 - P_y^1} \cdot \frac{P_y^2 + P_y^1}{Q_x^2 + Q_x^1} \quad \text{ceteris paribus} \dots(2.7)$$

**Income Elasticity of Demand**

The level of a consumer's income is also a very important determinant of demand. We can measure the responsiveness of demand for a commodity to a change in consumers' income

by the income elasticity of demand. It is measured as the ratio of the percentage change in demand for the commodity to the percentage change in consumers' income, assuming that all the other factors influencing demand remain unchanged.

So

$$e_i = \frac{\% \Delta Q}{\% \Delta I} \quad \text{ceteris paribus}$$

$$= \frac{\frac{\Delta Q}{Q} \times 100}{\frac{\Delta I}{I} \times 100}$$

$$= \frac{\Delta Q}{\Delta I} \cdot \frac{I}{Q} \quad \dots(2.8)$$

Notes

**Point Income Elasticity of Demand:** Point income elasticity provides a measure of the responsiveness of demand for a commodity at a specific income level over the demand function. It is measured as:

$$e_i = \frac{\partial Q}{\partial I} \cdot \frac{I}{Q} \quad \text{ceteris paribus} \quad \dots(2.9)$$

**Arc Income Elasticity of Demand:** Arc income elasticity of demand for a commodity is a technique for computing income elasticity between two income levels of the consumers. It is measured as:

$$e_i = \frac{\Delta Q}{\Delta I} \cdot \frac{\frac{I_2 + I_1}{2}}{\frac{Q_2 + Q_1}{2}}$$

$$= \frac{Q_2 - Q_1}{I_2 - I_1} \cdot \frac{I_2 + I_1}{Q_2 + Q_1} \quad \text{ceteris paribus} \quad \dots(2.10)$$

### Other Demand Elasticity Measures

Price, cross and income elasticities are the most important application of the elasticity concept of demand analysis. Two other important elasticities of demand are:

**Advertisement Elasticity of Sales:** It measures the responsiveness of sales to the changes in advertisement expenditure and is very helpful in determining the optimum level of advertisement expenditure.

**Elasticity of Price Expectations:** During the period of Price fluctuations, consumers' price expectations play a much more important role in determining demand than any other factor. The concept of elasticity of price expectation is extremely useful for demand analysis during the period of price fluctuations.

### Elasticities in Managerial Decision-making

Out of the numerous various factors that affect demand, some are well under the control of the firm, while others are not. A firm can usually set the prices of the commodity it sells and decide on the level of its expenditures on advertising, product quality and customer service. However, it has no control over the level and growth of consumers' income, consumers' price expectations, competitors' policies regarding price, expenditures on advertisement, product quality and customer service. The analysis of all these factors and reliable estimates of their quantitative effect on sales are essential for the firm to determine the optimal operational policies, and plans for its growth, and for responding most



effectively to competitors' policies. To make these points clear, consider the following instances:

1. If the demand for the product is price inelastic, the firm would not want to lower its price since that would reduce its total revenue, increase its total costs and this will give it lower profits.
2. If the elasticity of the firm's sales *w. r. t.* advertisement expenditure is positive and higher than for its expenditure on product quality and customer service, then the firms would find it more beneficial to concentrate its sales efforts on advertising rather than on product quality and customer service.
3. If the income elasticity is very low for the firm's product, management knows that the firm will not benefit much from rising income or may find it beneficial to improve product quality and customer service.
4. If the firm has estimated that the cross-price elasticity of demand for its product *w. r. t.* the price of a competitor's product is very high, it will be quick to respond to a competitor's price reduction.

Thus, the firm should first identify all the important variables that affect the demand for the product it sells. Then it should get reliable estimates of their quantitative effect and obtain the demand function. The firm can use this information to estimate the elasticity of demand for the product it sells *w. r. t.* each of the variable in demand function. These are essential for optimal managerial decisions in the short-run and in planning for growth in the long-run.

### Student Activity

1. Hold a group discussion on 'Nature of commodity and its effect of Elasticity of Demand on taxation'.
2. Select a medium corporate organisation in your region and study the relationship between advertisement budget and its product sales of past five years to know reasoning of sales budget.
3. Conduct a brainstorming exercise on 'How elasticity of demand is useful for international trade and for the Finance Minister'.

## Demand Forecasting

In today's very complex and dynamic environment, most business decisions are made in the face of risk and uncertainty. A firm is, in fact, always confronted with the question as to what would be the level of future economic activity in general and demand for its product in particular. It makes some 'forecast' or 'prediction' about the future situation to offset the risks and uncertainties involved in decision-making. A firm must decide how much of each product to produce, what price to charge, and how much to spend on advertising and it must also plan for the growth of the firm. All these decisions are based on some forecast of the level of future economic activity in general and demand for the firm's product(s) in particular. The aim of economic forecasting is to reduce the risk or uncertainty that the firm faces in its short-term operational decision-making and in planning for its long-term growth. Thus, good forecasting becomes a key factor in a firm's success. The unstable the demand, the more critical is forecast accuracy, and the more elaborate is the more forecasting procedure.

### Procedure to Prepare a Demand Forecast

Firms generally use a three-stage procedure to prepare a demand and sales forecast (see Figure 2.11.) They prepare a macroeconomic forecast first, followed by an industry forecast, followed by a firm demand and sales forecast. Forecasting the demand and sales of firm's product usually begins with a macroeconomic forecast of the general level of economic

activity for the economy as a whole or gross national product. The reason for this is that the demand and sales of most goods and services are strongly affected by business conditions. For instance, the demand and sales of new automobiles, new house, electricity, and most other goods and services rise and fall with the general level of economic activity. Thus, the macroeconomic forecast calls for projecting inflation, unemployment, interest rates, consumer spending, business investment expenditures, net exports and other variables.

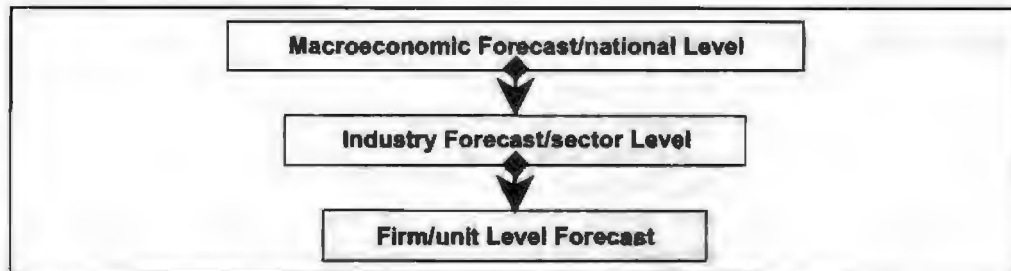


Figure 2.11: Three-stage Procedure to Prepare a Demand and Sales Forecast

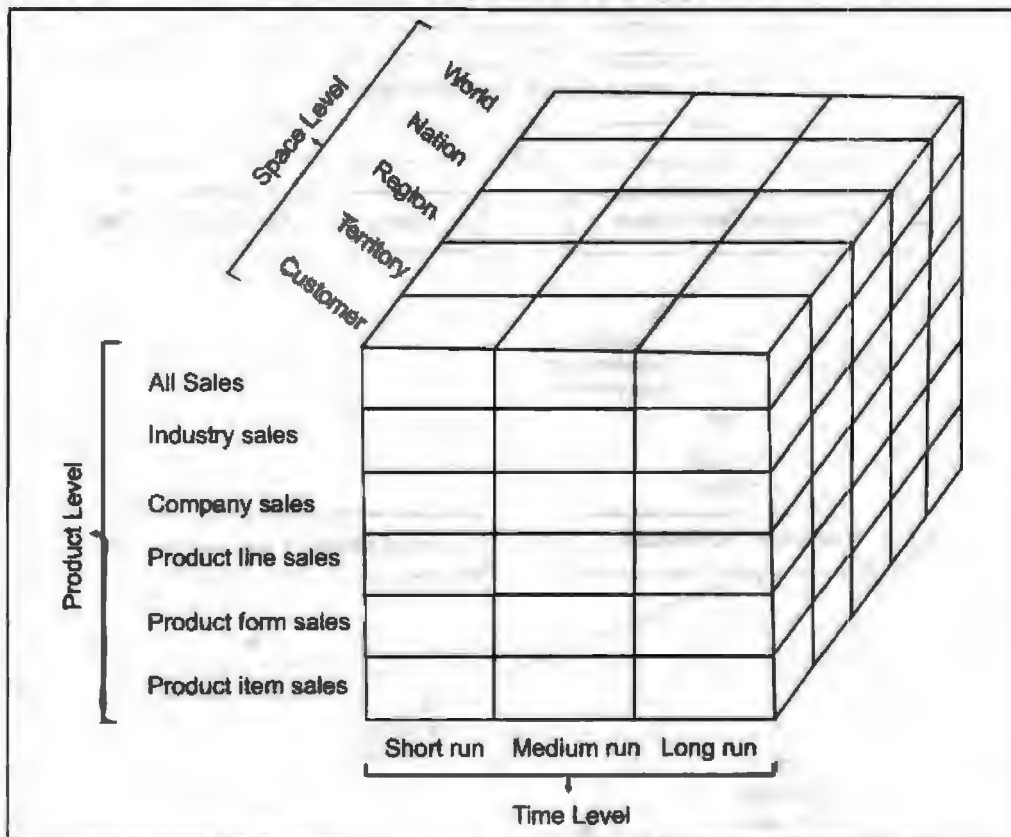


Figure 2.12: Different Types of Demand Estimates of Forecasts

The firm uses these macro forecasts of general economic activity as inputs for their micro forecast of the industry's and firm's demand and sales. The firm's demand and sales are usually forecasted on the basis of its historical market (industry) share and its planned marketing strategy (the introduction of new products and models, changes in relative prices and promotional effort). From its general sales forecast, the firm can forecast its sales by product line and region. These, in turn, are used to forecast the firm's operational needs for production (raw material, equipment, warehousing, and workers), marketing (distributional net work, sales force, promotional campaign), finances (cash flow, profits, need for and cost of outside financing) and personnel throughout the firm. The firm uses long-term forecasts for the economy and the industry to forecast expenditures on plant and equipment to meet its long-term growth plan and strategy.

**The Forecasts of Market Demand:** Firms can prepare as many as 90 different types of demand estimates or forecasts (see Figure 2.12). Demand can be forecasted for six different product levels, five different space levels, and three different time levels.

Each demand forecast serves a specific purpose. For example, a firm might forecast short-run demand for a particular product for the purpose of ordering raw material, planning production, and borrowing cash. Again, it might forecast regional demand for its major product line to decide whether to set-up a regional distribution center or not.

### Techniques of Demand Forecasting

The techniques of demand forecasting are many. These range from very naive ones that require little effort to very sophisticated ones that are very costly in terms of time and effort. Some forecasting techniques are basically qualitative, while others are quantitative. Some are based on examining only past values of the data series to forecast its future values; others involve the use of complex models based on a great deal of additional data and relationships. Some techniques, such as the barometric method, are more useful for short-term (monthly or quarterly) forecasts, while others are more useful for long-term forecasting of one year or longer. Some may be more appropriate for forecasting at the macro level, while others are better for forecasting at the micro level.

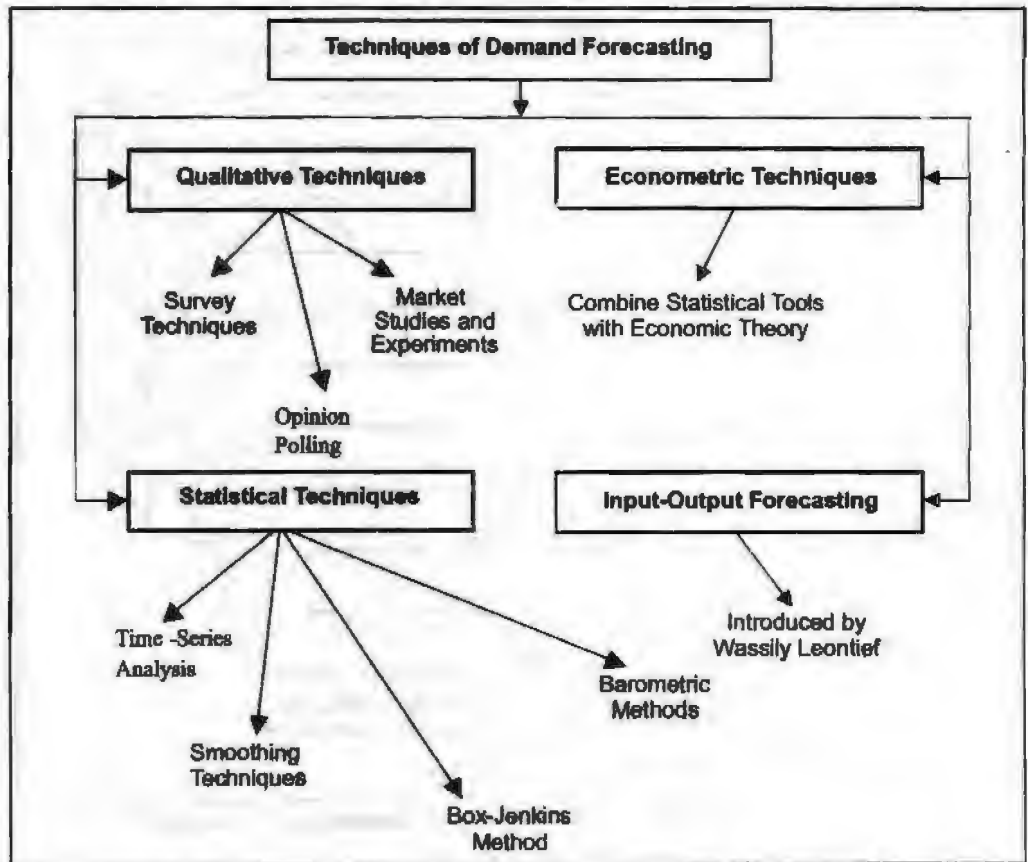


Figure 2.13: Various Techniques of Demand Forecasting

The choice of a suitable technique or a combination of techniques is a matter of purpose, experience and expertise, and depends on:

1. The cost of preparing the forecast and the benefit that results from its use,
2. The lead time in decision-making,
3. The time period of the forecast (short term or long-term),
4. The level of accuracy required,

5. The quality and availability of the data, and
6. The level of complexity of the relationships to be forecasted.

In general, the greater the level of accuracy required and the more complex the relationships to be forecasted, the more sophisticated and expensive will be the forecasting exercise.

Notes

The various techniques of demand forecasting that are discussed in this unit, are shown in Figure 2.13.

### **Qualitative Techniques**

Qualitative techniques are often used to make short-term forecasts when quantitative data are not available. These qualitative techniques can also be useful for supplementing quantitative forecasts that anticipate changes in consumer tastes or business expectations about future economic conditions. They can also be invaluable in forecasting the demand for a product that the firm intends to introduce. We will briefly discuss forecasting based on surveys, opinion polling, consumer clinics and market experiments.

**Survey Techniques:** Survey techniques are generally used to make short-run forecast of demand. These techniques of demand forecasting involve direct interview of potential consumers to collect information about their intentions and future purchase plans. The rationale for forecasting based on surveys of economic intentions is that many economic decisions are made well in advance of actual expenditures. For instance, businessmen actually plan to add to plant and equipment long before expenditures are actually incurred. Consumers' decisions to purchase house, automobiles, TV sets, washing machines, furniture, vacations, education and other major consumption items are made months or years in advance of actual purchases. Similarly, government agencies prepare budgets and anticipate expenditures a year or more in advance. Surveys of economic intention, thus, can reveal and can be used to forecast future purchases of capital equipment, inventory changes, and major consumer expenditures.

**Opinion Polling:** The opinion poll methods aim at collecting opinions of those who are supposed to possess knowledge of the market, such as sales representatives, sales executives, professional marketing experts and consultants. The opinion poll methods include:

1. **Expert-Opinion Method:** Firms having a good network of sales representatives can put them to the work of assessing the demand for the product in the areas, regions or cities that they represent. Sales representatives, being in close touch with the consumers or users of goods, are supposed to know the future purchase plans of their customers, their reaction to the market changes, their response to the introduction of a new product and the demand for competing products. They are, therefore in a position to provide at least an approximate, if not accurate, estimate of likely demand for their firm's product in their region or area. The estimates of demand thus obtained from different regions are added up to get the overall probable demand for a product. Firms not having this facility gather similar information about the demand for their products through the professional market experts or consultants, who can, through their experience and expertise, predict the future demand. This method is also known as *opinion poll method*.

Although this method is too simple and inexpensive, it has its own limitations. *First*, estimates provided by the sales representatives and professional experts are reliable only to the extent depending on their skill to analyze the market and their experience. *Second*, demand estimates may involve the subjective judgment of the assessor which may lead to over or under-estimation. *Finally*, the assessment of market demand is usually based on inadequate information available to the sales representatives as they have only a narrow view of the market. The factors of wider implication such as change in GNP, availability of credit, future-prospects of the industry and other such related issues fall outside their purview.

Notes

2. **Delphi Method:** Delphi method of demand forecasting is an extension of the *simple expert opinion poll method*. This method is used to consolidate the divergent expert opinions and to arrive at a compromise estimate of future demand. The process is simple.

Under the Delphi method, the experts are provided information on estimates of forecasts of other experts along with the underlying assumptions. The experts may revise their own estimates in the light of forecasts made by other experts. The consensus of experts about the forecasts constitutes the final forecast. It may be noted that the empirical studies conducted in the USA have shown that unstructured opinions of the experts is the most widely used technique of forecast. This may appear a bit unusual in as much as this give the impression that sophisticated techniques, such as simultaneous equations model and statistical methods are not the techniques, which are used most often. However, the unstructured opinions of the experts may conceal the fact that information used by experts in expressing their forecasts may be based on sophisticated techniques. The Delphi technique can be used for cross-checking information on forecasts.

3. **Market Studies and Experiments:** An alternative method of collecting necessary information regarding demand is to carry out market studies and experiments on consumer's behaviour under actual, though controlled, market conditions. This method is known in common parlance as *market experiment method*. Under this method, firms first select some areas of the representative markets – three or four cities having similar features, that is, population, income levels, cultural and social background, occupational distribution, choices and preferences of consumers, then they carry out market experiments by changing prices, advertisement expenditure and other controllable variables in the demand function under the assumption that other things remain the same. The controlled variables may be changed over time either simultaneously in all the markets or in the selected markets. After such changes are introduced in the market, the consequent changes in the demand over a period of time (a week, a fortnight, or month) are recorded. On the basis of data collected, elasticity coefficients are computed. These coefficients are then used along with the variables of the demand function to assess the demand for the product.

Alternatively, market experiments can be replaced by *consumer clinics* or *controlled laboratory experiment*. Under this method, consumers are given some money to buy, in a stipulated store, goods with varying prices, packages, displays, etc. The experiment reveals the consumers' responsiveness to the changes made in prices, packages and displays. Thus, the laboratory experiments also yield the same information as the market experiments. But the former has an advantage over the latter because of greater control over extraneous factors and its somewhat lower cost.

**Limitations:** The market experiment methods have certain serious limitations and disadvantages, which reduce the usability and reliability of this method.

**First,** a very important limitation of the experimental methods is that they are very expensive. Therefore, small firms cannot afford experimental methods.

**Second,** being a costly affair, experiments are usually carried out on a scale too small to permit generalisation with a high degree of reliability.

**Third,** experimental methods are based on short-term and controlled conditions that may not exist in an uncontrolled market. Hence, the results may not be applicable to the uncontrolled long-term conditions of the market.

**Fourth,** changes in socio-economic conditions during the field experiments, such as local strikes or lay-offs, advertising programmes by competitors, political changes and natural calamities may invalidate the results.

**Finally,** a big disadvantage of experimental methods is that tinkering with price increases may cause a permanent loss of customers to competitive brands that might have been tried.

## Statistical Techniques

Statistical methods of demand forecasting utilize historical (time-series) and cross-section data for preparing long-term demand forecasting. Statistical techniques are considered to be superior one for demand forecasting for the following reasons:

1. In the statistical methods, the element of subjectivity is minimum,
2. Method of estimation is scientific, as it is based on the theoretical relationship between the dependent and independent variables,
3. Estimates are relatively more reliable, and
4. Estimation involves smaller cost.

Statistical techniques of demand forecasting includes:

### Time-series Analysis

Time-series analysis or the analysis of time-series data is one of the most frequently used forecasting methods. Time-series data refers to the values of a variable arranged chronologically by days, weeks, months, quarters or years. The first step in time-series analysis is usually to plot past values of the variable that we seek to forecast (say, the sales of a firm) on the vertical axis and time on the horizontal axis in order to visually inspect the movement of the time series over time. Time-series analysis attempts to forecast future values of the time series by examining past observations of the data only. The assumption is that the time series will continue to move as in the past (the past pattern will continue unchanged or will be similar in the future). For this reason, time-series analysis is often referred to as "naive forecasting".

**Smoothing Techniques:** Other methods of naive forecasting are smoothing techniques. These predict values of a time series on the basis of some average of its past values only. Smoothing techniques are useful when the time series exhibit little trend or seasonal variations but a great deal of irregular or random variation. The irregular or random variation in the time series is then smoothed, and future values are forecasted based on some average of past observations.

**Box-Jenkins Method:** Suggested by G E P Box and G M Jenkins, this method of forecasting is used only for short-term predictions. Besides, this method is suitable for forecasting demand with only stationary time-series sales data. Stationary time-series data is one, which does not reveal a long-term trend. In other words, Box-Jenkins technique can be used only in those cases in which time-series analysis depicts monthly or seasonal variation recurring with some degree of regularity.

**Steps in Box-Jenkins method:** As mentioned above, Box-Jenkins method can be applied only to stationary time-series data. Therefore, the first step in Box-Jenkins approach is to eliminate trend from the time series data. Trend is eliminated by taking first differences of time-series data that is, subtracting observed value of one period from the observed value of the preceding year. After trend is eliminated, a stationary time-series is created. The second step in the Box-Jenkins approach is to make sure that there is seasonality in the stationary time-series. If a certain pattern is found to repeat over time, there is seasonality in the stationary time-series created. The third step involves use of models to predict the sales in the intended period. We give here a brief description of the Box-Jenkins models, which are used in the same sequence.

**Auto-regressive Model:** In a general autoregressive model, the behaviour of a variable in a period is linked to the behaviour of the variable in future period. The general form of the autoregressive model is given below.

$$S_t = a_1 S_{t-1} + a_2 S_{t-2} + \dots + a_n S_{t-n} + e_t \quad \dots (2.11)$$

This model states that the value of  $S_t$  in period  $t$  depends on the values of  $S$  in periods  $t-1, t-2 \dots t-n$ . The term  $e_t$  is the random portion of  $S_t$  not explained by the model.

Notes

If estimated value of one or some of the coefficients-  $a_1, a_2, \dots, a_n$  are different from zero, it reveals seasonality in data. This completes the second step.

The model (2.11), however, does not specify the relationship between the value of  $S_t$  and residuals ( $e$ ) of previous periods. Box-Jenkins method uses moving average method to specify the relationship between  $S_t$  and  $e_t$ , values of residuals in previous years. This is the third step. Let us now look at the moving average model of Box-Jenkins method.

**Moving Average Model:** The moving average model estimates  $S_t$  in relation to residuals ( $e$ ) of the previous years. The general form of moving average model is given below.

$$S_t = m + b_1 e_{t-1} + b_2 e_{t-2} + \dots + b_p e_{t-p} + e_t \quad \dots (2.12)$$

where  $m$  is mean of the stationary time-series and  $e_{t-1}, e_{t-2} \dots e_{t-p}$  are the residuals-the random components of  $S$  in  $t-1, t-2, t-p$  periods, respectively.

**Auto-regressive-Moving Average Model:** After moving average model is estimated, it is combined with autoregressive model to form the final form of the Box-Jenkins model, called autoregressive-moving-average model, given below:

$$S_t = a_1 S_{t-1} + a_2 S_{t-2} + \dots + a_n Y_{t-n} + b_1 e_{t-1} + b_2 e_{t-2} + \dots + b_p e_{t-p} + e_t \quad \dots (2.13)$$

Clearly, Box-Jenkins method of forecasting demand is a sophisticated and complicated method. Without the aid of computers it is rather an impracticable method.

**Barometric Forecasting:** Barometric forecasting, as conducted today, is primarily the result of the work conducted at the national Bureau of Economic Research (NBER) and Conference Board of U S. The basic approach of this technique is to construct an index of relevant economic indicators.

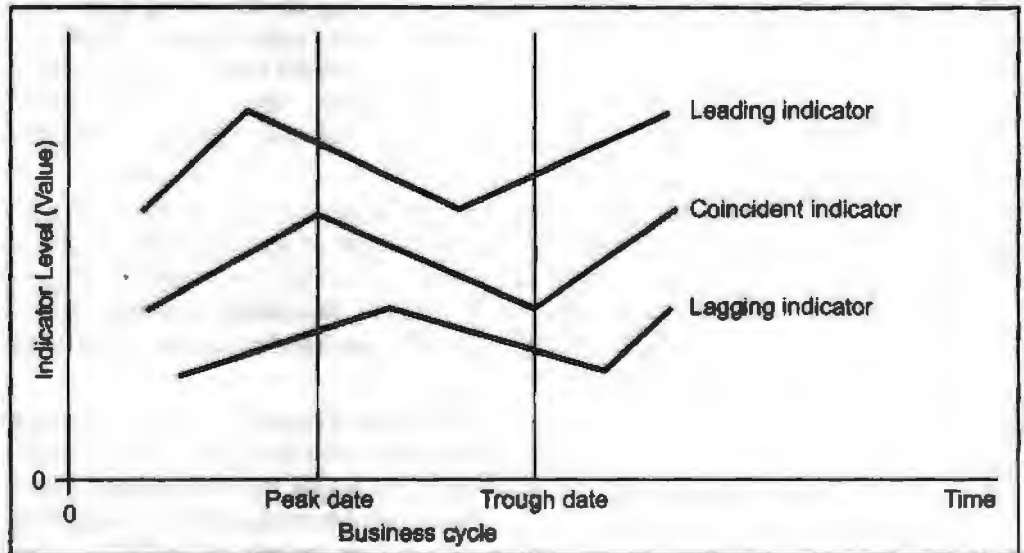


Figure 2.14: Relative Positions of Leading, Coincident and Lagging Indicators

The economic indicators are time-series that may:

1. precede (lead) changes in the level of general economic activity-**Leading indicators**, or
2. move in step or coincide with movements in general economic activity-**Coincident indicators**, or
3. follow or lag movements in general economic activity-**Lagging Indicators**.

The relative positions of leading, coincident and lagging indicators in the business cycle are shown graphically in Figure 2.14.

The index of leading economic indicators is used to forecast or anticipate short-term changes in economic activity or turning points in business cycle. The leading economic indicators tend to precede changes in the level of general economic activity, in the same way as changes in the mercury in a barometer precede changes in weather conditions.

It may be noted at the outset that the barometric technique was developed to forecast the general trend in overall economic activities. This method can nevertheless be used to forecast demand prospects for a product, not the actual quantity expected to be demanded. For instance, development and allotment of land by the Delhi Development Authority (DDA) to the Group Housing Societies (a lead indicator) indicates higher demand prospects for cement, steel, bricks and other construction materials.

Notes

The time series of various indicators are selected on the basis of the following criteria:

1. **Economic significance of the indicator:** the greater the significance, the greater the score of the indicator.
2. **Statistical adequacy of time-series indicators:** a higher score is given to an indicator provided with adequate statistics.
3. Conformity with overall movement in economic activities.
4. Consistency of series to the turning points in overall economic activity.
5. Immediate availability of the series, and
6. Smoothness of the series.

The problem of choice may arise because some of the indicators appear in more than one class of indicators. Furthermore, it is not advisable to rely on just one of the indicators. This leads to the usage of what is referred to as the diffusion index. A diffusion index copes with the problem of differing signals given by the indicators. A diffusion index is the percentage of rising indicators. In calculating a diffusion index, for a group of indicators, scores allotted are 1 to rising series,  $\frac{1}{2}$  to constant series and zero to falling series. The diffusion index is obtained by the ratio of the number of it indicators, in a particular class, moving up or down to the total number of indicators in that group. Thus, if three out of six indicators in the lagging series are moving up, the index shall be 50%. It may be noted that the most important is the diffusion index of the leading series.

Leading indicators can be used as inputs for forecasting aggregate economic variables, GNP, aggregate consumers' expenditure, aggregate capital expenditure, etc. The only advantage of this method is that it overcomes the problem of forecasting the value of independent variable under the regression method. The major limitations of this method are: (i) it can be used only for short-term forecasting, and (ii) a leading indicator of the variable to be forecasted is not always easily available.

### Student Activity

1. Hold a group discussion on 'which technique of demand forecasting should be used for assessing the market potential for a non-durable product.'
2. Conduct a brainstorming exercise on 'If you want to export your products in new market then how will you estimate export demand for a period of five years'.
3. Conduct direct personal interviews of 10-15 business managers to find out how they estimate the demand of their products.



## Notes

## Case: Micro Factors affecting Demand for Tanishq Products

### Price of jewellery – symbol of quality provided

Price of a commodity is known to have a direct influence on demand for it. This follows from the Law of Demand. But in the case of Tanishq jewellery this does not hold true, making it an exception to the Law. This can be explained in terms of Veblen effect, where the price of a commodity is regarded as an indicator of its quality. Sometimes certain commodities are demanded just because they happen to be expensive or prestige goods, and hence have a "snob appeal". These are generally luxury articles that are purchased by the rich as status symbols. The price of Tanishq jewellery is regarded by patrons as being the just cost of the purity and trustworthiness of the brand. Not only was Tanishq the first to offer branded jewellery in India, but it was also the first to introduce concepts such as testing the purity of jewellery through the Karat meter, a buyback guarantee as well as other exchange schemes. Each move by Tanishq has shown its confidence in its own product. This has in turn inspired confidence in its customers, who are loyal. Usually, when the price of gold bullion increases people tend to curb/postpone their purchases of gold ornaments. However, the demand for Tanishq jewellery is independent of this price factor because each piece of jewellery represents a promise of quality and purity, each piece is something different and new, each piece is something special. As such the income and substitution effects do not adversely affect the demand for Tanishq jewellery, and price has little impact overall. But it has also been observed that an escalation in the gold price, diamonds seem to have caught the fancy of the customer and the promotional offers are being designed to provide customers with significantly enhanced value.

### Designs offered

The average Indian has always been very discerning when it comes to the purchase of jewellery. However, with the spread of globalization customers want the best quality in terms of designs. Best quality is provided to meet the international standards. Creativity is the buzzword. Tanishq's primary customer, the urban Indian woman, has come along way. She is smart, educated, and confident of handling career and family, and looking to secure value for her money. Today's urban women no longer wear jewellery only at weddings and formal occasions. They require trendy accessories that match her attire and reflect her personality. In this context the demand is vast and widespread in terms of prices. The women of today want the best of everything and have become more and more and more selective in their choices. The brand's designs address the needs of the modern woman. Tanishq had crafted award-winning designs in 18 karat and 24 karat gold and gemstone jewellery. Its new range looks beautiful and yet is affordable and feels light.

### Promotional schemes

With cutthroat competition in the market, every company comes up with schemes to woo the customers. These offers are all the more visible during the festival season. Purchase of jewellery can happen any time of the year like – for birthdays, anniversaries, gifting, impulse purchases, etc. and of course for marriages as well. Therefore, in absolute terms, there is no lean period for jewellery – the jewellery market can be stimulated throughout the year through a host of well-designed marketing inputs. Tanishq to promote its brand comes up with all kinds of schemes like a jewellery exhibition which brings fresh talent to the forefront, launched a nationwide jewellery design competition on May 22nd 2004, 'Get Gold free with Diamonds' promotional offer across all 66 exclusive Tanishq boutiques in India. It's also specially designed the three crowns for the Ponds Femina Miss India Contest

Contd...

this year. It reached out to the target group through exclusive working women's meets, where well known career women spoke about issues relevant to working women. In addition, 'Tanishq Collection-G' ran joint promotions with brands such as L'Oreal and Wills Lifestyle, which it believed appeal to a similar set of consumers. Tanishq has successfully stimulated demand for jewellery throughout the year through launches of new jewellery collections, a range of exchange programs and other offers (such as our recently concluded "Impure to Pure" exchange offer) and a number of in-store events. As a result of these efforts, even while the market for jewellery declined by more than 15% last year, Tanishq grew by 40% for the third successive year. Amongst the most recent initiatives of Tanishq has been the targeting of the wedding market by making special offers on wedding jewellery. This promotional scheme has had the masses thronging in, in very large numbers. It also got the 4th Annual Lycra Images Fashion Awards in the Jewellery category.

### Discounts

Discounts play a major role in determining the demand for a product. Tanishq periodically offers discounts. In 2002 it offered a vast gamut of discounts in its showrooms in Bihar during the festival of Dhanteras resulting in sales of ₹ 5 crore in one particular store. During its fifth anniversary celebrations Tanishq offered discounts to customers, and the response was so overwhelming that extra security was called to handle the crowd even before the store opened. At select points of time in the year Tanishq also offers 20%-40% discount on making charges, which is also a large crowd puller.

### Guarantee

Tanishq has managed to establish its position in the market because its quality products are backed by a guarantee certificate. Each item of jewellery that is sold is accompanied by a guarantee card that states the weight of the gold/platinum as well as the cartage of the gemstones used. In case of any discrepancy the company is liable for legal action. All diamonds used are VVS certified, and the platinum is passed by the official Platinum Authority of India. 100% purity backed by an ironclad guarantee is thus the hallmark of Tanishq jewellery. This is a major demand inducer as the traditional jewelers are increasingly fudging on such things.

### Question

Analyse the role of other factors (other than price of products) in influencing the demand for Tanishq's products.

### Student Activity

Write a comprehensive paper on 'How the various determinants of demand affect the demand of Non-durable goods'.

## Summary

We use the term 'demand' in the broad sense to refer to the quantities of a commodity that buyers are willing and have ability to buy at different prices. The term 'quantity demand' refers to specific amount that buyers are willing and able to buy at particular price with reference to point or over a period of time. A market is a place that allows buyers and sellers to carry out any transaction. The communication between buyers and sellers may be by any means to settle the terms and conditions of transactions. The demand function is a mathematic expression of the relation between the quantity demanded of commodity and the various determinants of demand. The law of demand shows the inverse relationship between the quantity demand and price subject to ceteris paribus. All factors that affect the quantity demanded of a commodity except its own prices are called demand

Notes

determinants. These include income, taste and preferences, prices of related goods, social and cultural values, expectations about future price, government policies, number of buyers, international economic variables etc. A change in demand is reflected in a shift of the demand curve to a new position due to change in any one of the determinants of demand.

**Elasticity of demand** is a measure of the degree of responsiveness of demand to any of its determinants. It is defined as the proportionate change in the quantity demanded of a commodity divided by the proportionate of its determinant. There are as many elasticity's of the demand as its determinants. The most important of these elasticities are (a) price elasticity (b) income elasticity and (c) cross elasticity of demand.

**Economic forecasting** is the process of attempting to predict the future condition of the economy. This involves the use of statistical models utilizing variables that are sometimes called indicators.

Forecasting of demand is done for knowing the future demand of a product. The knowledge of future demand helps in decreasing the uncertainty involved in a business decision-making process. There are different methods of forecasting demand. They are broadly categorised into survey based methods and statistical methods. Survey based methods include opinion poll methods and consumer survey methods whereas statistical methods include trend method, barometric method and econometric method.

### Keywords

**Demand:** The quantity of the commodity which an individual is willing to purchase per unit of price at a particular time.

**Demand function:** A comprehensive formulation which specifies the factors that influence the demand for the product.

**Income effect:** Occurs due to increase (decrease) in real income resulting from a decrease (increase) in the price of a commodity.

**Substitution effect:** Occurs due to the consumer's inherent tendency to substitute cheaper goods for relatively expensive ones.

**Giffen Paradox:** The Positively Sloped Demand Curve. If the commodity in question is an inferior good, the increase in real income resulting from the reduction in its price will lead the consumer to purchase less, not more, of the commodity.

**Elasticity:** It measures the degree of responsiveness of demand/supply to change in price.

**Economic Forecasting:** The process of attempting to predict the future condition of the economy

**Demand Forecasting:** Activity of estimating the quantity of a product or service that consumers will purchase.

### Review Questions

1. What is demand? Discuss briefly the various determinants of demand.
2. State and illustrate the law of demand, giving its assumptions and importance.
3. Why does the demand curve slopes downward to the right? Under what circumstances a demand curve slopes upward to the right?
4. Distinguish between:
  - (a) Expansion in demand and increase in demand
  - (b) Contraction in demand and decrease in demand

Show this diagrammatically.

5. The demand function of a commodity X is given by  $Q_x = 12 - 2P_x$ . Find out the individual demand schedule and the demand curve.
6. Write short notes on:
  - (a) Demand function
  - (b) Demand schedule and demand curve
  - (c) Income and substitution effects of price change
  - (d) Giffen paradox
7. Define the concept of elasticity of demand. Discuss its significance in theory of demand.
8. "The concept elasticity is a versatile tool of economic analysis." Discuss the validity of this statement with appropriate examples.
9. What do you understand by price elasticity of demand? How is it measured?
10. Discuss briefly the factors on which price elasticity of demand for a commodity depends.
11. What do you understand by point and arc price elasticities of demand? How are these measured?
12. A list of goods is given below. Will their demand be less elastic, moderately elastic, highly elastic or completely inelastic? Give brief reasons in support of your answer.
 

(a) Demand for petrol	(b) Demand for needles
(c) Demand for textbooks	(d) Demand for seasonal vegetables
(e) Demand for salt	(f) Demand for milk
(g) Demand for cars	(h) Demand for cellular services
13. Discuss the relationship between price, quantity demanded, marginal revenue, total revenue and price elasticity of demand.
14. What do you understand by cross-price elasticity of demand? How is it measured?
15. What do you understand by point and arc cross-price elasticities of demand? How are these measured?
16. What is forecasting? Why is it so important in the management of the firm?
17. What are different types of forecasting methods? How can the firm determine the most suitable forecasting method to use?

Notes

## Further Readings

Karam Pal and Surrender Kumar, *Managerial Economics*, Excel Books

Samuelson, Stephen G. Marks, William *Managerial Economics* (Hardcover – Dec 29, 2008)

Christopher R. Thomas and S. Charles Maurice, *Managerial Economics* (Hardcover – Mar 7, 2007)

Christopher R. Thomas and S. Charles Maurice, *Managerial Economics* (Hardcover – Jan 27, 2010)

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# Unit 3 Production Analysis

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## Unit Structure

- Introduction
- Production Process
- Change in Input Prices
- Empirical Production Functions
- Summary
- Keywords
- Review Questions
- Further Readings

## Learning Objectives

At the conclusion of this unit, you should be able to:

- Define the term production function
- Understand one variable input and two variable inputs
- Explain changes in input prices
- Tell about returns to scale
- Know the empirical production functions

## Introduction

The production analysis of the firm brings into focus the process of production and related costs of production. We must take inputs into consideration applied for production and resulting into output. There are different methods to produce a commodity. The firm has to identify the technical efficient production processes for avoiding any wastage of resources. These technical efficient production processes provide a choice for choosing the least-cost process. This unit highlights the behaviour of production functions, which describe the laws of production.

## Production Process

Production refers to the transformation of resources into output of goods and services. For instance, a farm takes fertilizer, seed, land and labour and turns them into wheat or corn. Modern factories like Maruti hire workers who use machinery in factories to transform steel, plastic, glass, rubber and so on into automobiles. The output of a firm can either be a final commodity such as automobiles or an intermediate product such as steel. The output can also be a service rather than a good. An airline takes airplanes, fuel, labour and computer systems and provides passengers with the ability to travel quickly through its network of routes. An accounting firm takes pencils, computers, papers, office space and labour and produce audits or tax return for its clients.

Major portion of goods and services consumed in a modern economy are produced by firms. A firm is an organisation that combines and organises resources for the purpose of producing goods and services for sale at a profit. The most important reason for a firm or

business enterprises exist is that firms are specialised organisation devoted to manage the process of production.

Production is organised in a firm because efficiency generally requires large-scale production, the raising of significant financial resources and careful management and monitoring of ongoing activities. In microeconomic theory, our focus is to know what the firm does. Just as consumers seek to maximise utility or satisfaction; firms generally seek to maximise profits. Both consumer and firms can be regarded as maximising entities. For maximising the profit in a set of given circumstances, a firm always strives to produce efficiently, that is at its lowest cost. In other words, they always attempt to produce the maximum level of output for a given set of inputs, avoiding waste wherever possible.

Notes

## Inputs for Production

Firms convert the inputs into outputs. Inputs also refer to resources, or factors of production as being the means of producing goods and services demanded by society. Inputs can be classified broadly into labour or human resources, capital or investment goods, and land or natural resources. All these variables are flow variables, since they are measured per unit of time. Inputs may be further classified on the basis of availability as fixed and variable inputs. Fixed factor is one that remains fixed (or constant) for a certain level of output, for instance plant. A variable input is defined as one that changes with the change in output, for example, raw material and labour.

## The Production Function

The term production function refers to the physical relationship between a firm's input of resources and its output of goods or services per unit of time, leaving prices aside. In other words production function is a purely technical relation, which connects factor inputs and output. It means it is defined for a given state of engineering and technical knowledge. There may be many different production functions – one for each and every product or service. In areas of the economy where technology is changing rapidly like computer software and biotechnology production function may become obsolete soon after they are used and out of the range of techniques available, the firm uses those that are economically most efficient, that is those that provide the greatest value of output for a given value of input. An improvement in the state of technology will in general increase the output per unit of input.

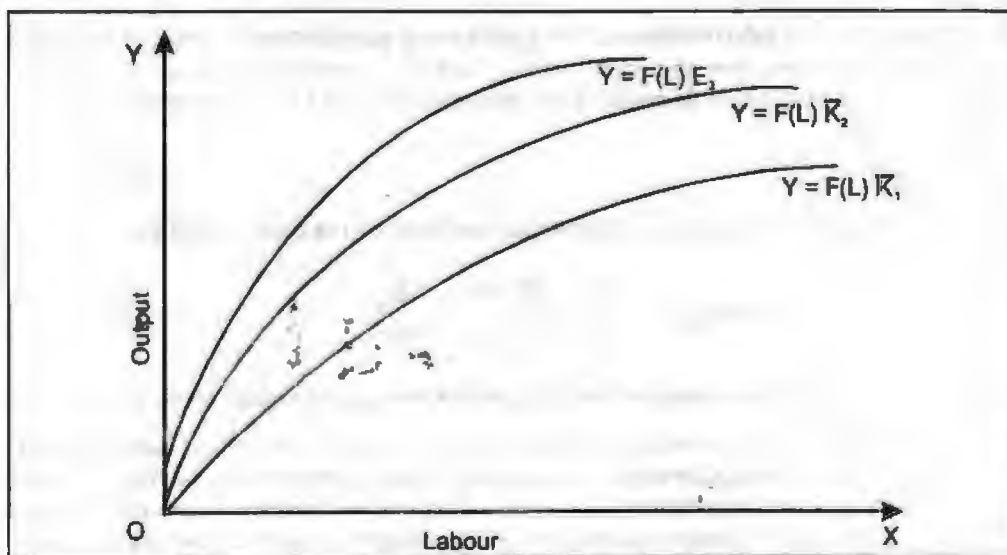


Figure 3.1: Relation between Labour and Total Output

A production function can be represented by a table, graph or equation and shows the maximum output for a commodity that can be produced per unit of time with each set of

inputs. Both inputs and outputs are measured in terms of physical rather than monetary units. Graphically, the production function is usually presented as a curve on two-dimensional graphs. Changes in relevant variables are shown either by movements along the curve that depicts the production function or by shift this curve. The most commonly used diagrams for production function of a single commodity are shown in Figure 3.1.

Assuming that production Y commodity depends upon the two inputs capital (K) and labour (L). As labour increases, while keeping capital constant, output measures we move along the curve depicting the production function. If capital (K) increases, the production function  $Y = f(L)$  shifts upwards.

**Production Function: One Variable Input Case: Short-run Analysis**

The general form of production function can be expressed as:

$$Y = f(L_1, L_2, \dots, L_n) \quad \dots(3.1)$$

Where Y is the quantity of output for a production unit and inputs are represented as  $L_1, L_2, \dots, L_n$ . In economic theory very often labour (L) and capital (K) are taken as variable. In agricultural economics, land is taken constant and other factors as variable. Production functions involve concepts, which are useful tools in all fields of economics. The main concepts are:

**The Marginal Productivity of Factors of Production:** It is defined as change in output resulting from a change in a factor of production, keeping all other factors constant. Mathematically, the marginal product of each factor is the partial derivative of the production function with respect to this factor. Thus

$$MP_L = \frac{\partial Y}{\partial L} \text{ and } MP_K = \frac{\partial Y}{\partial K} \quad \dots(3.2)$$

In principle, the marginal product of a factor may assume any value, positive, zero or negative. However, basic production theory concentrates only on the efficient part of the production function, that is, on the range output over which the marginal products of the factors are positive. Ranges of output over which the marginal products of factors would be negative imply irrational behaviour of the firm and are not considered by the theory of production.

**The Marginal Rate of Substitution and the Elasticity of Substitution:** The marginal rate of substitution measures how one factor of production is substituted for another while keeping the output constant. Suppose in simple case, output (Y) depends upon capital (K) and labour (L) so

$$Y = f(K, L) \quad \dots(3.3)$$

The marginal rate of substitution of labour for capital K can be determined as:

$$MRS_{L,K} = -\frac{\partial K}{\partial L} = \frac{\partial Y / \partial L}{\partial Y / \partial K} = \frac{MP_L}{MP_K} \quad \dots(3.4)$$

Where MPL and MPK are marginal productivity of labour and capital respectively.

The marginal rate of substitution as a measure of the degree of substitutability of factors has a serious defect since it depends on the units of measurement of the factors. A better measure of the ease of factor substitution is provided by the elasticity of substitution. The elasticity of substitution is defined as the percentage change in capital labour ratio divided by the percentage change in the rate of technical substitution

$$\sigma = \frac{\text{Percentage change in } K/L}{\text{Percentage change in MRS}} \quad \dots(3.5)$$

Or

$$\sigma = \frac{\frac{d\left(\frac{K}{L}\right)}{\frac{K}{L}}}{\frac{d(\text{MRS})}{(\text{MRS})}} \quad \dots(3.6)$$

Notes

The elasticity of substitution is a pure number independent of the units of measurement of K and L, since both the numerator and denominator are measured in the same units.

### Production Function with Two Variable Inputs

To illustrate the behaviour of production function, let us assume that output (Y) of a firm is based on two inputs capital (K) and labour (L)

$$Y = f(K, L)$$

For changing the output, the firm can change K and L or only L depending upon the time period and whether the firm considers a short run or a long run. The short run behaviour of production process is subject to three general restrictions: the time period should be (i) short enough so that the firm is unable to alter the levels of its fixed inputs (ii) sufficiently short so that the shape of the production function is not changed through technological improvements and (iii) sufficiently long to allow the completion of the necessary technical processes. In the long run, expansion of output may be achieved by varying all inputs. In the long run all factors of production are variable so the major difference between a short run and long run production analysis lies in the number of variable inputs. A variable input is defined as one whose supply in short run is elastic, for instance, labour and raw material. In short run output may be expanded by using more of variable factors where factors such as capital are kept constant. In the long run, however the firm can employ more of both capital and labour because capital becomes elastic overtime. It is to be noted that both types of inputs variable as well as fixed are necessary for production, only short run production function is characterised by variable or non proportional return to a variable factor ratio and may be expressed for instance as.

$$Y = f(L/K) \quad \dots(3.7)$$

Where only labour (L) is variable, while capital (K) is constant. The rate of increase in output in response to an increase in the variable input is not a question of logic and mathematics but of actual observation of real world and of the experience of producers.

Some factors of production are elastic in supply in short period and the production units can employ an unlimited quantity of such factors also called variable factors. For production, the firms can employ in short run varying quantities of variable inputs against a given quantity of fixed factors. This kind of change in input combination leads to variation in factor proportions. The relationship between varying factor proportions and output is known as law of diminishing returns. According to this law as equal increments of one input are added, the input of other productive services being held constant, beyond a certain point the resulting increments of product will decrease – that is marginal product will diminish. This law is subject to three conditions (i) there are other inputs whose quantities are held constant (ii) the state of technical knowledge is given and (iii) the proportions in which inputs can be effectively combined are variable and due to this it is also called law of variable proportions.



This law is illustrated with the help of Table 3.1. In this table it is assumed that a firm is using different amount of labour for given amount of capital.

Table 3.1: Law of Variable Proportions

Unit of Capital	No. of Labourers	Capital Labour Ratio	Total Output	AP	MP
1	1	1	3	3	3
1	2	1/2	8	4	5
1	3	1/3	12	4	4
1	4	1/4	14	3.5	2
1	5	1/5	14	2.8	0
1	6	1/6	12	2	-2

Notes

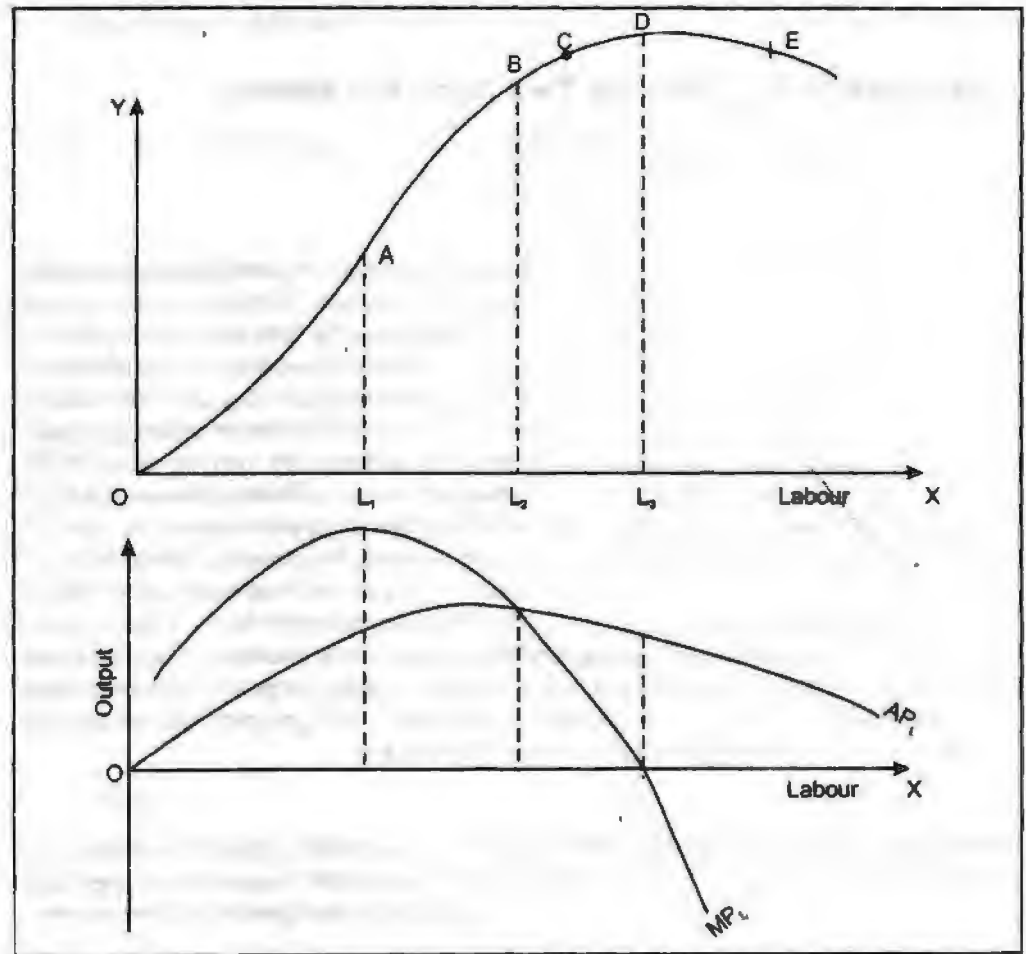


Figure 3.2

We can see from the table that if we combine increasing inputs of labour with constant amount of capital, total output increases at an increasing rate in the beginning from 3-8 that is, more than double. Whereas the labour input just doubles, hence increasing marginal returns) and then increases at a diminishing rate. By employing fifth unit of labour, the total product becomes constant so the marginal product becomes zero and further employing of the labour with constant amount of capital, leads to ultimately decline in the total production and so negative marginal productivity. Here in our case total product is a function of both factors K and L:  $Y = f(L/K)$  and marginal productivity of labour in and average productivity of labour is

$$AP_L = \frac{Y}{L} = \frac{f(L/K)}{L} \quad \dots (3.8)$$

The input level  $K$  is treated as a parameter and  $Y$  becomes a function of  $L$  alone.

If we see the relationship between the capital labour ratio and output it is observed that as the ratio of capital labour decreases initially the output increases at increasing rate and then intimately with declining rate. The reason for decline in production is that as more and more labour is employed the optimum combination of capital and labour lost and labourers get into each other's way and actually disturb the production where sixth worker is employed.

The short run behaviour of production function can also be explored through a diagram as shown in Figure 3.2.

**Law of variable proportions when labour is variable and capital is fixed:** It shows that as the firm uses more and more units of labour to work on a fixed quantity of capital, at first total product increases at an increasing rate up to the point of inflection  $A$  on total product curve and both  $AP_L$  and  $MP_L$  products consequently increase. At the point  $B$  on the TP curve average product of labour becomes equal to marginal product of labour ( $AP_L = MP_L$ ) and at point  $B$  the  $AP_L$  is highest meanwhile  $MP_L$  has already started declining and three workers are employed at this point. This is known as the first stage of production.

In the second stage, if the firm still continues to increase the units of variable factor labour, total output will continue to increase at diminishing rate and reaches the highest point  $D$ , with the result that the  $MP_L$  curve continues to decline and it is zero at the end of the stage when total output is the highest. The average output now starts declining though continues to be positive so long as the total output is positive.

In the third stage, if beyond second phase also the firm increases the units of variable factor the total output declines, the marginal output is negative and the average output continues to decline though positive. This is the phase of negative returns and no profit-maximising firm would increase the units of variable factors labour to enter this phase.

### Student Activity

1. Hold a group discussion on 'do you think that service sector follows the law of variables' and discuss results in the class.
2. Study the law of variable proportion and its causes of application in the agriculture sector.
3. Survey 3-4 firms of your region and write a report on the behaviour of laws of variable proportions.

## Change in Input Prices

If the price of one input, say labour, increases, the firm will adjust the input mix by substituting capital for labour. If the price of labour declines, thus making labour relatively less expensive, labour will be substituted for capital. In general, if the relative prices of inputs change, managers will respond by substituting the input that has become relatively less expensive for the input that has become relatively more expensive.

The isoquant-isocost framework can be used to demonstrate this principle (Figure 3.3). Let us suppose the firm is currently operating at point  $a$  where 100 units of output are produced using the resource combination  $K=10, L=2$ . This is an efficient resource mix because the 100 unit isoquant is tangent to the isocost line  $CC$  if the firm's goal is to maximise production subject to a cost constraint (i.e., the firm is limited to resource combinations on a given isocost function).

If the price of labour falls while the price of capital remains unchanged (i.e., labour has become relatively less expensive), the isocost pivots to the right from  $CC$  to the isocost  $CC_1$ . The reduction in the price of labour means that the firm is able to increase the rate of production. Hence the firm moves from point  $a$  to point  $b$ , which is a new efficient resource

combination. That is, the new isocost is tangent to the 120-unit isoquant at point b. Now 9 units of capital and 6 units of labour are employed. At point a, the efficient ratio of capital to labour was 5:1. Now the efficient ratio of two inputs is 3:2. The reduction in the price of labour has caused the firm to substitute that relatively less expensive input for capital.

### Returns to Scale

If all inputs are changed simultaneously (possible only in the long run), and say increased proportionately, then the concept of returns to scale has to be used to understand the behaviour of output. The behaviour of output is studied when all factors of production are changed in the same direction and proportion.

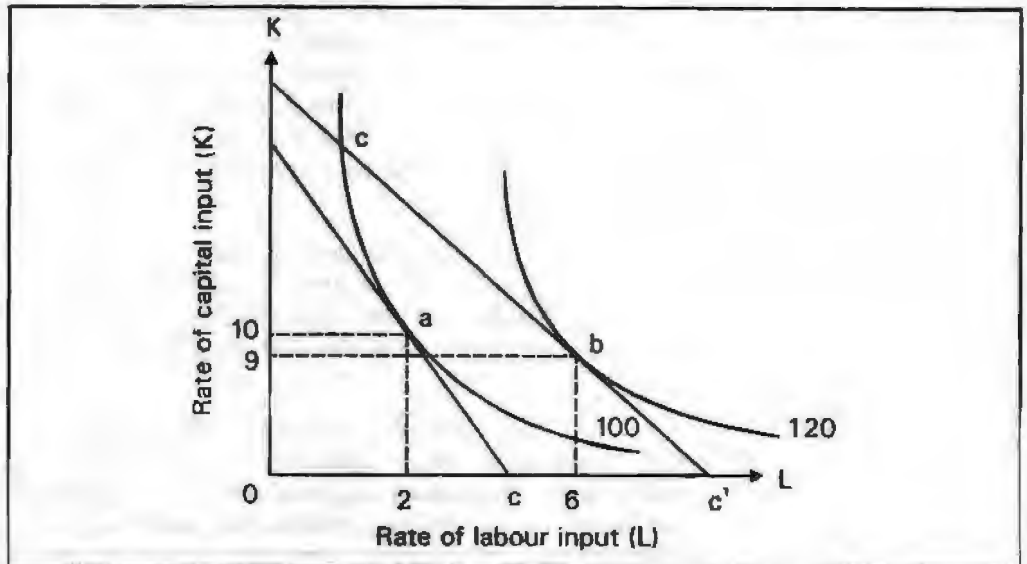


Figure 3.3: Response of the Firm to a Decrease in the Price of Labour

In the long run, output can be increased by increasing the 'scale of operations'. When we speak of increasing the 'scale of operations' we mean increasing all the factors at the same time and by the same proportion. For example, in a factory, in the long run, the scale of operations may be increased by doubling the inputs of labour and capital. The laws that govern the scale of operation are called the laws of returns of scale.

The laws of returns to scale always refer to the long run because only in the long run are all the factors of production variable. In other words, only in the long run is it possible to change all the factors of production. Thus the laws of returns to scale refer to that time in the future when changes in output are brought about by increasing all inputs at the same time and in same proportion.

Returns to scale are classified as follows:

- a. **Increasing Returns to Scale (IRS):** If output increase more than proportionate to the increase in all inputs.
- b. **Constant Returns to Scale (CRS):** If all inputs are increased by some proportion, output will also increase by the same proportion.
- c. **Decreasing Returns to Scale (DRS):** If increase in output is less than proportionate to the increase in all inputs.

### Causes of Decreasing Returns to Scale

The most common causes are "diminishing returns to management". The management is responsible for the coordination of the activities of the various sections of the firm. Even when authority is delegated to individual managers (production manager, sales manager,

etc.) the final decisions have to be taken by the board of directors. As the output grows, top management becomes eventually overburdened and hence less efficient in its role as coordinator and ultimate decision-maker. Another cause for decreasing returns may be found in the exhaustible natural resources: doubling the fishing fleet may not lead to a doubling of the catch of fish; or doubling the plant in mining or an oil extraction field may not lead to a doubling of output.

Notes

## Empirical Production Functions

The degree or extent of substitutability between or among inputs utilised decide the form of production function. There are various forms:

### 1. *Cobb-Douglas type:*

$$Q = Q(L, K)$$

$Q = AL^\alpha K^{1-\alpha}$  where 'A' is a constant (index of efficiency),  $\alpha$  and  $1 - \alpha$  indicate returns to factors labour and capital. These power terms added together are called 'function coefficient' ( $\alpha + 1 - \alpha = 1 \Rightarrow$  'constant returns to scale in production economics'. Mathematically, it reveals a homogenous function of degree one. Most of the manufacturing processes reveal this type of production function, such that diminishing returns to factors become perfectly compatible with constant returns to scale.

### 2. *Leontief type:* $Q = \text{minimum} \left( \frac{K}{a}, \frac{L}{b} \right)$ where 'a' and 'b' are constants. In this case of fixed proportion production function, there is no scope (technological feasibility lacking) for substitution between factors.

### 3. *Linear type:* At the other extreme, there may be cases where there is no limit to the substitutability between factors, such that a multi-variate production function works out to be a single-variable linear production function, $Q = aL$ or $bK$ where 'a' or 'b' represent factor proportionality.

### 4. *CES type:* The Cobb-Douglas type stated earlier, with function coefficient equal to 1 is a special case of Constant Elasticity of Substitution (CES) type. In other CES type, constant may take any other value (other than one). $Q = B[gL^{-h} + (1-g)K^{-h}]^{-1/h}$ is a CES types production function, with B, G and h as constants; $h > -1$ .

### 5. *VES type:* If the function coefficient does not remains constant, but varies in the productive process, pay over shifts, then it is Variable Elasticity of Substitution (VES).

### 6. *Cubic Production Function:* A different type of production function is a simple polynomial of the type

$$X = a + bY - cY^2$$

where the dependent variable X represents total output and the independent variable Y denotes input. The letters (a, b, c) are parameters (or constants).

### Student Activity

"As we add more and more of variable input to a fixed input, the amount of extra product will fall off". Explain the conditions under which this law operates and discuss if it will also operate with several variable inputs.

### Case: The XYZ Firm

The XYZ Firm located in Okhla Industrial Estate manufactures an item Q with the help of two resources a and b. The production process of the firm is characterised by the following function.

$$Q = 50.00 a^{0.20}, b^{0.80}$$

This is what was statistically estimated a year ago by a consultant employed by the firm. In the current year, the firm is facing a problem of allocating resources 'a' and 'b' in a combination such that the greatest amount of product will be produced for a given cost outlay. The prices of 'a' and 'b' are respectively ₹ 2 per unit and ₹ 1 per unit and the given cost outlay for the firm is ₹ 19. The production department of the firm has developed the following marginal product (MP) table.

Resource	MP <sub>a</sub>	Resource	MP <sub>b</sub>
'a'		'b'	
(units)	(units of Q <sub>a</sub> )	(units)	(units of Q <sub>b</sub> )
4	9	7	6
5	8	8	5
6	7	9	4
7	6	10	3
8	5	11	2

#### Questions

1. Is the finding of the production department consistent with the estimate of the consultant? Give reasons.
2. Assuming the table is correct, what combination of a and b would give maximum output, given prices and cost constraints?

*Hints:* Use concepts like input-elasticity, function-coefficient, returns to factors/scale, equi-marginalism, etc.

### Summary

Production means conversion of inputs or resources into usable commodities or services. Inputs are the resources used in the production of goods and services and are generally classified into three broad categories — labour, capital and land or natural resources.

The law of variable proportion of says that as more and more of the factor input is employed, all other input quantities remaining constant, a point will finally be reached where additional quantities of varying input will give diminishing marginal contributions to total product.

Some factors of production are elastic in supply in a short period and the production units can employ an unlimited quantity of such factors which are also called variable factors. For production, the firms can employ in short run varying quantities of variable inputs against a given quantity of fixed factors. This kind of change in input combination leads to variation in factor proportions. The relationship between varying factor proportions and output is known as law of diminishing returns. According to this law, as equal increments of one input are added, the input of other productive services being held constant, beyond a certain point, the resulting increments of product will decrease – that is marginal product will diminish.

In the long run, output can be increased by increasing the 'scale of operations'. When we speak of increasing the 'scale of operations' we mean increasing all the factors at the same time and by the same proportion.

Returns to scale are classified as: Increasing Returns to Scale (IRS): If output increase more than proportionate to the increase in all inputs. Constant Returns to Scale (CRS): If

all inputs are increased by some proportion, output will also increase by the same proportion. **Decreasing Returns to Scale (DRS):** If increase in output is less than proportionate to the increase in all inputs.

The Marginal Rate of Substitution and the Elasticity of Substitution measures how one factor of production is substituted for another while keeping the output constant. The marginal rate of substitution and a measure of the degree of substitutability of factors has a serious defect it depends on the units of measurement of the factors. A better measure of the ease of factor substitution is provided by the elasticity of substitution. The elasticity of substitution is defined as the percentage change in capital labour ratio divided by the percentage change in the rate of technical substitution.

## Keywords

**Production:** It refers to the transformation of resources into output of goods and services.

**Inputs:** Input also refer to resources, or factors of production as the means of producing the goods and services demanded by society.

**Production Function:** This refers to the physical relationship between a firm's input of resources and its output of goods or services per unit of time, leaving prices aside. It is a purely technical relation, which connects factor inputs and output.

**The Marginal Productivity of Factors of Production:** This is change in output resulting from a change in a factor of production, keeping all other factors constant. Mathematically, the marginal product of each factor is the partial derivative of the production function with respect to this factor.

## Review Questions

1. What is meant by production? Define production function and describe the underlying assumptions.
2. What do you mean by production function? What is the difference between a short-run and a long-run production function?
3. (a) What is the marginal rate of technical substitution?  
(b) What is elasticity of technical substitution?

## Further Readings

Karam Pal and Surrender Kumar, *Managerial Economics*, Excel Books

Samuelson, Stephen G. Marks, William *Managerial Economics* (Hardcover – Dec 29, 2008)

Christopher R. Thomas and S. Charles Maurice , *Managerial Economics* (Hardcover – Mar 7, 2007)

Christopher R. Thomas and S. Charles Maurice, *Managerial Economics* (Hardcover – Jan 27, 2010)

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# Unit 4 Cost Analysis

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Notes

## Unit Structure

- Introduction
- Cost Concepts
- Cost-output Functions
- Economies of Scale
- Summary
- Keywords
- Review Questions
- Further Readings

## Learning Objectives

At the conclusion of this unit, you should be able to:

- Discuss the cost concepts
- Describe the cost-output functions
- Explain the costs in the short-run and in long-run
- Understand the economies of scale and economies of scope.

## Introduction

The cost of production plays a prominent role in the analysis of price-output determination. It is the cost of product, which governs the supply side of market-mechanism in an open economy. When revenue and cost for an individual firm are brought together, then these determine the output of a firm. So, cost and supply analysis is as important as demand analysis in the theory of price.

Production function determines the cost function, laws of returns to factor and scale, which in return govern the behaviour of the cost of production and the shapes of cost curves. The law of returns to govern the shapes of short-run cost curves and the shapes of long-run cost curves are determined by the laws of returns to scale.

$$TC = f(q)$$

TC means total cost

q denotes the level of output

Given the factor prices, total cost is the function of the output level. There are different costs of production, which are very important in pricing of a commodity produced by the firm in an open economy. These concepts of cost can be explained as follows:

## Cost Concepts

The term cost has different meanings, so it becomes pertinent to define the term precisely. In the traditional approach, the explicit and historical dimension of cost is considered, whereas contrast the economic approach to cost emphasises opportunity cost rather than historical cost and includes both explicit and implicit costs.

## Opportunity Cost

It is major component of decision-making in economics. The best measure of cost of a consumer product or a factor of production is what must be given up to obtain that product for factor. For instance, the resources needed to build 10 houses can also be used to build one office building, and then opportunity cost of the decision to build that office building is equal to the 10 houses that have to be forgone. With fixed quantity of resources available to the organisation, input used in the production of one good cannot be used in the production of other goods. In general, opportunity cost is the value of a resource in its next best alternate use. Opportunity cost represents the return or compensation that must forego as a result of the decision to employ the resources in a given activity.

## Accounting Cost

Accounts have been primarily concerned with measuring cost for financial reporting purposes. So an accountant considers only the explicit costs as costs, which involve cash payment by the entrepreneur of the firm. Accountants define and measure the cost by the historical outlays of funds that take place in the exchange or transformation of a resource.

In case of economists, they are mainly concerned with measuring costs for decision-making purposes. The objectives are to determine the present and future costs of resources associated with various alternative courses of action. Such an objective requires a consideration of the opportunities whenever a resource is used in a given cause of action. An economist would include, in addition to accounting costs, all other implicit costs as well those which are typically not reflected in the cost figures appearing in the financial reports of the firm. Both the accounting cost and economic cost of a product will include such explicit cost as labour, raw material and rent. Economists also include several implicit costs. The implicit cost consists of the opportunity costs of time and capital that the owner manager has invested in producing the given quantity of output.

## Explicit and Implicit Costs

Explicit costs are those, which fall under actual or business costs entered in the books of accounts. The payments for wages and salaries, materials, license fee and insurance are the examples of explicit costs. These costs involve cash payments and are recorded in normal accounting practices. In contrast, there are certain other costs, which do not take the form of cash outlays, nor do they appear in the accounting systems. Such costs are known as implicit or imputed costs. An Opportunity cost is an important example of implicit cost. For instance, suppose an entrepreneur does not utilise his services in his own business and works as a manager in some other firm on a salary business. If he sets up his own business, he foregoes his salary as a manager. The loss of salary is the opportunity costs of doing his own business. This is an implicit cost of his own business. Thus, implicit wages, rent and implicit interest are the wages of rents and interest which the owners, labour, building and capital respectively can earn from these second best use.

## Social Costs and Private Cost of Production

The social cost of using a bundle of resources for the production of a unit of commodity X is the number of units of commodity Y that must be sacrificed in the process. The social cost of producing gun is the amount of butter foregone. It is also called the alternative or opportunity cost of production. Private costs of production refer to individual firms and include explicit costs as well as monetary estimates of implicit costs. Implicit costs consist of the amount of income the entrepreneur could earn in the best alternative use of his time and money.

## Marginal, Incremental and Sink Costs

Sink costs is the expenditure that has been made in the past or that must be paid in future as part of a contractual agreement. The cost of inventory and future rental payments on a



warehouse that must be paid as part of a long-term lease are examples. In general such costs are irrelevant in making a decision.

Marginal costs refer to the change in total cost associated with a unit of change in output. This concept is integral to short-run decision about profit maximising rates of output. For instance, in an automobile manufacturing plant the marginal cost of making one additional car per production period would be labour, materials and every cost directly associated with that extra car. In contrast, the long-run incremental cost refers to the total additional cost of implementing a managerial decision. The cost associated with adding a new product line, acquiring a major competitor to fall into the broader class of incremental costs. In a sense, marginal cost so that subcategory of incremental cost that refers to the additional cost associated with the decision to make marginal variation in the rate of output.

## Cost-output Functions

The cost function belongs to both in the short-run and the long-run. The short-run costs are those costs of production at which the firm operate in one given period when one or more factors of production are fixed in quantity. Therefore, the firm has some fixed costs and some variable costs. On the other hand, 'the long-run costs are planning costs or ex ante costs, in that they present the optimal possibilities for expansion of the output and thus help the entrepreneur to plan his future activities. In the long-run, there are no fixed factors of production and hence no fixed costs. In the long-run, all factors being variable, all costs are also variable. Therefore, the firm plans for the future, given its fixed capital equipment. But it operates on the short-run cost curves relating to each plant'.

The traditional theory of costs analyses the behaviour of cost curves in the short-run and the long-run and arrives at the conclusion that both the short-run and the long-run cost curves are U-shaped but the long-run cost curves are flatter than the short-run cost curves.

## Costs in the Short-run

The short-run is a period in which the firm cannot change its plant, equipment and the scale of organisation. To meet the increased demand, it can raise output by hiring more labour and raw materials or asking the existing labour force to work overtime. The scale of organisation being fixed, the short-run total costs are divided into total fixed costs and total variable costs:

$$TC = TFC + TVC$$

### Total Costs or TC

Total costs are the total expenses incurred by a firm in producing a given quantity or commodity. They include payments for rent, interest, wages, taxes and expenses on raw materials, electricity, water and advertising.

### Total Fixed Costs or TFC

These are costs of production that do not change with output. They are independent of the level of output. In fact, they have to be incurred even when the firm stops production temporarily. They include payments for renting land and buildings, interest on borrowed money, insurance charges, property tax, depreciation, maintenance expenditures, wages and salaries of the permanent staff. They are also called overhead costs.

### Total Variable Costs or TVC

These are costs of production that change directly with output. They rise when output increases, and fall when output declines. They include expenses on raw materials, power, water, taxes, hiring of labour, advertising etc. They are also known as direct costs.

The curves relating to these three total costs are shown diagrammatically in Figure 4.1 the TC curve is a continuous curve, which shows that with increasing output total costs also increase. This curve cuts the vertical axis at a point above the origin and rises continuously from left to right. This is because even when no output is produced, the firm has to incur fixed costs. The TFC curve is shown as parallel to the output axis because total fixed costs are the same whatever the level of output. The TVC curve has an inverted-S shape and starts from the origin O because when output is zero, the TVC are also zero. They increase as output increases. So long as the firm is using less variable factors in proportion to the fixed factors, the total variable costs rise at a diminishing rate. But after a point, with the use of more variable factors in proportion to the fixed factors, they rise steeply because of the application of the law of variable proportions. Since the TFC curve is a horizontal straight line, the TC curve follows the TVC curve at an equal vertical distance.

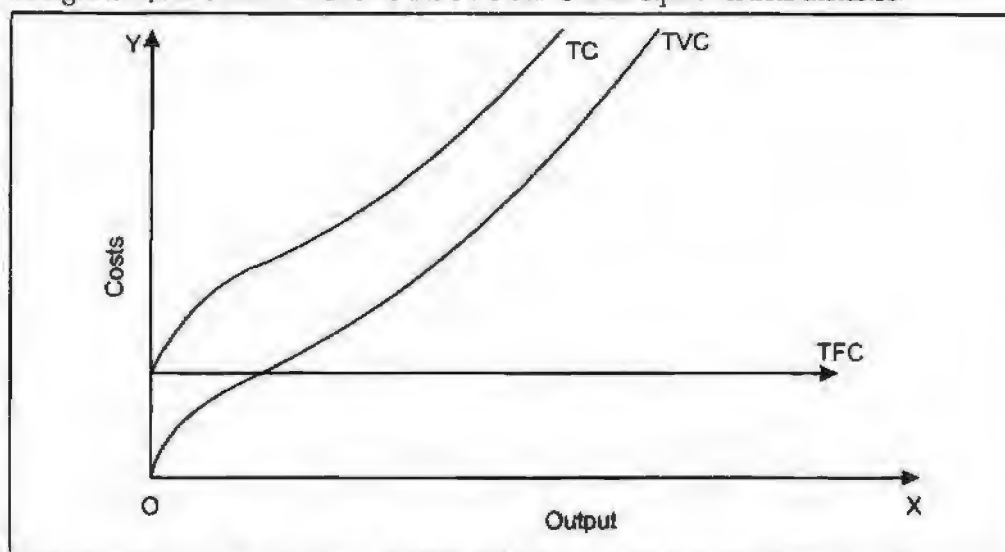


Figure 4.1: Total Variable and Total Cost Curve

**Short-run average costs:** In the short-run analysis of the firm, average costs are more important than total costs. The units of output that a firm produces do not cost the same amount to the firm. But they must be sold at the same price. Therefore, the firm must know the per unit cost or the average cost. The short-run average costs of a firm are the average fixed costs, the average variable costs and the average total costs.

**Average fixed costs or AFC** equal total fixed costs at each level of output divided by the number of units produced:

$$AFC = \frac{TFC}{Q}$$

The average fixed costs diminish continuously as output increases. This is natural because when a constant figure, total fixed costs, are divided by a continuously increasing unit of output; the result is continuously diminishing average fixed costs. Thus the AFC curve is a downward sloping curve which approaches the quantity axis without touching it, as shown in Figure 4.2. It is a rectangular hyperbola.

**Short-run average variable costs (or SAVC)** equal total variable costs at each level of output divided by the number of units produced:

$$SAVC = \frac{TVC}{Q}$$

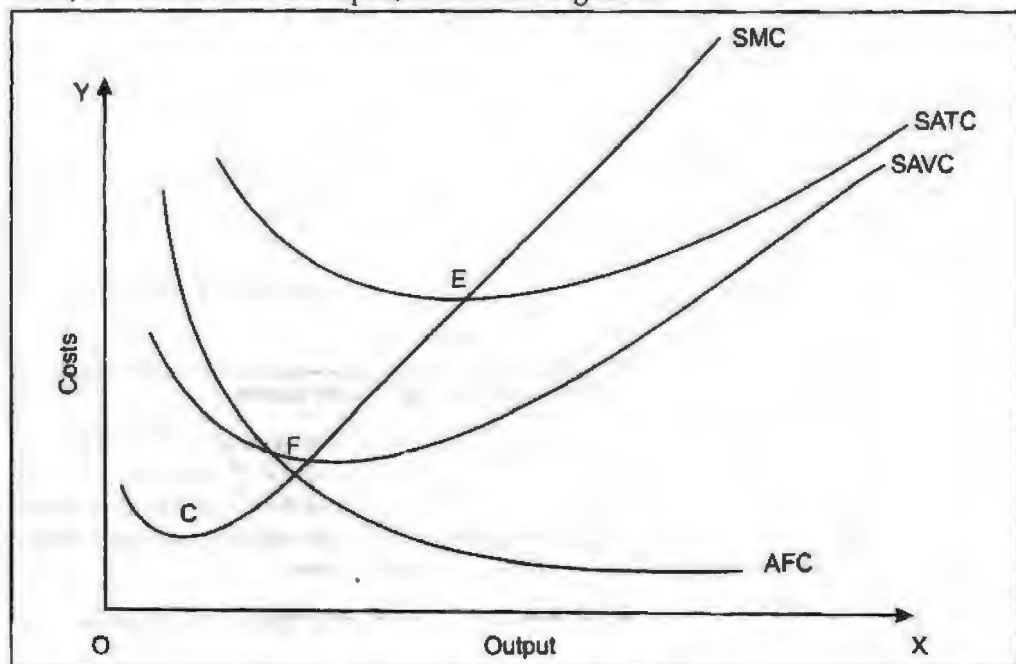
The average variable costs first decline with the rise in output as larger quantities of variable factors is applied to fixed plant and equipment. But eventually they begin to rise due to the law of diminishing returns. Thus the SAVC curve is U-shaped, as shown in Figure 4.2.

**Short-run average total costs (or SATC or SAC)** are the average costs of producing any given output. They are arrived at by dividing the total costs at each level of output by the number of units produced:

Notes

$$\text{SAC or SATC} = \frac{\text{TC}}{Q} = \frac{\text{TFC}}{Q} + \frac{\text{TVC}}{Q} = \text{AFC} + \text{AVC}$$

Average total costs reflect the influence of both the average fixed costs and average variable costs. At first average total costs are high at low levels of output because both average fixed costs and average variable costs are large. But as output increases, the average total costs fall sharply because of the steady decline of both average fixed costs and average variable costs till they reach the minimum point. This results from the internal economies, from better utilisation of existing plant and labour. The minimum point E in the figure represents optimal capacity. As production is increased after this point, the average total costs rise quickly because the fall in average fixed costs is negligible in relation to the rising average variable costs. The rising portion of the SAC curve results from producing above capacity and the appearance of internal diseconomies of management and labour. Thus, the SAC curve is U-shaped, as shown in Figure 4.2.



**Figure 4.2: Shows Various Short-run Cost Curves and Relationship among Them**

The U-shape of the SAC curve can also be explained in terms of the law of variable proportions. This law tells that when the quantity of one variable factor is changed while keeping the quantities of other factors fixed, the total output increases but after some time it starts declining. Machines, equipment and scale of production are the fixed factors of a firm that do not change in the short-run. On the other hand, factors like labour and raw materials are variables. When increasing quantities of variable factors are applied on the fixed factors the law of variable proportions operates. When, say the quantities of a variable factor like labour are increased in equal quantities, production rises till fixed factors like machines, equipment, etc. are used to their maximum capacity. In this stage, the average costs of the firm continue to fall as output increases because it operates under increasing returns. Due to the operation of the law of increasing returns when the variable factors are increased further, the firm is able to work the machines to their optimum capacity. It produces the optimum output and its average costs of production will be the minimum, which is revealed by the minimum point of the SAC curve, point E. If the firm tries to raise output after this point by increasing the quantities of the variable factors, the fixed factors like machines would be worked beyond their capacity. This would lead to diminishing

returns. The average costs will start rising rapidly. Hence due to the working of the law of variable proportions the short-run AC curve is U-shaped.

**Marginal cost:** A fundamental concept for the determination of the exact level of output of a firm is the marginal cost. Marginal cost is the addition to total cost by producing an additional unit of output:

$$MC = \frac{\Delta TC}{\Delta Q}$$

Algebraically, it is the total cost of  $n+1$  units minus the total cost of  $n$  unit of output  $MC_n = TC_{n+1} - TC_n$ . Since total fixed costs do not change with output, therefore, marginal fixed cost is zero. So marginal cost can be calculated either from total variable costs or total costs. The result would be the same in both the cases. As total variable costs or total costs first fall and then rise, marginal cost also behaves in the same way. The SMC curve is also U-shaped, as shown in Figure 4.2.

**Relationship of Short-run Cost Curves:** The relationships of short-run curves are explained in terms of Figure 4.2

1. The AFC curve declines continuously and is asymptotic to both axes. It means that the AFC curve approaches both axes but never touches either X-axis or Y-axis. Thus the AFC curve is a rectangular hyperbola.
2. The SAVC curve first declines, reaches a minimum at point F, and rises thereafter. When the SAVC curve reaches its minimum point F, the SMC curve equals the SAVC curve.
3. The SAC curve first declines, reaches a minimum at point E, and rises thereafter, when the SAC curve reaches its minimum point E, the SMC curve equals the SAC curve. Since  $SAC = AFC + AVC$ , the vertical distance between the SAC and the SAVC curves gives the AFC curve. So there is no need to draw a separate AFC curve. As output expands, the vertical distance between the SAC curve and the SAVC curve declines because of the falling AFC curve.

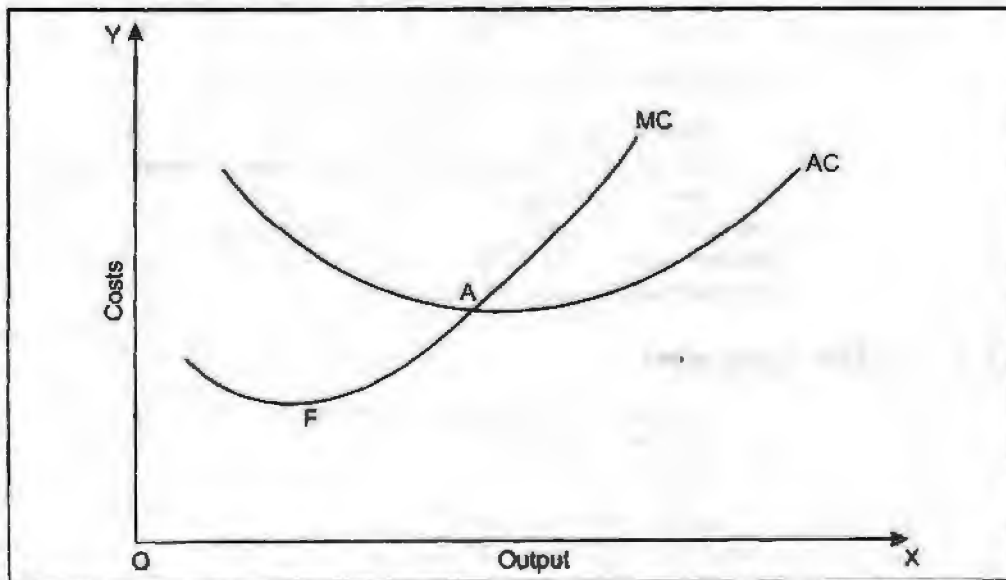


Figure 4.3: Shows Relationship between MC and AC

**Relation between AC and MC curves:** There is a direct relationship between AC and MC curves as shown in the Figure 4.3. Both the AC curve and the MC curve are U-shaped. When AC falls, MC is less than AC. This is because the fall in MC is related to one unit of output while in the case of AC the same decline is spread over all units of output. That is why the fall in AC is less and that in MC is more. This also explains the fact

Notes

that MC reaches its minimum point F before the minimum point A of AC is reached. So when MC starts rising, AC is still declining, as shown in Figure 4.3.

When AC is minimum, MC equals AC. The MC curve cuts the AC curve from below at its minimum point A in the figure.

When AC rises, MC is greater than AC. MC is above AC when AC is rising but the rise in MC is greater than AC. This is because the rise in MC is the result of the increase in one unit of output while in the case of AC the same increases are spread over all units of output.

It should be noted that we cannot say anything about the direction of MC, when AC rises or falls. When AC is falling, it is not essential that MC must fall. MC can increase or fall but it is definite that MC will be less than AC. Similarly, when AC is increasing, it is not essential that MC must rise. MC can fall or rise but it is definite that MC will be larger than AC. But if AC is constant, MC must be constant.

**Relation between SMC and AVC curves:** The SMC curve bears a close relationship to the SAVC curve along with the SAC curve. So long as the SMC curve lies below the SAVC and SAC curves, it continues to fall and its rate of fall is greater than that of SAC and AVC curves. But the AVC and SAC curves start rising from the points  $E_1$  and  $E_2$  respectively.

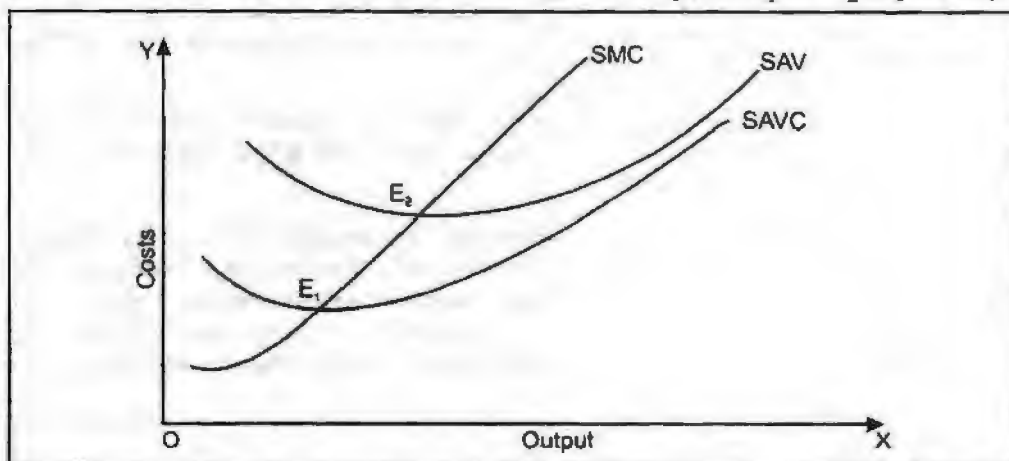


Figure 4.4: Relationship among SMC, SAC and SAVC

Where the SMC curve touches them, as shown in Figure 4.4. The SMC curve passes through the minimum point of the SAVC curve to the left of the minimum point of the SAC curve. Since AC is the sum total of  $ACV + AFC$ , therefore when SAVC is at its minimum point, AFC is falling and it takes time for SAC to reach its minimum point.  $E_1$  and  $E_2$  are thus the respective minimum points of the SAVC and SAC curves. After these points the SMC curve rises sharply and is above the SAVC and SAC curves.

### Costs in the Long-run

In the long-run, there are no fixed factors of production and hence no fixed costs. The firm can change its size or scale of plant and employ more or less inputs. Thus in the long-run all factors are variable and hence all costs are variable.

The long-run average total cost or LAC curve of the firm shows the minimum average cost of producing various levels of output from all possible short-run average cost curves (SAC). Thus the LAC curve is derived from the SAC curves. The LAC curve can be viewed as a series of alternative short-run situations into any one of which the firm can move. Each SAC curve represents a plant of a particular size, which is suitable for a particular range of output. The firm will, therefore, make use of the various plants up to that level where the short-run average costs fall with increase in output. It will not produce beyond the minimum short-run average cost of producing various outputs from all the plants used together.

Let there be three plants represented by their short-run average cost curves  $SAC_1$ ,  $SAC_2$  and  $SAC_3$  in Figure 4.5.

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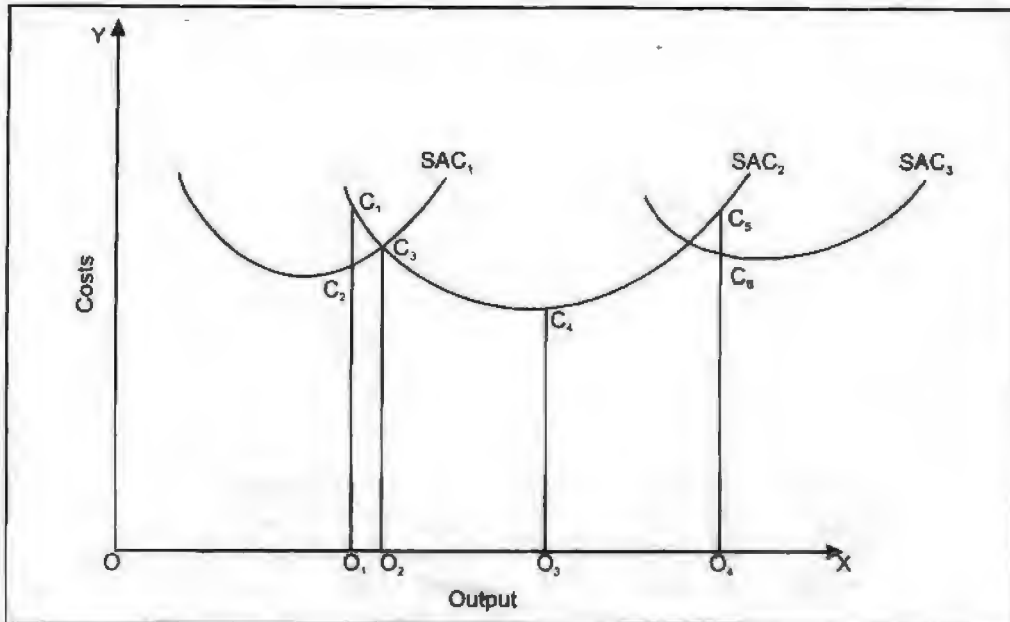


Figure 4.5: Short-run Average Cost Curves Corresponding to Different Plant Sizes

Each curve represents the scale of the firm.  $SAC_1$  depicts a lower scale while the movement from  $SAC_2$  to  $SAC_3$  shows the firm to be of a larger size. Given this scale of the firm, it will produce up to the least cost per unit of output. For producing  $OO_1$  output, the firm can use  $SAC_1$  or  $SAC_2$  plant. The firm will, however, use the scale of plant represented by  $SAC_1$  since the average cost of producing  $OO_1$  output is  $O_1C_2$ , which is less than  $O_1C_1$ , the cost of producing this output on the  $SAC_2$  plant. If the firm is to produce  $OO_2$  output, it can produce at either of the two plants. But it would be advantageous for the firm to use the plant  $SAC_2$  for the  $OO_2$  level of output because the larger output  $OO_3$  can be obtained at the lowest average cost  $O_3C_4$  from this plant. However, for output  $OO_4$ , the firm would use the  $SAC_3$  plant where the average cost  $O_4C_5$  is lower than  $O_4C_6$  of the  $SAC_2$  plant. Thus in the long-run in order to produce any level of output the firm will use that plant which has the minimum unit cost.

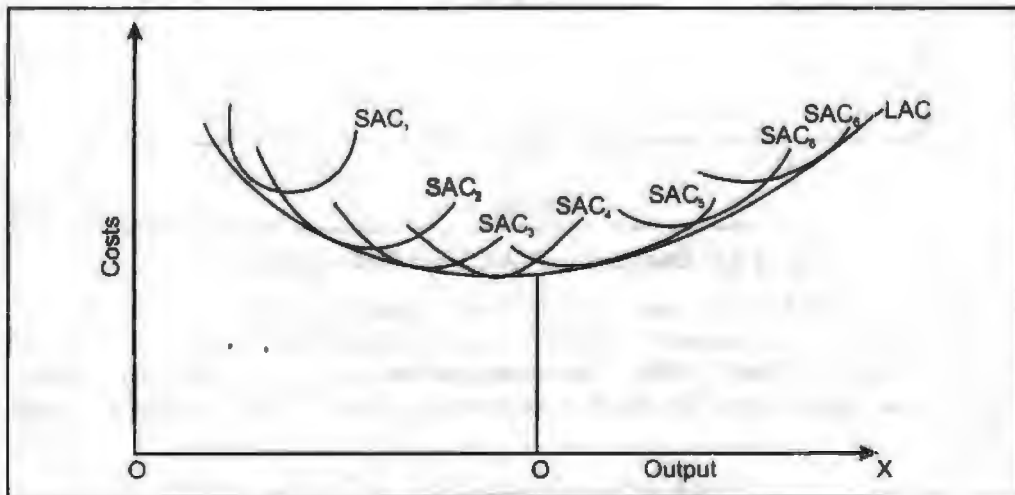


Figure 4.6: Derivation of Long-term Average Cost Curve

If the firm expands its scale by the three stages represented by  $SAC_1$ ,  $SAC_2$  and  $SAC_3$  curves, the thick wave-like portions of these curves form the long-run average cost curve. The dotted portions of these SAC curves are of no consideration during the long-run because the firm would change the scale of plant rather than operate on them.

But the long-run average cost curve LAC is usually shown as a smooth curve fitted to the SAC curves so that it is tangent to each of them at some point, as shown in Figure 4.6 where  $SAC_1, SAC_2, SAC_3, SAC_4$  and  $SAC_5$  are the short-run cost curves. It is tangent to all the SAC curves but only to one at its minimum point. The LAC is tangent to the lowest point E of the curve  $SAC_4$  in Figure 4.6 at  $OO_1$  optimum output, the plant  $SAC_3$  which produces this  $OO_1$  optimum output at the minimum cost  $EO_1$  is the optimum plant, and the firm producing this optimum output at the minimum cost with this optimum plant is the optimum firm. If the firm produces less than the optimum output  $OO_1$ , it is not working its plant to full capacity and if it produces beyond  $OO_1$ , it is overworking its plants. In both the cases, the plants  $SAC_2$  and  $SAC_4$  have higher average costs of production than the plant  $SAC_3$ .

The LAC curve is known as an 'envelope' curve because it envelopes all the SAC curves. Every point on an envelope long-run cost curve is also a point on one of the short-run cost curves which it envelopes. Some economists consider it as a planning curve because it is composed of plant curves and the firm plans to expand its scale of production over the long-run.

The long-run marginal cost (LMC) curve of the firm is derived from the SAC curves, as illustrated in Figure 4.7 where the  $SAC_1, SAC_2$  and  $SAC_3$  curves are enveloped by the LAC curve at points  $C_2, C_3$  and  $C_4$  respectively. Draw perpendiculars  $C_2O_1, C_3O_2$  and  $C_4O_3$  from these respective points on the X-axis. When the points  $C_1, C_3$  and  $C_5$ .

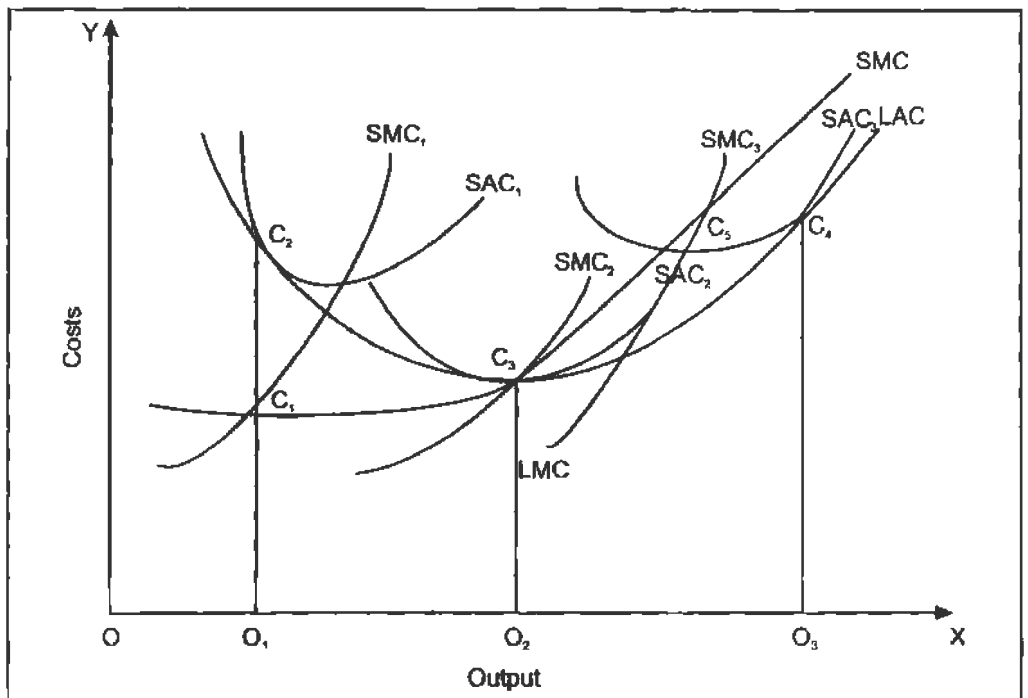


Figure 4.7: Derivation of LMC from SMCs and SACs

Where the curves  $SMC_1, SMC_2$  and  $SMC_3$  cut these vertical lines, are joined, they trace out the LMC curve. The LMC curve intersects the curves  $SAC_2$  and LAC at the minimum point  $C_3$  so that  $LMC=LAC=SAC_2=SMC_2$ . Thus there exists the usual relation between marginal and average cost curves. To the left of point  $C_3$ ,  $LAC > LMC$  and to its right  $LMC > LAC$ .

The long-run average cost function of economic theory is hypothesized to be U-shaped-Long-run average costs decline over lower range of output and rise over higher ranges of output.

## Economies of Scale

Declining long-run average cost over the lower part of the range of possible output is usually attributed to economies of scale. The sources of economies of scale can be classified into two categories – one is real economies and second is pecuniary economies of scale. Pecuniary economies are realised from paying lower prices for the factors used in the production and distribution of the product, due to bulk buying by the firm as its size increases. Such economies of scale do not imply reduction in the inputs used in production process. Real economies are those associated with a reduction in physical quantity of inputs, raw materials, various types of labour and various types of capital. These economies of scale can be explained as under:

Notes

### Real Economies of Scale

These economies of scale can be attributed to the following factors:

1. **Production Economies of Scale:** Production economies may arise from product specific economies and plant specific economies.
2. **Product Specific Economies:** A number of different sources of scale economies are associated with producing large volume of a single product. Expansion of output may lead to greater specialisation in the use of labour and capital. Large scale allows division of labour and specialisation of labour force with the result of an improvement of the skills and hence productivity of the various types of labour. As the scale of production is increased, the production process can be broken into a series of small tasks and the workers can be assigned to the tasks for which they are most qualified workers are then able to acquire additional proficiency through repetition of the tasks to which they are assigned. It is also observed a learning curve effect in producing multiple units of a product that is the amount of inputs such as labour and associated costs required to produce each unit of output decrease for successive increases in the cumulative output of the enterprise. Similarly the higher scale of production may lead to technical economies which are result of (i) specialisation and indivisibilities of capital (ii) set up costs (iii) initial fixed costs (iv) reserve capacity requirements. Modern technology generally involves a higher degree of mechanisation for large scales output. That is the production methods become more mechanised as scale increases. Mechanisation often implies more specialised capital equipment as well as more investment. Such method may lead to higher overhead costs but there methods have lower variable costs which may affect the overhead cost at higher output level.
3. **Firm's Specific Economies:** These economies are related to the overall size of the firm. The major sources of these economies arise from sales and distribution, raising funds and; transport and storage.
4. **Economies in Marketing:** Economies in marketing arise from large scale from the large-scale purchase of inputs and large scale selling of the firm's own products. As to get the economies in purchase of inputs the large size firms normally make bulk purchases of their inputs. The large-scale purchase entices the firm for certain discounts which are not available on small purchases. Large scale of firm may also lead to economies in marketing and sales promotion. These scale economies can take such forms as quantity discounts in securing advertising media space and time and ability of the large firm to spread the fixed costs of advertising preparation over a greater output volumes. In addition, the large firm may be able to achieve a relatively greater degree of brand recognition and brand loyalty from its higher level of sales promotion expenditure over an extended period of time. Purchasing financial funds for larger firm is also easy, because securities of larger firm are generally less risky than those of smaller firm. Most investors are averse to risk, so they are often willing to pay a higher price for less risky securities of larger firm.



5. **Managerial Economies:** Managerial economies are attributed to (i) specialisation in management and (ii) mechanisation of managerial functions. For a large size firm, it becomes possible to divide its management into specialised departments under specialised personnel such as production manager, sales manager, and finance manager. Such a framework in modern organisation lead to quick decision-making, help in saving valuable time of management and thereby the management efficiency.
6. **Economies of Transport and Storage:** The large size firms may acquire their own mean of transport and they can thereby reduce the unit cost of transportation compared to market rate and also prevents delay in transporting goods. Similarly large scale firm can generate their own god owns in the various centre of product distribution and can save cost of storage.

### **Diseconomies of Scale**

Rising long-run average costs at higher level of output are usually attributed to diseconomies of scale. These diseconomies are disadvantage that arise due to the higher scale of production and lead to rise in cost of production. These economies may be classified into two categories- (i) Internal diseconomies (ii) External diseconomies.

**Internal Diseconomies:** These diseconomies are exclusive and internal to a firm. When a firm becomes very large a limit of economies of scale may reached. This limit is reached when the advantage of division of labour and managerial staff have been fully exploited, excess capacity of plant, storage, transport and communication system is fully used. These diseconomies may also appear in the form of problems of co-ordination and control encountered by management as the scale of operation is increased. These coordination and control problems may impose rising cost on the firm in a number of different ways. These costs may be associated with the increase in costs of salary and perks, and losses arising from delayed or faulty decision and weakened or distorted management incentives.

### **Economies of Scope**

The concept of economies of scope is of modern development in the literature on applied economics. The basic argument is that cost-efficiency in production process is brought about by variety rather than volume. Thus, product diversification which is incorporated within the given scale of the plant offers better cost advantages to manufacturers. For example, in the Indian context, the policy of Broad-banding is primarily designed to exploit such economies of scope more than the economies of scale. It is suggested that a single firm can produce a given level of each product line relatively more cheaply than a combination of separate firms producing exclusively single products. Thus, there are positive economies of scope because of joint utilisation of inputs. Some inputs are not finitely divisible and therefore, the production of a single product leaves unutilised capacity of this input. Therefore, when joint products or multiproducts are produced, such underutilised capacities are fully exploited and this gives rise to economies of scope. Such economies of scope or multiproduct diversification may also accrue due to sharing of common intangible assets such as research and goodwill or due to free accessibility of public goods.

It follows that economies of scope exist where the same equipment can produce multiple products more cheaply in combination than separately. A computer controlled machine tool does not care whether it works in succession on a dozen units of the same design or in random sequence on a dozen different product designs—within, of course, a family of design limits. Change over times (and therefore, costs) are negligible, since the task of machine set-up involves little more than reading a computer programme. Thus, computerisation brings about enhanced feasibility, rapid response, immediate management information, greater control, reduced wastage, greater predictability, advanced technology, continuous product or process development and what you have: all these constitute economies of scope. The visible hand of such economies of scope has brought about the managerial revolution in modern business.

Economies of scope(s) are measured by the ratio of average costs (AC) to marginal costs (MC) when production process turns joint products or multiple products. Thus, in the joint products case that we have presented earlier,

$$C = C(Q_1, Q_2) \Rightarrow C(Q) \Rightarrow C(Q_1 + Q_2)$$

We may measure the marginal costs by way of partial derivatives,

$$\frac{\Delta C}{\Delta Q_1} \text{ or } \frac{\delta C}{\delta Q_1} \text{ and } \frac{\Delta C}{\Delta Q_2} \text{ or } \frac{\delta C}{\delta Q_2}$$

but it is not possible to measure the joint product case because product aggregation of separate products may not be feasible. Such material problems may be overcome by using value rather than volume of output produced.

Despite the measurement difficulties, the economies of scope concept has provided a new logic for production and it stands in sharp contrast to the old concept of economies of scale. This is shown in the Table 4.1

**Table 4.1: Comparison between Economies of Scale and Economies of Scope**

Economies of Scale	Economies of Scope
Old style technology	Computer technology
Standardisation	Diversification
Cost advantage from volume	Cost advantage from variety
Separable variable costs	Joint costs
Task specialisation	Multi-mission companies
Work as a social activity	Unmanned system
Expensive flexibility	Profitable flexibility
Large plant	Disaggregated capacity

In this context it may be noted that the cost diagram we have used earlier may capture scale economies, but may not always capture scope economies, unless the X-axis representing output is in 'value' (rather than 'volume') terms.

While talking about scope of producing a variety, we may also think of diseconomies of scope, i.e., over-exploration and/or over-exploitation of scope of production may yield cost disadvantages. For example, the same Maruti Van may be utilised as a Mobile Van serving fast food just as it can be utilised for a domestic leisure trip or as a rest house; but in these cases maintenance costs and conversion costs may go up. In the same way, a camera with complicated and sophisticated features, giving a wide range of scope for fine photography, may break down easily if it is mishandled. In the days of computers and telecommunication revolution, cyber crimes, the economic offence, constitute an example of diseconomies of scope.

### **Case: Bajaj Auto Limited : Cost Analysis**

Indian businessmen, as a rule, do not wear their politics on their sleeves. But there is always an exception to the rule – Rahul Bajaj, India's giant scooter maker. Since its inception in 1960, Bajaj Auto India has been the most dominant two wheeler manufacturer. In the mid-eighties the President, Madhur Bajaj, took pride in the fact that the waiting list was four lakhs long. Today, the company claims that every third automobile and every second two wheeler in the country bears its brand.

The mission of the company has been to provide to its customer the best value for his money.

Till 1996, Bajaj Auto India had an overall 49% share in the market. Bajaj scooter had a 69% share in the market. Bajaj moped 12% and Bajaj three wheeler a whopping

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## Notes

90% share in the market. The company claims to be the lowest-cost producer of scooters in the world. It also enjoys a rupees three thousand three hundred margin on every scooter as against LML's, its nearest competitor in the scooter segment, rupees two thousand two hundred margin on every scooter, in spite of the fact that LML charges a price 50% higher than that of Bajaj.

In spite of having the most illustrious market profile, the company's overall performance has taken a beating. Its profit margin has fallen from 20.24% in 1995-96 to 19% in 1996-97. The likes of Kinetic Honda and TVS Suzuki have slowly been eating into its 44% share in two wheelers, bringing it down to 41.6% in 1996-97 alone. The scooter segment has dipped to a 66% share in the market, the moped share down by 2% to 10% and three wheeler share down by 5% to 85% share of the market.

The present plants near Pune and Indore are running to their full capacity manufacturing one million scooters per year making Bajaj the only company to have achieved the feat outside Japan. The new plant coming at Chakan near Pune and the expansion of capacity at Akurdi and Waluj will enable the company to sell about two million units only beyond 1999. So, to face the growing competition from the other manufacturers presently in the field and the new foreign competitors trying to enter the scooter/scooterette/three wheeler segments, while still keeping the inflating costs under check, it becomes imperative for us to analyse the cost structure of Bajaj Auto India Ltd, and the options that are open to the company.

Bajaj Auto is a legendary story of optimising costs to maximise value for the customer. In its quest to minimise costs it has shown tremendous amount of professionalism in beating competition not only through cutting down heavily on manufacturing costs, but also on other indirect costs that form a part of overheads. The cost optimisation programme has yielded results which show that Bajaj being an Indian company has successfully prevented foreign giants to invade the Indian markets and capture large market shares.

**Table 1: Analysis of Cost according to Variability: Total Costs (₹ Crores)**

<b>Variable Costs</b>	
Raw materials	1489.90
Freight and job contract	99.68
Stores consumed	58.75
Distribution and commission	100.77
Excise duty	518.73
<b>Total Variable Costs</b>	<b>2267.83</b>
<b>Fixed Costs</b>	
Employee costs	198.58
Repairs and maintenance	46.12
Rent, rates and taxes	1.95
Insurance	1.79
Advertisement expenses	53.54
Auditor's fees	0.25
Royalty and technical fees	2.41
Director's remuneration	0.27
Donations	1.78

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Loss on sale of asset	0.15
Power and fuel cost	61.57
Other misc. expenses	40.99
Total Fixed Costs	409.50

Notes

### Components of Cost

In an effort to study the break up of the costs involved in manufacturing of two wheelers at Bajaj Auto we present an abridged cost sheet of the manufacturing process followed by an analysis of the various components of the total costs.

**Table 2: Cost Sheet**

	Total Cost (Rs Crores)	Percentage
Direct Material	1489.90	55.65%
Direct Labour	198.58	7.42%
Direct Expenses	61.57	2.3%
Prime Cost	1750.05	65.37%
Production Overheads	204.55	7.64%
Factory Costs	1954.60	73.01%
Office & Admin. Overheads	160.98	6.01%
Cost of Production	2115.58	79.02%
Selling & Distribution Overheads	561.65	20.98%
Cost of Goods Sold	2677.23	100%
Operating Profit	802.23	
Revenue from Sales	3479.46	

### Deductive Analysis

As can be seen from this cost sheet, the direct costs form a major portion (65.37%) of the total costs. Out of these, material costs comprise 55.65%. With this background it can be inferred that the prime cost of manufacturing at Bajaj Auto is, to a great extent, a function of the raw material purchased. Thus, the total cost function is extremely sensitive to the raw material prices.

Production overheads constitute 7.64% of the total costs. For a corporation like Bajaj, with large scale manufacturing facilities, such low Production overheads is a good sign of determination from the management of Bajaj Auto to give the customers a product at the lowest possible price and thus delight customers. They should try to maintain this low level of overheads or try to lower them further as there is always a scope of improvement.

Direct labour cost is hovering around 7.42% which is pretty decent for a large scale labour intensive manufacturing industry. Maruti Udyog has changed the perception of Indian automobile industry as to the long term benefits of being capital intensive than being labour intensive. Also with the change in time labour is becoming costly while product innovation is bringing better machines/equipments for the same price. Thus, now Bajaj Auto should try to bring in higher level of automation in its plant.

### Recommendations

In the light of the analysis made from the study of the cost structure of Bajaj Auto, we make the following recommendations which in our perception would enable the

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company to achieve the long-term objective of value maximisation through strategic input optimisation. As Bajaj Auto is not a company with the short term goal of profit maximisation the steps it takes must, in every way, should contribute to the overall growth of the company. The following is the list of the recommendations that we make for Bajaj Auto.

- **Maximising Marginal Utility:** With the background of the threat from foreign competition and the plethora of brands that are entering the two wheeler market, the corporate should strive to maximise value obtained by the consumer on the purchase of the product. The effort should be to increase the marginal utility of the product by adding features in coherence with the demands of the consumer.
- **Cutting Overheads:** The expenditure on overheads incurred by a company of the size of Bajaj Auto, when compared to the general standards of the industry, are on the lower side. But to achieve global competitiveness in the area of two wheeler manufacturing and servicing the requirements of the consumer the competition is with oneself. This is an aspect Bajaj needs to realise. To achieve this it is imperative that the company keeps a tab on overhead expenditure as this is, most of the time, the cause of overshooting cost targets.
- **Employee Cost:** Human resource is by far the most important resource in an enterprise. This is because it is human resources the one that manages all the other resources in running a corporation. Employee remuneration thus, becomes the most actively monitored cost in running an organisation. In order to facilitate the continuous growth of the company along its vision, it is necessary for Bajaj to keep the motivation levels of the employees higher by paying them adequate remuneration. Hence, the cost in this respect needs to be harmonised with the efficiency of the company.
- **Optimising Inputs:**
  - ✦ Cost of funds
  - ✦ Cost of raw materials
  - ✦ Cost of labour

The inputs going into the production process require to be harmonised in a manner that is most beneficial for the company. The costs incurred in all these inputs should be prioritised according to their importance.

**Questions**

1. Analyze the case and interpret it.
2. Write down the case facts.

**Student Activity**

1. Select a particular private sector unit and analyze its cost structure of last five years. Discuss the changes in cost structure in your class.
2. Conduct a team research to find out the various cost components of an educational institute and suggest the means for controlling costs.

**Summary**

Opportunity cost is the value of a resource in its next best alternate use. Opportunity cost represents the return or compensation that must be forgone as a result of the decision to employ the resources in a given activity.

Accountants define and measure the cost by the historical outlays of funds that take place in the exchange or transformation of a resource. Explicit costs are those which fall under actual or business costs entered in the books of accounts. The payments for wages and salaries, materials, license fee, insurance etc. are the examples of explicit costs. Implicit Cost: There are certain other costs which don't take the form of cash outlays, nor do they appear in the accounting systems. Such costs are known as implicit or imputed costs.

Sink costs are the expenditures that have been made in the past or that must be made in future as part of a contractual agreement. Marginal costs refer to the change in total cost associated with a unit of change in output. In the long-run, there are no fixed factors of production and hence no fixed costs. The firm can change its size or scale of plant and employ more or less inputs. Thus in the long-run all factors are variable and hence all costs are variable.

Declining long-run average cost over the lower part of the range of possible output is usually attributed to economies of scale. Rising long-run average costs at higher level of output are usually attributed to diseconomies of scale.

## Keywords

**Opportunity cost:** Opportunity cost represents the return or compensation that must be forgone as a result of the decision to employ the resources in a given activity.

**Accounting cost:** Accountants define and measure the cost by the historical outlays of funds that take place in the exchange or transformation of a resource.

**Explicit costs:** These costs fall under actual or business costs entered in the books of accounts. The payments for wages and salaries, materials, license fee, insurance etc. are the examples of explicit costs.

**Implicit Cost:** There are certain other costs which don't take the form of cash outlays, nor do they appear in the accounting systems. Such costs are known as implicit or imputed costs.

**Sink costs:** These are the expenditures that have been made in the past or that must be made in future as part of a contractual agreement.

**Marginal costs:** These refer to the change in total cost associated with a unit of change in output.

**Economies of scale:** Declining long-run average cost over the lower part of the range of possible output is usually attributed to economies of scale.

**Diseconomies of Scale:** Rising long-run average costs at higher level of output are usually attributed to diseconomies of scale.

## Review Questions

1. Discuss the nature of the short-run and long-run average cost curves.
2. Why is the long-run cost curve flatter than the short-run cost curve?
3. Explain and illustrate the traditional cost curves of a firm in the short-run and the long-run.
4. How do economies and diseconomies of scale affect the LAC curve?
5. What is opportunity cost? Give some examples of opportunity cost. How are these costs relevant for managerial decisions?

## **Further Readings**

Karam Pal and Surrender Kumar, *Managerial Economics*, Excel Books

Notes

Samuelson, Stephen G. Marks, William *Managerial Economics* (Hardcover – Dec 29, 2008)

Christopher R. Thomas and S. Charles Maurice , *Managerial Economics* (Hardcover – Mar 7, 2007)

Christopher R. Thomas and S. Charles Maurice, *Managerial Economics* (Hardcover – Jan 27, 2010)

# Unit 5 Application of Cost Analysis

## Unit Structure

- Introduction
- Break-even Analysis: Cost-Volume-Profit
- Cost Functions: Empirical Determination
- Summary
- Keywords
- Review Questions
- Further Readings

## Learning Objectives

At the conclusion of this unit, you should be able to:

- Describe break-even analysis
- Discuss volume-cost-profit
- Understand empirical determination of cost functions
- Explain the relevance of cost theory for managers
- Explain the relevance of the shape of costs

## Introduction

Cost concepts and analysis have a wide range of application for managerial uses. Few of these are given below.

## Break-even Analysis: Cost-Volume-Profit

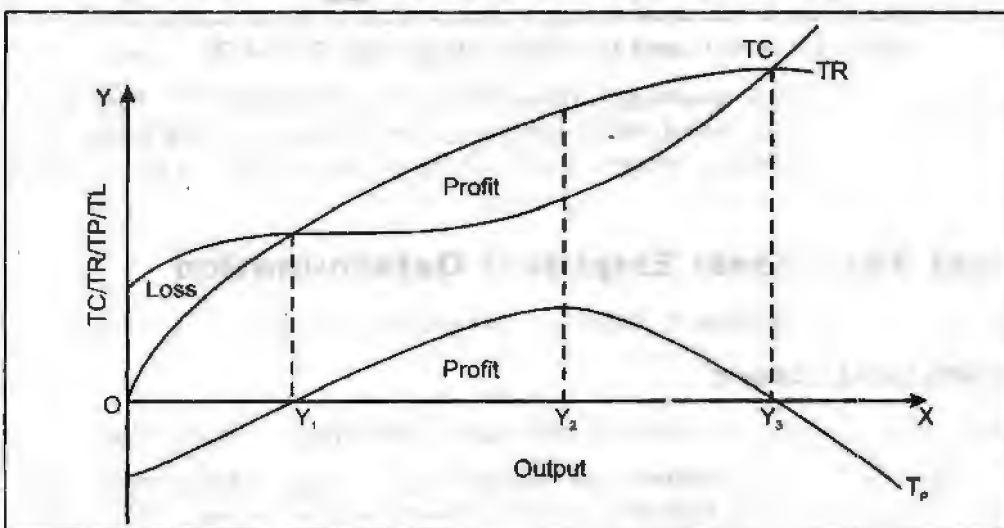


Figure 5.1: Break-even Analysis by using Non-linear TC and TR Curves

Many of the planning activities that take place within a firm are based on anticipated level of output. The study of the interrelationship among firm's sales, costs and operating



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profits at various level of output levels is known as cost-volume profit analysis or break-even analysis. This analysis is often used by business executive to determine the sales volume required to break even and total profits and losses at different output levels. For illustrating the breakeven analysis. It is assumed that the cost and revenue curves are non-linear as shown in Figure 5.1. Total revenue is equal to the number of units of output sold multiplied by the price per unit. The concave form of revenue curve implies that the firm can sell additional units of output only by lowering the price. The total cost curve is based on traditional approach of relationship between cost and output in short-run.

The difference between total revenue and total cost at any level of output represents the total profit or loss that will be realised. The Total Profit (TP) at any level of output is given by vertical distance between the Total Revenue (TR) and Total Cost (TC) curves. A breakeven situation (zero profit) occurs whenever total revenue equals total cost. In the Figure, breakeven condition occurs at two different output level-  $Y_1$  and  $Y_3$ . Below an output level  $Y_1$  losses will incurred because  $TR < TC$ . Between  $Y_1$  and  $Y_3$  profits will be obtained because  $TR > TC$ . An output level above  $Y_3$ , losses will occur again because  $TR < TC$ . Total profit are maximised within the range of  $Y_1$  to  $Y_3$ , where the vertical distance between the TR and TC curves is greatest, that is at an output level of  $Y_2$ .

For practical decision-making the non-linear revenue output and cost output relationship of economic theory are generally replaced by linear functions. The breakeven analysis based on linear function is shown in Figure 5.2.

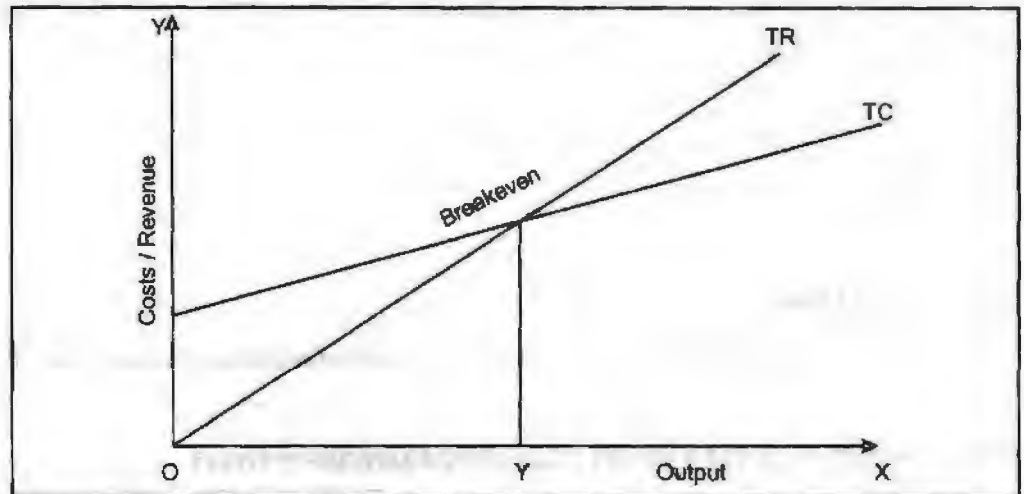


Figure 5.2: Break-even Analysis by using Linear TC and TR Curves

Here TR is a straight line assuming that firms charge a constant selling price  $P$  per unit of output. In case of cost curve, total cost is taken as sum of fixed cost which are independent of the output level plus the variable costs which increases at a constant rate per unit of output.

### Cost Functions: Empirical Determination

There are two related issues: 1. Statistical issues and 2. Economic issues

#### Statistical Issues

These problems relate to difficulties in methodology and measurement as follows:

1. It tries to solve this problem have taken the form of weighing the quantity of each product by the proportion of total direct cost that is incurred by the product. In effect, this amounts to determining output as a function of costs, at least to some degree when what is needed is cost as a function of output. Paralleling this problem is the difficulty of measuring the size of the firm in the long run studies.

2. Whenever technology changes, a new cost function emerges. Thus, no cost function can accurately account for technological change. Closely related to this is the problem of variations in the size of the firm.
3. There are problems relating to measurement of capital as a stock or as a flow, valuation of fixed assets, inventory valuation, unaccounted value changes, valuation of working capital, measurement of depreciation, etc. Some of these problems bring about a debate between accounting approval, economists approach and engineering approach.
4. Operating efficiency can be measured in terms of rate of return on investment, net profit, retained earnings after tax and dividends, etc. Depending upon the use of a particular measure, a particular cost efficiency may be indicated, but that may not truly reflect "economic efficiency" or "technical efficiency".

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### **Economic Issues**

Economic theory often mentions U-shaped nature of average cost curve, but in reality, we come across various other types like the stair-shaped one, L-shaped learning curve or flat bottomed average cost curve. To take care of these empirical situations, the modern theory of costs has been developed. Some explanations are given hereunder:

1. It is possible that assumptions of economic theory are approximately correct, but total costs tend to be linear or nearly so within the practical operating range.
2. It is possible that assumptions of economic theory are approximately correct, but constant marginal costs prevail over wide ranges of total costs. If this is true, it means that within relevant range of the data, input or factor proportions are constant and there are no significant economies or diseconomies of scale.
3. In a dynamic economy, firms have to be flexible to adapt themselves to changing business conditions. Out of experience, the firms "learn" how to take advantage of continuous technological progress. Thus, they prevent the costs from going up, i.e., over a long range of output they reap maximum "economies of scale" and "economies of scope".

### **Relevance of Cost Theory for Managers**

The cost theory has an important role to play in decision-making by managers. Some of these are given below:

- Managers should be able to distinguish between relevant and irrelevant costs so that the former can be used properly in decision-making.
- There is possibility of diminishing returns in the short run production processes and this will cause marginal cost to increase as output increases.

It is often assumed, for convenience, that production of additional units of a product will cost the same extra amount (i.e., constant marginal cost). Managers should recognise that the law of diminishing returns will cause marginal cost to increase. Thus, even though a firm is able to sell more at the same price, additional profit from the sale of these additional units may begin to decline if marginal cost begins to increase.

- Economies of scale, the learning curve effect and economies of scope may enable a firm to reduce its unit cost of production as it increases its entire scale of operation.

In the long run, economic theory suggests that firms may be able to reduce their unit costs due to the impact of economies of scale, the learning curve effect, and possibly economies of scope. Managers should recognise this possibility and observe whether indeed the unit cost of production decreases as a firm increases the size of a particular site, e.g., site of branch office, warehouse operation or its scale of operation for the entire firm.

- Increasing the entire scale of operation does not automatically lead to reduction in per unit cost.

Sometimes an increase in scale of operation could lead to an increase in unit costs instead of decrease because of diseconomies of scale (caused mainly by inefficiencies related to a large bureaucracy and the tendency for the number of staff positions to grow at a disproportionate rate relative to line jobs as the firm expands in size).

### Relevance of the Shape of Costs

Knowledge of the short run costs is crucial for pricing and output decisions while the long run costs provide useful information for planning the growth and investment policies of the firm.

1. **Cost and Price Output Decisions:** Costs are one of the main determinants of price in all market structures and in all models pertaining to the explanation of the behaviour of the firm.

The pure competition model breaks down unless the costs are U-shaped, since otherwise the size of the firm (its optimal output) is indeterminate.

In monopolistic competition the shape of the cost curves is of no particular importance; so long as the slope of the marginal cost is smaller than the slope of the marginal revenue curve the size of the firm is indeterminate. However, costs are one of the determinants of price and output, both in the short run and the long run, since the profit maximising position of the firm is determined by the marginalistic rule,  $MC = MR$ .

Similar considerations hold for the equilibrium of the monopolist, who sets his price at the level defined by the intersection of his MC and MR curves. Thus, the cost curves are entering into the monopolist's price-output decisions explicitly.

In oligopolistic markets that operate with collusion, the level of costs is one of the main determinants of the bargaining power of the firms which enter collusive agreements. In cartels the costs of individual firms determine the supply of the industry and the price which will be set in the market, as well as the quota of each firm member, either by marginalistic calculations or by bargaining procedures.

In the traditional theory of price leadership, the leader will be the firm with the lowest costs. Even if the leader is a large firm, its costs must be low if it is to enforce its leadership on the smaller firms.

The average cost pricing practices are based on detailed knowledge of the costs of the firm. Managerial and behavioural models imply some form of collusion, which is again based on the cost structure of the firm.

2. **Cost and Barriers to Entry:** Costs, either in the form of an absolute cost advantage or minimum optimal scale of output, have been found to be the most important determinants of the height of barriers to entry in many industries. Preference barriers may, in general, be overcome if new firms are prepared to spend an adequate amount of money on research and development as well as on advertising and other selling activities. Such actions, of course, will raise the costs of the new firms and this will put them at a relative cost disadvantage. The lower the costs (at all levels of output) and the larger the minimum optimal scale (i.e., the greater the economies of scale) the greater the entry barriers and hence the higher the price that firms in an industry can charge without attracting entry.

3. **Costs and Market Structure:** Market structure is determined by costs to a large extent. Given the size of the market, the greater the economies of scale, the smaller the number of firms in the industry. Thus, when the economies of large scale production are important, one should expect an oligopolistic market structure to emerge in the long run. If the economies of scale are not important one should, in general, expect a large number of firms in the industry.

4. **Costs and Growth Policy of the Firm:** Given the market size, the direction of growth of a firm is determined basically by cost considerations. If the long run costs are U-shaped and the firm has exhausted the available economies of scale, further expansion in the same market will most probably take place by building up a new plant. If the firm is faced with a U-shaped scale curve and the market is stagnant, the firm will look for investments in other markets (diversification).

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Mergers and takeovers are based, among other things, on cost considerations. Similarly, if cost advantages are expected from a vertical integration of various stages of production, the firm will later adopt such a policy. Integrated production may also be attractive as a means for preventing entry, since a new firm must enter with a similar integrated production organisation, which requires substantial initial capital outlays.

5. **Costs and Regulation of Industry:** A detailed knowledge of costs is essential for the regulation of industry by the government and various regulatory authorities.

### Case: Returns to Scale in High School Education

—(J. Rieu, 1966)

Studies of per student expenditures in the nation's schools have usually shown a tendency for these costs to increase as the size of the school increases. Such studies have led to the conclusion that there are decreasing returns to scale in production of education. This conclusion has not taken into account differences in the quality of output among schools. If the larger schools are producing a higher quality product (i.e., a better educated student), it is not legitimate to infer that higher cost per student in the larger schools is indicative of decreasing returns to scale.

J. Rieu (1966) made a study of 102 accredited high schools. He found that if adjustments are made for quality of education, there are significant economies of scale in producing high school education. He specified a general average cost function of the form

$$\text{Average cost per student} = f(\text{number of students, quality})$$

Average cost per student (AC) was measured by expenditure per student and number of students by average daily attendance. The following measures were used to define quality – percentage of classrooms built within the last ten years; average teacher's salary; number of credit units offered; average number of courses taught per teacher and change in enrolment.

The least squares regression technique was used to estimate the parameters of a quadratic cost equation of the form

$$AC = C_0 + C_1Q + C_2Q^2 + C_3(\text{Quality variables})$$

Where AC is cost per student and Q is number of students. After adjusting for quality differences among schools, the following net relationship between cost and number of students was estimated.

$$AC = 10.3 - 0.402Q + 0.0012 Q^2$$

$$R^2 = 0.56$$

$$(6.38) \quad (5.22)$$

The values of the t-statistics are shown in parentheses and indicate that both coefficients are significantly different from zero at the 0.05 level of significance.

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The number of students that minimises this function is found by setting the first derivative of the average cost function equal to zero and showing for Q. That is,

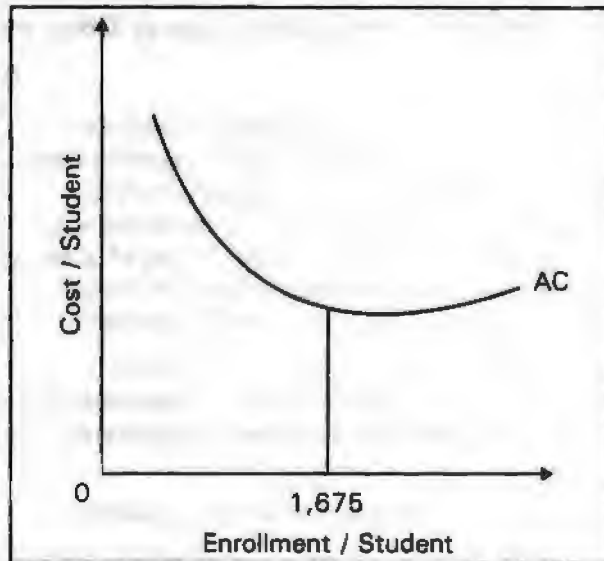
$$\frac{d(AC)}{dQ} = -0.402 + 0.00024 q = 0$$

$$Q = 1,675$$

The value of the second derivative is positive, that is,

$$\frac{d^2(AC)}{dQ^2} = 0.00024$$

Thus, average cost is minimised. When graphed, this estimated function is a U-shaped average cost curve having a minimum point at 1,675, as shown in Figure below;



Only the largest high schools in the state had enrolment of 1,675 or more. Thus, after adjusting for quality, it was found that there were significant economies of scale in high school education at least up to the largest schools of that state. As there were few schools larger than this threshold, it is possible that economies of scale might be achieved in even larger schools. The data were not adequate to test this possibility.

**Questions**

1. Analyze the case and interpret it.
2. Write down the case facts.

**Student Activity**

Hold a group discussion on 'Marginal cost is very important tool used in determining the level of output'.

**Summary**

The study of the interrelationship among firm's sales, costs and operating profits at various level of output levels is known as cost-volume profit analysis or break-even analysis. This analysis is often used by business executive to determine the sales volume required to break even and total profits and losses at different output levels. For illustrating the breakeven analysis. It is assumed that the cost and revenue curves are non-linear.

Whenever technology changes, a new cost function emerges. Thus, no cost function can accurately account for technological change. Closely related to this is the problem of variations in the size of the firm.

Operating efficiency can be measured in terms of rate of return on investment, net profit, retained earnings after tax and dividends, etc. Depending upon the use of a particular measure, a particular cost efficiency may be indicated, but that may not truly reflect "economic efficiency" or "technical efficiency"

Economic theory often mentions U-shaped nature of average cost curve, but in reality, we come across various other types like the stair-shaped one, L-shaped learning curve or flat bottomed average cost curve.

Managers should be able to distinguish between relevant and irrelevant costs so that the former can be used properly in decision-making. There is possibility of diminishing returns in the short run production processes and this will cause marginal cost to increase as output increases.

Knowledge of the short run costs is crucial for pricing and output decisions while the long run costs provide useful information for planning the growth and investment policies of the firm.

## Keywords

**Cost-volume profit analysis or break-even analysis :** The study of the interrelationship among firm's sales, costs and operating profits at various level of output levels is known as cost-volume profit analysis or break-even analysis.

**Operating efficiency:** Percentage measure of a management's ability to generate sales revenue and to control costs. Mathematically,  $\frac{\text{Income before fixed charges}}{\text{Sales revenue}} \times 100$

**Economic theory:** Economic Theory provides an outlet for research in all areas of economics based on rigorous theoretical reasoning and on topics in mathematics that are supported by the analysis of economic problems.

## Review Questions

1. Discuss optimum output level.
2. What is optimum inventory level?
3. Account for Economic order quantity.
4. What is meant by optimum scale? What is its significance?
5. Discuss the aspects of empirical determination of cost functions.
6. Describe various forms of cost functions.
7. Explain relevance of cost theory for managers.
8. Discuss relevance of the shape of cost.
9. Explain cost and growth policy of the firm.
10. Interrelate cost and regulation of industry.

## **Further Readings**

Karam Pal and Surrender Kumar, *Managerial Economics*, Excel Books

Samuelson, Stephen G. Marks, William *Managerial Economics* (Hardcover – Dec 29, 2008)

Notes

Christopher R. Thomas and S. Charles Maurice, *Managerial Economics* (Hardcover – Mar 7, 2007)

Christopher R. Thomas and S. Charles Maurice, *Managerial Economics* (Hardcover – Jan 27, 2010)

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# Unit 6 Price-output and Market Structure

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## Unit Structure

- Introduction
- Theory of Pricing
- Various Forms of Market Structures
- Equilibrium of a Firm
- Price Determination
- Equilibrium between Demand and Supply
- Pricing and Output Decisions under Perfect Competition and Monopoly
- Summary
- Keywords
- Review Questions
- Further Readings

## Learning Objectives

At the conclusion of this unit, you should be able to:

- Discuss the theory of pricing
- Describe the various forms of market structures
- Explain the equilibrium of a firm
- Understand the price determination and equilibrium between demand and supply
- Tell about the pricing and output decisions under perfect competition
- Tell about the pricing and output decisions under monopoly

## Introduction

The market period is a very short period in which the supply is fixed – that is no adjustment can take place in supply conditions. In other words, supply in the market period is limited by the existing stock of the good. In this period more goods cannot be produced in response to an increase in demand.

The price prevailing in the market period is called market price which changes with the nature of the commodity – many a time within a day or a week or a month. In reality, market price is that price which is determined by the forces of demand and supply in the market at a point of time. The determination of market price can be explained separately for perishable and durable goods.

## Theory of Pricing

The theory of pricing was propounded by Marshall who states that price is determined by both demand and supply, also gave a lot of importance to the time element in the



determination of price. Time element is of great relevance in the theory of value since one of the two determinants of price, namely supply, depends on the time allowed to it for adjustment. The reason why supply takes time to adjust itself to a change in the demand condition is that the nature of technical conditions of production is such as to prohibit instantaneous adjustment of supply to changed demand conditions. Marshall divides time periods into four categories: market-period, short-period, long-period and secular-period.

## Various Forms of Market Structures

The popular basis of classifying market structures rests on two crucial elements (i) the number of firms producing a product and (ii) the nature of product produced by the firm, that is, whether it is homogeneous or differentiated. The price elasticity of demand for a firm's product depends upon the number of competitive firms producing the same or similar product as well as on the degree of substitution which is possible between the product of a firm and other products produced by rival firms. Therefore, a distinguishing feature of different market categories is the degree of price elasticity of demand faced by an individual firm.

On the basis of the competition, markets can be divided into three forms.

1. Perfect competitive market
2. Monopoly
3. Monopolistic competition
  - (i) Duopoly
  - (ii) Oligopoly

**Firm:** Basically there are two types of actors in an economy: (1) Households, (2) Firms.

Households are the consumers of the goods and services while firms are the producers of such goods and services. Firm is an economic entity which works for profit motive.

## Perfect Competitive Market

Perfect competitive market is that market where large numbers of buyers and sellers producing homogeneous product exist. But the size of the individual seller and buyer is as small relative to the market as a whole that they cannot change the demand and supply of the product. In this market the price of the commodity is determined by the industry and the firm is merely a price taker.

### Characteristics of the Perfect Competitive Market

1. Larger number of buyers and sellers and their size is small.
2. Homogenous product.
3. Perfect knowledge.
4. Perfect mobility.
5. There is no entry ban on the firms.
6. There are no transport and selling costs in this market.
7. Equal cost throughout the market.

## Imperfect Competition

Imperfect competition is an important market category where individual firms exercise control over the price to a smaller or larger degree depending upon the degree of imperfection present in a case. The existence of imperfect competition can be caused

either by the fewness of the firms or by product differentiation. Therefore, imperfect competition has several subcategories. The first important subcategory of imperfect competition is monopolistic competition. In monopolistic competition a large number of firms produce somewhat different products which are close substitutes of each other. The second subcategory is oligopoly without product differentiation which is also known as pure oligopoly. Under it there is competition among the few firms producing homogeneous or identical products. The fewness of the firms ensures that each of them will have some control over the price of the product and the demand curve facing each firm will be downward sloping which indicates that the price elasticity of demand for each firm will not be infinite. The third subcategory is called differentiated oligopoly. It is characterised by competition among the few firms producing differentiated products which are close substitutes of each other. The demand curve under this kind of oligopoly is downward sloping and so firms would have control over the price of their individual products

## Monopoly

Monopoly means the existence of a single producer or seller which is producing or selling a product which has no close substitutes. As such it is an extreme form of imperfect competition. Since a monopoly firm wields sole control over the supply of the product which can have only remote substitutes, the expansion and contraction in its output will affect the price of the product. Therefore, the demand curve facing a monopolist is downward sloping and has a steep slope.

Monopoly is a market where there is only one producer of a good or service. There is also no close substitute of the good or service.

### Conditions of Monopoly

1. Single seller and large number of buyers.
2. There is no substitute in the market.
3. Entry ban.
4. Controlled supply.
5. Independent price policy.
6. There is no difference between firm and industry.
7. Price discrimination.
8. Abnormal profit.
9. There are no selling costs.
10. Different average and marginal revenue curve.

## Equilibrium of a Firm

Firm is said to be in equilibrium when it has no tendency either to increase or to contract its output. Firm's equilibrium level of output will lie where its money profits are maximum. Now profits are the difference between total revenue and total cost. So in order to be in equilibrium, the firm will attempt to maximise the difference between total revenue and total cost.

An old method of explaining the equilibrium of a firm is to draw the total revenue and total cost curves of the firm and locate the maximum profit point. But with the appearance of marginalist revolution, equilibrium of a firm is explained with the aid of marginal revenue and marginal cost curves.

Equilibrium of a firm by curves of total revenue and total cost profit is the difference between total revenue and total cost. Thus the firm will be in equilibrium at the level of

output where the difference between total revenue and total cost is the greatest. Figure 6.1 depicts short run total revenue and total cost curves of a firm. As a firm starts from zero output and increases its production of the good, in the very initial stages total cost is greater than total revenue and the firm is not making any profits at all. When it is producing OL level of output, total revenue just equals total cost and the firm is therefore making neither profits nor losses, that is, the firm is only breaking even. Thus the point S corresponding to OL output is called break-even point.

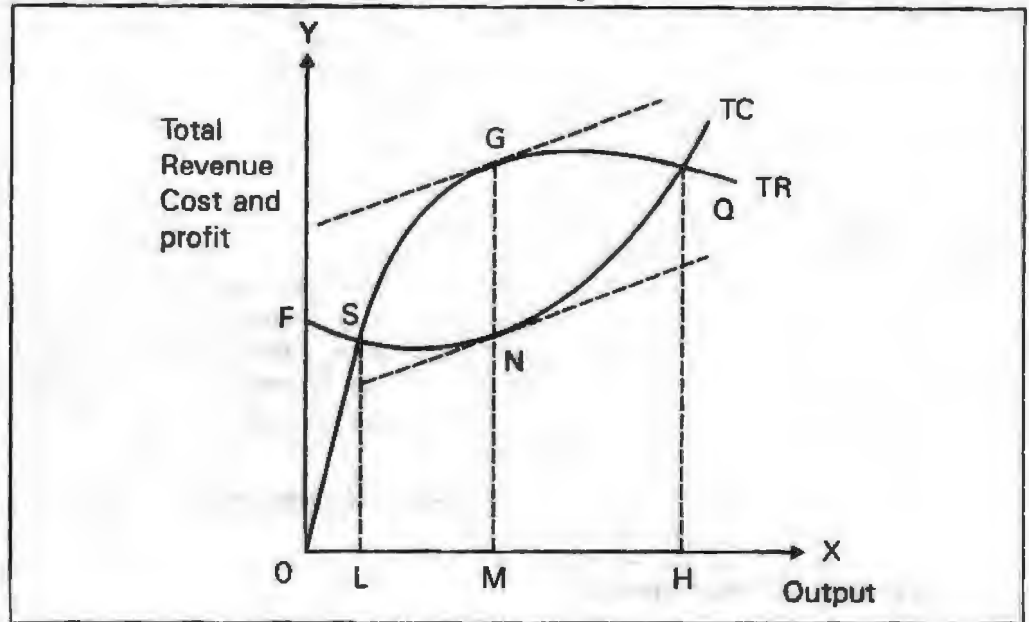


Figure 6.1: Equilibrium of a Firm

When the firm increases its output beyond OL, total revenue becomes larger than total cost and profits begin to accrue to the firm. It will be seen that profits are rising as the firm increases production to output OM. At OM output, the distance between TR and TC is the greatest and so the profits will be the maximum. Thus the firm will be in equilibrium at the OM level of output. The firm will not produce any output larger than OM since after it the gap between TR and TC curves goes on narrowing down and therefore, the total profits will be declining. At OH level of output TR and TC curves again intersect each other, which means that total revenue is equal to total cost at output OH. Thus point Q is again a break-even point.

## Price Determination

The determination of output and the price of a commodity in a market depend upon the number of buyers, sellers and the characteristics of the product, which are also the determinants of market structure.

According to the law of demand, the demand curve of a commodity normally slopes downward. In other words, with the fall in price, quantity demanded rises and vice versa. In the theory of firm we studied that the supply curve of a commodity usually slopes upward. In other words, an industry will offer to sell more quantity of a good at a higher price than at a lower one. The level of price at which demand and supply curve intersect each other will finally come to stay in the market. And at this price quantity demanded equals quantity supplied and it is called equilibrium price.

Price of the commodity is determined by the industry. The industry determines the price of the commodity at the point where the market demand and supply of the commodity becomes equal to each other. We can show it with the help of following schedule and Figure 6.2:

Price of the commodity	Demand	Supply
1	10	2
2	8	4
3	6	6
4	4	8
5	2	10

Notes

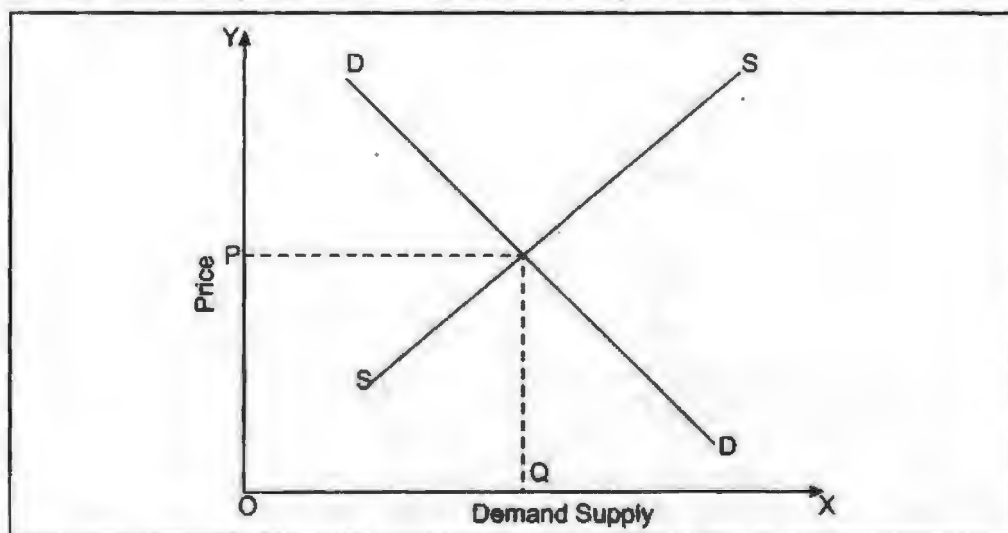


Figure 6.2: Demand and Supply Forces in Perfect Competitive Market

## Equilibrium between Demand and Supply

The price wishes of both the buyers and sellers are satisfied only at the equilibrium stage. If prices were greater or lesser than the equilibrium price the buyers and sellers wishes would be inconsistent. If prices were greater than the equilibrium price, quantity supplied would exceed quantity demanded. It means some of the sellers would not be able to sell the amount of the good they wanted to supply. These sellers would try to dispose of the unsold goods by bidding price down. The price would go on declining till the quantity demanded equaled quantity supplied. On the other hand, if prices were lower than the equilibrium price, the quantity demanded would exceed quantity supplied. Some buyers would not be able to obtain the amount of the good they wanted to purchase at the prevailing price. They would therefore bid price up in their effort to get all that they desired to buy. The price would go on rising till the quantity demanded and quantity supplied would again be equal.

## Pricing and Output Decisions under Perfect Competition and Monopoly

Perfect competition is the ideal market, and serves as a benchmark. We can use the outcomes of other markets to compare with outcomes that would have been achieved under perfect competition. For instance, if the market is competitive, prices would be lower and closer to costs, while if the market is monopolised then prices are likely to be higher. Another useful comparison relates to the concept of consumer's surplus.

Intuitively, consumer's surplus can be thought of as the difference between the maximum amount the consumer is willing to pay for a product and the amount he actually pays.

A firm under perfect competition is a price-taker and not a price-maker. Because an individual firm's demand or Average Revenue (AR) curve is horizontal under perfect competition, the Marginal Revenue (MR) curve of the firm is also horizontal and coincides with the AR curve. In other words, AR and MR are constant and equal at all levels of

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output. You should satisfy yourself that if price (i.e. average revenue) is constant, marginal revenue will be equal to price.

Monopoly can be described as a market situation where a single firm controls the entire supply of a product which has no close substitutes. The market structure characteristics of monopoly are listed below:

Number and size of distribution of sellers	Single seller
Number and size of distribution of buyers	Unspecified
Product differentiation	No close substitutes
Conditions of entry and exit	Prohibited or difficult entry

Though perfect competition and monopoly are the two extreme cases of market structure, they both have one thing in common – they do not have to compete with other individual participants in the market. Sellers in perfect competition are so small that they can ignore each other. At the other extreme, the monopolist is the only seller in the market and has no competitors. The market or industry demand curve and that of the individual firm are the same under monopoly since the industry consists of only one firm.

Managers of firms in a perfectly competitive market facing a horizontal demand curve would have no control over the price and they simply choose the profit maximising output. However, the monopoly firm, facing a downward-sloping demand curve (see Figure 6.3) has power to control the price of its product. If the demand for the product remains unchanged, the monopoly firm can raise the price as much as it wishes by reducing its output. On the other hand, if the monopoly firm wishes to sell a larger quantity of its product it must lower the price because total supply in the market will increase to the extent that its output increases. While an individual firm under perfect competition is a price-taker, a monopolist firm is a price-maker. It may, however, be noted that to have price setting power a monopoly must not only be the sole seller of the product but also sell a product which does not have close substitutes.

A monopolist determines that price of his product at which he will get maximum profit. He will be in equilibrium when he produces that amount of his product at which his total profit will be maximum. In the short-run the monopolist may get minimum loss at the equilibrium position.

In monopoly also price and equilibrium determined by two ways:

1. Total revenue and total cost method.
2. Marginal revenue and marginal cost method.

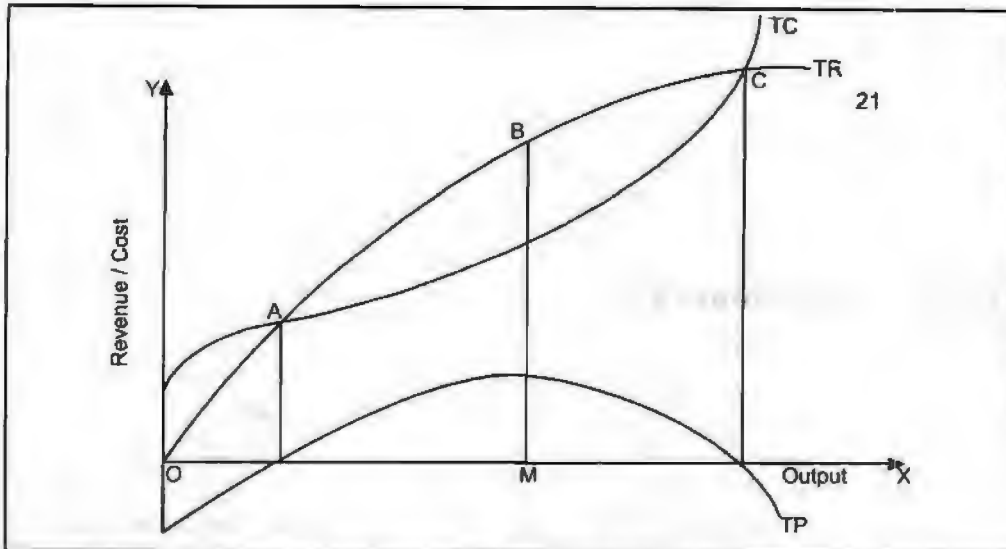
**Total Revenue and Total Cost Method:** According to this method a monopolist will be in equilibrium when he is acquiring maximum profit where the difference between total revenue and total cost will be maximum.

$$TR - TC = \text{maximum} = \text{Total profit}$$

$$TR = \text{Total revenue}$$

$$TC = \text{Total cost}$$

This can be shown as under



Notes

Figure 6.3: Firm's Equilibrium by using TC and TR in Monopoly

TC is the total cost curve in the above diagram and TR is the total revenue curve. TC starts from OP it means that if the firm stops production then also it has to bear fixed costs. TP is the total profit curve. The firm is in equilibrium when it produces OM quantity of its product because of this production the firm is getting maximum profit.

**Marginal Revenue and Marginal Cost Analysis:** According to this method, a monopolist is in equilibrium when (a) its MR is equal to MC (b) MC cuts MR from below. This can be shown as:

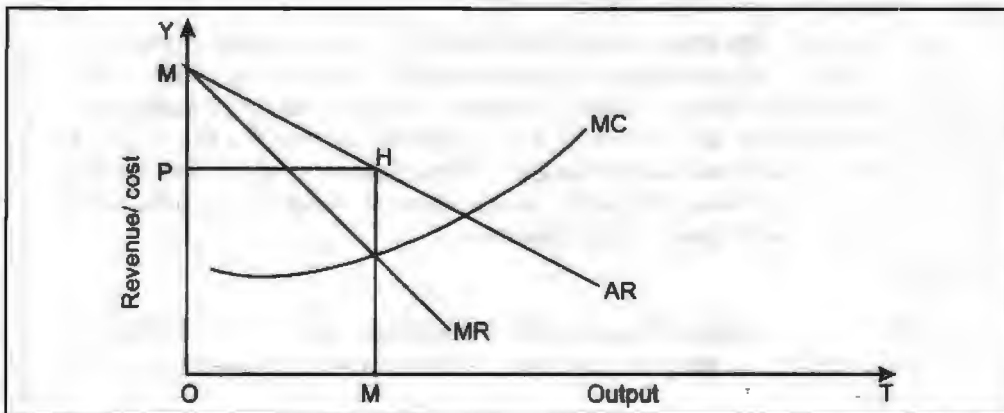


Figure 6.4: Firm's Equilibrium Point at E by using MC and MR in Monopoly

E is the equilibrium point in the above diagram where  $MC = MR$  and MC cuts MR from below.

Think about your purchase of a big ticket item such as a camera. You have a price in mind that is the maximum you are willing to pay. The difference between this and the price actually paid is the consumer's surplus. In perfectly competitive markets, consumer's surplus is the maximum, while in monopoly markets it is low. In fact, it is the endeavour of monopolies to capture as much of the consumer's surplus as possible. When a perfectly competitive industry gets monopolised there is a transfer of surplus from the consumer to the producer. Or stated differently, the producer is able to increase his surplus (or profit) at the expense of the consumer. On the other hand, when a monopolised industry becomes competitive, there is transfer from producers to the consumers; i.e. consumers become better off when there is increased competition. An illustration of this can be gauged from the conduct of the automobile industry in India since it was deregulated in 1991. The

consumers have benefited from competition in the sector and one can definitely assert that producer margins (or surplus) have declined to the benefit of the consumers. Under perfect competition, since an individual firm cannot influence the market price by raising or lowering its output, the firm faces a horizontal demand curve, that is, the demand curve of any single firm is perfectly elastic – its elasticity is equal to infinity at all levels of output. If a firm charges a price slightly higher than the prevailing market price, demand for that firm will fall to zero because there are many other sellers selling exactly the same product. On the other hand, if a firm reduces its price slightly, its demand will increase to infinity and thus other firms will match the low price.

### Case: Philips India Ltd.

The Union Government issued a "show cause" notice to Philips India Ltd., a multinational company, for alleged violation of Industrial Development and Regulation Act 1951. Notice was issued against the company for alleged unauthorised manufacture and sale of cassettes for tape recorders.

The ministry of industry is believed to have made an inquiry into the allegation made by some MPs that Philips were engaged in such activities. The government had assured the Parliament that the matter would be fully inquired into.

The unauthorised manufacture of cassettes for tape recorders by the company violates not only the Industrial Development and Regulation Act but also attracts the Monopolies and Restrictive Trade Practices Act.

The small scale industries have been the pioneers in the field of cassettes for tape recorders. The small scale manufacture of cassette started as early as 1973. There are also in the market foreign brand named cassettes which are claimed to be made in India. Qualified observers say that there was no need for the country to support foreign brand names in such a simple consumer item as cassettes.

Viewed in this light, the government action is started to be significant in extending protection to the small scale sector. Though no official statistics of production of cassettes for tape recorders are readily available, it is stated that the demand for the item would amount to one million. It is also pointed out that the item has large demand potential at home and in foreign markets. Since it is rather skill-oriented and highly labour-intensive, the government has been wanting as a matter of policy to encourage its production in small scale sector.

#### Questions

1. Suppose, the Philips India Ltd. fails to "show satisfactory cause". What will be the impact on the price and the market structure of cassettes for tape recorders?
2. Suppose, the Philips India Ltd. "shows good cause". How will the price output decision of the small sector be affected?

Source: SPAN, August, 1976

### Student Activity

State and show in diagrams the conditions of long-run equilibrium of the firm and industry under perfect competition.

### Summary

Perfect competitive market is that market where large numbers of buyers and sellers producing homogeneous product exist but the size of the individual sellers and buyers is relatively so small that they cannot change the demand and supply of the product. In this market, the price of the commodity is determined by the industry and the firm is merely a price taker.

A firm is a business or economic entity that produces goods and services for sale. Its motive is to maximise its profit. In the perfect competitive market there are so many firms which produce a homogeneous product. A group of these firms is known as industry.

A firm is in equilibrium when it is satisfied with its present production quantity. At its equilibrium point the firm is getting either maximum profit or minimum loss. For a firm, equilibrium is a position where to increase and decrease in production is not profitable for it.

The change in total revenue due to addition of revenue by selling one more unit by a firm is known as the marginal revenue. Marginal revenue should be equal to marginal cost is the necessary condition for a firm's equilibrium but not the sufficient condition. Short-run is the time period in which the firm can increase its production by increasing its variable factor only. Long-run is the time period in which supply can be changed according to demand.

According to Lerner monopoly power depends upon the difference between price and marginal cost. The monopoly power increases as this difference increases.

Professor Bain measured monopoly power on the basis of difference between price and average cost. The difference between price and average cost is known as abnormal profit. More will be this difference more will be the abnormal profit and more will be the monopoly power.

When a monopolist charges different prices from different consumers of the same product. Such a situation is described as a discriminating monopoly situation.

## Keywords

**Perfect competitive market** : It is that market where large numbers of buyers and sellers producing homogeneous product exist but the size of the individual sellers and buyers is relatively so small that they cannot change the demand and supply of the product. In this market, the price of the commodity is determined by the industry and the firm is merely a price taker.

**Firm**: A firm is a business or economic entity that produces goods and services for sale. Its motive is to maximise its profit.

**Industry**: In the perfect competitive market there are so many firms which produce a homogeneous product. A group of these firms is known as industry.

**Marginal Revenue**: The change in total revenue due to addition of revenue by selling one more unit by a firm is known as the marginal revenue.

**Short-run**: It is the time period in which the firm can increase its production by increasing its variable factor only.

**Long-run**: It is the time period in which supply can be changed according to demand. The new firms can enter or the existing firms can leave the industry. The existing firms can also change their scale of production according to their necessity.

**Monopoly**: It is a market where there is only one producer of a good or service. There is also no substitute of the good or service.

## Review Questions

1. "No producer can be in equilibrium unless his marginal revenue and marginal cost are equal". Comment on this.
2. Explain with the help of a diagram how price is determined in a perfectly competitive market.
3. How does a monopolist fix the price of the product? Is it inevitable that the monopoly price is higher than the competitive price?



## **Further Readings**

Karam Pal and Surrender Kumar, *Managerial Economics*, Excel Books

Samuelson, Stephen G. Marks, William *Managerial Economics* (Hardcover – Dec 29, 2008)

Notes

Christopher R. Thomas and S. Charles Maurice, *Managerial Economics* (Hardcover – Mar 7, 2007)

Christopher R. Thomas and S. Charles Maurice, *Managerial Economics* (Hardcover – Jan 27, 2010)

# Unit 7 Pricing Strategies

Notes

## Unit Structure

- Introduction
- Multi Product Pricing
- Price Discrimination
- Summary
- Keywords
- Review Questions
- Further Readings

## Learning Objectives

At the conclusion of this unit, you should be able to:

- Explain multi product pricing
- Describe price discrimination
- Discuss pricing methods in practice
- Know the method of government's control on pricing

## Introduction

Theoretically, if a firm is a price taker, there it has to design strategy to sell quantity. Knowing fully well that neither product nor promotion is relevant competitive consideration. The real world business situation is of course, far away from this theoretical position. In reality the firm is price maker; it may be a price beeder or price follower or a price discriminator either in the product market or in the factor market or both.

## Multi Product Pricing

In recent time, firms produce a variety of products rather than a single product. This requires that we expand our simple pricing rule and consider demand and product interdependencies. Normally in the case of a firm which is producing multiple commodities, the demands for its various products are separable but the costs are not quite divisible, product-wise. Thus, while there are separate demand functions for all products of a multiple product firm, there is only one cost function for all products. In the livestock industry, meat and wool are produced together where sheep are reared. Crude oil and natural gas may be found together in oil exploration. In these joint products, costs also are joint. In most cases, joint products come in fixed proportions.

In joint products, the profit maximising prices will be given by the point at which the combined marginal revenue of the products equals the marginal costs as shown in Figure 7.1.

The line CMR denotes the combined marginal revenue. It is obtained by summing  $MR_1$  and  $MR_2$  vertically. The CMR equals MC at point E. A horizontal line passing through point E determines the prices and quantities of the two commodities. It is assumed that the demand functions of different commodities are independent of one another. The profit-

maximising prices are  $OP_1$  and  $OP_2$  and the quantities are  $OQ_1$  and  $OQ_2$  of commodities 1 and 2 respectively. The prices in the case of more than two joint products can also be determined in the same manner.

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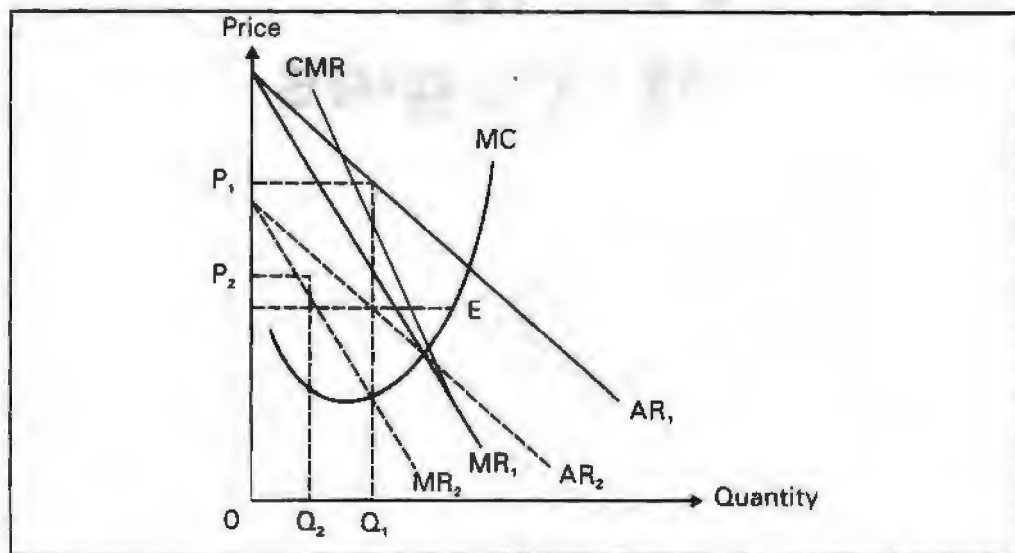


Figure 7.1: Pricing of Joint Products

## Price Discrimination

Price discrimination occurs when variation in prices for a product in different markets does not reflect variation in costs. It is designed to increase the total profit. Three conditions must be fulfilled before a firm successfully practises price discrimination.

1. The firm must have at least some control over price.
2. It must be possible to group different markets in terms of the price elasticity of demand in each.
3. The firm's markets must be separable, meaning that products cannot be purchased in one market and then resold in another.

## Monopoly and Price Discrimination

When a monopolist charges different prices from different consumers of the same product. Such a situation is described as a discriminating monopoly situation. For instance, barbers charge different rates from different clients. In the same way electricity department also charges different prices from industries and households.

## Types of Price Discrimination

Price discrimination is of three types mainly:

1. **Discrimination of First Degree:** It is said to exist when the monopolist or the monopoly firm charges a separate price for each separate unit of the commodity from the same consumers of the product. Consumers are charged according to their demand functions. The maximum price they are willing to pay for each unit rather than doing without it. There is no consumer surplus here according to Joan Robinson this type of price discrimination is known as perfect price discrimination.
2. **Second Degree Price Discrimination:** In this discrimination consumption of a good is divided into various blocks, a separate price is charged from each separate block but for each block a uniform price is charged. This type of pricing rule is adopted by public utility concerns like electricity, telephones, waterworks and gas supplies.

3. **Third Degree Discrimination:** This is the most commonly observed discrimination. In this discrimination consumers are divided into various groups. According to their price elasticities and different prices are charged from different consumer groups. The market for a good is split into submarkets with differential prices charged from sub-markets.

### **Conditions of Price Discrimination**

Price discrimination means to charge different prices from different consumers. But this is possible only when there prevail these conditions in the market.

1. There should be monopoly in the market.
2. Reasonable distance between different markets.

For price discrimination it is necessary for the monopolist that he can differentiate the markets from each other. It is possible only when the commodities can not be transferred from cheap market to costly market nor the buyers can go from cheap to costlier market.

3. Difference in Price Elasticity of Demand.

Price discrimination is possible only when the price elasticity of demand is different in different submarkets.

4. The expenditure on division and sub-division of markets should be minimum.
5. Recognition by law.
6. Commodity differentiation.
7. Behaviour of the consumers.

### **When the Price Discrimination is Beneficial**

Price discrimination is beneficial only when the price elasticity of demand is different in one market from other. If the price elasticity is equal in both the markets then the marginal revenue acquired from the commodity unit in both the markets will be same. So there will be no benefit to the monopolist. On the other hand if the price elasticity is different in two markets then the marginal revenue acquired from these two markets will be different and the monopolist will earn profit only when he sells commodity in the market where he get more marginal revenue.

### **Social Effects of Price Discrimination**

Price discrimination is both beneficial and harmful for society.

#### **Beneficial Effects of Price Discrimination**

1. **Beneficial for the Backward Section of the Society:** If the price of a commodity is decided low so that the backward section of the society can also consume it and the losses on account of it are compensated by charging high price from the rich people. In this way, price discrimination will be beneficial for the society.
2. **Public Services:** There are so many public services, which cannot be provided without price discrimination for instance – train services and electricity.
3. **Total Utilisation of the Factors of Production:** With the help of price discrimination producers can sell their products in the foreign market and the factors of production of a country can be utilised perfectly in this way.

#### **Harmful Effects of the Price Discrimination**

1. **Imperfect Utilisation of the Sources of Production:** In price discrimination, factors of production are not properly utilised because the monopolist tempts to produce luxury goods as price discrimination is easily possible in luxury goods. The necessary goods are produced less and the poor people will have to face problem.

2. **Low Production:** The price discrimination is also harmful when the monopolist produces less to maximise its profit and to charge high price. It leads to the explanation of consumers.

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**Dumping**

Dumping is a special type of price discrimination where the monopolist sells his production on price less than its cost in the foreign market. In this situation there are two markets for the monopolist.

1. Home market
2. Foreign market

He will be perfect monopolist in the home market but in the foreign market he has to face perfect competition. So in the home market he charges high price and in foreign market he charges less price.

**Motives of Dumping**

1. To destroy the competitors in the foreign market.
2. To get benefits of increasing returns.
3. To increase the demand of the commodity in the foreign market.
4. To dispose the extra storage of the commodity.
5. To acquire the benefit of difference in elasticities in demand.

**Pricing Methods in Practice:**

1. **Full cost pricing or Mark-up pricing:** It is also known as cost plus pricing, such that  $P = C + \pi$  where C stands for average cost and  $\pi$ , the normal rate of profit fixed as percentage of average costs. It is this fixed percentage (or absolute quantum) which is called mark-up. Lower the elasticity of demand, higher is likely to be the mark-up. The Children Toy Companies may fix 200% as mark-up because in a certain segment, the demand for those types are inelastic. Thus, if the average labour and material costs work out ₹ 100, then the toy is priced as ₹ 300 (= ₹ 100 + ₹ 300). As costs go up, so does the price. But the reverse may not always be true.
2. **Price minus costing:** This is a comparable strategy. This particularly holds for the tailor made products. In this case,  $C = P - p$  and the profits p may be fixed either as a percentage or an absolute amount. If the customer wants ₹ 400 for product, the producer may want 25% profit then he decides to spend only ₹ 300 on its labour and material cost, if he has a predetermined objective to make 25% profit. Thus

$$₹ 300 = ₹ 400 - ₹ 100$$

In this case, P is fixed as a per cent of price offered. In the preceding case, P is fixed as per cent of cost incurred.

3. **Incremental pricing or Direct cost pricing:** In this, the price of a product is based on incremented or direct costs of labour and materials, and not on average cost (full cost). In economic sense, in full cost pricing, both fixed and variable cost have to be covered; but here only variable costs are to be covered. The reader may recall, this is a relevant consideration in 'shut-down' decision. The price must cover the average variable costs.

$$P \geq AVC$$

If there is any surplus of P over AVC, then that becomes the contribution to cover fixed cost on the loss thereupon.

4. **Going rate pricing:** Some firms examine carefully the general pricing structure of the industry to which they belong and then fix their respective prices. Going rate pricing does not necessarily mean that the firm becomes a price-taker. By accepting the current market rate, the firm only tries to avoid some market risks.
5. **Pricing life cycle pricing:** Every product place in the market goes through various stages illustrated as below:

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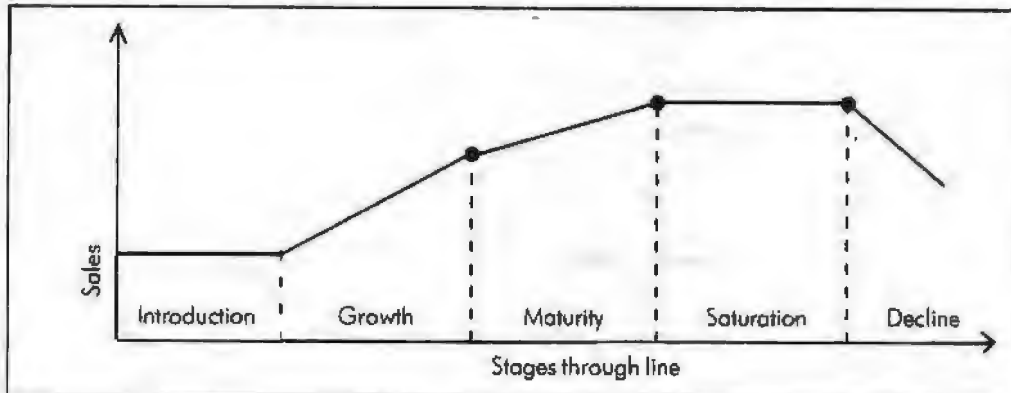


Figure 7.2

The objectives and methods of pricing differ, depending upon the life cycle of the product. 'New Product' may not be priced on same considerations as 'matured products'. When a product is first introduced with market for consumer's awareness and acceptance, some firms may decide to charge a very low penetration price or a very high skimming price or just a very moderate price compared to the 'going rate' of same or similar products. Similarly, at the saturation stage, the firm may think more of non-price competition than price competition. At the decline stage, some firms may think of discount sale at throw away price just to clear the stock. Pricing strategy differs depending upon the product and its stage of life cycle.

6. **Product line pricing:** In the context of marketing, a product mix includes at least one or usually several product lines. A product line is a group of products which perform generally similar functions, with similar physical features, classified according to size, quantity, customer's age and other problems etc. Obviously, pricing a children wear and pricing an adult outfit, the principles and considerations may be different. The seller has to consider not only (a) product-line pricing issues, but also (b) product line coverage. The latter is a part of product policy, but has its influence on pricing, such as pricing spare parts, pricing licenses and leases or pricing related goods.
7. **Price lining:** Within each product group, there may be varieties and qualitative differences. For example, the children wear shops may sell baby suits of same size in different design and quality, and price them accordingly. Many firm purchase in wholesale at one rate; and then price them differently and different rates in the retail market so as to maximise their average profits margin. In a way, this is a form of 'discriminatory pricing' or 'price discrimination'.
8. **Peak load pricing:** It is typical of price discrimination. It involves charging a higher price for consumers who require service during periods of peak demand and a lower price for those who consume during low or off-peak periods. Such pricing is often practised with regard to telephone tariff and allocation of computer timing. Such pricing can be used to reduce costs and increase profits when (a) same facilities are used to provide a product or service at different periods of time (b) the product or service is not storable and (c) demand characteristics vary from period to period.
9. **Transfer pricing:** This is sometimes referred as pricing of 'intermediate goods'. In modern economic systems, goods are produced, in stages, may be in different centres, before the 'final goods' roll out of the factory. Many times, each centre is required to

work as a profit centre. Thus the prices of intermediate goods have to be recovered while charging the price of final goods. In a way it is almost like costs plus pricing. If there is perfectly competitive external market for an intermediate goods, market forces will cause the price of the goods to approach marginal costs. In the absence of external market, profit maximisation requires that the price of each intermediate goods be set equal to its marginal costs.

10. **Cyclical pricing:** The concept of 'trade cycle' suggests that business is subject to fluctuations. There are phases of business (trade) cycles; as illustrated below:

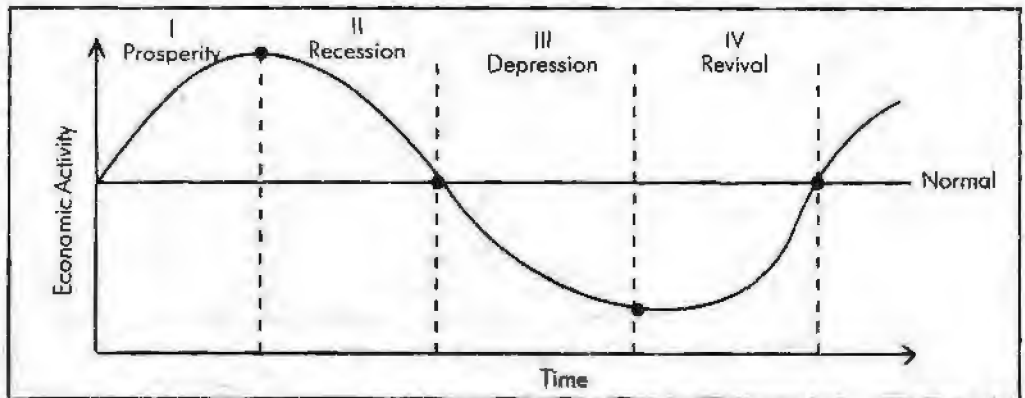


Figure 7.3

Depending upon the phase of a business cycle the pricing strategy has to be designed. If the economy is caught up in recession, then recession pricing strategy may include heavy price discount, trade discount, reduced distribution margin, gift coupons or schemes, buy back scheme etc., – all of these will have direct or indirect bearing on price (in both real terms and money terms). In the same way, prosperity phase pricing strategy may be different from the depression pricing of shares.

11. **Pricing of public goods and services:** Public enterprises and suppliers of public goods and services including utilities like electricity follow several principles while pricing. In some cases, the government follows administered pricing policy in setting procurement price, levy price, release price / issue price of grains. In some case, the government follows no-profit no-loss pricing i.e., average cost pricing. In some cases, there is the practice of marginal cost pricing, comparable to direct cost pricing. Very often, the government enforces subsidised prices so that the public get the benefit of low prices due to subsidy.

### Government's Control on Pricing

The government has from time to time introduced price control for certain commodities. Two categories of commodities have been brought under price control. Necessities of various kinds such as edible oils, drugs and textiles fall into the first category. The second category consists of certain basic goods such as cement and steel which are intermediate inputs in the production of other commodities. The Tariff Commission of India and the Bureau of Industrial Costs and Price (BICP) have been involved in determining fair prices for commodities under price control.

This approach to price fixation has led to a great deal of controversy in India. Questions have been raised as to what constitutes a reasonable rate of return. The argument is that the rates of return assumed by the Tariff Commission and similar price fixing agencies fall below what investors would consider reasonable. As a result, it is claimed that resources may not flow into industries under price control, thereby impairing the long run interests of consumers. If excess demand conditions exist, contradiction of supply of the goods in question will have an adverse effect on consumer interests. Price control calls for a careful balancing of the interests of consumers and producers, which is an inherently difficult task to perform.

**Case: Dingle Dairies Inc.**

Dingle Dairies Inc. are producers of ice cream, having

Fixed production costs = ₹ 24000

Variable production costs = ₹ 4 per dozen

On the basis of market survey, it was thought that the distribution, selling and administrative expenses would be 10 per cent of the total production costs. Initially, in May 1970, the company decided to produce 10,000 dozen ice cream. The company employed Mr V K Jain, the management consultant to work out and suggest a remunerative price for their product, ice cream. On enquiry, Mr Jain found that the Dingle Dairies Inc. would like to have a target rate of profit: 10 per cent of the total costs; and the relevant cost data were also supplied to Mr Jain.

Mr Jain used the costs plus pricing method and recommended a selling price of 7.74 per dozen. At this price, the turnover increased rapidly; the company estimated a sales forecast of 12,000 dozen for the next year (May, 1971). On having been supplied this forecast alongwith a request that he should follow the same pricing method. Mr Jain recommended a selling price of ₹ 7.26 per dozen of ice cream. Mr Jain suggested this rate with a note.

"I understand that your (company's) cost situation has not changed and that you still would attempt to make a target rate of profit, i.e., 10 per cent of total cost." The company checked with its cost department and management; and found that both assumptions of Mr Jain were absolutely correct. Accordingly, the company accepted Mr Jain's suggested price. In the following year, a superior brand of ice cream, at a slightly lower price, was found to make preparation for market penetration through various devices of advertisement. The Dingle Dairies Inc. quickly made a sales forecast of 8,000 dozen for May 1972. Given no change in either the cost situation or the profit objective, the company was advised by Mr Jain to set a price of ₹ 8.47 per dozen of ice cream, in view of the new projected sales. Mr Jain assured that he had not changed his earlier pricing principle in recommending the new price.

This time, the management of Dingle Dairies Inc. got little perplexed. When the sales turnover was expected to drop from 12,000 from to 8,000 dozen. Mr Jain asked the management to raise price further (from ₹ 7.26 to ₹ 8.47 per dozen) and earlier when the sales turnover was expected to increase from 10,000 dozen to 12,000 dozen, Mr Jain had advised the management to reduce price (from ₹ 7.74 to ₹ 7.26 per dozen). This looked absurd: Reduce price when you are taking business away from others and increase price when you are loosing business to others!

On reading this trend and tendency, the management got very much upset and, therefore, wanted an explanation from their consultant, Mr Jain. The sum and substance of Mr Jain's explanation was: "This is what costs-plus-pricing or profit-pricing means. It ignores demand and fails to reflect competition, that is why my recommendations appear fallacious, but I have been true to the principle you wanted me to follow."

**Questions**

1. What is meant by 'costs-plus-pricing'?
2. Do you accept Mr Jain's final observation that costs-plus-pricing ignores demand and fails to reflect competition?
3. Make necessary calculations to detect if or not the prices recommended by Mr Jain were right (i.e., true to the principle).

Contd...

Notes



4. Can you recommend an alternative principle or an approach which, when carried through in terms of its implications, will not result in the so-called "fallacious recommendations" (in italics in the above case)?

Source: MBA, D.U. 1986

### Student Activity

We can apply the equi-marginal principle in the context of multi-product pricing. True or False? Explain.

### Summary

If a firm is a price taker, there it has to design strategy to sell quantity. Knowing fully well that neither product nor promotion is relevant competitive consideration.

In modern time firms produce a variety of products rather than a single product. This requires that we expand our simple pricing rule and consider demand and product interdependencies. Normally in the case of a firm which is producing multiple commodities, the demands for its various products are separable but the costs are not quite divisible, product-wise.

Price discrimination occurs when variation in prices for a product in different markets does not reflect variation in costs. It is designed to increase the total profit.

When a monopolist charges different prices from different consumers of the same product. Such a situation is described as a discriminating monopoly situation. For instance, barbers charge different rates from different clients. In the same way electricity department also charges different prices from industries and households.

Price discrimination is both beneficial and harmful for society.

If the price of a commodity is decided low so that the backward section of the society can also consume it and the losses on account of it are compensated by charging high price from the rich people. In this way, price discrimination will be beneficial for the society.

The price discrimination is also harmful when the monopolist produces less to maximise its profit and to charge high price. It leads to the explanation of consumers.

Dumping is a special type of price discrimination where the monopolist sells his production on price less than its cost in the foreign market. In this situation these are two markets for the monopolist. 1. Home market and 2. Foreign market

### Keywords

**Price discrimination :** Price discrimination occurs when variation in prices for a product in different markets does not reflect variation in costs.

**Discrimination of First Degree:** It is said to exist when the monopolist or the monopoly firm charges a separate price for each separate unit of the commodity from the same consumers of the product.

**Second Degree Price Discrimination:** In this discrimination consumption of a good is divided into various blocks, a separate price is charged from each separate block but for each block a uniform price is charged.

**Third Degree Discrimination:** This is the most commonly observed discrimination. In this discrimination consumers are divided into various groups. According to their price elasticities and different prices are charged from different consumer groups.

**Dumping :** Dumping is a special type of price discrimination where the monopolist sells his production on price less than its cost in the foreign market.

## Review Questions

1. State and explain the factors which you would normally consider while pricing a new product.
2. Explain the principles involved for the success of price discrimination. Do you think that price discrimination is anti-social?
3. A seller sells his commodity in two markets I and II and their demand schedules are as follows:

Market I		Market II	
$P_r$	$D_x$	$P_r$	$D_x$
10	80	12	120
8	120	10	160
6	180	8	220
4	200	6	280

The seller wants to maximise profits by selling just 280 units. What prices will he set in the two markets?

4. Given two isolated markets supplied by a single monopolist, the two corresponding demand functions being

$$P_1 = 12 - Q_1 \text{ and } P_2 = 20 - 3Q_2$$

Suppose the total cost function for the monopolist is

$$C = 3 + 2(Q_1 - Q_2)$$

What will prices, sales and marginal revenues be in the two markets, under regime of price discrimination and what profit will the monopolist earn?

5. Explain discriminatory pricing under monopoly. Is price discrimination economically justifiable?
6. What conditions must be present for price discrimination to be possible under monopoly? Under what circumstances might price discrimination be possible, but not profitable?

## Further Readings

Karam Pal and Surrender Kumar, *Managerial Economics*, Excel Books

Samuelson, Stephen G. Marks, William *Managerial Economics* (Hardcover – Dec 29, 2008)

Christopher R. Thomas and S. Charles Maurice, *Managerial Economics* (Hardcover – Mar 7, 2007)

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# Unit 8 Investment Decisions

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## Unit Structure

- Introduction
- Meaning of Investment
- Investment Alternatives available for a Household
- Desirable Attributes of Investments
- Meaning and Significance of Capital Budgeting
- Techniques or Methods of Investment Evaluation
- Summary
- Keywords
- Review Questions
- Further Readings

## Learning Objectives

At the conclusion of this unit, you should be able to:

- Explain the meaning and significance of capital budgeting
- describe the techniques or methods of investment evaluation

## Introduction

The endurance of a business in the competitive market involves a lot of monetary and non-monetary effort. One of the major strategies would be investing in new opportunities with changing time. Generation of capital from own resources or borrowing helps in investing in the long run. However, often the capital may be scarce and this calls for its allocation in such a manner that maximum return is obtained from the capital invested. Capital being expensive, the basic objective of the investor is to make the most of the net return, i.e., revenue minus costs. Capital would then be invested in only those products where the excess of revenue over (capital) expenditure or investment is the maximum over the period of that investment, i.e., the life of the plant. This process can indeed be applied to various other areas including service industry. In setting up a management consultancy firm, for example, investment will be made in acquiring professionals. In most cases, they are very expensive.

## Meaning of Investment

An investment is the purchase of an asset in the expectation of receiving a return. Purchase of goods is called *real investment*, e.g. machines, building, etc. Purchase of financial assets like shares, bonds, etc. is called *financial investment*. Purchasers of real investment participate directly in production process. Purchasers of financial assets provide funds and participate indirectly in production. Most households participate through providing funds by saving a part of their income. Explained below are the alternatives available for making financial investment.

## Investment Alternatives available for a Household

The main alternatives are:

### 1. *Bank deposits:* Types: Savings a/c and Fixed deposits

(a) *Savings Account:* Offers three advantages:

- i. Pays interest.
- ii. Allows easy access.
- iii. Offer security (insured upto ` 1 lakh)

(b) *Fixed deposits:* a deposit for preset length of time.

*Advantage:* Higher return than on saving bank a/c.

*Disadvantage:* Penalty if withdrawn before maturity. Less liquidity.

### 2. *Housing:* Riskier than putting money into bank deposits.

*Advantage*

- i. *Tax deductible:* taxes on houses, interest on house finance, etc. get exemption from income tax.
- ii. *Capital gains can escape taxation:* Capital gain is the gain from selling a house. If a person invests the capital gain in certain specified schemes, he gets exemption from paying capital gain tax. For example, in India, if the capital gain is invested in deposits with NABARD it gets exemption from capital gain tax.

*Disadvantage*

- i. *Fairly illiquid:* Selling a house is time consuming. If one tries to sell house quickly one receives less than if you had 2-3 months or more to sell it.
- ii. *Costs of selling are substantial:* Likes broker's commission, transfer taxes, registration charges, etc.

### 3. *Bonds:* Issuing bonds is one way of borrowing by corporations, i.e. joint stock companies. It is for a specified number of years and carries a fixed rate of interest. The period for which the bond is issued is called the *maturity* period. Bonds that mature within a few years are called *short-term bonds*. Those that mature in more than 10 years are called *long-term bonds*.

*Risks involved:* Bonds carry the risk of losing money partly or wholly. These are because of:

- i. *Fluctuating market value:* The market value of bond depends on the current market rate of interest. There is inverse relation between the change in the R/I and change in the market value of bond. By 'market value' we mean the price at which the bond is currently salable in the market. If the rate of interest rises, price of bond falls. If the R/I falls, market price of bond rises.

For example, a corporation issues bonds each of ₹ 1000 and carrying interest rate of 10%. It means the bond carries an interest income of ₹ 100 on each bond each year. Now suppose R/I falls to 5%. Note that the R/I on bond is predetermined for the whole period and remains 10%. Only the current market R/I falls to 5%. It means that if a person makes a fresh investment today in new bonds he earns only ₹ 50 per year. If he buys the old bond for ₹ 2000 he also earns 5% or ₹ 100 per year. This raises the price of old bonds.

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The market price of bond equals the present discounted value. 3 year bond that pays 10% each year has a value of:

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$$\text{Present discounted value} = \frac{110}{1+r} + \frac{110}{(1+r)^2} + \frac{110}{(1+r)^3}$$

where r is the current market R/I. From the equation it is clear that higher the r lower the discounted value.

- ii. **Uncertain real value at the end of maturity:** We know that as the general price level rises, the real value of money falls. The borrower pays back the principle at the time of maturity. If general price level is higher at the time of maturity, the real value of principle amount falls. It means the borrowers get back less in real terms. This is a loss to the borrowers.

For example, if prices rise at 7%, with compounding the price level in 10 years is  $(1.07)^{10}$  times the level today,  $(1.07)^{10}$  approximately equals 2. It means prices have doubled. This reduces the real value of the principle to half. It means that borrower can buy only half the quantity of goods and services after 10 years as compared to the current year.

- iii. **Chance of borrower getting bankrupt:** Longer the maturity period higher the risk. The risk is of not getting back the principle. The risk is virtually nil in case of government bonds but varies from one private corporation to another. The risk is less with sound corporations like Reliance Industries, the firms controlled by Tata, Birlas, etc.

Generally, higher the risk of default higher is the R/I as compensation for risk. Similarly, higher the period of bond, more the risk of default and other risks.

Therefore, long-term bonds compensate investors by paying higher returns, on average, than comparable short-term bonds.

- 4. **Shares or Stocks:** Investors invest in stocks for two reasons: (a) get dividend, i.e. share in profit and (b) shares may appreciate in value. Such an appreciation is called '*capital gain*'.

*Risks involved:* Investment in shares is risky because of:

- i. Earnings of firms vary greatly.
- ii. Possibility of *capital loss* as share prices may fall due to loss of faith in company and other economic happenings, political developments, etc in the country.
- iii. Shares are riskier than bonds: If the share issuing firm goes bankrupt bondholders have first legal claim on assets of the firm. Shareholders' claim comes next.

- 5. **Mutual funds:** "Mutual fund" is the name given to an institution which gathers funds from many different investors. These funds are then invested in shares, bonds, and other financial assets purchasable from the stock market or directly from the issuing firms. The income earned from these assets is distributed among the investors after deducting operating expenses. Mutual funds are also called "*unit trusts*".

Mutual funds, or the schemes launched by these, are broadly of two types: money market MFs and growth MFs. The *money market MFs* invest funds in fixed income earning assets like bonds, treasury bills, etc. *Growth MFs* invest in risky ventures, like in shares. Money market funds are less risky and carry low rate of return. Growth MFs are highly risky and carry high rate of return. If the things go wrong, there may be negative returns.

The money market MFs have two *advantages*. First, the return is higher as compared to return on bank deposits, and still able to maintain liquidity. The investors are

allowed to withdraw their money whenever they like, and without attracting any penalty. This is the *second* advantage. This provides easy access to their funds. In many countries, funds invested in MFs can be withdrawn by writing cheques. The second advantage is also available to growth MFs.

The *major disadvantage* of MFs is that they are not insured like bank deposits. The bank deposits are insured upto ₹ one lakh in India. However, most money market MFs play safe by investing their funds in large number of companies. By doing this, they take advantage of *diversification*.

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## Desirable Attributes of Investments

The term "attributes" means ideal characteristics. An ideal investment is one which has the following attributes.

1. **High rate of return:** Return on an asset has *two components*; (i) current income on the assets like dividend, interest, etc. (ii) capital gain, the difference between the sale price and the purchase price of an asset. For example, a share purchased for ₹ 100 and sold for ₹ 120 after some period, ₹ 20 is the capital gain.

The actual return on an asset will be known only when the asset is actually sold by the owner of the asset. Therefore, assets are purchased on the basis of *expected return*. Expected return is the probable return that combines the various possible returns per rupee of investment with the chances that each of these various possibilities will occur. Suppose, the probabilities of return on an asset are:

Probability	Return	Expected return %
25%	20%	$.25 \times 20\% = 5.0$
50%	5%	$.50 \times 5\% = 2.5$
25%	0%	$.25 \times 0\% = 0.0$
		Total = 7.5

The expected return is calculated by multiplying probability with the return. The investor makes choice of investment by comparing expected returns.

2. **Low risk:** Most of the investors are "risk-averse", i.e. avoid risks. Different assets have different degrees of risks. Bank deposits are *less risky*. Investment in shares, bonds and housing are *more risky*. Therefore, they carry a lower return. Fluctuations in stock market make investment in shares *more risky*. Therefore, they carry higher return.

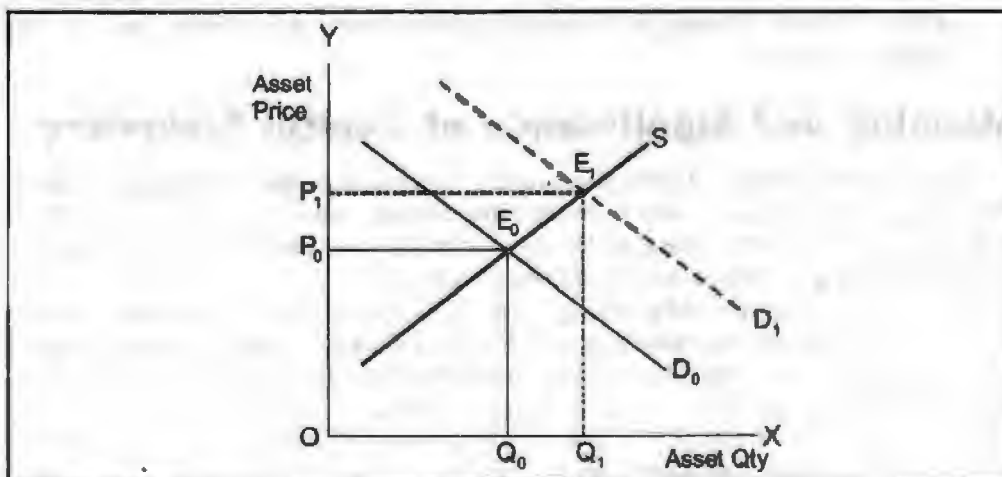


Figure 8.1: Demand Curve (Right Shift)

Lower the risk, higher the demand and higher the market price of an asset. Higher the market price lower the return. A reduction in the riskiness of an asset raises its

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market price and lowers the return. Graphically (Figure 8.1), reduction in riskness shifts demand curve of the asset to the right, and raises the price from  $P_0$  to  $P_1$ .

Lesser the risk more desirable the asset. Desirable assets sell at a *premium* while risky assets sell at *discount*.

3. **Tax exemptions:** Dividend, rent, capital gain, etc. are incomes, and therefore, taxable. Investments that face relatively low tax rates are said to be *tax-favoured*. For example, long-term capital gain on shares in India is completely exempt from income tax. Similarly, interest income on Public Provident Fund (PPF) is completely exempt from income tax.

Demand for assets with tax advantage is high. If this advantage is reduced or withdrawn, the demand curve (Figure 8.2) shifts downwards which leads to reduction in price of the asset. For example, the Finance Minister of India, in his budget 2005-06 has withdrawn exemption of interest income (upto ₹ 12000) on investments in bank deposits, post office schemes, Government of India bonds, life insurance, etc. It has made investment in these assets less attractive.

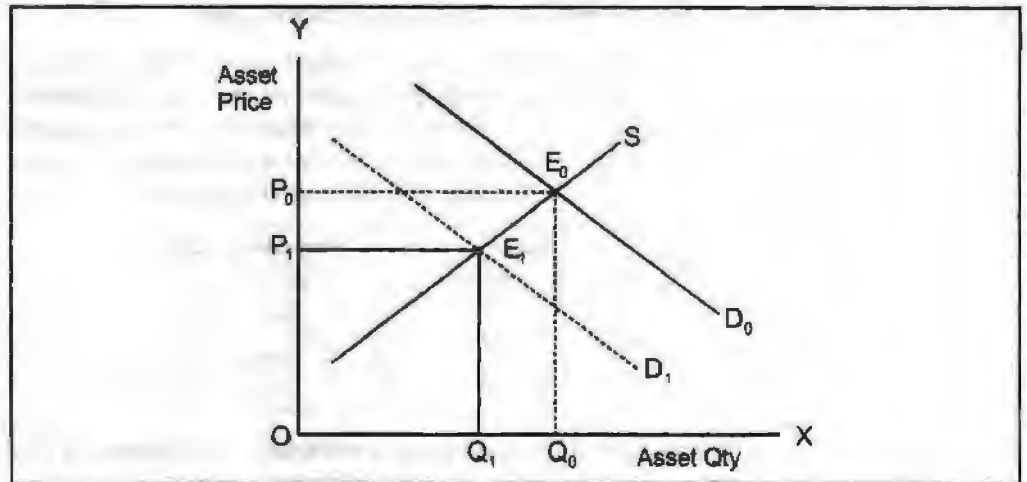


Figure 8.2: Demand Curve (Left Shift)

4. **High liquidity:** Liquidity means the ease with which an investment can be turned into cash. An asset is liquid if the costs of selling it are very low. A bank account is 100% liquid because you can turn it into cash at virtually no charge by writing a cheque. Shares, bonds, are fairly liquid because they can be sold in the stock market with small cost. Housing is quite less liquid because it takes time to sell and has high cost of selling.

### Meaning and Significance of Capital Budgeting

Capital budgeting is related with planning and control of capital expenditure. Capital expenditure is given as one which involves the current outlay of cash in return for an anticipated flow of future benefits, these benefits being available in the long run. So, capital budgeting decisions may be explained as the decision of the firm to invest its current finances most efficiently in long-term productive activities, with expectations of flow of future benefits over a long period. It may also be explained in terms of capital projects which are expected to generate returns for more than one year. In this source, capital budgeting refers to the process of planning capital projects, raising funds and efficiently allocating resources to those capital projects. Examples of capital projects include new factories, machines, automobiles and trucks and computers. Outlays for research and development and advertising programmes are also capital expenditures if the returns on those projects will flow for more than one year.

Capital budgeting covers issues like decisions regarding the amount of money for capital investment, the source of financing this investment and the allocation of the investment between different projects and over time.

Capital budgeting is used not only to plan for the replacement of worn-out capital and equipment for the expansion of production facilities or for entering new product lines but also in planning major advertising campaigns, employee training programmes, research and development, decisions to purchase or rent production facilities or equipment and any other investment project that would result in costs and revenues over a number of years. In general, firms classify investment projects into the following categories:

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- a. **Replacement:** Investments to replace equipment that is worn out in the production process.
- b. **Cost reduction:** Investments to replace working but absolute equipment with new and more efficient equipment, expenditures for training programmes aimed at reducing labour costs and expenditures to move production facilities to areas where labour and other inputs are cheaper.
- c. **Output expansion of traditional products and markets:** Investment to expand production facilities in response to increased demand for the firm's traditional products in traditional or existing markets.
- d. **Expansion into new products and/or markets:** Investment to develop, produce, and sell new products and/or enter new markets.
- e. **Government regulation:** Investment made to comply with government regulations. These include investment projects required to meet government health and safety regulations, pollution control and to satisfy other legal requirements.

**Why capital budgeting decisions are among the most important for both the owners as well as managers of a firm?**

There are at least five reasons for explaining this, which are discussed hereunder:

1. Since capital budgeting involves long-term commitment of funds, these investments take the form of sink costs. These decisions cannot, therefore, be reversed without significant loss of capital. The long-term implications of a capital budgeting decision, thus, make it quite important.
2. The amount of finances involved in an investment proposal of capital budgeting nature are quite large, its impact on profitability of the firm is also quite significant.
3. The effect of a capital budgeting decision extends beyond the current accounting period. Consequently, its impact on the firm's profitability cannot be immediately and easily ascertained.
4. Capital budgeting decisions are quite vital for the reputation of the management. Once capital expenditure is undertaken the capital base on which the profit has to be earned also expands. The managerial team is then required to earn an expected return on total capital employed, which is the yardstick of its achievement.
5. Capital budgeting decisions involving long-term investments, are subject to uncertainties attached to it. Sound judgement, scientific analysis and product forecasting help in reducing these uncertainties and, thereby, improving profitability.

## Techniques or Methods of Investment Evaluation

The essence of capital investment analysis is in comparing the benefits that accrue over a period of time with the amount invested. This comparison is made with a view to judging whether or not the benefits are at least as high as the amount invested. There are several methods available for making such comparisons.



The five commonly used methods for economic evaluation of an investment are:

1. The payback period method
2. The average return on investment
3. The net present value method
4. The internal rate of return method
5. Profitability index criterion

Let us explain the above methods in more detail:

### **Payback Period Method**

This method which is also called payout or pay off period method, is the most simple criterion commonly used in capital budgeting for evaluating investment proposals.

The payback period method calculates the period of time required to return the original investment. It enables the firm to know how quickly it can recover its invested funds from the gross earnings of the new capital asset, estimated without deducting depreciation on the new asset or what is called capital wastage.

The payback period, thus, is the ratio of the initial investment to annual net cash inflows (which comprise profit after tax plus depreciation).

That is,

$$P = \frac{I}{C} = x \text{ years.}$$

Where P is the payback period, I is the initial investment and C is the yearly net cash inflows. The above formula can be used if the cash flows are the same every year; in case they vary from year to year then we simply add the net cash flows of each year till the year when its cumulative total equals the initial cost.

### **Advantages**

1. **Simple method:** This method is the most simple to compute and without any complication. It is more realistic and safe than other methods.
2. **Liquidity:** This method offers information about liquidity. The method ignores the most distant cash inflows. This method is particularly useful in situations with a high degree of uncertainty about cash benefits to be received for a number of years.
3. **Appropriate for assets with same economic life:** Where different alternative projects of capital investment have almost the same economic life and profile of benefits, then this method seems to be appropriate.
4. **Screen against risky projects:** The payback period criterion acts as a screen against risky projects. It helps in selecting less risky projects at the cost of those having longer gestation periods and longer revenue stream.
5. **Complications in estimation avoided:** In this method gross earnings are taken into consideration, complication in estimating capital wastage over the time period are avoided, service gross earnings are inclusive of capital wastage.

### **Limitations**

1. Profitability is not considered.
2. Cash flow variation is ignored.
3. Time value of money is ignored.

4. There is under emphasis on liquidity.
5. Other objectives are ignored.

### Average Rate of Return on Investment

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The Average Return on Investment (ARI) is defined as the ratio of the net average annual income from the project to the initial investment. The net income is defined as the difference between the net cash inflows generated by the project and the cash outflows resulting from the initial investment. The net average annual income is defined as the income divided by the life of the project measured in years.

In computing the average return on investment, the initial investment is deducted from the gross total income over the life of the project. This net income is then divided by the number of years of the life of the project to obtain the average income per year. The average annual income divided by the initial investment gives the return.

Symbolically,

$$\text{ROI or ARR} = \frac{\left[ \sum_{t=1}^n R_t \right]}{\frac{n}{C_0}}$$

Where  $R_t$  signifies the contribution to overhead and profits in each future period;  $t$  refers to time period (from year 1 to year  $n$ );  $n$  is the number of years, i.e., the life time of the project and  $C_0$  is the initial cost of the project.

### Advantages

1. This technique is easily understandable and computable.
2. This measure, unlike the payback period, takes into account all the benefits generated during the life of the project.
3. Given the date of the initial investment and returns over the life time of the project, with the help of the ARI method it is possible to calculate a number which could represent the benefits resulting from the investment.

### Limitations

1. Like the payback period method this method, does not distinguish between cash inflows received at different points of time.
2. It also does not discriminate between projects that have the same net average income but which differ in the timings of cash inflows.
3. This method is inadequate for comparing projects of different duration. This may mean that a project with greater aggregate returns is given a reduced ranking.

### Net Present Value (NPV) Method

This method is based on the economic reasoning of discounting future cash flows to make them comparable. If we represent the discount rate by 'r' we can say that a rupee received

at the end of the  $n$ th year is equivalent to  $\frac{1}{(1+r)^n}$  now.

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In other words, the present value of a rupee received at the end of the  $n$ th year is  $\frac{1}{(1+r)^n}$ ;

the factor  $\frac{1}{(1+r)^n}$  being called the discount factor. According to NPV criterion, investment on the project is profitable if the present value of the sum of cash inflows over the life of the project is greater than the present value of its cash outflows.

The discounted present value method of investment appraisal involves two concepts: gross present value and net present value.

$$\begin{aligned} \text{Gross Present Value (GPV)} &= \frac{A_1}{(1+r)} + \frac{A_2}{(1+r)^2} + \dots + \frac{A_n}{(1+r)^n} \\ &= \sum_{i=1}^n \frac{A_i}{(1+r)^i} \end{aligned}$$

where  $A_1, A_2, A_3, \dots, A_n$  show stream of receipts

$r$  is discount rate of the opportunity cost of capital; and

$t$  is  $(1, 2, \dots, i, \dots, n)$  is the notation for different time periods.

Once all future receipts have been discounted to their present value, we may find the net present value (NPV) to know whether the project is worth taking up or not.

$$\text{NPV} = \text{GPV} - C_0$$

$$= \sum_{i=1}^n \frac{A_i}{(1+r)^i} - C_0$$

Where  $C_0$  is initial cost of the project.

Thus, net present value refers to the sum of the discounted value of the future stream of costs and receipts associated with a particular project. If the  $\text{NPV} > 0$ , the proposal passes the test. This means that if the return on the new product line exceeds the firm's cost of capital, if the investment should be made because it will increase the value of the firm. A positive net present value implies that the investment is profitable at the rate specified while a negative net present value will mean that the investment is not profitable.

### Internal Rate of Return (IRR) Criterion

This is another method of evaluation of projects based on discounted cash flow technique. It considers the time factor and therefore takes into account the opportunity cost of investment (say equal to current rate of interest). The IRR is the same as the MEI (marginal efficiency of capital) concept of Keynes in his *General Theory of Employment, Interest and Money*.

The internal rate of return is the rate of discount which equates the present value of the income stream over the life of the machine with the present value of the net cash investment. In other words, the net cash benefits are discounted at that rate of discount which reduces the NPV to zero. We may state it in the following equation

$$C_0 = \sum_{i=1}^n \frac{A_i}{(1+r)^i}$$

Where  $C_0$  is the current net investment;  $A_t$  is the income stream of the project over different years ( $t = 1, \dots, m$ );  $t$  = time period;  $r$  = interest rate of return.

If investments are spread over a number of years or are accompanied by additional annual expenditure, then the equation may be written as under:

The sum of discounted value cost of investment = the sum of the discounted value of gross earning.

$$\sum_{i=1}^n \left[ \frac{C_i}{(1+r)^i} \right] = \left[ \sum_{i=1}^n \frac{A_i}{(1+r)^i} \right]$$

Where  $C_i$  represents investment spread over a number of years and  $r$  the rate of discount to find out the present value of the sum of annual cash flows and costs of investment.

If the internal rate of rate of return is greater than the opportunity rate of interest then the project is accepted.

If the internal rate of return is less than the opportunity cost of investing available funds elsewhere, then the project is rejected.

### Profitability Index Criterion

It is a variant of NPV method. It is the ratio of present value of the stream of net cash flows of a project over its life span to the initial cost of the project. That is,

$$\text{Benefit-Cost Ratio (BCR)} = \frac{\text{The sum of discounted cash benefits over the life of machine}}{\text{Cash investment}}$$

While Net Benefit-Cost Ratio (NBCR) = BCR-1

As is obvious, this method highlights the benefits per rupee spent as investment. That is why it has also acquired the nomenclature of benefit-cost ratio method or "present value per rupee outlay" method.

If the value of NBCR is greater than zero, project is accepted.

If the value of NBCR is less than zero, project is rejected.

The value of NBCR > 0 implies that the project will add more to present value of receipts than it will to the cost of investment.

### Case: Coke Bottles Losses in India with a \$400 Million Asset

That Coke was taking a hit in India was known, but to what extent wasn't. Now it is and it's stunning. Coca-Cola Co's chief financial officer, Gary Payard told analysts in New York on Tuesday that the company was writing off \$400 million of its assets in India in the first quarter of 2000. In other words, virtually half the investment made by the beverages giant in India has turned to ashes.

This huge dent in its Indian assets, the company clarified, didn't in any way alter Coca-Cola's commitment to India. "We remain just as committed," said a company spokesman here, while declining to comment any further. He wouldn't be drawn into a discussion on the implications of the write off on Coke's future plans here or on whether this would lead to changes in the management structure.

The cat was out of the bag on January 26. When Coke filed its 1999 fourth quarter results with the US Securities & Exchange Commission on that day, it had admitted to a 21 per cent dent in its bottom line and a \$45 million loss in that quarter.

It had admitted to more: "The reason for this is the company's investments in Japan and India." It had also said that it would carry out a comprehensive re-evaluation of its assets in India:

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The job, therefore, was cut out for its new worldwide boss. Douglas Daft and his new Indian lieutenant Alex von Behr. And it was obvious that it wouldn't be a pleasant one. The magnitude of the writing down of its assets makes it appear that the Coke brass has chosen to make a clean breast of the Indian mess and restart it with a clean slate.

But why had the mess piled up in the first place. While Coke India itself is not communicative about it, piecing together available information makes it appear that the large losses were mainly due to three reasons – the huge expenses Coke incurred in buying out bottlers, its lavish market discounting schemes and its expensive advertising campaigns.

Coke is estimated to have paid off its bottlers about ₹ 1,500 crores for a smooth acquisition process, which apart from giving the company an integrating bottling network, hasn't really given commensurate returns. On top of that, there have been high discounting scheme expenses as well as the expenses to acquire key accounts (restaurants, five-star hotels, movie theatres) as well as costly ad campaigns (it's said that it has signed on current Bollywood sensation Hrithik Roshan for more than ₹ 5 crore).

The runaway expenses in India is said to have been worrying Atalanta for a while.

Coke's former boss, Doug Ivestor, had come to India in August 1999 to see things for himself. Prior to that, an audit team from the headquarters had visited the local HQ in Gurgaon and said to have found the expenses high indeed. Thereafter, there has been a change in local management structure and cost control measures were initiated.

Now, the impact of the write off could be two fold. One: Coca-Cola India now gets to start afresh. And two: the big brother in Atalanta is likely to keep a close eye on future expenses which might reduce the operating freedom of the local management.

**Questions**

1. Analyse the case. Comment on the nature of 'economic problem' and 'choice of strategy'.
2. Analyse the market environment of Coca-Cola in India to-day. Comment on the observation, "AD war is a mad war; it is just a zero-sum game at the end."

Source: The Economic Times, April 5, 2000

**Student Activity**

The Fiasio Co. has got up to ₹ 20,000 to invest. The following proposals are under consideration:

Project	Initial Outlay (Rs)	Annual Cash Flow (Rs)	Life (years)
A	10,000	2,500	5
B	8,000	2,600	7
C	4,000	1,000	15
D	10,000	2,400	20
E	5,000	1,125	15
F	6,000	2,400	6
G	2,000	1,000	2

- a. Rank these projects under the payback method.
- b. Rank these projects under net present value method.
- c. Are there striking contrasts between (A) and (B)?

## Summary

Capital being expensive, the basic objective of the investor is to make the most of the net return, i.e., revenue minus costs. Capital would then be invested in only those products where the excess of revenue over (capital) expenditure or investment is the maximum over the period of that investment, i.e., the life of the plant. This process can indeed be applied to various other areas including service industry.

An investment is the purchase of an asset in the expectation of receiving a return. Purchase of goods is called real investment, e.g. machines, building, etc. Purchase of financial assets like shares, bonds, etc. is called financial investment. Purchasers of real investment participate directly in production process. Purchasers of financial assets provide funds and participate indirectly in production. Most households participate through providing funds by saving a part of their income. Explained below are the alternatives available for making financial investment.

Issuing bonds is one way of borrowing by corporations, i.e. joint stock companies. It is for a specified number of years and carries a fixed rate of interest. The period for which the bond is issued is called the maturity period. Bonds that mature within a few years are called short-term bonds. Those that mature in more than 10 years are called long-term bonds.

The market value of bond depends on the current market rate of interest. There is inverse relation between the change in the R/I and change in the market value of bond. By 'market value' we mean the price at which the bond is currently salable in the market. If the rate of interest rises, price of bond falls. If the R/I falls, market price of bond rises.

Mutual fund is the name given to an institution which gathers funds from many different investors. These funds are then invested in shares, bonds, and other financial assets purchasable from the stock market or directly from the issuing firms. The income earned from these assets is distributed among the investors after deducting operating expenses. Mutual funds are also called "unit trusts".

Capital budgeting is related with planning and control of capital expenditure. Capital expenditure is given as one which involves the current outlay of cash in return for an anticipated flow of future benefits, these benefits being available in the long run. So, capital budgeting decisions may be explained as the decision of the firm to invest its current finances most efficiently in long-term productive activities, with expectations of flow of future benefits over a long period.

The five commonly used methods for economic evaluation of an investment are: 1. The payback period method, 2. The average return on investment, 3. The net present value method, 4. The internal rate of return method and 5. Profitability index criterion.

## Keywords

**Investment:** An investment is the purchase of an asset in the expectation of receiving a return.

**Real investment:** Purchase of goods is called real investment, e.g. machines, building, etc.

**Financial investment:** Purchase of financial assets like shares, bonds, etc. is called financial investment.

**Issuing bonds:** Issuing bonds is one way of borrowing by corporations, i.e. joint stock companies. It is for a specified number of years and carries a fixed rate of interest.

**Maturity period:** The period for which the bond is issued is called the *maturity period*.

**Short-term bonds:** Bonds that mature within a few years are called short-term bonds

**Long-term bonds:** Those that mature in more than 10 years are called long-term bonds.

Notes

Notes

**Mutual fund:** Mutual fund is the name given to an institution which gathers funds from many different investors.

**The payback period:** The payback period, is the ratio of the initial investment to annual net cash inflows (which comprise profit after tax plus depreciation).

**Average return on investment (ARI):** The average return on investment (ARI) is defined as the ratio of the net average annual income from the project to the initial investment.

**Net Income:** The net income is defined as the difference between the net cash inflows generated by the project and the cash outflows resulting from the initial investment.

**Net average annual income:** The net average annual income is defined as the income divided by the life of the project measured in years.

**Net Present Value (NPV) Method:** This method is based on the economic reasoning of discounting future cash flows to make them comparable.

**Internal Rate of Return (IRR):** This is another method of evaluation of projects based on discounted cash flow technique. It considers the time factor and therefore takes into account the opportunity cost of investment.

**The Profitability Index:** It is a variant of NPV method. It is the ratio of present value of the stream of net cash flows of a project over its life span to the initial cost of the project.

**Review Questions**

1. What is capital budgeting? Explain its nature.
2. Discuss the considerations in various kinds of capital investment decisions.
3. What is "internal rate of return"? How is it different from "net present value"? Under what conditions would the two methods provide the same results?
4. Discuss some of the principal problems involved in an attempt to rank several alternative investment proposals in order of their profitability.
5. Review the appropriateness of the following criteria of appraising investment:
  - (a) Payback Period
  - (b) Net Present Value
6. Given three investment projects, each with a life of two years, described in the following table:

Project	Initial Capital Cost	1st year pay off	11nd year pay off
A	300	600	0
B	300	200	400
C	300	300	333

- (a) Calculate the payback period for each project.
  - (b) Calculate the internal rate of return for the three projects.
  - (c) Assuming the rate of discount to be 10 per cent capital, calculate the net present value for the three projects.
  - (d) Which project would you prefer?
7. Discuss the meaning and nature of cost of capital.
8. Calculate the average cost of capital before tax and after tax from the following information. Assume that the tax is 55%.

Type of Capital	Proportion in the New Capital Structure	Before Tax Cost of Capital (%)
Equity capital	25	24.44
Preference capital	10	22.29
Debt capital	50	7.99
Retained earnings	15	18.33

Notes

## Further Readings

Karam Pal and Surrender Kumar, *Managerial Economics*, Excel Books

Samuelson, Stephen G. Marks, William *Managerial Economics* (Hardcover – Dec 29, 2008)

Christopher R. Thomas and S. Charles Maurice, *Managerial Economics* (Hardcover – Mar 7, 2007)

Christopher R. Thomas and S. Charles Maurice, *Managerial Economics* (Hardcover – Jan 27, 2010)



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# Unit 9 Public Investment Decisions

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## Unit Structure

- Introduction
- Public Investment Decisions
- Risk
- Risk and the Investment Decisions
- Summary
- Keywords
- Review Questions
- Further Readings

## Learning Objectives

At the conclusion of this unit, you should be able to:

- Tell about the public investment decisions
- Understand the risk and uncertainty concept in public investment decisions

## Introduction

Investment decisions involve a good deal of risk and uncertainty. Lack of authentic information, dependable data and imperfect foresight of the investor creates problems. Different approaches have been proposed for dealing with the consequences of imperfect ability to predict events and the investors' risks involved therein.

Risk and uncertainty play a crucial role in all investment decisions. The element of risk and uncertainty is involved in all decisions including the investment decisions. Economic analysis of risk and uncertainty thus becomes crucial, especially with reference to investment decisions.

Certainty appears to be a theoretical and impractical idea as it means that the investor has a perfect knowledge of the investment environment such that he is definite about the size, regularity and periodicity of flow of returns. Such situations do exist in the short-run (e.g., fixed deposit in a nationalised bank). However, long-run or long-range investments are not predictable as they are influenced by many kinds of changes that are likely to take place with time: political, economic, market, technology, etc.

Risk is more common in the real world. A situation with more than one possible outcomes to decisions so that the probability of each of these outcomes can be measured is a risk situation. For example, tossing of a coin (i.e., 50-50) or investing in a stock. The greater the number and range of outcomes, the greater is the risk associated with the decision or action.

Uncertainty is a situation where there is more than one possible outcome to a decision but the probability of each specific outcome occurring is not known or even meaningful. This

may be due to insufficient information or instability in the nature of variables. In extreme cases of uncertainty, the outcome itself may not be clear.

## Public Investment Decisions

Notes

Government is an important member in the economy and its investment is called public investment. Many activities of the state are related to its investment intentions, decisions and activities. Thus, managers have to study and understand different facts of public investment decisions. For many reasons, the government is concerned with the future economic life and well-being of society. This concern makes public investment an important economic activity with significant implications for management of every sphere of economic and social life. Many of the private and non-government activities and investment become possible on the basis of a whole range of public investments in roads, ports, bridges, universities, airports, etc. Moreover, the public goods, which result from such investments are critical for the continued reproduction of the economy and are complementary to the production of other goods. Many of them are universal intermediates like means of transport, energy supply, communication, etc. No significant managerial decision can remain uninformed of the nature and extent of the influence of public investment decisions.

### Similarities and Dissimilarities between Public Investment and Private Investment

Both public investment and private investment link the present to the future as both involve postponement of current consumption in order to generate the capacity to obtain a large flow of consumption in the future. However, the difference in the type of agencies brings about following dissimilarities between the two.

1. The prime aim of a private enterprise is to invest a certain amount of capital (C) to obtain a larger sum of money ( $C_1$ ) such that  $C_1 > C$ , i.e., to obtain surplus or profit. The government investment does not have profit as its basic motive. It is for the common social purposes of the community.
2. To earn profit, private enterprise uses well calculated strategies like market structure, degree of risk, product nature, technology, international factors.
3. Public investments are generally complementary to a large number of private activities. If left in private hands, these goods may not be made at all, e.g., roads, or may be made on such conditions as may be harmful to the society.
4. Public investments are large sized characterised by indivisibilities, and are useful for a large number of activities. They are treated as overhead facilities or socio-economic infrastructure. Private investments are usually for individual wants with a price for it.
5. Public investments have a long gestation period – both in the sense of requiring a long construction/installation period and yielding benefits for a number of years. Moreover, they are based on social objectives. Large external economies of these investments make them unsuitable from the angle of private profit.

### Organization of Public Investment Decisions

In India, the central and state governments, along with public enterprises under their control account for an overwhelming part of public investment. Various local bodies at the level of districts, blocks, cities, towns and villages too make public investment creating a variety of assets. The planning commission makes sectoral and inter-state allocation of the investment and outlays determined as a part of the plans.

Our plans evolve various programmes involving both current outlays and long-term asset forming investment decisions. These decisions are generally taken by the concerned administrative ministries or departments or specific programme authorities in consultation

with the planning commission and finance ministry as a part of the exercise of preparing annual budgets.

A number of projects for expansion and diversification or modernisation are sanctioned by various public enterprises. A good number of investments are financed by loans, by various public financial institutions (like IDBI, ICICI, SFCs, etc.) either directly to the public sector or to private units.

Two major agencies for appraising public investment projects are Project Appraisal Division (PAD) of the planning commission and Public Investment Board (PIB).

## Risk

Risk is defined as a state of knowledge in which each alternative leads to one of a set of specific outcomes with objectively determined probabilities. Risk can be determined a priori (i.e., by deduction) or a posteriori (i.e., by statistical analysis of data obtained by experimentation or sampling).

Intuitively, we sense that the degree of risk is indicated by the degree to which the actual outcome or pay off of a strategy or project deviates from its expected (mean) value. This is indicated by the spread or variation in the probability distribution of possible outcomes for each proposal.

One way of measuring variation is to calculate the range, which is the difference between the most extreme pay off values. A common and accurate measurement of variation in the statistics is called the standard deviation,  $\sigma$  (sigma).

## Risk Adjustment

In estimating the pay offs for a particular strategy, the decision maker must consider not only the degree of risk involved, but also the time value of money. Both considerations are incorporated in the valuation model developed earlier.

$$NPV = \sum_{t=1}^n \frac{R_t}{(1+r)^t}$$

where

NPV = The net present value of a flow of future profits

$R_t$  = The net return or profit in time period  $t$

$r$  = The required rate of return considering the level of business risk involved

$n$  = The number of time periods considered.

$I$  = Investment

Several ways to adjust the valuation model for risk are discussed in the literature of finance. Two of the most commonly used methods are the risk adjusted discount rate and the certainty equivalent approach.

## Risk Adjusted Discount Rate

As discussed earlier, every firm has a required rate of return reflecting its perception of business risk. In order to find the present value of a project's future pay off, the firm uses its required rate of return as the discount rate, provided the project's business risk is the same as the firm's. If the project's risk is greater than the firm's normal risk, a higher discount rate will be used to compensate for the greater risk.

For example, suppose a firm's normal business risk requires a 20 per cent rate of return. Then the net present value equals:

$$NPV = ₹ 100,000 + \frac{₹ 50,000}{(1.20)} + \frac{₹ 50,000}{(1.20)^2} + \frac{₹ 50,000}{(1.20)^3} = ₹ 5,324$$

Notes

Since the net present value is positive, the project is accepted. But suppose the risk were such that management feels it should get a 25 per cent return, then the net present value equals:

$$NPV = ₹ 100,000 + \frac{₹ 50,000}{(1.25)} + \frac{₹ 50,000}{(1.20)^2} + \frac{₹ 50,000}{(1.20)^3} = ₹ 2,400$$

Now the net present value is negative, so the proposal should be rejected. Thus, in the risk adjusted discount rate approach, risk is wholly reflected by the discount rate and discounting process. There are, however, at least three limitations to this approach.

First, how do we determine the appropriate discount rate? Clearly, the introduction of a new product is riskier than buying government bonds – but how much riskier? It is very difficult to resolve this question consistently and objectively, particularly when there is no historical evidence on which to base an estimate.

Second, this method ignores the probability distribution of future cash flows information that could be of great value. It is possible that management may consider such probabilities in determining what discount rate to use, but there are better ways of evaluation and incorporation of such information.

Third, the risk-adjusted discount rate does not offer any consistent method for incorporating the decision maker's attitude towards risk; however, this objection may be overcome by the certainty-equivalent approach.

### Certainty Equivalent Approach

The risk adjusted discount rate approach discussed in the preceding sub-section simply modified the discount rate in the denominator of the valuation model. In contrast, the certainty-equivalent approach uses a risk free discount rate in the denominator and accounts for risk by modifying the numerator of the valuation model, as follows:

$$NPV = \sum_{t=1}^n \frac{\alpha_t R_t}{(1+r)^t}$$

where

$r$  = The risk free interest rate, assumed to be constant for all future periods.

$R_t$  = The risky cash flow in the  $t^{\text{th}}$  time period.

$\alpha_t$  = The certainty-equivalent coefficient for the  $t^{\text{th}}$  time period.

The certainty-equivalent coefficient,  $\alpha$ , is a number between 0 and 1 that reflects the decision maker's utility function. It varies inversely with the degree of risk. A value of 0 means the decision maker feels the project is too risky to offer any effective return. A value of 1 means that the decision maker sees the project as risk free.

The decision maker's attitude towards risk is incorporated by first determining for each time period a risk free cash flow,  $R_t^*$ , that the decision maker regards as equivalent to the risky cash flow,  $R_t$ . Then the certainty-equivalent coefficient,  $\alpha_t$ , is calculated as the ratio of the equivalent certain cash flow to the risky cash flow:

$$\alpha_t = \frac{\text{Equivalent certain sum}}{\text{Expected risky sum}} = \frac{R_t^*}{R_t}$$

To illustrate, recall the firm that is considering an investment strategy having an initial cost of ₹ 100,000 and expected to yield ₹ 50,000 per year for the next three years. Suppose that the interest rate on (risk free) treasury bills is 12 per cent.

Management believes that the longer it has to wait for a return the riskier it becomes. Consequently, it determines that  $\alpha_0 = 1.0$ ,  $\alpha_1 = .90$ ,  $\alpha_2 = .80$  and  $\alpha_3 = .70$ . Then the net present value of the investment is:

$$NPV = ₹ 100,000 + \frac{.9(₹ 50,000)}{1.12} + \frac{.8(₹ 50,000)}{(1.12)^2} + \frac{.7(₹ 50,000)}{(1.12)^3} = - ₹ 3,021$$

The net per cent value of the return on the Treasury bills equals:

$$NPV = ₹ 100,000 + \frac{₹ 12,000}{1.12} + \frac{₹ 12,000}{(1.12)^2} + \frac{₹ 12,000}{(1.12)^3} + \frac{₹ 100,000}{(1.12)} = 0$$

The proposal would be rejected because the returns do not commensurate with the management's perception of the risk involved.

The certainty-equivalent approach also presents practical problems when it comes to implementation, mainly with respect to the calculation of certainty-equivalent coefficients. However, it is theoretically superior to the risk-adjusted discount rate approach because it does consider the decision maker's attitude towards risk.

### Insurable and Non-insurable Risks

The distinction between insurable and non-insurable risks is an important point of consideration. Every entrepreneur faces many risks besides the most important risk – that he may lose money as a result of misjudging market conditions. There is always the risk that fire, theft, death and the like may cause business losses. But these latter risks can be insured against. Indeed, the modern economy provides a whole industry to deal with insurance against the risks of this kind. The businessman need not worry about what will happen to his dependents if he dies, for he can insure his life. Nor need he lose sleep over the danger of losing plant or stock through fire. Fire also can be insured against.

Now, the entrepreneur only has to meet those risks which cannot be insured against. We must, therefore, decide what kind of risks these will be and discover why they cannot be insured against. What is the main difference between insurable and non-insurable risks? The difference lies in the fact that the probability that some events will occur, can be calculated mathematically whilst the probability that others will occur cannot. For example, statisticians are able to calculate the probability of fires occurring quite accurately. An insurance company, therefore, knows that, say, 1 per cent of factories in the country will have a fire each year. It is impossible to say which particular factory will catch fire; but it is possible to say with considerable accuracy what percentage of factories in general is likely to suffer from fire in any one year. It is, therefore, possible for businessmen to insure against this type of risk. Insurance company knows how high a premium it must charge in order to meet fire insurance claims. The businessman knows what that premium is and he knows also what the risk of fire is. Since no one wants deliberately to take risks which can be avoided, the entrepreneur is only too pleased to pay the premium and avoid the risk. The reason why this can be done, as has been stated, is that an accurate quantitative estimate of the danger of fire can be made. The fire insurance premium is a cost of production just as much as payments for labour or raw materials are.

We must now move away from these definite and calculable risks to the sort of risk which is more vague and uncertain. What are these risks taken by entrepreneurs which are incalculable and which no insurance company will dare to insure against? The kind of decisions made by entrepreneurs are decisions about, for example, whether it will pay to increase or decrease the output of a given article. The entrepreneur has to guess what his cost conditions will be, which is usually quite simple. He also has to guess what demand conditions will be, and this is often extremely difficult. He may earn a profit or he may

make a loss. But no one can say which with any real degree of certainty. Nor can anyone say with certainty how large that profit or loss will be. It is, therefore, no accident that it is impossible for entrepreneurs to insure against commercial losses. It is possible for an insurance company to estimate accurately that, say, 1 per cent of all firms will have a fire each year. It is quite impossible to say whether 5 per cent, 25 per cent or 50 per cent firms in an industry will make losses or how much will be lost. It is quite possible that all might make profits or that all might suffer losses. It is, therefore, impossible for any organisation to insure firms against loss. It would not know what premium to charge and, in a slump, would probably go bankrupt itself.

We can now explain why entrepreneurs earn profits. It is because they have to trust their own judgement about the likelihood of success or failure if they expand or contract their output, raise or lower their prices. If a businessman refuses to insure against fire but relies on his ability to design efficient fire fighting devices, he is fulfilling the function of a true entrepreneur. Since fire insurance is not expensive, there is no need for him to do this – so he will not normally do so. The real function of the entrepreneur is to take those risks where the unknowns to be dealt with are more intangible than the danger of fire. The sort of question which the entrepreneur has to answer is: "Will consumers like my new frying pan"? The responsibility for making this kind of decision cannot be shifted, and it is because this kind of decision is typical of entrepreneurial decisions in general that being an entrepreneur is much more risky than being a wage earner. Thus, a specific function that can be isolated and ascribed to the entrepreneur is: he has to take the risks of making price-output decisions.

## **Risk and the Investment Decisions**

### **Basic Concepts**

#### **Strategies and State of Nature**

A strategy is one of the many alternative plans or courses of action that could be implemented in order to achieve managerial goals. A manager might be considering three strategies to increase profits: build a more modern plant which may produce at low cost, implement a new marketing programme to increase sales or change the design of product to decrease cost and increase sales.

A state of nature is a condition that may exist in the future and that will have a significant impact on the success of a strategy. For example, the manager may not be aware of the economic conditions in the future. The possible states of nature may be normal, recession or boom.

#### **Outcome and Pay-off Matrix**

The outcome results in either gain or loss based on a particular combination of strategy and state of nature.

The decision maker has no control over the states of nature that will prevail in future but the future states of nature will certainly affect the outcome of any strategy that he or she may adopt. The particular decision made will depend, therefore, on the decision maker's knowledge or estimation of how a particular future state of nature will affect the outcome of each particular strategy.

A pay-off matrix is a table that shows the possible outcomes or results of each strategy under each state of nature. For example, it may show the level of profit that may result if the firm builds a large or small plant and if the economy will be in recession, normal or boom.

Table 9.1: Pay-off Matrix Showing Level of Profit for each Strategy – State of Nature Combination

Notes

Strategy	State of Nature		
	T <sub>1</sub>	T <sub>2</sub>	T <sub>3</sub>
S <sub>1</sub>	-40	26	40
S <sub>2</sub>	-25	32	64
S <sub>3</sub>	-16	30	58

### **Risk-return Evaluation**

The statics of probability distribution for the outcomes of a business decision can be used to evaluate return and risk.

- The expected value or mean is a measure of expected return.
- The standard deviation is a measure of risk.
- The coefficient of variation is a measure of risk per unit of money (say dollar) of return.

### **Risk Preference**

Return is taken as a function of risk. Different investors may take different views of the investment climate. Thus, there are different risk-return functions or market indifference curves for different investors.

In case of risk aversion, as risk increases, the required return increases at an increasing rate. The investor who is a risk seeker, also gets increase in return with increase in risk but at a decreasing rate. The desirability of an expected return is measured by its vertical distance and direction from the decision-maker's risk-return trade-off curve.

Risk attitudes can be of three types: (a) A risk-seeker is the one who prefers risk; given a choice between more or less risky investments with identical expected money returns, he will select the riskier investment. (b) A risk-avorter, faced with the same situation will select the less risky investment. (c) A risk-indifferent, faced with the same situation will be blind to the choice; for him any investment is equally preferable to the other.

There is increasing marginal utility of income for a risk-seeker, decreasing marginal utility of income for a risk-avorter and equal marginal utility of income for a risk-indifferent person.

Some of the methods are discussed hereunder:

#### **Finite Horizon Method**

Here the decision procedure involves laying down a terminal date beyond which any prospective development out of an investment activity today is simply ruled out. The argument is that any forecast for a period longer than the terminal date is so unreliable that it is best not undertaken at all. Such a finite and arbitrary horizon is not really a defensible method for dealing with imperfect foresight. Many public investment decisions do have considerable long-term effects, particularly the conservation effects of a project which may assume importance only in the fairly distant future. This method forces us to ignore totally what little we can forecast about the distant future with some degree of confidence.

#### **Risk Discounting Method**

A method more attractive than the finite horizon method is the use of a risk discount factor. A risk factor  $d$  is added to the rate of interest,  $r$ , which is employed in discounting calculations. Suppose, the actual rate of interest is 5 per cent. The rate used in discounting

might then be increased to 7 per cent, 2 per cent being the 'risk factor'. Such a risk discount reduces the value of the discount rate,  $d$ , because,

$$d = \frac{1}{1+r+d}, \text{ and}$$

$$d < \frac{1}{1+r}$$

Notes

This means that higher the risk, the more we lower our evaluation of a given expected return. Since in the discounting process more distant returns are multiplied by higher powers of the discount factor, this method automatically assigns a higher weight to risk factor in more remote future periods unless we deliberately use different risk factors for different periods. By computation,  $0 < d < 1$  for any  $0 < n < a$ , where  $n =$  periods. The basic difficulty in this method is to assign values to the risk factor,  $d$ . The value of  $d$  has to be estimated on the basis of judgement or intuition; thus the evaluation of investment risks remains subjective.

### **The Shackle Approach**

Prof George Shackle argues that most investors characterise the risk inherent in investment decisions with the aid of two representative outcomes – potential gain and potential loss, which are called respectively, the 'focal gain' and the 'focal loss'. Instead of a risk discount, Shackle proposes a concept of 'potential surprise' which asserts that investors think in terms of measure, which indicates how surprised they would be if, say, outcome  $V$  transpired rather than outcome  $U$ . If there is a fifty-fifty chance of  $U$  or  $V$ , neither outcome may really surprise us if it transpires, i.e., zero potential surprise. Thus, even though on an actual risk calculation each outcome should be discounted substantially, under the potential surprise hypothesis, neither of them would be discounted at all. Using these concepts and an appropriate indifference map, Shackle determines what he calls 'certainty equivalent' of any risky investment proposition. The 'certainty equivalent' of a risky investment,  $I$ , is a (hypothetical) completely riskless investment,  $I^*$  such that the investor is indifferent as to the choice between  $I$  and  $I^*$ ; here  $I^*$  corresponds to "the present value of investment after discounting for risk" under the earlier method. Some of the problems of the risk discounting method still remain under the Shackle approach. For example, investors' indifference mapping involves subjective elements; shackle approach does not, therefore, furnish an objective operational techniques.

### **The Probability Theory Approach**

This approach points out that no expected return figure can adequately represent the full range of possible alternative outcomes of a risky investment activity. Rather, a large number of alternative pay offs must be considered for each pertinent future data and each such possibility must be assigned some statistical probability. If the return at period  $t$  is represented by  $R_t$  and if  $R_t$  is assumed to have a finite value, then we can deal with a probability function.

$$P = p(R_t)$$

For example, there is 4 per cent probability ( $P = .05$ ) that  $R_t$  will exceed ₹ 10,000 and that  $P = .08$  for ₹ 10,000 <  $R_t$  < ₹ 9,000. The risk discount method takes no account of this full range of possibilities and their associated probabilities. The insurance company normally uses, therefore, the probability approach rather than the risk discounting method. However, the basic problem is: do we ever know the full probability function? With probabilities unknown, such an approach is neither defensible nor feasible in practice.

However, the probability theory approach has been widely used in the analysis of returns and risks involved in investment. Markowitz uses this approach for an optimum selection of portfolio of securities – combination of stocks, bonds and other financial instruments. The Markowitz analysis uses two focal measures – an index of expected returns and an index of risk. On the basis of extrapolation of past earnings and evaluation of present



market, one can estimate the expected average future returns from a given investment. On the same basis, one can calculate a rough figure for the standard deviation of these returns which serves as the basis for the construction of a measure of risk. Using programming methods, Markowitz then calculates, for any given level of expected returns, what portfolio (i.e., the combination of securities) minimises the index of risk. In the Figure 9.1, the curve AA may be designated as 'risk-return possibility curve' which shows that for each attainable level of expected returns there is some smallest risk involved (K is involved in attaining R). Large returns involve higher risk. Different investors may prefer different points on AA. The curves  $I_1 \dots I_2$  constitute a 'risk-return indifference map'. Compared to standard consumers' indifference curves, the investors' indifference curves here are inverted in shape, because we usually prefer lower levels of risks, their positive slope, i.e., the marginal rate of substitution between risk and returns, indicates that as risk increases, the investors require a higher level of returns to keep them indifferent.

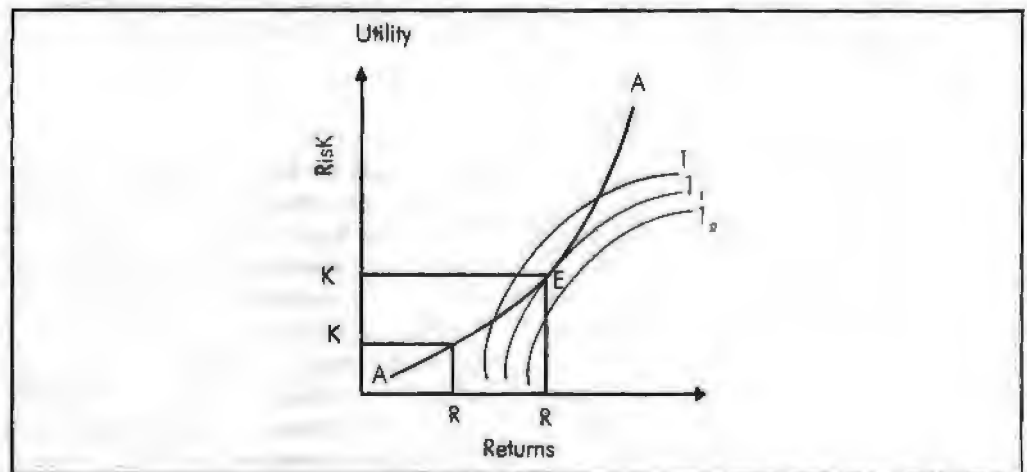


Figure 9.1

The point E, where AA is tangent to  $I_1$ , indicates the optimal combination of returns ( $R^*$ ) and risk ( $K^*$ ) for the investor. However, the problem still remains: the construction of Markowitz curves cannot be based purely on objective data; much would depend on the psychological preference and character of the investor. It is difficult to measure the investor's attitude to risk and returns.

### Sensitivity Analysis

Here is another method of considering the risk element in investment decisions. First step is to decide the most crucial and most uncertain variables in calculations and then to test how sensitive the computed present value figure is to likely change in the value of that strategic variable. Suppose that a company is considering an investment proposal of launching a new product and its plans are based on the assumption that the company will be in a position to capture 10 per cent share of the market within the next year. From this and other information, the company can estimate:

- (a) the anticipated present value of the investment if the expectation comes true;
- (b) the effect of alternative possible market share figures on the calculated present value of investment and particularly;
- (c) the market share figure at which the net present value of the investment is zero, i.e., the 'breakdown' market share.

Let us assume that the breakdown market share works out to be 7 per cent; unless it is attained, the net returns from the investment will be negative. This enables the company to calculate the risk involved in investment. In this way, management can obtain a risk index and also an index of expected returns. One can then apply Markowitz type of analysis in making optimum project selection.

The sensitivity analysis can be applied in cases where the probabilistic information required by Markowitz is not available. However, a sensitivity analysis is more subjective and less powerful analytically.

### **The Decision Theory and the Von Neumann- Morgenstern Utility Index**

Notes

Here are the most sophisticated and the most recent methods of considering risk and uncertainty. The decision theory, which is an extension of the game theory, starts with knight's distinction between risk and uncertainty. Risk refers to situations in which the outcome is not certain but where the probabilities of the alternative outcome is not certain but at least be estimated. Uncertainty is present where the unknown outcomes cannot even be predicted in probabilistic terms. Available information may enable one to locate either risk or uncertainty in given investment proposals and then a number of 'decision rules' (such as the maximin criterion, the minimax criterion, the Hurwicz criterion, the minimax regret criterion, etc.) may be applied to select the optimum investment decision under risk and uncertainty.

### **Decision Tree – A Technique: Sequential Decision Analysis under Risks**

A decision tree is a graphic device that shows a sequence of strategic decisions and the expected consequences under each possible set of circumstances. The construction and analysis of a decision tree is appropriate whenever a sequential series of conditional decisions must be made under conditions of risk. By conditional decision, we mean a decision that depends upon circumstances or options that will occur at a later time.

Construction of the decision tree begins with the earliest decision and proceeds forward in time through a series of subsequent events and decisions. At each decision or event the tree branches out to depict each possible course of action, until finally all logical consequences and the resulting pay offs are depicted.

### **Investment Decision under Uncertainty**

Uncertainty is defined as the state in which one or more alternatives result in a set of possible specific outcomes whose probabilities are either unknown or meaningless. This means that decision-making under uncertainty is always subjective. However, if the decision maker can identify the possible states of nature and estimate the resulting pay offs for each available strategy, then the two basic approaches are available.

1. The decision maker uses the best available information and his own personal judgement and experience to assign subjective probabilities to the possible states of nature.
2. The decision maker may either disregard probabilities or treat them as equal, which amounts to the same thing. When this approach is taken, four decision criteria are available for evaluation of proposed strategies:
  - (a) The Wald decision criterion, also called maximin.
  - (b) The Hurwicz alpha decision criterion.
  - (c) The Savage decision criterion, also called minimax regret.
  - (d) The Laplace decision criterion, also called the Bayes decision criterion.

### **The Wald Decision Criterion**

The Wald, or maximum decision criterion is described by various authors as the criterion of pessimism, the criterion of extreme conservatism and an attempt to maximise the security level. It envisions nature as perverse and malevolent with Murphy's law full operational. Therefore, the criterion say: determine the worst possible outcome of each strategy and then pick yielding the best of the worst results.

The maximum criterion can be illustrated to applying it to the example first shown in Table 9.2. Now, however, assume that the probabilities of the various states of nature are unknown. As shown in Table below the most dismal pay off from each row is chosen as the minimal security level associated with the strategy. The largest of these, a value of 4, implies that strategy,  $S_1$  is the best strategy under this criterion.

Table 9.2: Application of Maximin and Maximax Criteria

Strategy	States of Nature				Criterion	
	$N_1$	$N_2$	$N_3$	$N_4$	Maximin	Maximax
$S_1$	06	06	06	04	04*	06
$S_2$	25	07	07	-15	-15	25*
$S_3$	20	20	07	-01	-01	20
$S_4$	19	16	09	-02	-02	19
$S_5$	20	15	15	-03	-03	20

\* Best Strategy under stated criterion

Is this a good choice? It all depends upon what you mean by 'good'. Note that if state of nature  $N_4$  should occur,  $S_1$  is the only strategy that avoids a loss. On the other hand, should any other state of nature occur, strategy  $S_1$  repeatedly results in the poorest return. Is such a situation inconsistent with reality? Perhaps, but perhaps not.  $S_1$  simply represents the conservative bankers strategy—it involves the smallest risks but at the same time promises the smallest returns. It is up to the firm to decide just how a minimal level of return is to be weighted in the decision-making process and how much it can afford to risk if things turn for the worse. Because the criterion is fiscally conservative, it is particularly well suited to small business firms whose survival depends upon avoiding losses.

Added to figure is the antithesis of maximin, called the maximax criterion. Here the decision maker is completely optimistic and therefore chooses the maximum pay off for each strategy as his yardstick. The strategy that offers the best of the best is then chosen as optimal. This, of course, is nonsense. We have included it because maximax and maximin represent the extremes of alpha in the Hurwicz alpha decision criterion, which will be discussed next.

### The Hurwicz Alpha Decision Criterion

The Hurwicz alpha decision criterion proposes to create a decision index ( $d$ ) for each strategy, which is a weighted average of its extreme pay offs. The weighting factors are a coefficient of optimism ( $\alpha$ ), which is applied to the maximum pay off ( $M$ ) and its complement ( $1 - \alpha$ ), which is applied to the minimum pay off ( $m$ ). The value of each strategy is thus:

$$d_i = \alpha M_i + (1 - \alpha)m_i$$

The strategy with the highest value for  $d$ , is chosen as optimal.

The coefficient of optimism ranges from 0 to 1, enabling the decision maker to express his attitude toward risk taking as a subjective degree of optimism. If the decision maker is completely pessimistic, he may decide that  $\alpha = 0$ . The result is the Wald or maximin criterion. If the decision maker is an incurable optimist, he may decide that  $\alpha = 1$ . The result would be the maximax criterion.

Actually, the Hurwicz alpha criterion was advanced to enable the decision maker to look at both the worst and the best pay offs for a particular strategy and so assign a subjective probability to each. Suppose, for example, that the decision maker is on the optimistic side and decides that  $\alpha = 0.7$ . His analysis of the current decision problem would be as shown above. It can be seen that the highest weighted average pay off results from selecting strategy  $S_3$ .

The decision indicated by the Hurwicz alpha criterion depends on the value of  $\alpha$ , which in turn depends on the decision maker's own attitude toward risk. It is suitable for use by business firms; but if the decision maker's degree of optimism proves unfounded, substantial losses are likely. Therefore, due caution is advised.

Table 9.3: Hurwicz Alpha Solution to Decision Problem

	M	$\alpha$	$\alpha M$	m	$1-\alpha$	$(1-\alpha)m$	d
S <sub>1</sub>	06	0.7	04.2	04	0.3	1.2	5.4
S <sub>2</sub>	25	0.7	17.5	-15	0.3	-4.5	13.0
S <sub>3</sub>	20	0.7	14.0	-1	0.3	-0.3	12.7*
S <sub>4</sub>	19	0.7	13.3	-2	0.3	-0.6	12.7
S <sub>5</sub>	20	0.7	14.0	-3	0.3	-0.9	13.1

\* Best strategy under stated criterion

Notes

### The Savage Decision Criterion

The Savage criterion, sometimes called the minimax regret criterion, examines "regrets", which are the opportunity costs of incorrect decisions. Regret is measured as the absolute difference between the payoff for a given strategy and the payoff for the most effective strategy within the same state of nature.

The rationale for measurement of regret is quite simple. If any particular state of nature occurs in the future and if we have chosen the strategy that yields the maximum payoff for the state of nature, then we have no regret. But if we choose any other strategy, regret is the difference between what actually occurs and what we could have earned had we made the optimal decision. After determining the maximum regret for each strategy, the strategy with the smallest maximum regret is chosen.

A regret matrix is needed and it is constructed by modifying the payoff matrix. Within each column (state of nature) the largest payoff is subtracted from each payoff number in the column. The absolute difference between them is the measurement of regret. From our example in table, we construct the regret matrix seen in Table 9.4. This table shows that when the state of nature turns out to be N<sub>1</sub> and the decision maker has chosen S<sub>2</sub>, there is no regret because the right strategy was chosen. However, if S<sub>1</sub> had been chosen, the regret is measured as [6 - 25] = 19; if S<sub>3</sub>, regret would be [20 - 25] = 5; and so forth. After completing the regret matrix, the correct strategy is seen to be S<sub>4</sub> because it minimises the maximum penalty for an incorrect guess about the state of nature.

Table 9.4: Construction of a Regret Matrix

Strategy	Pay off Matrix				Regret Matrix				Maximum Regret
	N <sub>1</sub>	N <sub>2</sub>	N <sub>3</sub>	N <sub>4</sub>	N <sub>1</sub>	N <sub>2</sub>	N <sub>3</sub>	N <sub>4</sub>	
S <sub>1</sub>	06	06	06	04	19	14	09	00	19
S <sub>2</sub>	25	07	07	-15	00	13	08	19	19
S <sub>3</sub>	20	20	07	-1	05	00	08	05	08
S <sub>4</sub>	19	16	09	-2	06	04	06	06	06*
S <sub>5</sub>	20	15	15	-3	05	05	00	07	07

\* Best strategy under stated criterion

Note that the decision maker who uses the Savage criterion explicitly abandons attempts to maximise a satisfactory payoff in favour of a strategy to achieve a satisfactory payoff with less risk. The Savage criterion is therefore particularly useful for evaluating a series of projects over a long span of time.

## The Laplace Decision Criterion

There is Bayesian postulate that if the probabilities of occurrences are unknown, they should be assumed equal. The Laplace criterion uses this postulate to calculate the expected value of each strategy; hence the Laplace criterion is also called the 'Bayes criterion'. The strategy selected is the one with the greatest expected value that results from the assumed (subjective) probabilities.

For strategies  $S_1, S_2, S_3, S_4$  and  $S_5$  from our example, the expected values are  $22/4, 24/4, 46/4, 42/4$  and  $47/4$  respectively, and strategy  $S_5$  would be selected. The effect of assuming an equal probability for each of the states of nature is to transform the decision problem under uncertainty into one under risk, so the previous discussion of the decision criterion under risk applies.

The Laplace criterion is a criterion of rationality, completely insensitive to the decision maker's attitude. It is extremely sensitive, however, to the decision maker's definition of the states of nature. For example, suppose the states of nature are hot, warm and cool weather. In the absence of weather forecast, the Bayesian probability of cool weather would be one third. But suppose the states of nature are warm and cool. Now the probability of cool weather has changed to one half. In reality, of course, equiprobability of all states of nature is unlikely, particularly in the short run. Thus, the Laplace criterion is more suitable to long run forecasts by larger firms.

To conclude, the process of decision-making under uncertainty is essentially one of choosing a criterion and then performing the calculations necessary to establish a choice within that criterion. We have also seen that the four decision criteria discussed, when applied to the same decision matrix, can lead to four different strategy selections.

Which criterion is the 'best'? There is no universally correct answer. Each of the criteria is logically defensible under particular circumstances and each can be criticised on one ground or another. The choice will often depend on personal considerations. In view of this, of what use is the notion of a payoff matrix? Perhaps the best answer is that it provides a useful tool for conceptualising and formalising the decision process into (1) a statement of objectives, (2) a selection of payoffs, (3) an evaluation of alternative pay offs and (4) a selection of alternative strategies. At this point it should be noted that there are other, non-quantitative methods of dealing with uncertainty.

### Case: Slimming the Bretton Woods Duo

When a report sponsored by America's Congress and embraced by senior Republicans, argues that the IMF and the World Bank should be radically scaled back, but that foreign aid to the poorest countries should be dramatically increased, it is hard not to be cynical. America is one of the world's stingiest donors of foreign aid. It spends a measly 0.1% of GDP on development aid a year, by far the lowest of any industrialised country. In countless budget battles, Republicans have masked their parochialism with rhetoric about international bureaucracies and contempt for corrupt foreign countries.

Put aside that cynicism. Does this report (known as the Meltzer report, after the committee's Allan Meltzer of Carnegie-Mellon University and signed by Jeffrey Sachs, a well-known development economist at Harvard) offer sensible principles for reforming international financial institutions and for rebuilding consensus for foreign aid in America?

The report argues that the IMF should concentrate on one big market failure: financial panics in which solvent economies cannot borrow. It should stop having detailed loan agreements with economic strings attached. To be eligible for IMF support, countries should pass four preconditions, including adequately capitalised banks and a yet-to-be-determined criterion for fiscal prudence. The money should be lent

short-term and at penal rates. Only in systemic crises should non-eligible countries receive fund bail-outs. And it should not lend at subsidised rates to the poorest countries.

This vision of the IMF providing liquidity to healthy countries as a central bank might provide it to healthy banks is not new; a small library to academic papers is devoted to the subject. It is, nonetheless, appealing. How much better to have a clearly focused IMF than today's grubby combination of geopolitical slush fund and emerging-economy schoolmaster. Unfortunately, the appealing principle does not translate easily into practice.

It is, first of all, impossible to devise preconditions ensuring that basically sound but strapped-for-cash countries get IMF money. Make eligibility conditions too stringent and too few countries would qualify; but bail-outs of big countries would be justified because of "systemic risk". Make them too loose and moral hazard would increase because investors would expect bail-outs of too many countries. But the Meltzer report is, nonetheless, a sensible direction for IMF reform. Countries with better banking systems and more prudent economic policies should have easier access to money at lower interest rates than those that do not. The IMF should provide incentives for countries to aspire to better financial standards.

### Developing Principles

Underlying the report's vision for the development banks such as the World Bank is a similarly attractive principle. In a world where private capital flows to poor countries dwarf official assistance, development banks should do what markets cannot or will not do. They should provide international public goods (such as research into the treatment of tropical diseases) and should transfer resources to alleviate poverty in the very poorest countries, and those that do not have access to private capital.

That hardly seems today's practice. According to the report, some 70% of the Bank's non-concessional lending over the past seven years has gone to 11 countries (including China, Argentina, Mexico and Brazil) that had access to capital markets. And, it says, almost half of the Bank's lending to countries with access to capital markets in the 1990s went to activities from which the private sector can profit.

Given that poverty alleviation is the Bank's ostensible goal, this is odd. It is true that the Bank's lending has become more focused on social sectors recently and it is also true that the majority of the world's poor people live in countries such as China or Brazil, which do have access to capital markets. But, as the report points out, the fact that there are poor people in a country with such access does not self-evidently justify lending by the Bank.

Often, such countries' failure to spend on the poor is down to bad budgeting. That is why the report recommends phasing out all development-bank lending to countries with investment-grade ratings or an income per head of over \$ 4,000. Instead, resources should focus on the poorest: countries with income per head of less than \$ 2,500. Those in between and those with erratic access to capital markets, would get limited aid. Again, however, the attractive principle faces a murky reality. Countries' access to private capital is more limited than aggregate figures would suggest.

On occasion, the Bank can be a catalyst for private sector money. In the aftermath of Asia's crisis, Bank guarantees helped to speed up countries' return to the capital markets. And with the advice and conditions it attaches to its loans, World Bank lending arguably fosters good economic policy better than the private sector. But even these qualifications do not undermine the basic direction of sensible reform: not to concentrate resources on countries with access to capital markets.

The real risks of refocusing the Bank more explicitly on the poorest countries are political. The Bank itself is a mechanism to raise resources for the poorest. Roughly a third of the Bank's shareholders would use this as an excuse to cut their own foreign-aid budgets still more. Then you would lose the Bank's benefits for middle-income countries and also have less money for the poorest. To expect such an outcome would, of course, be much too cynical.

### Questions

1. Do you agree with the recommendations of the report under reference? Argue it from the standpoint of both developed and developing economies.
2. Recall your understanding of
  - (a) Bretton Woods Duo,
  - (b) Asia crisis
  - (c) International Public goods
  - (d) Development Banks
  - (e) Systemic Risk

Source: The Economist, March 18, 2000

### Student Activity

Observe the real world of business around you and find how do the following economic agents hedge risk?

- (a) An individual
- (b) A company
- (c) A Government

### Summary

Investment decisions involve a good deal of risk and uncertainty. Lack of authentic information, dependable data and imperfect foresight of the investor creates problems. Risk and uncertainty play a crucial role in all investment decisions. The element of risk and uncertainty is involved in all decisions including the investment decisions. Economic analysis of risk and uncertainty thus becomes crucial, especially with reference to investment decisions.

Managers have to study and understand different facts of public investment decisions. For many reasons, the government is concerned with the future economic life and well-being of society. This concern makes public investment an important economic activity with significant implications for management of every sphere of economic and social life. Many of the private and non-government activities and investment become possible on the basis of a whole range of public investments in roads, ports, bridges, universities, airports, etc. Moreover, the public goods, which result from such investments are critical for the continued reproduction of the economy and are complementary to the production of other goods.

In India, the central and state governments, along with public enterprises under their control account for an overwhelming part of public investment. Various local bodies at the level of districts, blocks, cities, towns and villages too make public investment creating a variety of assets. The planning commission makes sectoral and inter-state allocation of the investment and outlays determined as a part of the plans.

## Keywords

**Outcome:** The outcome results in either gain or loss based on a particular combination of strategy and state of nature.

**Pay-off Matrix:** A pay-off matrix is a table that shows the possible outcomes or results of each strategy under each state of nature.

**Return:** Return is taken as a function of risk.

**Risk-seeker:** A risk-seeker is the one who prefers risk; given a choice between more or less risky investments with identical expected money returns, he will select the riskier investment.

**Risk-averter:** A risk-averter, faced with the same situation will select the less risky investment.

**Risk-indifferent:** A risk-indifferent, faced with the same situation will be blind to the choice; for him any investment is equally preferable to the other.

**Finite Horizon Method:** Here the decision procedure involves laying down a terminal date beyond which any prospective development out of an investment activity today is simply ruled out.

**Risk discounting Method:** A method more attractive than the finite horizon method is the use of a risk discount factor.

**Shackle Method:** Shackle proposes a concept of 'potential surprise' which asserts that investors think in terms of measure, which indicates how surprised they would be if, say, outcome V transpired rather than outcome U. If there is a fifty-fifty chance of U or V, neither outcome may really surprise us if it transpires, i.e., zero potential surprise.

**Probability Theory Approach:** This approach points out that no expected return figure can adequately represent the full range of possible alternative outcomes of a risky investment activity.

**Decision tree:** A decision tree is a graphic device that shows a sequence of strategic decisions and the expected consequences under each possible set of circumstances.

**The Laplace Decision Criterion:** There is Bayesian postulate that if the probabilities of occurrences are unknown, they should be assumed equal. The Laplace criterion uses this postulate to calculate the expected value of each strategy; hence the Laplace criterion is also called the 'Bayes criterion'.

## Review Questions

1. How do the determinants of private investment differ from those bearing on public investment?
2. Distinguish between 'risk' and 'uncertainty'. Give some business examples to illustrate the distinction.
3. Comment on the business uses and abuses of Evaluation Statistics which attempts to measure risks.
4. A marketing consultant, while servicing his clients has come up with five alternative brand names, four package design of a product and three advertising campaigns to be released through two media.
  - (a) How many strategies must management consider?
  - (b) What states of nature might affect management's choice? Give examples.
  - (c) How can management take into account the rival's reaction?

Notes



## **Further Readings**

Karam Pal and Surrender Kumar, *Managerial Economics*, Excel Books

Samuelson, Stephen G. Marks, William *Managerial Economics* (Hardcover – Dec 29, 2008)

Notes

Christopher R. Thomas and S. Charles Maurice , *Managerial Economics* (Hardcover – Mar 7, 2007)

Christopher R. Thomas and S. Charles Maurice, *Managerial Economics* (Hardcover – Jan 27, 2010)

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# Unit 10 Firm – Objectives and Constraints

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## Unit Structure

- Introduction
- Main Objectives of the Firm
- Theories of the Firm
- Value Maximization
- Firm's Constraints
- Summary
- Keywords
- Review Questions
- Further Readings

## Learning Objectives

At the conclusion of this unit, you should be able to:

- Explain the managerial theories of Firm
- Understand the behavioral theories of Firm
- Know about the value maximization
- Tell about firm's constraints

## Introduction

The most basic theory of the firm views the firm as a means of transforming things into other more valuable things, which is known as production. Thus, smelting of copper or gold removes impurities and makes the resulting product more valuable. Silicon Valley transforms silicon, which is the primary ingredient of sand, along with a thousand other chemicals and metals into computer chips used in everything from computers to toasters. Cooking transforms raw food, adding flavour and killing bacteria. Moving things to locations where they have higher value is a form of production. Moving stone to the location of a house where the stone can be installed or bringing the King Tut museum to exhibit temporarily to Chicago or a basketball team to the playoffs are all examples of production. In this simplistic view, a firm comprises of a technology or set of technologies for transforming things and then chooses the transformation to maximise the net profits. This "firm as a production function" view of the firm is adequate for some purposes, especially when products are relatively standardised and technologies widely available, but fares poorly when the internal organisation of the firm matters a great deal. Nevertheless, the "firm as a production function" model is a natural starting point in the investigation of competition.

## Main Objectives of the Firm

### Notes

Consider an entrepreneur who would like to maximise profit, perhaps by running a delivery service. The entrepreneur uses two inputs, capital  $K$  (example, trucks) and labour  $L$  (example, drivers), and rents the capital at cost  $r$  per dollar of capital. The wage rate for drivers is  $w$ . The production function is  $F(K, L)$ , that is, given inputs  $K$  and  $L$ , the output is  $F(K, L)$ .

In addition, a second characteristic of a maximum is that the second derivative is negative (or non-positive). This arises because at a maximum point the slope moves from positive (since the function is increasing up to the maximum), to zero (at the maximum), to a negative number (because the function is falling as the variable rises past the maximum). This means that the derivative is falling, that is, the second derivative is negative. This is an important conclusion because different kinds of capital may be complements or substitutes for labour. Are computers complements or substitutes for labour? Some economists consider that computers are complements to highly skilled workers, increasing the marginal value of the most skilled, but substitute for lower skilled workers. In academia, the ratio of secretaries to professors has fallen dramatically since the 1970s as more and more professors use machines to perform secretarial functions. Computers are thought to have increased the marginal product of professors and reduced the marginal product of secretaries.

**The Shadow Value:** When capital  $K$  can't be adjusted in the short-run, it creates a constraint on the profit available on the entrepreneur – the desire to change  $K$  reduces the profit available to the entrepreneur. There is no direct value of capital, because capital is fixed. That does not mean we can not examine its value, however, and the value of capital is called a shadow value because it refers to the value associated with a constraint. Shadow value is well-established jargon. What is the shadow-value of capital? Let's return to the constrained, short-run optimisation problem. Any constraint has a shadow value. The term refers to the value of relaxing a constraint. The shadow value is zero when the constraint does not bind. For instance, the shadow value of capital is zero when it is set at the profit maximising level. Technology binds the firm; the shadow value of a superior technology is the increase in profit associated with it. For instance, parameterise the production technology by a parameter  $a$ , so that  $[F(K, L)]$  is produced.

**Input Demand:** Over a long period of time, an entrepreneur can adjust both the capital and the labour used at the plant. This lets the entrepreneur maximise profit with respect to both variables  $K$  and  $L$ . We will use a double star, \*\*, to denote variables in their long-run solution. The approach to maximising profit over two variables is to maximise it separately over each variable, thereby obtaining it. How do equilibrium values of capital and labour respond to a change in input prices or output price for the Cobb-Douglas production function? It is useful to cast these changes in percentage terms. It is straightforward to demonstrate that both capital and labour respond to a small percentage change in any of these variables with a constant percentage change.

An important insight of profit maximisation is that it implies minimisation of costs of yielding the chosen output, that is, profit-maximisation entails efficient production. The logic is straightforward. The profit of an entrepreneur is revenue minus costs, and the revenue is price times output. For the chosen output, then, the entrepreneur earns the revenue associated with the output, which is fixed since we are considering only the chosen output, minus the costs of producing that output. Thus, for the given output, maximising profits is equivalent to maximising a constant (revenue) minus costs. Since maximising is equivalent to minimising  $C$ , the profit-maximising entrepreneur minimises costs. This is important because profit-maximisation implies not being wasteful in this regard and entrepreneur produces at least cost.

**Dynamic Firm Behaviour:** In this section, we will consider a firm or entrepreneur who cannot affect the price of output or the prices of inputs, that is, a competitive firm. How does such a competitive firm respond to price changes? When the price of the output rises,

the firm earns profits. The long-run marginal cost has a complicated relationship to short-run marginal cost. The problem in characterising the relationship between long-run and short-run marginal costs is that some costs are marginal in the long-run that are fixed in the short-run, tending to make long-run marginal costs larger than short-run marginal costs. However, in the long-run, the assets can be configured optimally, while some assets are fixed in the short-run, and this optimal configuration tends to make long-run costs lower. Instead, it is more useful to compare the long-run average total costs and short-run average total costs. The advantage is that capital costs are included in short-run average total costs.

An economy of scale – that larger scale lowers cost – arises when an increase in output reduces average costs. We met economies of scale and their opposite, diseconomies of scale, in the previous section, with an example where long-run average total cost initially fell, then rose, as quantity was increased. What makes for an economy of scale? Larger volumes of productions permit the manufacture of more specialised equipment. If Mr. Satish is producing a million identical automotive tail lights, he can spend \$50,000 on an automated plastic stamping machine and only affect his costs by five cents each. In contrast, if I am producing 50,000 units, the stamping machine increases his costs by a dollar each and is much less economical. Indeed, it is somewhat more of a puzzle as to what produces a diseconomy of scale. An important source of diseconomies are managerial in nature – organising a large, complex enterprise is a challenge, and larger organisations tend to devote a larger percentage of their revenues to management of the investment.

The distinction between the short-run supply and the long-run supply is governed by the time that investment takes. Some of the difference between short-run demand and long-run demand arises because we do not scrap capital goods – cars, fridges and air conditioners in response to price changes. In both cases, investment is an important component of the responsiveness of supply and demand. In this section, we will first take a look at investment and then look at investment from a somewhat different perspective later when we consider basic finance tools near the end of the book. Investment goods require expenditures today to produce future value, so we begin the analysis by examining the value of future payments.

**Present Value:** The promise of \$1 in the future is not worth \$1 today. There are a variety of reasons why a promise of future payments is not worth the face value today, some of which involve risk that the money may not be paid. Let's set aside such risk for the moment; we will consider risk separately later. Even when the future payment is perceived to occur with negligible risk, nevertheless most people prefer \$1 today to \$1 payable a year hence. One way of expressing this is that the present value – the value today – of a future payment of a dollar is less than a dollar. From a present value perspective, future payments are discounted. From the individual perspective, one reason that you should value a future payment less than a current payment is due to arbitrage. Suppose you are going to need \$10,000 one year from now, to put a down-payment on a house. One way of producing \$10,000 is to buy a government bond that pays \$10,000 a year from now. What will that bond cost you? At current interest rates, a secure bond will cost around \$9700. This means that no one should be willing to pay \$10,000 for a future payment of \$10,000, because instead one can have the future \$10,000, by buying the bond, and have \$300 left over to spend on cappuccinos or economics textbooks. In other words, if you will pay \$10,000 for a secure promise to repay the \$10,000 a year hence, then I can make a successful business, selling you the secure promise for \$10,000, and pocketing \$300. This arbitrage consideration also suggests how to value future payments: discount them by the relevant interest rate.

A simple investment project involves spending an investment,  $I$ , and then reaps a return over time. If you dig a mine, drill an oil well, build an apartment building or a factory, or buy a share of stock, you spend money now, in the hope of earning money subsequently. We will set aside the very important risk issue until the next subsection and ask how to

Notes

make the decision to invest. The NPV approach involves assigning a rate of return ( $r$ ) that is reasonable for, and specific to, the project and then computing the present value of the expected stream of payments. Since the investment is initially expended, it is counted as negative revenue.

**Investment under Uncertainty:** Risk has a cost, and people, and corporations, buy insurance against financial risk. The standard approach to investment under uncertainty is to compute an NPV, with the revenues composed of expected values and the interest rate be adjusted to compensate for the risk. For instance, consider a project like oil exploration. The risks are enormous. Half of all underwater tracts in the Gulf Coast near Louisiana and Texas that are leased are never drilled, because later information makes them a bad bet. Half of all the tracts that are drilled are dry. So right off the bat, three-quarters of the tracts that are sold produce zero or negative revenue and positive costs. To see how the economics of such a risk investment might be developed, suppose that the relevant rate of return for such a risky investment is 18%. Suppose the tract can be leased for \$50,000 and the initial exploration costs \$1 million. If the tract has oil (with a 25% probability), it produces \$1 million per year for 20 years and then runs dry. This gives expected revenue of \$2,50,000 per year. To compute the expected net present value, we first compute the returns.

**Resource Extraction:** For the past 60 years, the world has been "running out of oil." There are news stories about the end of the reserves being only 10, 15 or 20 years away. The tone of these stories is that, at that time, we will run out of oil completely and prices will be extraordinarily high. Industry studies counter that more oil continues to be found and that the world is in no danger of running out of oil. If you believe that the world will run out of oil, what should you do? You should buy and hold. That is, if the price of oil in 20 years is going to be \$1,000 per barrel, then you can buy oil at \$40 and hold it for 20 years and sell it at \$1,000.

**A Time to Harvest:** A tree grows slowly, but is renewable, so the analysis does not help us understand when it is most profitable to cut the tree down. Consider harvesting for pulp and paper use. In this use, the amount of wood chips is what matters to the profitability of cutting down the tree and the biomass of the tree provides a direct indication of this. Suppose the biomass sells for a net price  $p$ , which has the costs of harvesting, and replanting deducted from it, and the biomass of the tree is  $[b(t)]$  when the tree is  $t$  years old.

**Collectibles:** Many people purchase durable goods as investments, including Porsche Speedsters, Tiffany lamps, antique telephones, postage stamps, coins, baseball cards, original Barbie dolls, antique credenzas, autographs, original rayon Hawaiian shirts, old postcards, political campaign buttons, old clocks and even Pez dispensers. How is the value of, say, a 1961 Porsche Speedster or a \$500 bill from the confederacy, which currently sells for over \$500, determined? The theory of resource prices can be adapted to cover these items, which are in fixed supply. There are four major differences that are relevant. First, using the item doesn't consume it; the goods are durable. I can own an "I Like Ike" campaign button for years, and then sell the same button. Second, these items may depreciate. Cars wear out even when they are not driven, and the brilliant colour of Pez dispensers fades. Every time a standard 27 ½ pound gold bars, like the kind in the Fort Knox depository, is moved, approximately \$5 in gold wears off the bar. Third, the goods may cost something to store. Fourth, the population grows and some of the potential buyers are not yet born.

**Consumer Theory:** Consumer theory is the parallel for demand that producer theory is for supply. The major difference is that producer theory assumes that sellers are motivated by profit and profit is something that one can usually directly measure. Moreover, the costs that enter into profit arise from physical properties of the production process – how many coffee cups come from the coffee cup manufacturing plant? In contrast, consumer theory is based on what people like, so it begins with something that we can not directly measure, but must infer. That is, consumer theory is based on the premise that we can infer what people like from the choices they make. Now, inferring what people like from choices they

make does not rule out mistakes. But our starting point is to consider the implications of a theory in which consumers do not make mistakes, but make choices that give them the most satisfaction. Economists think of this approach as analogous to studying gravitation in a vacuum before thinking about the effects of air friction. There is a practical consideration that dictates ignoring mistakes. There are many kinds of mistakes, for instance, “I meant to buy toothpaste but forgot and bought a toothbrush,” a computational problem, “I thought this toothpaste was better but it is actually worse,” a learning issue, “I meant to buy toothpaste but I bought crack instead,”. All of these kinds of mistakes lead to distinct theories. Moreover, we understand these alternative theories by understanding the basic theory first and then seeing what changes these theories lead to.

**Utility Maximisation:** Economists use the term utility in a peculiar and idiosyncratic way. Utility refers not to usefulness but to the flow of pleasure or happiness that a person enjoys - some measure of the satisfaction a person experiences. Usefulness might contribute to utility, but so does style, fashion, or even whimsy. The term utility is unfortunate not just because it suggests usefulness, but because it makes the economic approach to behaviour appear more limited than it actually is. We will make very few assumptions about the form of utility that a consumer might have. That is, we will attempt to avoid making value judgments about the preferences a consumer holds - whether they like smoking cigarettes or eating only carrots, watching Arnold Schwarzenegger movies or spending time with a hula hoop. Consumers like whatever it is that they like; the economic assumption is that they attempt to obtain the goods that they like. It is the consequence of the pursuit of happiness that comprise the core of consumer theory. The consumption of goods doesn't take place in a single instance, but over time. How does time enter into choice? We are going to simplify the problem a bit, and focus only on consumption and set aside working for the time being. Let  $x_1$  be consumption in the first period,  $x_2$  in the second period.

**Risk:** There are many risks in life, even if one does not add to these risks by intentionally buying lottery tickets. Gasoline prices go up and down, the demand for trained people in your major fluctuates, house prices change. How do people value gambles? The starting point for the investigation is the von Neumann – Morgenstern utility function. The idea of a von Neumann-Morgenstern utility function for a given person is that for each possible outcome  $x$ , there is a value  $v(x)$  assigned by the person, and the average value of  $v$  is the value the person assigns to the risky outcome. This is a “state of the world” approach, in the sense that each of the outcomes is associated with a state of the world, and the person maximises the expected value of the various possible states of the world. Value here does not mean a money value but a psychic value or utility. To illustrate the assumption, consider equal probabilities of winning \$100 and winning \$200. The expected outcome of this gamble is \$150 – the average of \$100 and \$200. However, the expected value of the outcome could be anything between the value of \$100 and the value of \$200. The von Neumann – Morgenstern utility is  $[\frac{1}{2}v(\$100)] + [\frac{1}{2}v(\$200)]$ . The von Neumann-Morgenstern formulation has certain advantages, including the logic that what matters is the average value of the outcome. On the other hand, in many tests, people behave in ways not consistent with the theory. Nevertheless, the von-Neumann approach is the prevailing model of behaviour under risk.

**Market Imperfections:** We have so far focused on unimpeded markets and seen that markets may perform efficiently. In this unit, we examine impediments to the efficiency of markets. Some of these impediments are imposed on otherwise efficiently functioning markets, as occurs with taxes. Others, such as monopoly or pollution, are problems that may arise in some circumstances and may require correction by the government.

**Price Floors and Ceilings:** A price floor is a minimum price at which a product or service is permitted to sell. Many agricultural goods have price floors imposed by the government. For instance, tobacco sold in the United States has historically been subject to a quota and a price floor set by the Secretary of Agriculture. Unions may impose price floors as well. For example, the screen actors' guild imposes minimum rates for guild members, generally

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pushing up the price paid for actors above that which would prevail in an unconstrained market. The wages of big stars are not generally affected by SAG, because these are individually negotiated. The most important example of a price floor is the minimum wage, which imposes a minimum amount that a worker can be paid per hour. A price ceiling is a maximum price that can be charged for a product or service. Rent control imposes a maximum price on apartments (usually set at the historical price plus an adjustment for inflation) in many U.S. cities. Taxi fares in New York, Washington DC and other cities are subject to maximum legal fares. During World War II and in the 1970s, the United States imposed price controls to limit inflation, imposing a maximum price for legal sale of many goods and services. For a long time, most states limited the legal interest rate that could be charged (these are called usury laws) and this is the reason so many credit card companies are located in South Dakota. South Dakota was the first state to eliminate such laws. In addition, ticket prices for concerts and sporting events are often set below the equilibrium price. Laws prohibiting scalping then impose a price ceiling. Laws preventing scalping are usually remarkably ineffective in practice, of course.

**Political Motivations:** The politics of rent control are straightforward. First, rent control involves a money transfer from landlords to tenants, because tenants pay less than they would absent the law and landlords obtain less revenue. In the short-term, due to the inelastic short-run supply, the effect on the quantity of apartments is small, so rent control is primarily just a transfer from landlords to tenants.

**Externalities:** When the person sitting next to you lights up a cigarette, he gets nicotine, and the cigarette company gets some of his money. You just suffer, with no compensation. If your neighbour's house catches fire because he fell asleep with that cigarette burning in his hand, your house may burn. The neighbour who plays very loud music late into the night before your big economics test, enjoys the music, and the record company and stereo component companies get their money. You fail college and end up borrowing \$3,00,000 to buy a taxi medallion. Drunk drivers, cell phones ringing in movies, loud automobiles, polluted air, and rivers polluted to the point that they catch fire like Cleveland's Cuyahoga did, are all examples where a transaction between two parties harmed others. These are "external effects." But external effects are not necessarily negative. The neighbour who plants beautiful flowers in her yard brightens your day. Another's purchase of an electric car reduces the smog you breathe. Your neighbour's investment in making his home safe from fire conveys a safety advantage to you. Indeed, even your neighbour's investment in her own education may provide an advantage to you – you may learn useful things from your neighbour. Inventions and creations, whether products or poetry, produce value for others. The creator of a poem, or a mathematical theorem, provides a benefit to others.

These effects are called external effects, or externalities. An externality is any effect on people not involved in a particular transaction. Pollution is the classic example. When another person buys and smokes cigarettes, there is a transaction between the cigarette company and the smoker. But if you are sitting near the smoker, you are an affected party not directly compensated from the transaction, at least before taxes were imposed on cigarettes. Similarly, you pay nothing for the benefits you get from viewing your neighbour's flowers, nor is there a direct mechanism to reward your neighbour for her efforts.

Externalities will generally cause competitive markets to behave inefficiently from a social perspective, absent a mechanism to involve all the affected parties. Without such a mechanism, the flower-planter will plant too few beautiful flowers, for she has no reason to take account of your preferences in her choices. The odious smoker will smoke too much, and too near others, and the loud neighbour will play music much too late into the night. Externalities create a market failure, that is, a competitive market does not yield the socially efficient outcome.

Education is viewed as creating an important positive externality. Education generates many externalities, including more and better employment, less crime, and fewer negative externalities of other kinds. It is widely believed that educated voters elect better politicians.

Educated individuals tend to make a society wealthy, an advantage to all of society's members. As a consequence, most societies subsidize education, in order to promote it. A major source of externalities arises in communicable diseases. Your vaccination not only reduces the likelihood that you contract a disease but also makes it less likely that you infect others with the disease.

**Private and Social Value, Cost:** Let us consider pollution as a typical example. A paper mill produces paper, and a bad smell is an unfortunate by-product of the process. Each tonne of paper produced increases the amount of bad smells produced. The paper mill incurs a marginal cost, associated with inputs such as wood, chemicals and water. For the purposes of studying externalities, we will refer to the paper mill's costs as a private cost, the cost to the paper mill itself. In addition, there are external costs, which are the costs borne by others, which arise in this case from the smell. Adding the private costs and the external costs yields the social costs.

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## Theories of the Firm

Different firms belonging to the same industry, facing the same market environment, behave differently. Thus, the necessity for theories of the firm. The theory must have both explanatory and predictive values. The validity of the theory is judged on the basis of several criteria, like, consistency, realism of its assumptions, its generality and application and simplicity. The purpose of the theory of the firm is to provide models for the analysis of the decision making in the firm in various market structures. A theory of the firm needs to explain the entire range of price-output decisions – how the firms set their price, decide their product line, advertisement expenses and sales promotion efforts, research and development expenses, etc.

Economists, however, have viewed the ways in which managers take such decisions differently. In general, firms strive for profit maximisation. The traditional theory of the firm deals with this aspect. But in the early 1930s, this theory faced several criticisms and dissatisfaction. The reasons for this were twofold:

1. Emergence of oligopoly, a market structure characterised by the existence of a few large firms. Mergers and amalgamations have made the structure of industries concentrated so that few large (dominant) firms accounted for a major portion of an industry's output. This shifted the pressure on each firm to maximise profits independently and led to joint profit maximisations through cartels and collusions. Profit maximisation was not the only inevitable objective.
2. Separation of ownership from management: Modern firms started showing a separation of ownership from control – firms were controlled by managers rather than owners (share holders) due to fragmentation and dispersion of ownership of shares. The notion of the entrepreneur started losing relevance with management becoming an executive function. Managers may wish to pursue goals other than profit maximisation, and would be forced to take into consideration the matter of profits to the extent that sufficient cash had to be generated to pay satisfactory dividends to the share holders (so that they did not withdraw funds from the company).

There have been a number of different theories of the firm which can be shown as below.

### Profit Maximising Theory (Marginalist Theory of the Firm)

#### Concept of Economic Profit

Profit is defined as revenues minus costs. But the definition of cost is quite different for the economist than for the accountant. Economic profit equals the revenue of the firm minus its explicit and implicit costs.



**Assumptions:** The basic assumptions of this theory can be listed as follows:

1. The entrepreneur is also the owner of the firm.
2. The firm has a single goal, that of profit maximisation.
3. This goal is attained by application of the marginalist principle— $MC = MR$ .
4. The world is one of certainty – full performance, the present conditions and the future developments in the environment of the firm. The firm knows with certainty its own demand and cost functions. It learns from past mistakes in that its experience is incorporated into the continuous appraisal (estimation) of its demand and costs.
5. Entry assumptions vary according to the particular model. The common elements regulating entry in all models of the firm are the following (a) Entry refers to actual model entrants in an industry; no account of potential entrant is taken; (b) Entry in the short-run is practically impossible: entry can take place only in the long-run.
6. The firm acts with a certain time horizon which depends on various factors such as the rate of technological progress, the capital intensity of the methods of production, the nature and gestation period of the product, etc. The firm aims at the maximisation of its profit over this time horizon: the goal of the firm is long-run profit maximisation.

There are various theories to explain profit-making by firms, the important ones are presented below.

### **Innovation Theory**

Firms make innovations in new products, new production techniques, new marketing strategies, etc. These innovations are costly and must obviously be rewarding for them to be followed continuously. For this reason, innovating firms are sometimes awarded patent rights for a specific period of time, during which time no other firm is permitted to copy the product and/or technology. Profits are thus considered a reward for innovation.

### **Risk-bearing Theory**

Firms invest large sums in the production system, expecting to produce goods and make profits on it. However, the production may run into difficulties, be delayed and there may not be an adequate market when production is ready. The firms take these risks and must be adequately rewarded.

### **Monopoly Theory**

Some firms are able to enjoy certain monopoly powers in view of being in possession of a huge capital, economies of scale, patent protection or socio-political powers. As a result, there is a lack of perfect competition and such firms are able to reap economic profits.

### **Friction Theory**

According to this theory, there is a long-run equilibrium of economic profit which is zero (adjusted for risk). However, markets are seldom in equilibrium and that gives rise to economic profits or losses. For example, if winter is too severe or too prolonged, firms dealing in woollen garments would reap large economic profits while those dealing in items like ice-cream, or fans may run into losses.

### **Managerial Efficiency Theory**

This theory argues that economic profit can arise because of exceptional managerial skills of well managed firms. For example, if firms that operate at an average level of efficiency can avoid losses, then those which operate above that level must reap economic profits. Thus, existence of profit is essential to ensure good performance.

**Criticism of the Theory:** The following arguments are put forward to show that the assumption of profit maximisation is amply borne out by business behaviour.

1. Businessmen sometimes assert that it is their business to look after social welfare, rather than personal gain.
2. The postulate of profit maximisation certainly applies to industries and it is the behaviour of the industry, rather than of an individual firm which determines the flow of products and the demand for inputs.

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Those who question the validity of the profit maximisation postulate put forward the following arguments:

1. Enlightened businessmen vehemently deny that their object is to maximise profits. Servicing society rather than personal profit is said to be their aim.
2. The profit maximisation doctrine would be the rule if business decisions were taken by those who are to be rewarded for the profits. However, most business decisions are taken by business executives or salaried managers, rather than by owners of firms.
3. The objective of profit maximisation is difficult to realise. If a businessman is to maximise his profits, he must fix a price so as to equalise marginal revenue and marginal cost. This means that he must be able to estimate demand at all prices and marginal cost at all outputs. This is a fantastically difficult task and is seldom attempted in practice.
4. The business policies and practices actually pursued by businessmen are not consistent with the profit maximisation doctrine. The calculus of maximisation does not fit with the notions which actually guide small businessmen – they are guided by a sense of fairness, adequacy, etc. and are satisfied with a satisfactory rate of profit instead of pursuing maximum profits with callous disregard for other interests.
5. Firms cannot have profit maximisation as their goal as they lack the necessary information and ability to do so.
6. Firms do not maximise profits but face some kind of minimum profit constraint. The management has discretion in setting goals subject to the minimum profit constraint.
7. Besides being difficult to calculate precisely, profit maximisation is also regarded as immoral because it requires the businessman to use every trick he can think of to keep wages and fringe benefits down, to extract the last possible dollar from the consumer, to sell as few quality merchandise as he can legally hoodwink the customer into buying, to use income solely for the benefits of the stock holder, to disclaim any responsibility to the community, to wrangle the lowest possible price from his vendors regardless of its effect on them, and so on.

Modern business firms, however, do not have profit as their sole variable in the objective function of the firm. There are many other goals which firms pursue like production, sharing social responsibility and consumer consciousness, etc. Similarly, to assume that the firm has perfect and complete knowledge of the operating environment is unrealistic. In reality the firm has to continuously search for information flow and choose the relevant information to direct its economic activity. Thus, various other theories have been underlined to explain the modern approach in business firms.

## Managerial Theories of the Firm

### Williamson's Model and Maximisation of Management Utility

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In the Williamson's model, managers are free to pursue their own self interest once they have achieved a level of profit that will pay satisfactory dividends to shareholders and still ensure growth. The managers self interest depends upon many other things besides salary. Further, so far as the goodwill of the firm serves their own ends and ambitions, the managers would be concerned about it, else they would try to bypass it.

*Assumptions:* Williamson adopts the same set of assumptions as does Baumol in his sales revenue maximisation model, viz.,

1. Market is non-perfectly competitive.
2. Ownership of the firm and management of the firm are divorced from each other.
3. A minimum profit constraint is imposed on the managers by the capital market (or shareholders) which cannot be ignored by the management.

*Framework of the Model:* Williamson conceives of managers as having their own, "utility functions", i.e., a set of factors which give rise to managerial satisfaction. According to him, managers have the discretion to pursue policies which maximise their own utility rather than aiming to maximise profits. Profit, in fact, acts as a constraint to managerial behaviour. The managerial satisfaction or utility is taken to arise from certain aspects of the management task, like responsibility, status, prestige, dominance, professional excellence, security, salary, etc. Of these only salary is measurable, other aspects being non pecuniary. In order to take accounts of these non pecuniary variables, some closely related variables which can be measured need to be suggested to be included. In order to do this, Williamson introduces a concept of "expense preference" defined as the satisfaction which managers derive from certain types of expenditures. Baring the idea of expense preference the motives of managers expressed in the pecuniary and non pecuniary variables (discussed above) can be taken care of with the help of three variables, viz.

1. Additional expenditure on staff (S),
2. Managerial emoluments (M) and
3. Discretionary investments ( $I_D$ ).

These three variables can always be measured in monetary terms. The manager's utility function is thus defined by Williamson as

$$U = f(S, M, I_D)$$

The manager is expected to follow policies which maximise his utility function.

The staff variable (S) is designed to cover the benefits (to the manager) of increase in the quality and number of staff reporting to the manager. In many cases this will be mainly in the form of salary, i.e., a manager over a bigger team of subordinators getting higher salary than the one managing a smaller team. However, there are other positive aspects of the staff variable. Increase in S is taken, to a large extent, equivalent to the manager's promotion as it increases the range of his activity and control over resources of the firm and is, in a way, a measure of his professional excellence.

Managerial enrolments or manage real slack (M), absorbed as a cost, includes facilities like expense account for entertainment, luxurious office, staff car, etc. This variable reflects the utility desired by the manager from being able to authorise expenditure of the firm to serve his own ends. Expenditures of this nature reflect, to a large extent, the prestige, power and status of the manager. Though to many these expenses seem unnecessary from the viewpoint of productivity of the firm, the manager defends it on the ground that it helps in creating goodwill and right atmosphere for business activities and would,

therefore, be in the interest of long run profitability. It has, however, been found that such expenses are not the strongest motives for managers.

Discretionary power of investment expenditure (ID) is something similar to managerial emoluments in the sense that it reflects the power and status of the manager as it implies the discretion of the manager to undertake investments beyond those required for normal operations. The manager is therefore in a position to take up projects which appeal to him in particular but which may not necessarily be the best in terms of generating profits for the firm. Often such investments involve advanced technology. Projects of this kind may reflect a fascination by the manager for what is 'new' and can be deemed as "scientific progress", as this would put him above other managerial staff in terms of status and esteem. Such investments may or may not be economically efficient. But what the discretionary power of investment expenditure reflects is that some such investments are taken up, not for their efficiency as such, but more on the basis of sense of self-fulfillment which it provides to the manager.

Thus, Williamson's model suggests that a firm led by utility maximising managers spends more on staff expenditures and exhibits more organisational slack than a profit maximising firm. Evidence provided by Williamson in support of his theory is not fully convincing. His theory has at least one serious flaw, i.e., the measure of executive compensation does not give sufficient importance to non salary components of the compensation. Consequently, it may significantly underestimate the profit maximising behaviour of managers in the real world.

### **Marris' Model of 'Managerial Enterprise'**

Marris tried to improve upon Baumol's model. He offered a variation of Baumol's model that stressed the maximisation of growth subject to the security of management's position. Marris' hypothesis is that executive actions are limited by the need for management to protect itself from dismissal or takeover raids in the event of failure.

Like Williamson, Marris's approach is also based on the fact that ownership and control of the firm is in the hands of two different sets of people. He, like Williamson, also suggests that managers have a utility function in which salary, status, power, prestige and security are important variables. Owners of the firm (i.e., shareholders) are, however, more concerned about profits, market share, output, etc. In other words, goals of the managers and shareholders differ from each other. The utility function of managers (UM) and that of the owners (UO) may, therefore, be defined as

$$UM = (\text{salaries, power, status, job security})$$

and

$$UO = (\text{profits, market share, output, capital, public esteem}).$$

In contrast to Williamson, Robin Marris believes that most of the variables entering into the utility function of managers and owners are strongly correlated with a single variable: the size of the firm. He therefore postulates that the managers would be mainly concerned about the rate of growth of size. However, various measures of size like capital, output, revenue and market share exist. Marris defines size in terms of corporate capital, which is measured as the "sum total of the book value of assets, inventory and short-term assets including cash revenue." Further, it may be noted that managers aim to maximise rate of growth of size rather than absolute size as the managers generally wish to stay in the concern and grow rather than move from a smaller size firm to a bigger size firm. Moreover, maximising the rate of growth of size also satisfies the owners, while absolute size may not. Thus, the attraction of the growth rate of size stems from the fact that not only does it have a positive effect upon the prospects of promotion of the managers but it also keeps the shareholders satisfied.

Marris recognises that the drive for the rate of growth of size is not, however, without constraints. He lists mainly two constants to the achievement of maximisation of the rate of growth:

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1. Marris adopts Penrose's thesis of the existence of a sure limit on the rate of managerial expansion. In other words, the capacity of the managerial team in fact determines the upper limits to the growth of the firm. There is a high possibility that management would lose control over a rapidly growing firm. There is a limit to output increase by hiring new managers due to their lack of experience and the time lag involved in their acquiring the specific corporate culture and developing coordination with the existing managerial team. The ability of managers to find and successfully launch new products to take the place of old products is also subject to a limit. Similarly, the research and development department cannot be expected to produce an expanding flow of products continuously. All these facts are strong enough to set a limit to the rate of growth of size of the firm.
2. The second constraint on rate of growth stems from the voluntary slowing down process by the management itself. This slowing down process comes from the desire of the management for job security. The management which holds the consideration of job security very highly would grow in such a way that it remains safe on the financial side. For example, in case management aims to achieve growth at any cost, it should not hesitate to borrow large sums of money from the capital market for investment purposes. But an increase in the rate of borrowings may give out an impression of following a less prudent financial policy, thus inviting take over bid by another firm. This would definitely be a real danger to the job secure motivation of the managers. Obviously, there is definite distillate of risk and managers would like to seek job security through the adoption of a cautions and prudent financial policy which would consist of:
  - i. non-involvement in risky investments; and
  - ii. financing growth mainly from the profit levels being generated by the present set of products. The ratio of external to internal finance is not allowed to grow significantly.
  - iii. In order to identify the prudence of a financial policy, Marris proposes the concept of financial constraint,  $a$ , which is mainly determined by the risk attitude of the top management. A risk loving management would prefer a high value of  $a$ , while a risk averting management would prefer a low value of  $a$ . Marris defines 'a' as the weighted average of the following three security ratios

$$\text{Liquidity ratio } a_1 = \frac{\text{Liquid Assets}}{\text{Total Assets}}$$

$$\text{Leverage Ratio } a_2 = \frac{\text{Value of Debts}}{\text{Total Assets}} ; \text{ and}$$

$$\text{Profit Retention Ratio } a_3 = \frac{\text{Retained Profits}}{\text{Total Profits}}$$

Low liquidity ratio implies the possibility of insolvency of the firm. High liquidity, of course, increase the security but a too high liquidity ratio has an adverse impact on rate of growth. The management has, therefore, to choose a level of  $a_1$  which is neither too high nor too low so as to ensure security. The leverage ratio relates to the extent of reliance on borrowing for expansion purposes. A high and growing leverage ratio would invite take over bids and increase the rate of failure, while a too low leverage ratio would retard growth. Retained profits are perhaps the most important financial source for the growth of capital. But a high level of retained profits cannot keep the shareholders happy and a

too high  $a_3$  would mean that management is taking a risk of displeasing the shareholders. As is obvious from the discussion above, value of the financial constraint ( $a$ ) would increase if either  $a_2$  or  $a_3$  are increase or  $a_1$  is reduced. That is, liquidity ratio and profit retention ratio are positively related. Marris further postulates that there is a negative relationship between job security and financial constraint: job security of managers is reduced if  $a$  is increased and it increases if  $a$  is reduced. Thus, financial security constraint determines the level of job security and, therefore, limits the rate of growth of the capital supply and thereby the rate of growth of the firm.

**The Model:** Marris argues that the managers would aim to have a balanced growth in the sense that growth in demand (stemming mainly from new products) would be matched by growth in capital (making available the invisible funds for launching and producing the products). That is, the managers would want to maximise balanced growth rate ( $g$ ) which is equal to the growth rate of demand for the products ( $g_d$ ) and growth rate of capital supply ( $g_c$ )

$$\text{Max. } g = g_d = g_c$$

By this the managers achieve maximisation of their own utility as well as that of the shareholders. In case the management wants to expand too rapidly (by undertaking highly risky projects, resorting to heavy borrowing for expansion, etc.), it runs the risk of job security. On the other hand, if it wants to expand too slowly (due to lack of initiative in finding new markets and products, keeping excessive reserves by high profit retention ratio but shying away from new investment projects), it would be considered as an inefficient management, again impairing job security.

The first step to achieve balanced growth rate would be to identify the factors that go in to determine  $g_d$  and  $g_c$ . According to Marris, these determinants can be expressed in terms of two variables:

1. Diversification rate ( $d$ ); and
2. Average profit margin ( $m$ ).

Both these variables can however, be determined only after the management has decided about its financial policy,  $a$ . The diversification rate can be chosen either by changes in style of the existing products or by expanding the range of products. Given the price of the product and the production cost, the average profit margin would be affected by the levels of advertising and R & D. Higher the expenditure on advertisement ( $A$ ) as well as R & D, lower would be the average profit margin ( $m$ ). Thus, the Marris' firm has three policy variables:  $a$ ,  $d$  and  $m$ .

Marris also points out that there can be a conflict between managers' objective of maximising growth and stockholders' objective of maximising profits. Therefore, if the growth maximising solution does not generate sufficient profits, growth rate will have to be reduced to increase dividend to meet shareholders' expectations.

In brief, in Marris' model, the management, whose actions are limited by the motivation to protect itself from dismissal or take over bids, takes to the following course:

1. The management must walk on a knife edge between a debt/asset ratio high enough to stimulate growth but not low enough to suggest financial imprudence.
2. The management must also maintain a low liquidity ratio, i.e., liquid assets/total assets. But this ratio must not be so low that it endangers paying all obligations on time.
3. The management must try to keep a high retention ratio, viz., retained earnings/total profits. But this ratio should not be so high that shareholders are not paid satisfactory dividend.

## Behavioural Theories of the Firm

Behavioural theories combine industrial economics and organisational theory. Unlike managerial theories, behavioural theories view the firm as engaged in non-maximising behaviour. According to behavioural theories, the firm's sub-optimal behaviour arises from uncertainty and conflicting goals of various groups within the firm. Behavioural theories analyse the organisation of the firm, the way in which decisions are reached, and the inter-group conflicts within the organisation. Thus, while managerial theories emphasise the role of management, the behavioural theories argue that groups within the firm other than managers influence the behaviour of the firm.

### Simon's 'Satisficing' Model

Simon proposes an alternative model to the profit maximising one as he believes that the relevant information with the managers is far from complete. The managers take decisions for the future on the basis of incomplete information. Management, realising the complexity of calculations, inevitable uncertainties of future and the imperfections of the data that would have to be employed in any determination of "optimal" decisions, cannot help but be satisfied with something less: its behaviour will be only "satisficing". In fact, the management generally is not even certain whether it is maximising profits or not; instead it aims merely at satisfactory profits. The management determines a 'satisfactory aspiration level' on the basis of its past experience and judgment about future uncertainty. If the 'aspiration level' is attained easily it is revised upwards for future operations, while if it remains unachieved or proves highly difficult to be achieved it is revised downwards. However, both in the case of upward as well as downward revisions, the management indulges in 'search behaviour' to find the reason for the deviations for the 'aspiration level'. Since management can explore only limited alternatives, a 'satisfactory' alternative course of action is pursued. Simon suggests that if the satisfactory state is not achieved even by lowering the aspiration level and the search behaviour, the behaviour pattern of managers becomes that of apathy or aggression.

This model helps in explaining certain real world situations. For example, the firms generally use mark-up pricing to generate reasonable profits rather than resorting to marginal cost pricing to maximise profits. Moreover, Simon's model is consistent with the theory of motivation where human action is a function of drives and it terminates when drives are satisfied.

There are, however, serious flaws in the theory of 'satisficing' behaviour. Some of them are as follows:

1. What is the nature of information Simon is talking about? He alleges that the knowledge available to the firm for its rational decision making is imperfect and that there are screens and blockages in "the flow of information through the hierarchies of the organisation." But what can be imperfect about the information in, say, tax increase or wage increase? Why should it take a special theory to explain how the information 'flows' through various hierarchical levels—up or down or across? Yet, it is these types of information alone that are essentially involved in the theory of price and allocation, since it is the adjustment to such changes in conditions for which the postulate of maximising behaviour is employed.
2. It is not easy to determine a "satisfactory level". Unlike a single well-defined level of optimum profit, there can be many levels of satisfactory profits, depending upon persons or situations. This creates a major difficulty in the operational use of this theory. We can, however, state some of the main factors influencing the decisions for arriving at a satisfactory level of profit. Like a certain minimum amount of profit is needed
  - i. to meet some of investment needs internally
  - ii. to keep the shareholders satisfied, thus avoiding take over bids
  - iii. to demonstrate company's health for raising capital

The satisfactory level of profit is also related to the kind of market in which the firm operates; in a high risk market, higher profits will be considered satisfactory.

3. When Simon is talking about 'satisficing behaviour', is he referring to mere adjustment to a simple change or to a coordinated, or integrated whole of its activities? Evidently, only the latter is the highly ambitious aim, the former does not call for impossible performance. In fact, Simon confuses in the important difference between information about conditions and information about changes in conditions. For purposes of competitive price and allocation theory, it does not make much difference whether the information which we assume to have regarding the conditions of demand, production and supply under which it works is correct or not, as long as we may safely assume that any change in these conditions is registered correctly. If we want to inquire into the effects of a change in wage rates or tax rates, etc., we must, of course, assume that the decisionmaker reacts to the change. But whether his 'previous' store of information — from which he started when the change occurred — was accurate or not will rarely make a qualitative difference to the reactions.

Notes

### **Cyert and March Model**

The behavioural theory developed by Cyert and March in their book 'A Behavioural Theory of the Firm' can be studied in the following sequence.

1. **The firm as a coalition of groups with conflicting goals:** The theory focuses on the decision making process of a "large multi-product firm under uncertainty in an imperfect market". The firm is not treated as a single goal, single decision unit, as in the traditional theory, but as a multi-goal, multi-decision organisational coalition. The firm is conceived as a coalition of different groups which are connected with its activity in various ways: managers, workers, shareholders, customers, suppliers, bankers, tax-inspectors and so on. Each group has its own set of goals or demands.
2. **The process of goal formation – the aspiration level:** Each member or group of the coalition firm has a multiplicity of demands on the organisation, often conflicting with the demand of other members and with the overall goals of the firm. There is a strong relation between demands and past achievement. Demands take the form of aspiration levels. They change continuously depending on past achievement and on changes in the firm and its environment.

Demands of the various groups of the coalition firm change contiguously over time. Given the resources of the firm in any one period, not all demands which confront the top management can be satisfied. Hence there is a continuous bargaining process between the various members of the coalition firm and the inevitable conflict.

3. **Goals of the firm:** The goals of the firm are set ultimately by the top management. There are five main goals of the firm – production, inventory, sales, share-of-the market and profit. Goal formation by top management is done by continuous bargaining between the groups of the coalition. In this process, it tries to satisfy as many as possible of the demands with which it is confronted by the various members of the coalition. Cyert and March argue that satisficing behaviour is rational given the limitations, internal and external, within which the operation of the firm is confined. Thus, the firm is not a maximising but rather a satisficing organisation.

Behaviourists, thus, redefine rationality. Traditional theory defined rational firm as the firm that maximises profit (short-run and long-run). The behaviourists postulate a satisficing behaviour of the firm which is rational given the limited information and limited computational abilities of the managers.

4. **Means for resolution of the conflict:** Given the limited resources of the firm in any one period and the impossibility of satisfying all demands, conflict is inevitable. There is a continuous struggle and bargaining process as the various groups compete for the given resources of the firm. However, this conflict does not lead to any chaotic



unstable condition, rather both the goals and functioning of the firm show remarkable stability. The smooth functioning is secured by various means which the top management uses. Some important ways are:

- i. Budget-share and its use by various groups.
  - ii. Firm is an adaptive organisation; it sets its present goals, behaviour and decisions based on past experience.
  - iii. There is delegation of functions which limits the discretion of various groups of coalition, thus reducing source of conflict.
  - iv. Money payments are a major source of satisfying the demands of various groups of the coalition firm, but not the only means as in the traditional theory.
  - v. Side payments mostly take the form of policy commitments by the top management and are a means of satisfying some demands, e.g., a scientist may get salary and some extra fund for research work.
  - vi. Slack payments are defined as payments to the various groups of the coalition over and above those required for efficient working of the firm, e.g., workers may be paid higher wages to keep them in the firm; managers may be given higher salaries with attractive perks; shareholders may be given higher dividends, etc.
  - vii. Sequential attention to demands. The top management, depending on the urgency of different demands, attaches priority and satisfies first the demands that seem more important in any one period.
  - viii. Decentralisation of decision making. The top management organises departments and sections to which definite assignments and authority are delegated.
5. *The Decision making process:* The goals of the firm, as set by the top management and approved by board of directors, have to be implemented by decisions. Decisions are taken at various levels of administration. Two levels of decision making can be prominently distinguished.
- i. The decision making process at the level of top management
  - ii. Decisions at lower level of management (administration).

The decisions at the level of top management are not taken on a complete and exhaustive examination of all possible alternatives nor are they based on detailed cost-benefit studies, or application of marginalistic rules. Rather the top management undertakes a quick screening of the most promising alternatives and then directs more "search" for further information on the "best" of these solutions.

Four points are stressed by the behavioural theorists regarding the search activity (1) search is problem oriented; (2) it is not costless; (3) it may be biased due to "position bias"; (4) and its position within the organisation is not always smooth. The final decision on any particular project is based normally on two simple evaluation criteria: financial and an improvement criterion.

The decision process at lower levels of administration involves various degrees of freedom of action. The administrative staff at lower levels learns by experience and is helped by "blueprint" or simple rules in making their decisions. The execution of budget in each period provides invaluable experience. The whole firm is an adaptively rational system. Measures which failed in the past are unlikely to be adopted again. The top management has the budget and the balance sheet of each section and uses these as controlling devices for the lower levels; on top of various other "policing" techniques (e.g., employment of supervisors).

6. **Uncertainty and the environment of the firm:** Cyert and March distinguish two types of uncertainty: **market uncertainty** and **uncertainty of competitor's reactions**. Market uncertainty refers to possible changes in customers, preferences or changes in techniques of production. It can partly be avoided by search activity and information gathering, but not completely. Given market uncertainty, the theory postulates that the firm considers only the short-run and chooses to ignore the long-run consequences of short-run decisions.

The uncertainty due to competitor's actions and reactions (oligopolistic interdependence) is brushed aside by this theory by assuming that existing firms have arrived at some form of collusive action.

The theory pays too little attention to the environment and its effect on the goal formation process and the pricing and output decisions at the level of top management. It examines internal resource allocation, assuming collusion.

7. **A simple model for illustration of theory:** The model refers to the case of a duopoly. The decision process involves determination of the output which is homogeneous, so that a single price will ultimately prevail in the market. Of course, each firm, in deciding its output automatically induces price changes in the market. No inventories are allowed in this model. The steps may be outlined as follows:

- i. Forecast of competitors' reactions based on the past observed reactions of competitors.
- ii. Forecast of demand based on an estimate of demand functions from past observations.
- iii. Estimation of costs usually assumed to be the same as in the past period.
- iv. Specification of goals of the firm.
- v. Evaluation of results by comparing them to the goals.
- vi. If goals are not attained the firm re-examines the estimate of its costs.
- vii. If the new solution with the downward adjusted costs leads to target profits it is adopted. If not, the firm proceeds to the next step.
- viii. Re-examination of estimate of its demand which consists of considering possible changes in the sales strategy (more advertising, more salesmen, etc.). The result is an upward adjustment of the initial estimate of demand.
- ix. Evaluation of the new solution by comparing it to goals. If target profits are attained, it is adopted, if not, the firm proceeds to next step.
- x. If goals are not met the firm readjusts downwards its aspiration level.

(The firm has multiple goals though only one explicitly appears in the above model).

Cyert and March based their theory on four actual case studies and two experimental studies conducted with hypothetical firms. It is obvious that the theory is found on too few cases for it to be possible to show that it has generality. However, the part that describes the decision making process and the allocation of resources in large complex organisations could be incorporated in, and hence, enrich other theories of the firm.

## Value Maximization

Short-term profit has been sidelined by most firms as their objective. Firms are often found to sacrifice their short-term profit for increasing the future long-term profit. This theory states that the objective of the firm is to maximise the wealth or value of the firm. For example, firms undertake research and development expenditure, expenditure on new capital equipment or major marketing programmes which require expenditure initially

but are meant to maximise the future profit. The objective of the firm is thus to maximise the present or discounted value of all future profits and can be stated as,

Notes

$$PV(\pi) = \frac{\pi_1}{(1+r)^1} + \frac{\pi_2}{(1+r)^2} + \dots + \frac{\pi_n}{(1+r)^n}$$

$$= \sum_{t=0}^n \frac{\pi_t}{(1+r)^t}$$

where,

PV = Present value of all expected future profits of the firm.

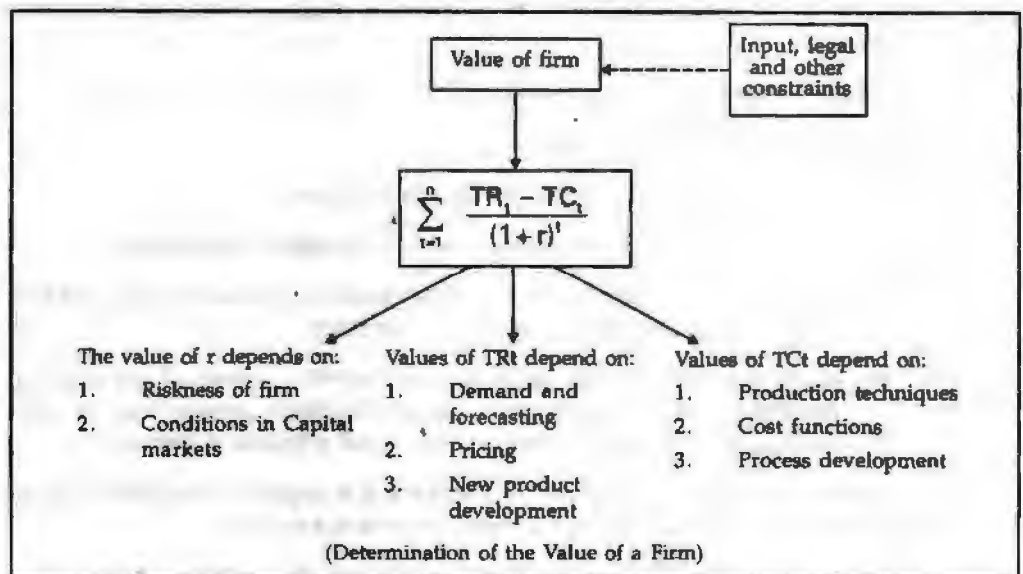
$\pi \dots \pi_n$  = Expected profit in 1, 2 .....n years

r = Appropriated discount rate

t = Time period of 1 .....n years. Assumed profit is equal to total revenue (TR) minus total cost (TC), then the value of the firm can also be:

$$\text{Value of the firm} = \sum_{t=0}^n \frac{TR_t - TC_t}{(1+r)^t}$$

Value or wealth maximisation has become one of the primary objectives of many firms.



A careful inspection of the equation suggests how a firm's managers and workers can influence its value. For example, in a company, its marketing managers and sales representatives work hard to increase its total revenues, while its production managers and manufacturing engineers strive to reduce its total costs. At the same time, its financial managers play a major role in obtaining capital, and hence influence the equation, while its research and development personnel invent and reduce its total costs. All of these diverse groups affect the company's value, defined here as the present value of all expected future profits of the firm.

### Firm's Constraints

Decision making by firms takes place under several restrictions or constraints, such as,

1. **Resource constraint:** Many inputs may be available in a limited or fixed quantity, e.g., skilled workers, imported raw material, etc.

2. **Legal constraint:** Both individuals and firms have to obey the laws of the state as well as local laws. Environmental laws, employment laws, disposal of wastes are some examples.
3. **Moral constraints:** These refer to actions that are not illegal but are sufficiently inconsistent with generally accepted standards of behaviour to be considered proper.
4. **Contractual constraints:** These bind the firm because of some prior agreement such as a long-term lease on a building or a contract with a labour union that represents the firm's employees.

Notes

Decision making under these constraints with optimal results is a fundamental part of managerial economics.

### **Case: Technical Projects India (TPI)**

Technical Projects India Ltd. has recently booked a large number of orders. For example, it has undertaken to supply equipment for a steel plant in Yugoslavia, taken up a project to increase water supply in Basrah (Iraq), contracted to supply supporting structural for lighting equipment in Kuwait and water treatment plant in Bangkok. The TPI has also in its order book projects like an international airport in Kuwait, a rolling mill in Yugoslavia, a sugar plant in Sudan, a transmission line in Iraq, a structural steel factory, a zinc smelter plant and an airport project for Iraq, so on and so forth.

In January 1987, it was reported that Technical Projects (India) Ltd. has bagged a ₹ 80 crores massive civil construction order for building a full-fledged defence camp in Kuwait.

Besides, it has also been awarded a letter of intent for a ₹ 35 crores civil works for the construction of a residential complex in Kuwait. With these the company has bagged turnkey projects worth ₹ 115 crores during the first month of 1987 in Kuwait alone.

In yet another achievement during January, the TPI is likely to be awarded another ₹ 50 crores contract in one of the Middle East countries. With this the company would have secured three project contracts on a turnkey basis of the value of ₹ 165 crores in the beginning of the current year itself.

The contractual agreement for the execution of the defence project was signed in Kuwait. Under the agreement, the TPI is expected to complete the project within a period of two and a half years from the date of the award of the contract.

Besides, in addition to the execution of the project, the company would also be supplying the basic designs, the requisite materials and manpower.

The TPI is already undertaking a massive ₹ 730 crores project in Kuwait for the construction of an entirely new township at Ardiya. As this is the first phase of the project, negotiations are afoot for the second phase of a value of another ₹ 230 to ₹ 250 crores, which is also likely to be awarded to the company.

The company at present has on hand 54 turnkey project contracts, including three bagged now, of a total value of ₹ 705 crores. This comprise 11 project contracts overseas in Europe, Saudi Arabia, Kuwait and Iraq of the value of ₹ 450 crores.

The TPI's coke oven project in Yugoslavia which was executed in collaboration with Dr C Otto of West Germany and Delattre Levivier of France has since been completed and is expected to be commissioned soon.

The TPI had entered into an agreement with these two companies for the execution of the coke oven project in Yugoslavia in October 1985. The TPI's share in this project was of the order of ₹ 5.7 crores.

In view of the past potential for business in these countries, the company has set itself a target of ₹ 1,000 crores to be achieved during the current year.

As the ultimate aim is to achieve a project completion rate of minimum three years, the company is apparently gearing itself to completing projects of a value of ₹ 300 crores per year by 1990 and further at a rate of ₹ 660 crores per annum in the subsequent years.

#### Questions

1. Is TPI, an economic unit? Does it produce any thing?
2. What are the possible objectives of the TPI as a firm?

Source: The Hindustan Times, Jan 1, 1986

### Student Activity

1. Hold a group discussion 'on the major factors influencing scale of production of a firm'.
2. Hold a panel discussion on the 'Impact of last union budget on the small-scale units'.
3. Conduct a brainstorming exercise on 'the risk associated with investment in a joint stock company.'

## Summary

Most academic economics today begin with the premise that resources are scarce and that it is necessary to choose between competing alternatives. That is, economics deals with tradeoffs. With scarcity, choosing one alternative implies forgoing another next best alternative—the opportunity cost. The opportunity cost creates an implicit price relationship between competing alternatives. In addition, in both market oriented and planned economies, scarcity is often explicitly quantified by price relationships.

Understanding choices by individuals and groups is central. Economists believe that incentives and desires play an important role in shaping decision making. Concepts from the Utilitarian school of philosophy are used as analytical concepts within economics, though economists appreciate that society may not adopt utilitarian objectives. One example of this is the idea of a utility function, which is assumed to represent how economic agents rank the choices given to them. Then the utility function ranks available choices from best to worst, and the agent gradually learns to choose the best-ranked choice in the feasible set of his alternatives.

Most economists also acknowledge the existence of market failure and many insights from Keynesian economics. They look to game theory and asymmetric information to solve problems on a microeconomic level.

Economics studies the optimum allocation of scarce resources among people - examining what goods and services end up in the hands of which people. Why scarce resources? Absent scarcity, there is no significant allocation issue. All practical, and many impractical, means of allocating scarce resources are studied by economists. Markets are an important means of allocating resources, so economists study markets. Markets include stock markets like the New York Stock Exchange, commodities markets like the Chicago Mercantile, but also farmer's markets, auction markets like Christie's or Sotheby's (made famous in movies by people scratching their noses and inadvertently purchasing a Ming vase) or eBay, or more ephemeral markets, such as the market for music CDs in your neighbourhood. In addition, goods and services (which are scarce resources) are allocated by governments, using taxation as a means of acquiring the items. Governments may be controlled by a political process, and the study of allocation by the politics, which is known as political economy, is a significant branch of economics.

## Keywords

**Producer theory:** Producer theory assumes that sellers are motivated by profit and profit is something that one can usually directly measure.

**Consumer theory:** Consumer theory is based on what people like, so it begins with something that we can not directly measure, but must infer.

**Utility:** Utility refers not to usefulness but to the flow of pleasure or happiness that a person enjoys - some measure of the satisfaction a person experiences. Usefulness might contribute to utility, but so does style, fashion, or even whimsy.

**Profit:** Profit is defined as revenues minus costs.

**Economic profit:** Economic profit equals the revenue of the firm minus its explicit and implicit costs.

**Innovation Theory:** Firms make innovations in new products, new production techniques, new marketing strategies, etc. These innovations are costly and must obviously be rewarding for them to be followed continuously.

**Risk-bearing Theory:** Firms invest large sums in the production system, expecting to produce goods and make profits on it. The firms take these risks and must be adequately rewarded.

**Monopoly Theory:** Some firms are able to enjoy certain monopoly powers in view of being in possession of a huge capital, economies of scale, patent protection or socio-political powers. As a result, there is a lack of perfect competition and such firms are able to reap economic profits.

**Friction Theory:** According to this theory, there is a long-run equilibrium of economic profit which is zero (adjusted for risk). However, markets are seldom in equilibrium and that gives rise to economic profits or losses.

**Managerial Efficiency Theory:** This theory argues that economic profit can arise because of exceptional managerial skills of well managed firms.

**Behavioral theories:** According to behavioural theories, the firm's sub-optimal behaviour arises from uncertainty and conflicting goals of various groups within the firm. Behavioural theories analyse the organisation of the firm, the way in which decisions are reached.

**Value Maximization:** This theory states that the objective of the firm is to maximise the wealth or value of the firm.

## Review Questions

1. Underline the concept of a firm.
2. What are the major objectives of a firm?
3. 'Among the various objectives of a modern firm, profit maximisation is the most important'. Comment.
4. 'Value maximisation has become the major objective of a modern firm'. Comment.
5. Compare the managerial theories of Williamson and Marris.
6. Underline the basic postulates of Cyert and March model.
7. What are the basic propositions of the economic theory of the firm?
8. What is the relevance of Baumol's model of sales revenue maximisation?
9. "Firm's constraints affect decision-making". Comment.
10. Why is it important to develop various theories of the firm?

Notes

11. "Managerial Economics may be defined as the study of the allocation of scarce resources among competing ends." Examine the statement in the light of firm's objectives.
12. Discuss and illustrate the different objectives of a firm that are essentials in decision-making process.
13. "The objective of managerial economics is not merely to discover the truth but also to assist in the solution of concrete problems." Comment.
14. Profit is maximum when the difference between total revenue and total cost is the greatest. How is this equivalent to saying that profit is maximum when  $MR=MC$ ?
15. Explain the determination of equilibrium output of a firm which aims at sales maximisation while earning a given amount of profit.
16. Give the reason why authors who receive a fixed percentage of the books sales revenue as royalties would never fix the same price, if they could, as their publishers.

### Further Readings

Karam Pal and Surrender Kumar, *Managerial Economics*, Excel Books

Samuelson, Stephen G. Marks, William *Managerial Economics* (Hardcover - Dec 29, 2008)

Christopher R. Thomas and S. Charles Maurice, *Managerial Economics* (Hardcover - Mar 7, 2007)

Christopher R. Thomas and S. Charles Maurice, *Managerial Economics* (Hardcover - Jan 27, 2010)

# Unit 11 Advertising

Notes

## Unit Structure

- Introduction
- Advertising in Managerial Economics
- The Optimal Level of Advertising Expenditure
- Economic Effects of Advertising
- Summary
- Keywords
- Review Questions
- Further Readings

## Learning Objectives

At the conclusion of this unit, you should be able to:

- Understand promotional elasticity of demand
- Discuss practical tools for advertising
- Describe optimal level of advertising expenditure
- Explain economic effects of advertising

## Introduction

Advertising provides information about the choices available to the consumers. It conveys information about new firms, new products, discounts on products, etc.

A distinction is made between *informative* advertising and *persuasive* advertising. Informative advertising conveys information about price, places where available, characteristics of the product and so on. Persuasive advertising attempts to make consumers feel good about the product. It tries to convince that the product is better than the other substitute products. In this way, it tries to influence the preferences of the buyers.

There is no scope for advertising in a perfectly competitive industry because the products of all the firms are identical. Advertising is both a cause and consequence of imperfect competition. It is a cause because it attempts to make the buyers believe that the advertised product is different from the other substitute products. Advertising tries to influence the preferences of the buyers. If it succeeds, a situation of product differentiation is created and competition becomes imperfect. The firm now faces a downward sloping demand curve for its product. Once imperfect competition exists it causes further advertising. Advertising is now used to increase the demand (shift the demand curve). In this way, it becomes the consequence of imperfect competition.

The increase in profit is on the assumption that the rivals do not advertise. If the rivals also advertise.

## Advertising in Managerial Economics

Almost every important enterprise has to find out ways of dealing with the problem of planning its advertising budget over a period of years. It has to decide how this amount should change from year to year with change in business conditions and how each yearly total should be apportioned among products, territories and classes of products.



Notes

Advertising expenditure of a firm and other related promotional activities are a kind of selling cost. However, they require a different kind of economic approach than the production cost. Selling costs may be regarded as all costs incurred to shift the demand curve for a particular product to the right.

Advertising is a tool for manipulating the sales volume of an enterprise, like price and product improvement. It shifts the whole demand schedule for the product, like product improvement. Price affects the volume obtained from any given demand schedule. Thus short-run profit depends on the combination of price, product improvement, advertising outlay and other selling activities. These four influences are interactive. The price fixed affects the response of volume to additional advertising expenditure, changes in product will definitely do so. The price that will maximise profits may be different when advertising is stepped up or the product is improved. Advertising shifts the demand curve to the right. It also makes the demand less elastic.

**Promotional Elasticity of Demand**

The relationship that exists between sales and advertising of any product can be enumerated as:

1. Some sales are possible even if there is no advertising. Thus for the minimum level of sales, no advertising is needed.
2. Sales increase and decrease with advertisement respectively. That is, there is a direct relationship between sales and advertising if other things are assumed to be constant.
3. In the initial stages of advertisement expenditure, the resulting increase in sales will be more than proportionate to the increase in advertisement expenditure (upto point A). Beyond a particular point, increase in advertisement expenditure will result in less than proportionate increase in sales (between point A and B). Finally, a stage will come where no further increase in sales is possible with the help of advertisement (beyond B) as shown in the Figure 11.1.

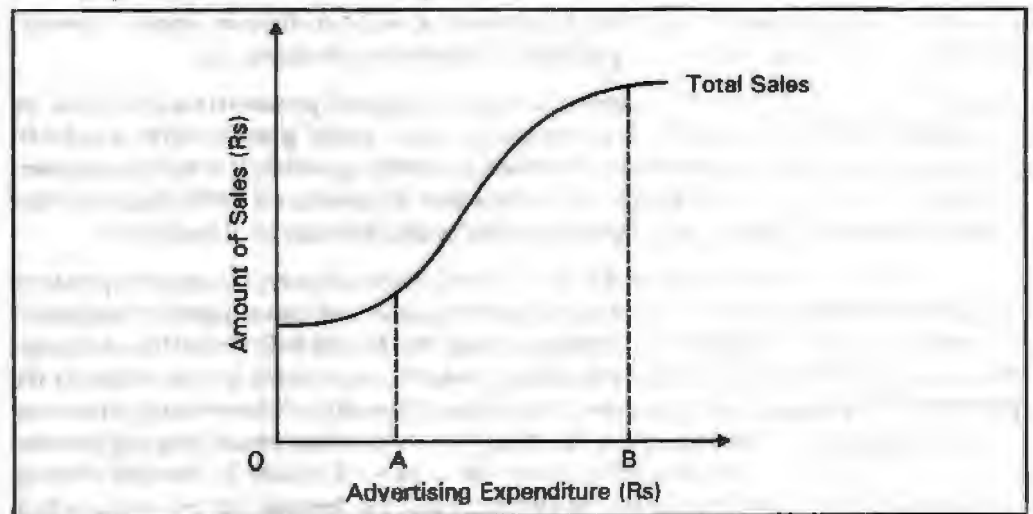


Figure 11.1

Promotional elasticity of demand measures the responsiveness of sales to changes in the amount of advertising with constant price. It is the ratio of proportional change in sales to the proportionate change in advertising that causes the change.

$$EA = \frac{Q_2 - Q_1}{Q_2 - Q_1} \div \frac{A_2 - A_1}{A_2 - A_1}$$

Where Q and A are sales and advertising expense respectively. Some goods are more responsive to advertising, e.g., cosmetics. Others are less, e.g., heavy machinery. The factors that influence the advertising elasticity of demand are:

1. Stage of the product in market, e.g., old or new product, growing or established market etc.
2. Effect of advertising in terms of time
3. Influence of advertising by rivals.

Notes

## **Practical Tools for Advertising**

Methods used for setting advertising budgets are given hereunder.

### **All you can afford Approach**

Here the firm spends on advertising upto the limits of its cash resources. In practical terms this could mean that the advertising budget is set as a result of some sort of dialogue between the firm's financial and marketing directors.

Profitable market opening might be present in forthcoming periods for which past profit levels are insufficiently high to support an optional advertising budget. In such cases the firm might be better advised to borrow resources for advertising, rather than limit its expense to what it could afford.

### **Objective and Task Method**

This approach tackles budget determination in the reverse order. It first defines the objective it wants the advertising to attain. For example, the objective might be to attain sales of product A in territory Z of some specified amount. Secondly, the advertising tasks which must be carried out to reach the objectives, are defined. The programme, for example, could take the form of giving a number of inserts in the local newspaper serving territory Z in a specified period. Then the aggregated cost of all the tasks is obtained and the advertising budget is determined. This method depends on the past experience of the firm to ascertain the fundamental relationship between the objectives and advertising media.

### **The Percentage of Sales Approach**

The advertising budget is set at a level equal to some predetermined percentage or part of anticipated sales. Firms will tend to choose the percentage which they traditionally use.

Ease of decision making is a major advantage in this approach. The use of past sales to share as a base for advertising expenditure has been criticised.

### **Competitive Parity Approach**

This method again has the attraction of apparent security. The firm spends on advertising at the share percentage of sales assets, maximum shares or some other variables, on its competitors in the same industry.

The disadvantage of this method is that with differing degrees and directions of separate diversification, it seems unlikely that any one firm can identify itself completely with a group of firms all of whom are allegedly competing in the same market.

### **Return on Investment Approach**

Advertising increases sales as well as builds goodwill. The latter helps in increasing sales in future, thereby, improving the rate of return of investment over a long period. Expenditure on advertisement becomes an investment and then its rate of return can be measured.

The major drawback is that, in the long run, various factors operate to influence the rate of return and it is difficult to isolate the impact of advertisement.

## The Optimal Level of Advertising Expenditure

Notes

Figure 11.2 shows the advertising decision of a firm. The total revenue curve shows that increased advertising expenditure can always increase physical volume, though after a point, diminishing returns may set in. This implies that total revenue must vary with advertising expenditure directly. Thus, an increase in physical volume produced by a price reduction may or may not increase sales, depending on whether the demand is elastic. An increase in volume brought about by added advertising outlay must always result in a proportionate increase in total revenue.

If all other costs are added to advertising cost, the firm's total cost (production, distribution, selling) is obtained as a function of advertising outlay. Total profit (curve  $PP_1$ ) is obtained by the difference in the total cost and level of sales at each advertising outlay.

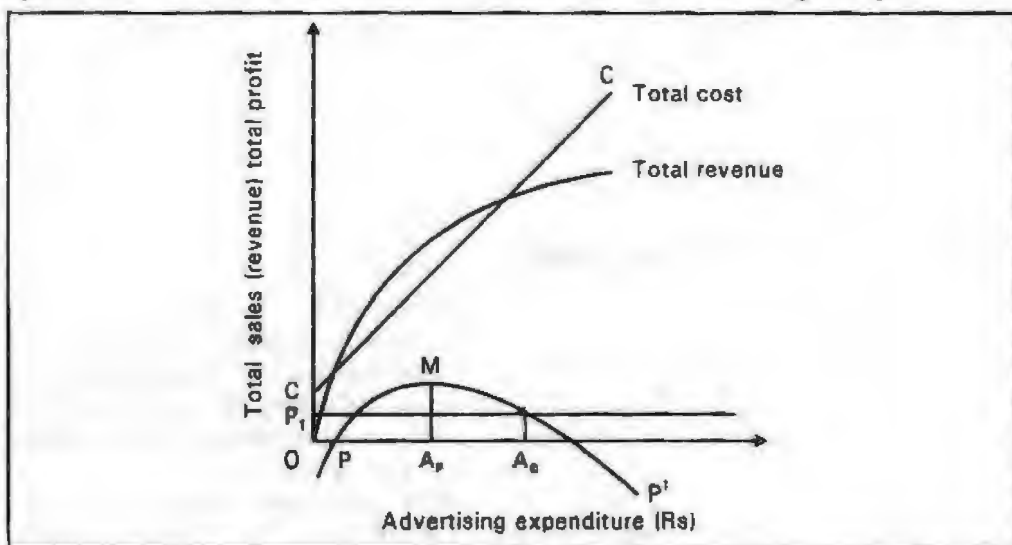


Figure 11.2

$PP_1$  is maximum at  $M$ , and so  $OA_p$  is the profit-maximising expenditure. If we take  $OP_1$  as the sales maximiser's minimum profit level, the sales maximising advertising budget level is  $OA_c$ . Unlike price reduction, an increase in advertising expenditure always increases total revenue. It will always pay the sales-maximiser to increase the outlay on advertising till stopped by the profit constraint – until profits are reduced to minimum acceptable level. Thus unless the maximum profit level  $AP_M$  is no greater than the required minimum  $OP_1$ , it will be possible to increase advertising somewhat beyond the profit maximising level  $OA_p$  without violating the profit constraint. This increase will be desirable, as it will increase sales. Since its marginal revenue is always positive, advertising can always be used to increase sales upto a point where profits are driven to their minimum level. In other words, the optimal level of advertising will be that level at which the last rupee spent on advertising contributes just one rupee towards overheads and profits.

A simple rule can be derived to determine how much should a profit maximising firm spend on advertising. The quantity that a firm sells of its products is assumed to be a function of its price and the level of its expenditure. There are assumed to be diminishing marginal returns to advertising expenditures which means that beyond some point, successive increments of advertising outlays will yield smaller and smaller increases in additional sales.

If  $P$  is the price of a unit of product and  $MC$  is the marginal cost of production and it is assumed that neither price nor marginal cost will be altered by small changes in advertising expenditures, the firm receives an increase in gross profit of  $(P-MC)$  from each additional

unit of the product that it makes and sells. To get the net profit, the firm must deduct the additional advertising outlays from the gross profit.

For its total net profit to be a maximum firm must set its advertising expenditures at the level where an extra dollar of advertising results in extra gross profit equal to the extra rupee of advertising cost. Unless this is the case, the firm's total net profits can be increased by changing its advertising outlays. If an extra rupee of advertising results in more than a rupee increase in gross profit, the extra rupee should be spent on advertising (since this will increase the total net profits). If an extra rupee (as well as the last rupee) of advertising results in less than a rupee increase in gross profit, advertising outlays should be cut.

Thus if  $\Delta Q$  is the number of extra units of output sold as a result of an extra rupee of advertising, the firm should set its advertising expenditures such that

$$\Delta Q (P - MC) = 1$$

because the right hand side of this equation equals the extra rupee of advertising cost, and the left hand side equals the extra gross profit resulting from this advertising rupee.

Multiplying both sides by

$$\frac{P}{P - MC}$$

$$P\Delta Q = \frac{P}{P - MC}$$

Since the firm is maximising profit, it is producing an output where marginal cost (MC) equals marginal revenue (MR). Thus substituting MR for MC

$$P\Delta Q = \frac{P}{P - MC} = |e_p|$$

where  $e_p$  is the price elasticity of demand for the firm's product. Thus, to maximise profit, the firm should set its advertising expenditure so that MR from an extra rupee of advertising =  $n$ .

(We know that  $MR = P \left(1 - \frac{1}{e_p}\right)$ . Thus  $1 - 1/e_p = MR/P$  and  $1/e_p = 1 - MR/P$ , i.e.,

$$e_p = \frac{1}{1 - MR/P} = \frac{P}{P - MR}$$

This rule can be very helpful for managers. For example, if a firm's price elasticity of demand for its product is 1.6. To maximise profit, this firm must set the MR from an extra rupee of advertising equal to 1.6. Suppose managers believe that an extra ₹ 1 lakh of advertising would increase the sales by ₹ 2 lakh, which means that MR from an extra rupee of advertising is ₹ 2 lakh ÷ ₹ 1 lakh = 2.0 rather than 1.6. Since the MR exceeds the price elasticity, the firm will increase its profit if it advertises more. To maximise profit, it should increase its advertising upto the point where MR from an extra rupee of advertising falls to 1.6, the value of price elasticity of demand.

### Determining Advertising Expenditure Graphically

A simple graphical technique can be used to see how much a firm should spend on advertising. Curve A in Figure 11.3 shows the relationship between the price elasticity of demand of a firm's product and the amount it spends on advertising. With little or no advertising, this firm's product would be regarded by customers as similar to lots of other products, hence its price elasticity of demand would be very high.

Notes

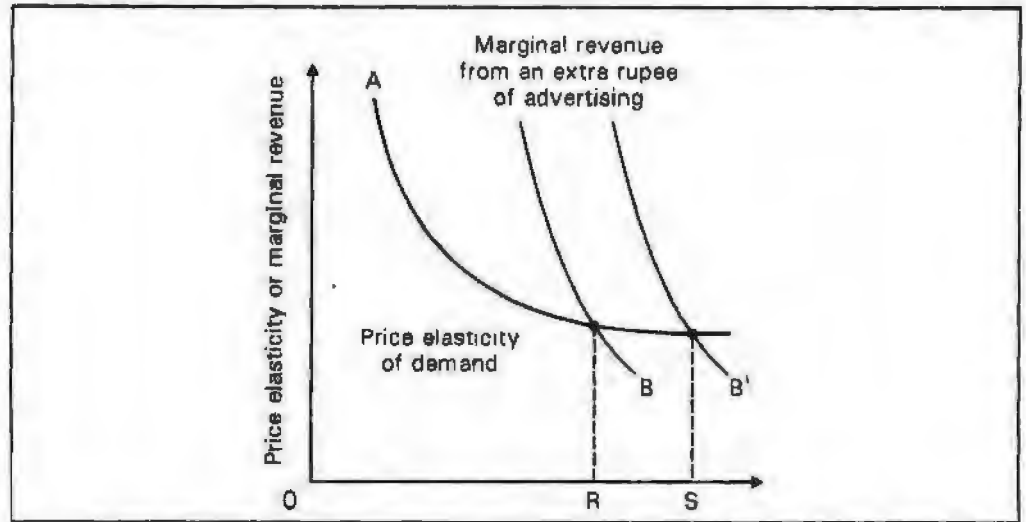


Figure 11.3: Optimal Advertising Expenditure

The firm's optimal advertising expenditure is R if the MR curve is B (or S if MR curve is B<sup>1</sup>) But since appropriate advertising can induce consumers to attach importance to this product's distinguishing features, increases in advertising expenditure reduce its price elasticity considerably (by decreasing the product's perceived substitutability with other goods). At each level of advertising expenditure, the B curve shows the MR from an extra rupee of advertising. Since the A curve intersects the B curve when the firm's advertising expenditure is R rupees, this based on the equation below is the level of advertising expenditure that maximises the firm's profits.

MR from an extra rupee on advertising

$$\frac{1}{1 - MR/P} = \frac{P}{P - MR^1}$$

A firm's optimal advertising expenditure depends on the position and shape of its B curve and its A curve. For example, suppose that the firm's B curve shifts towards right to B<sup>1</sup>. Such a shift might occur if the firm or its advertising agency found ways to increase the effectiveness of its advertisements. An increase in the optimal level of the firm's advertising expenditure (to S rupees) would be the result.

### Optimal Level of Advertising Budget between Different Media

Every firm has different media to choose from for advertising their products. The advertising expenditure differs between different media. The total yearly expenditure through all the media used by the firm must not exceed the total advertising budget of the firm. The choice of media, frequency and the extent of advertisement is to be decided basically by the sales contribution of the money spent on the medium of advertisement. The firm will keep on changing its advertisement expenditure from a lower contribution medium to higher contribution media, until the marginal contribution per rupee spent is equal in all the media used by the firm. This is the marginal equivalency principle which states that any advertising budget will be optimally allocated between different media of advertisement when,

$$\frac{MRS_1}{P_1} = \frac{MRS_2}{P_2} = \dots = \frac{MRS_n}{P_n}$$

where

MRS = Marginal increase in sales due to advertisement

P = Price of one unit of advertising media

1, 2, ..., n = Different types of media

Notes

Suppose  $\frac{MRS_1}{P_1} > \frac{MRS_2}{P_2}$ , then there is no equivalence, and the firm should transfer some advertising effort from medium 2 to medium 1.

### Caselet

Mayur Enterprises manufactures an electronic good. The enterprise is a relatively new one and so is its product. Currently, its sole objective is to maximise the sale of its product. With the help of a consultant, the enterprise has discovered that its sales depend solely on the money it would put on advertising the product. There are two media of advertising, TV and newspapers, and the estimated sales function by the consultant is  $S = 150 + 150A - 7.5A^2 + 24B - 3B^2$

Where

S = Sales (in number of units)

A = Advertising through TV (in ₹ thousands)

B = Advertising through newspapers (in ₹ thousands)

- If you were the marketing manager of the enterprise, how much money would you like to spend on each of the two kinds of advertisement?
- Suppose the enterprise has a fixed constraint on the total advertisement budget in the amount of ₹ 10,500 (i.e.,  $A+B = 10.5$ ), what would be your suggestion regarding allocation of this budget between the two advertising media?

## Economic Effects of Advertising

Advertising has a mixed effect on an economy. Some economic effects of advertising are important for growth and development. Yet it has certain disadvantages too. These are enumerated below.

### Advantages

- Advertising gives information about the price, quality and availability of a good. This helps the consumer in making an efficient choice.
- Demand of a good increases by advertising. This leads to expansion in scale of production and achieving economies of scale.
- Competition is encouraged by advertising, competing producers undertake innovative and new technologies thereby modernising output and making goods available at lower prices.
- Monopoly is threatened and broken by announcing the availability of substitutes through advertisement.

### Disadvantages

- Advertisement may mislead the consumer.
- Advertising has become a necessity thus diverting resources.
- Since small firms cannot bear the high expenses of advertising, it leads to growth of big oligopoly firms.

### Case: Sales Maximisation Decision

A prominent advertising agency, STA, did a study to estimate the effects of advertising expenditures on the sales of "Ex" (trademark for an instant breakfast drink) and found that the relationship between advertising expenditures and sales in two districts were:

$$Q_1 = 10 + 5X_1 - 1.5X_1^2$$

$$Q_2 = 12 + 4X_2 - 0.5X_2^2$$

where  $Q_1$  is the sales of "Ex" (in ₹ crores per year) in the first district,  $Q_2$  is its sales in the second district,  $X_1$  is the expenditure on advertising of "Ex" (in ₹ crores per year) in the first district and  $X_2$  the advertising expenditure in the second district.

STA wanted to determine the amount of additional sales that an extra rupee of advertising would generate in each district. To answer this, the derivative of sales with respect to advertising expenditure was calculated for each district, the result being as follows:

$$\frac{dQ_1}{dX_1} = 5 - 3X_1$$

$$\frac{dQ_2}{dX_2} = 4 - X_2$$

Thus, in each district the effect on sales of an extra rupee of advertising depended on the amount spent on advertising. Suppose that ₹ 0.5 crore was being spent on advertising in the first district and ₹ 1 crore in the second district,

$$\frac{dQ_1}{dX_1} = 5 - 3(0.5) = 3.5$$

$$\frac{dQ_2}{dX_2} = 4 - 1 = 3$$

Consequently, an extra rupee of advertising generated an extra ₹ 3.50 of sales in the first district and an extra ₹ 3 of sales in the second district.

Based on these findings, STA made a number of recommendations to Food India Ltd concerning the regional allocation of the "Ex" brand advertising budget. In particular, they recommended that if General Goods wanted to boost the total sales of "Ex", more should be spent on advertising in the first district and less should be spent on it in the second district. This would not mean an increase in Food India Ltd's total advertising budget, since the extra advertising expenditure in the first district would be offset by the reduced advertising expenditure in the second district.

How did STA come to this conclusion? The fact that an extra rupee of advertising would result in a greater addition to sales in the first district than in the second indicated that a reallocation of the advertising budget was called for. To see this, consider what would happen if a rupee extra was spent on advertising in the first district and a rupee less spent in the second. The result as indicated above would be an extra ₹ 3.50 of sales in the first district and ₹ 3 reduction in sales in the second. The overall effect would be a ₹ 3.50 - 3.00 = ₹ 0.50 increase in total sales. Thus if Food India Ltd. wanted to increase the sales of "Ex" beverages, a reallocation of the advertising budget in favour of the first district was to be recommended.

### Analysing Managerial Decisions

In the above study, STA found that the relationship between advertising expenditures and sales in the two districts were of the following form:

$$Q_1 = 10 + 5X_1 - 1.5X_1^2$$

$$Q_2 = 12 + 4X_2 - 0.5X_2^2$$

where  $Q_1$  is "Ex"'s sales in the first district and  $Q_2$  in second district,  $X_1$  is the advertising expenditure (₹ in crores per year) on Ex in the first district and  $X_2$  in the second district.

#### Questions

1. If Food India Ltd wants to maximise "Ex" sales in the first district, how much should it spend on advertising?
2. If Food India Ltd wants to maximise "Ex" sales in the second district, how much should it spend on advertising?
3. Show that your answer to parts (a) and (b) maximise, rather than minimise sales.
4. Would you recommend Food India Ltd attempt to maximise "Ex"'s sales? Why or Why not?

Notes

### Student Activity

Out of the following indicate the appropriate answers:

1. Which is the most important factor that will determine whether advertising by a manufacturer will lead to higher sales:
  - (a) The product can be differentiated
  - (b) Demand is elastic
  - (c) The product is branded
2. A fundamental point that should be understood in deciding on the proper size of an advertising budget is that:
  - (a) Increased advertising and marketing effort yield increasing returns.
  - (b) Sales are always a unique function of marketing and advertising expenditures.
  - (c) Increased advertising and marketing efforts yield increasing returns.
  - (d) The optimum advertising budget is one that maximises sales.
  - (e) There is a law of diminishing returns that should guide advertising and marketing efforts.

### Summary

Advertising is a tool for manipulating the sales volume of an enterprise, like price and product improvement. It shifts the whole demand schedule for the product, like product improvement. Price affects the volume obtained from any given demand schedule.

Advertising provides information about the choices available to the consumers. It conveys information about new firms, new products, discounts on products, etc.

A distinction is made between *informative* advertising and *persuasive* advertising the informative advertising conveys information about price, places where available, characteristics of the product and so on. Persuasive advertising attempts to make consumers



feel good about the product. It tries to convince that the product is better than the other substitute products. In this way, it tries to influence the preferences of the buyers.

Almost every important enterprise has to find out ways of dealing with the problem of planning its advertising budget over a period of years. It has to decide how this amount should change from year to year with change in business conditions and how each yearly total should be apportioned among products, territories and classes of products.

Advertising expenditure of a firm and other related promotional activities are a kind of selling cost. However, they require a different kind of economic approach than the production cost. Selling costs may be regarded as all costs incurred to shift the demand curve for a particular product to the right.

## Keywords

**All you can Afford Approach:** Here the firm spends on advertising upto the limits of its cash resources. In practical terms this could mean that the advertising budget is set as a result of some sort of dialogue between the firm's financial and marketing directors.

**Objective and Task Method:** This approach tackles budget determination in the reverse order. It first defines the objective it wants the advertising to attain. Then the aggregated cost of all the tasks is obtained and the advertising budget is determined. This method depends on the past experience of the firm to ascertain the fundamental relationship between the objectives and advertising media.

**The Percentage of Sales Approach:** The advertising budget is set at a level equal to some predetermined percentage or part of anticipated sales. Firms will tend to choose the percentage which they traditionally use. Ease of decision making is a major advantage in this approach.

**Competitive Parity Approach:** This method again has the attraction of apparent security. The firm spends on advertising at the share percentage of sales assets, maximum shares or some other variables, on its competitors in the same industry.

**Return on Investment Approach:** Advertising increases sales as well as builds goodwill. The latter helps in increasing sales in future, thereby, improving the rate of return of investment over a long period. Expenditure on advertisement becomes an investment and then its rate of return can be measured.

**Advertising :** Advertising is a tool for manipulating the sales volume of an enterprise, like price and product improvement. It provides information about the choices available to the consumers. It conveys information about new firms, new products, discounts on products, etc.

**Informative advertising:** The informative advertising conveys information about price, places where available, characteristics of the product and so on.

**Persuasive advertising:** Persuasive advertising attempts to make consumers feel good about the product.

## Review Questions

1. What is the importance of advertising in a modern firm?
2. What are the different methods of determining various advertising outlays?
3. What is the relation between advertising and demand?
4. Underline the method by which a firm decides about the expenditure on advertising in different media.

5. With which of the statements would you agree more?

1. a and e;                      2. b and e;                      3. a and d;  
4. b and d;                      5. c and e;

- a. There is no point in advertising if competition is perfect.  
b. There is no point in a monopolist advertising his product.  
c. Advertising tends to increase the demand for a product.  
d. Advertising has no effect on elasticity of supply in the short run.  
e. Advertising may sell more goods but in the long run, it must raise the price of the product.

Notes

## Further Readings

Karam Pal and Surrender Kumar, *Managerial Economics*, Excel Books

Samuelson, Stephen G. Marks, William *Managerial Economics* (Hardcover - Dec 29, 2008)

Christopher R. Thomas and S. Charles Maurice, *Managerial Economics* (Hardcover - Mar 7, 2007)

Christopher R. Thomas and S. Charles Maurice, *Managerial Economics* (Hardcover - Jan 27, 2010)

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# Unit 12 Welfare Economics

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## Unit Structure

- Introduction
- General Equilibrium
- Utility Analysis
- Pareto Optimality: Alternative Approach
- Criteria for Welfare Judgements
- Summary
- Keywords
- Review Questions
- Further Readings

## Learning Objectives

At the conclusion of this unit, you should be able to:

- Define the term welfare economics
- Understand the concept of general equilibrium, and utility analysis
- Discuss the term consumer's surplus and producer's surplus.
- Tell about pareto optimality
- Explain the criteria for welfare judgements

## Introduction

Welfare economics is a branch of economics that uses microeconomic techniques to evaluate economic well-being, especially relative to competitive general equilibrium within an economy as to economic efficiency and the resulting income distribution associated with it. It analyzes *social welfare*, however measured, in terms of economic activities of the individuals that comprise the theoretical society considered. Accordingly, individuals, with associated economic activities, are the basic units for aggregating to social welfare, whether of a group, a community, or a society, and there is no "social welfare" apart from the "welfare" associated with its individual units.

Welfare economics typically takes individual preferences as given and stipulates a welfare improvement in Pareto efficiency terms from social state *A* to social state *B* if at least one person prefers *B* and no one else opposes it. There is no requirement of a unique quantitative measure of the welfare improvement implied by this. Another aspect of welfare treats income/goods distribution, including equality, as a further dimension of welfare.

Thus, we can say that, welfare economics is that branch of economic theory which investigates the nature of the policy recommendations that the economist is entitled to make. Its literature is mostly confined to the construction of a theoretical framework which can be applied to some actual policy problems in the real world.

## General Equilibrium

General equilibrium theory is a branch of theoretical economics. It seeks to explain the behavior of supply, demand and prices in a whole economy with several or many interacting markets, by seeking to prove that a set of prices exists that will result in an overall equilibrium, hence *general* equilibrium, in contrast to *partial* equilibrium, which only analyzes single markets. As with all models, this is an abstraction from a real economy; it is proposed as being a useful model, both by considering equilibrium prices as long-term prices and by considering actual prices as deviations from equilibrium.

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General equilibrium theory both studies economies using the model of equilibrium pricing and seeks to determine in which circumstances the assumptions of general equilibrium will hold. The theory dates to the 1870s, particularly the work of French economist Léon Walras.

General equilibrium theory was developed to take into account an important feature of the structure of our economy: the interdependence of its parts, e.g., a rise in price of cars may reduce the demand for tyres and automobile parts but increase the demand for bus transportation. Two such interdependent relationships are of considerable discussion, namely,

- a. substitutability, and
- b. complementarity.

These are based on substitute goods and complementary goods which have been defined earlier in terms of the effect of a change in the price of one of such a pair on the other. If we omit the income effect, then a reduction in the price of one of a pair on substitute items should decrease the demand for the other whereas the reverse holds for complementary goods.

Many commodities have slight relationships yet they will be mild substitutes because they are competitors for the consumer's limited purchasing power. For example, a rise in house price may bring a fall in attendance at hotels.

Thus, a demand (or a supply) function for commodity  $x$  should not just include the price of  $x$  as its only price variable. A general equilibrium demand function has to include every price in the economy as a possibility, i.e., the demand for any item which is at least potentially dependent on the price of every other item in the economy.

Thus the demand of commodity  $X$  in an economy having say 1096 goods will be given by

$$Q = D_8(P_1, P_2, \dots, P_{1096}, A, M),$$

Where  $D_8$  is demand for item 8

$P_1 \dots P_{1096}$  are prices of all commodities

$A$  is wealth of the economy

$M$  is stock of cash in existence

There is a similar supply function for item 8 ( $X$ ) which may be given by

$$S_8(P_1, P_2, \dots, P_{1096}, A, M)$$

The economy is said to be in general equilibrium if the supply of every commodity is equal to the demand for it. Thus, for 1096 commodities, 1096 supply function equations must be satisfied.

If we are given the values of  $A$  and  $M$ , we have as many unknown prices as equations and the system can therefore be solved for the equilibrium values of the prices,  $P_1, P_2, \dots, P_{1096}$ . Substitution of these values into the demand or supply expressions will indicate the quantities of the various commodities which will be exchanged. This, in essence, is the general equilibrium system and the method by which it determines the

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prices and quantities sold of the various commodities. It can be complicated by inclusion of exogenous variables (e.g., temperature) or endogenous ones (e.g., advertising) which also clearly affect demand.

Welfare economics has concerned itself mainly with policy issues which arise out of the allocation of resources – with the distribution of inputs among the various commodities and vice versa.

This is a general equilibrium problem because if resources are moved into one industry, they have to be taken out of another. The problem arises because the quantities of all resources are limited. It will be undesirable to increase the output of a because the decrease in product b is more valuable. Thus, a product's optimal level can be determined only in comparison with other commodities with which it competes for society's limited resources. In principle, then, resource allocation is necessarily a matter for general equilibrium analysis.

Broadly speaking, general equilibrium tries to give an understanding of the whole economy using a "bottom-up" approach, starting with individual markets and agents. Macroeconomics, as developed by the Keynesian economists, focused on a "top-down" approach, where the analysis starts with larger aggregates, the "big picture". Therefore, general equilibrium theory has traditionally been classified as part of microeconomics.

The difference is not as clear as it used to be, since much of modern macroeconomics has emphasized microeconomic foundations, and has constructed general equilibrium models of macroeconomic fluctuations. General equilibrium macroeconomic models usually have a simplified structure that only incorporates a few markets, like a "goods market" and a "financial market". In contrast, general equilibrium models in the microeconomic tradition typically involve a multitude of different goods markets. They are usually complex and require computers to help with numerical solutions.

## Utility Analysis

Utility analysis is a subset of consumer demand theory that analysis consumer behavior and market demand using total utility and marginal utility. The key principle of utility analysis is the law of diminishing marginal utility, which offers an explanation for the law of demand and the negative slope of the demand curve.

Utility is the satisfaction, pleasure or need-fulfilment derived from consuming some quantity of a good. Utility is thus a psychological feeling. The concept of utility formed the core of the classical theory of demand in the form of law of diminishing marginal utility. Alfred Marshall gave the final form to the theory of marginal utility.

The primary focus of utility analysis is on the satisfaction of wants and needs obtained by the consumption of goods. This is technically termed utility. The utility generated from consumption affects the decision to purchase and consume a good.

When used in the analysis of consumer behavior, utility assumes a very precise meaning, which differs from the everyday use of the term. In common use, the term utility means "useful." For example, a "utility" knife is one with many uses, something that is handy to have around. In baseball, a "utility" player can perform quite well at several different positions and is thus useful to have on the team. Moreover, a public "utility" is a company that supplies a useful product, such as electricity, natural gas, or trash collection.

In contrast, the specific economic use of the term utility in the study of consumer behavior means the satisfaction of wants and needs obtained from the consumption of a commodity. The good consumed need not be "useful" in the everyday sense of the term. It only needs to provide satisfaction.

Marginal utility is the key concept underlying demand. It is the satisfaction an individual receives from consuming one additional unit of a good or service. The height of a demand curve indicates the marginal utility of the good. Marginal utility decreases as more units of the same good are consumed. (Law of diminishing marginal utility).

The basic assumption of the utility theory is that every consumer will seek to maximise his total utility. This is stated in the principle of Equi-marginal Utility – that the consumer would maximise his utility if he allocates his expenditure on various goods he consumes such that the utility of the last rupee spent on each good is equal. In other words, a consumer will keep buying a good until its marginal utility falls just to the level of its price.

With this background we will have to develop a common base to compare the gains and losses of consumers, producers and the government. It is not enough to know, for example, that consumers benefit while producers lose because of a particular policy. It should also be known whether the gain to consumers is more than the loss to producers if policy recommendations are to be made. For this the following two concepts must be known:

- a. Consumer's Surplus
- b. Producer's Surplus

## Consumer's Surplus

Consumer surplus or consumers' surplus is the monetary gain obtained by consumers because they are able to purchase a product for a price that is less than the highest price that they would be willing to pay. Consumer's surplus is a concept introduced by Marshall who maintained that it can be measured in monetary units and is equal to the difference between the amount of money that a consumer actually pays to buy a certain quantity of a commodity  $x$  and the amount that he would be willing to pay for this quantity rather than do without it.

Graphically the consumer's surplus may be found by his demand curve for commodity  $x$  and the current market price which he cannot affect by his purchases of the commodity. Assume that the consumer's demand for  $x$  is a straight line (AB in Figure 12.1) and the market price is  $P$ . At this price the consumer buys  $q$  units of  $X$  and pays an amount  $P$  for it. However, he would be willing to pay  $P_1$  for  $q_1$ ,  $P_2$  for  $q_2$  and  $P_3$  for  $q_3$  and so on. The fact is that the price in the market is lower than the price he would be willing to spend to acquire the quantity  $q$ . This difference is the consumer's surplus and is the area of the triangle PAC.

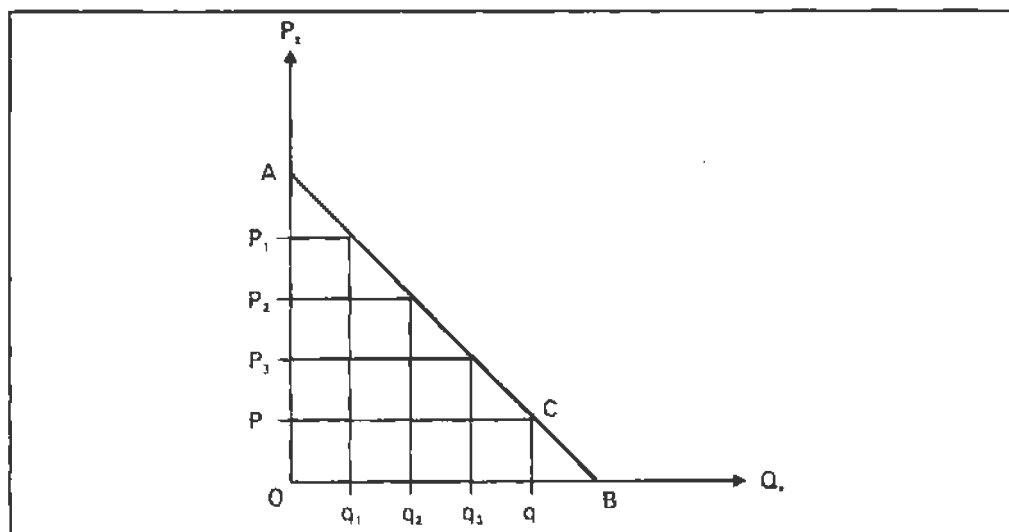


Figure 12.1

Thus, consumer's surplus is the difference between the amount people would willingly pay for various amounts of specific goods and the amounts they do pay at market prices. Thus the consumer's surplus can be measured as the area below the demand curve but above the price line, i.e., area APOB in Figure 12.2.

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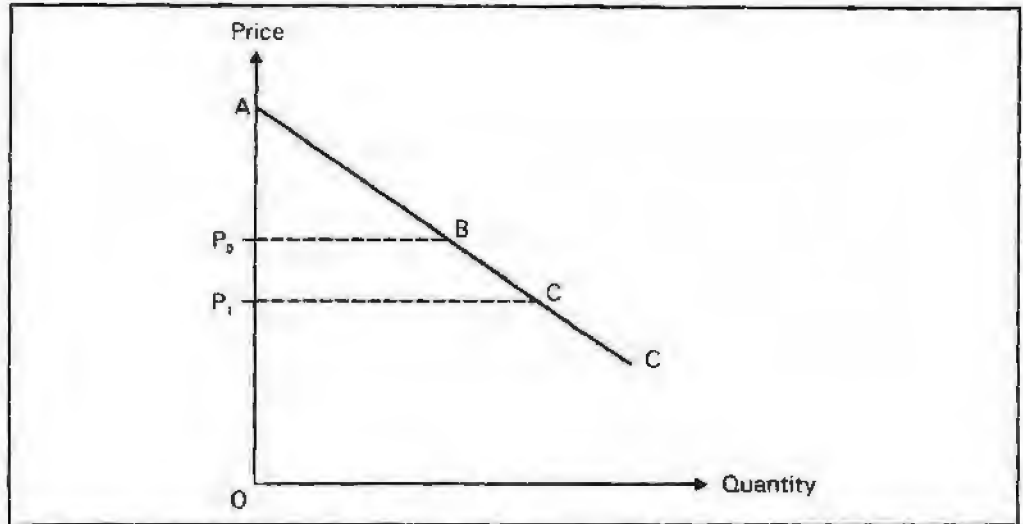


Figure 12.2

When price falls to  $P_1$ , the consumer's surplus increases to  $AP_1C$ .

Theoretically speaking, there are some problems with the measurement and use of the concept of consumer's surplus. However, it serves as a great tool for practical decision making, especially social decisions. It is used extensively in social cost-benefit analysis, such as deciding when the community should incur the heavy initial expenses of constructing a road or bridge. Consumer's surplus alone cannot provide a complete answer to the investment appraisals but it certainly helps to organise the decision and may help avoid costly errors in decision making.

### Producer's Surplus

Producer surplus or producers' surplus is the amount that producers benefit by selling at a market price that is higher than the least that they would be willing to sell for.

Figure 12.3 shows a supply curve. It shows the minimum prices acceptable for supplying various quantities. If the equilibrium price in the market is 20 units, then for each unit sold the suppliers get a price of 20 units. However, the figure shows that the suppliers were willing to supply the first unit at the price of 5 units. Thus in some sense, they are getting a surplus of 15 units on the first unit. Similarly, producers are willing to supply the second unit of this product for 8 units, but they actually get 20 units for it. The surplus is 12 units.

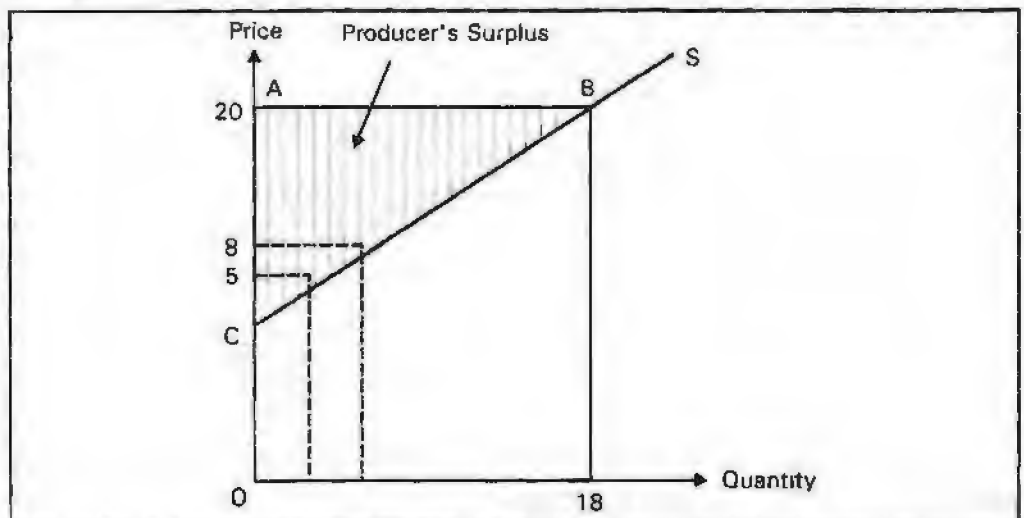


Figure 12.3

This goes on until the last unit supplied, unit 18. On this the producers are getting only their minimum acceptable price of 20 units and are not reaping any surplus. The total amount of the producer's surplus is the sum of the producer's surplus on each unit and is given by the area ABC.

When price falls the producer's surplus decreases and vice versa. In Figure 12.4 we see that when price falls from  $P_0$  to  $P_1$ , the producer's surplus decreases from  $P_0BC$  to  $P_1EC$ .

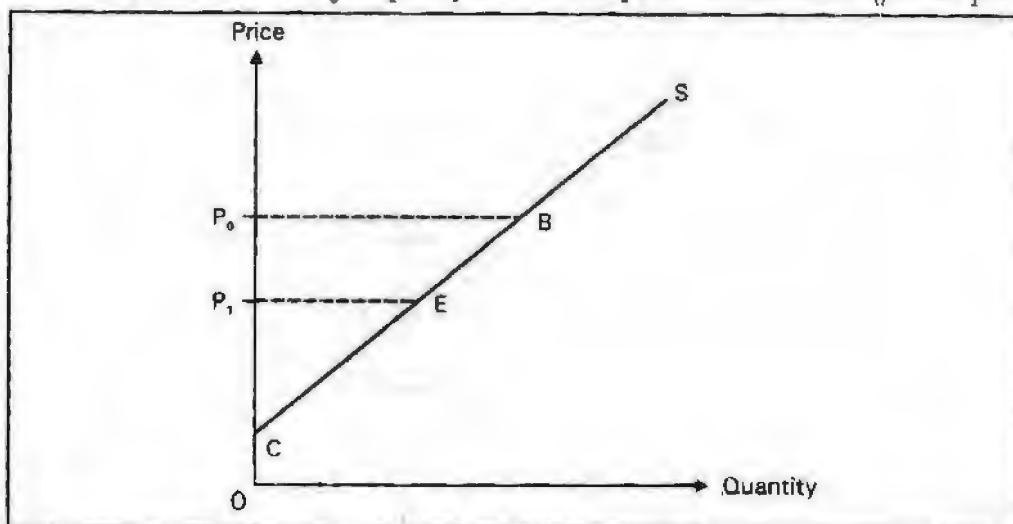


Figure 12.4

In case of equilibrium the producer's surplus and consumer's surplus can be shown as in Figure 12.5.  $ABP_0$  is the consumer's surplus and  $CBP_0$  is the producer's surplus.

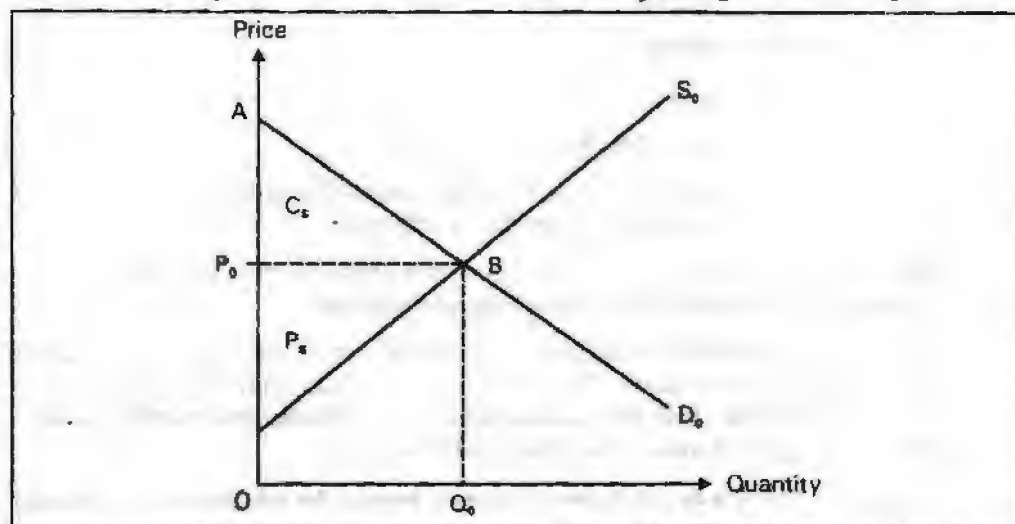


Figure 12.5

Consumer's surplus and producer's surplus help us by providing a basis for comparison about whether the society gains or loses on balance as a result of various economic policies.

## Pareto Optimality: Alternative Approach

The welfare economists often retreat to a second line of approach (other than consumer's surplus) which asserts that a social optimum must offer everything to any one individual at its maximum that it can provide him without harming anyone else.

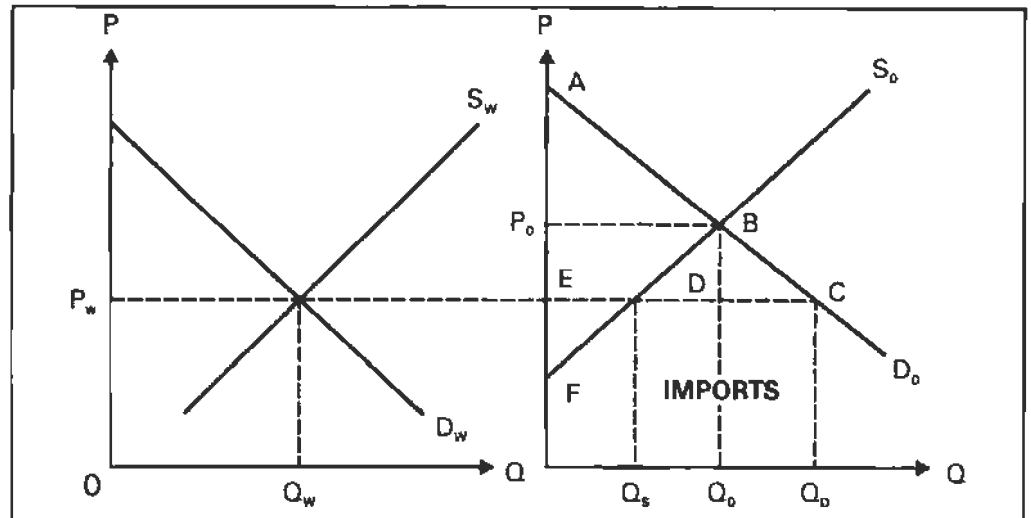
Thus, selecting any one individual of society (individual I) his utility  $u_1$ , should be made as large as possible while making sure that there is no loss in the utility  $u_2, \dots, u_m$  of any other  $m$  persons of the community.

Notes



Notes

This approach is referred to as the Pareto Optimality and it treats social optimality as a problem of Constrained Maximisation, with the utility of some one person maximised and each other person's utility function serving as a constraint. Thus this approach requires Maximise  $u_1 = f_1(X_{1j}, \dots, X_{1n})$



Where  $X_{ij}$  is the quantity of commodity I consumed by individual j and u is the utility function.

There should be no loss in the utility of any other individual 2 to m.

$$u_2 = f_2(x_{12}, \dots, x_{n2}) = k_2$$

$$u_m = f_m(x_{1m}, \dots, x_{nm}) = k_m$$

Productive efficiency here can be given by

Maximise  $y_1 = q_1(r_{11}, \dots, r_{w1})$

Where  $y_1$  is the output of any commodity 1 using quantity  $r_{11}$  of input K.

The requirement is that there should be no reduction in any other output  $y_2, \dots, y_n$ , and the constraints given by the available quantity of each input.

Pareto optimality analysis sidesteps the issue of income distribution. The various propositions developed under this approach are given below.

- i. **Compare optimal allocation of goods among consumers:** For any two products X and Y and any two consumers 1 and 2, consumer 1's marginal rate of substitution of X for Y must be the same as that of consumer 2, i.e., to both consumers the ratio of marginal utilities of the two products must be the same.
- ii. **Productive efficiency in allocation of several inputs:** An efficient use of any two inputs I and j, in the production of output X and Y, requires that

$$MP_x / MP_j = MP_y / MP_j$$

i.e., it requires that the ratio of the marginal physical products of I and j in the production of X be the same as the corresponding ratio for commodity Y.

- iii. **Optimal relative inputs:** If resources are to be allocated optimally between any two outputs X and Y, then the marginal rate of substitution between X and Y for every individual  $j = 1, 2, \dots, m$ , who consumes some of each good must be equal to the ratio of the marginal (social) costs of production of the two goods. That is, we must have

$$\frac{mu'_x}{mu'_y} = \frac{mu^1_x}{mu^2_y} = \dots = \frac{mu^m_x}{mu^m_y} = \frac{mu_x}{mu_y}$$

- iv. Suppose we institute a price system which has the following characteristics:
- All inputs and outputs have fixed prices which are same for every buyer and seller and which no buyer or seller can change.
  - All quantities supplied are demanded and hence sold, i.e., these are the equilibrium prices of the general equilibrium system.
  - Any firm can enter (or leave) the production of any commodity at these prices if it finds it profitable to do so.

Then under these circumstances, if every consumer maximises his utility and every firm maximises its profits, all the preceding marginal optimality requirements will automatically be satisfied.

- v. Perfect or pure competition will tend to yield an optimal allocation of resources.
- vi. a. The Pareto optimal prices  $P_1$  and  $P_2$  of two goods whose output are subject to a budget constraint must satisfy

$$P_1 - mc_1 = (mr_1 - mc_1) \text{ or,}$$

$$\frac{P_1 - mc_1}{P_2 - mc_2} = \frac{mr_1 - mc_1}{mr_2 - mc_2}$$

That is, the optimal deviation between price and marginal cost will be proportionate to the deviation between the marginal revenue and marginal cost of that commodity.

- b. If  $E_1$  and  $E_2$  are the elasticities of demand of two goods whose outputs are subject to a budget constraint and all cross elasticities of demand happen to be zero, then Pareto optimality of their pricing requires:

$$\frac{(P_1 - mc_1)}{P_1} = \frac{K}{E_1}$$

$$\text{or, } \frac{(P_1 - mc_1)/P_1}{(P_2 - mc_2)/P_2} = \frac{E_2}{E_1}$$

That is, the optimal percentage deviation of the price of any item from its marginal cost  $(P_1 - mc_1)/P_1$  will vary inversely with the elasticity of demand for that item,  $E_1$ .

- vii. Externalities may lead to a misallocation of resources even in perfect competition. Too little may be produced by industries in which external benefits prevail, while there may be more than an optimal output of commodities whose production involves detrimental externalities.
- viii. At an optimal output of public good X its social marginal benefit must be equal to the marginal cost.

$$mu'_x/mu'_n + \dots + mu'_x/mu'_m = mc_x$$

- ix. In a world of pure competition a tariff must result in a misallocation of resources and in a reduction in net social welfare when all affected nations are considered together.
- x. Wherever it is necessary to restrict the use of a number of commodities, it is better to do so by means of a system of point rationing in which each consumer is assigned an equal number of points to be used by him as he prefers, rather than the more usual method of assigning an equal amount of each good to each consumer.

- xi. If the government decides to obtain some fixed amount of money by means of taxation, it is better to do so by income taxation rather than by sales taxation (debatable).
- xii. It is not necessarily worse for society if a large number of optimality conditions are violated than if only a few are violated.

## Criteria for Welfare Judgements

How do we decide whether a certain reallocation of resources, (e.g., a government project) will increase or decrease social welfare? Our whole course is directed towards answering this question.

What welfare economists have tried to do is to develop simple welfare criteria that the government can use to evaluate different projects. It simply means a criteria that do not have all the informational requirements noted above, e.g., a criteria that can be used to determine whether a tax should be imposed on fish, or that whether social welfare will increase when a certain amount of pollution is abated.

Consider now some simple rules (criteria) that have been proposed as ways to determine if a reallocation of resources (project or policy) will increase social welfare.

Any attempt to construct a rigorous and universally applicable criterion for distinguishing what policy change is an economic improvement must find on the problem of interpersonal judgements. Yet the different criterion used from time to time are mentioned below.

### Pareto Criterion

A basic criterion used in comparing situations is the Pareto Criterion named for Vilfredo Pareto (1848-1923). By the Pareto Criterion, a reallocation of resources increases social welfare if it makes some members of society better off (8 their utility) and doesn't make any members worse off (9 their utility).

While most would agree that when the conditions for the Pareto Criterion are fulfilled, the reallocation will increase social welfare, the Pareto Criterion, unfortunately, cannot be used to evaluate most projects. Most projects make at least one person worse off. In these cases the Pareto Criterion gives us no guidance.

As discussed above the formulation states that any change which harms no one and which makes some people better off must be considered to be an improvement.

However, this criterion works by sidestepping the crucial issue of interpersonal comparison and income distribution, that is by dealing only with cases where no one is harmed so that the problem does not arise.

### The Kaldor Criterion

This lack of guidance from the Pareto Criterion led Kaldor to develop a criterion known as the Kaldor Criterion. The Kaldor Criterion says a move from allocation A to allocation B improves social welfare if the amount the potential gainers would pay (give up in terms of commodities / money) for the move is greater than the amount the potential losers would pay to stop the move.

This criterion requires that the gainer be able to make his compensation out of his gains. It states that a change is an improvement if those who gain evaluate their gains at a higher figure than the value which the losers set upon their losses.

The serious weakness of this criteria is that it does not test whether the entire change is a good thing by cross testing.

## The Scitovsky Double Criterion

To get around this reversibility problem (non asymmetry problem), Scitovsky suggested what is now known as the Scitovsky Criterion. The Scitovsky Criterion says a move from I to II increases social welfare if, when at I, II<sup>TM</sup> I by the Kaldor Criterion but when at II, I is not preferred to II by the Kaldor Criterion.

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This is an improvement over the Kaldor criteria. It proposed a stricter test having two parts:

1. Use the Kaldor criterion to see if the move from the initial point to a new point is an improvement.
2. Use of Kaldor criterion to make sure that the return move from the new point back to the initial point is not an improvement. If and only if the move passes both parts of the double test is the move an improvement.

However, the above criteria are just designed to measure whether production, and hence potential welfare, are increased by a policy change; these criteria disentangle the evaluation of a production change from that of a distribution change by which it is accompanied.

## The Bergson Criterion

This suggests that the only way out of the problem is the formulation of a set of explicit value judgements which enable the analyst to evaluate the situation. These judgements as to what constitutes justice and virtue in distribution may be of an economist, legislature, government authority, management or other groups. This amounts to the construction of an indifference map ranking different combinations of the utility which may accrue to various members of society. Such an indifference map is called the "social welfare function", and it does permit the analyst to judge definitely whether or not a proposed policy change is an improvement.

Of late, the concepts of consumer's surplus and producer's surplus have been developed and used extensively for evaluation and decision-making of such policy changes by a firm or government.

### Case: Microsoft held Guilty of breaking Antitrust Laws

A Federal judge has ruled in a landmark decision that Microsoft Corporation seriously violated US antitrust laws, exposing the software giant to harsh penalties that could even result in its break-up.

District Judge Thomas Penfield Jackson yesterday found that the Redmond, Washington based firm broke the law by abusing its monopoly power in personal computer operating systems, doing "violence to the competitive process."

Microsoft promised to appeal once the trial ends months from now and was confident it would ultimately prevail. The company's stock, down the entire day, improved slightly after verdict but was still off \$ 15-3/8 at \$ 90-7/8 in after-hours trading.

Judge Jackson's most serious conclusion was that Microsoft violated Section 2 of the Sherman Antitrust Act by using its might against other companies, especially Netscape Communications, its rival in the 1990s for control of the internet browser market.

Netscape's market share withered under Microsoft's attack and it sold out to America Online during the early part of the trial. "Microsoft maintained its monopoly power by anti-competitive means and attempted to monopolise the web browser market," wrote Judge Jackson in his 43-page ruling.

Contd...

While it is legal to gain a monopoly through skill or lucks, it is illegal to use that power to perpetuate a monopoly by preventing competitors from springing up.

Representatives of the justice department and the 19 States that brought the case, left open the possibility that they would seek the strongest remedy available for such a serious violation – a break-up of the company. Alternatively, they could seek changes in the company's business practices.

#### ₹ 60,000 Crore Gone as Markets Crash

The panic on the country's stock markets over the last few days today took a dramatic turn for the worse with investors losing a massive ₹ 60,000 crore in the largest meltdown in the country's stock market history since the Harshad Mehta bubble burst in the early '90s. The Bombay Stock Exchange's Sensex fell 361 points or lost over 7.2 per cent of its total value today, with 55 top stocks in the 'A' group falling by 8 per cent before they hit the lower 'circuit filter' which stopped all trading in them.

In continuing with the trend of the past few days, technology firms like Infosys and Satyam were the worst hit – tech stocks have been falling on the US Nasdaq as well with investors of the view that these stocks have been hyped too much. Technology shares like Infosys, Satyam and Wipro, pharma shares like Ranbaxy, L&T, MTNL, Reliance, HFCL, VSNL and SBI plunged on sustained unloading of shares by panicky investors.

Today's bloodbath, initially triggered off by the collapse of the American Nasdaq after the US court ruled that Microsoft had indeed violated antitrust legislation, was worsened by rumours spread by interested stock market operators in the Indian markets.

One of the country's pink financial dailies carried a report this morning (April 4) that the income tax authorities were demanding taxes from Foreign Institutional Investors (FIIs) which had routed their investment through the Mauritius tax-haven, to claim tax advantages. While the report was denied by the Finance Ministry in New Delhi early enough in the morning – the income tax claims were a mere ₹ 9 crores from just 7 of the total of over 600 FIIs who operate in India – operators used this to wreak havoc.

Rumours were spread that this was just the beginning of a massive income tax swoop on FIIs.

#### Questions

1. State the case for and against Microsoft as a company.
2. What are the macro implications of such a ruling on a micro unit?

Source: The Economic Times, April 4, 2000

### Student Activity

"Welfare economics has concerned itself mainly with policy issues which arise out of the allocation of resources – with the distribution of inputs among the various commodities and vice versa". Explain in the context of Indian economic situations.

### Summary

Welfare economics is a branch of economics that uses microeconomic techniques to evaluate economic well-being, especially relative to competitive general equilibrium within an economy as to economic efficiency and the resulting income distribution associated with it. Welfare economics typically takes individual preferences as given and stipulates a welfare improvement in Pareto efficiency terms from social state A to social state B if at least one person prefers B and no one else opposes it. There is no requirement of a unique

quantitative measure of the welfare improvement implied by this. Another aspect of welfare treats income/goods distribution, including equality, as a further dimension of welfare.

General equilibrium theory is a branch of theoretical economics. It seeks to explain the behavior of supply, demand and prices in a whole economy with several or many interacting markets, by seeking to prove that a set of prices exists that will result in an overall equilibrium. Welfare economics has concerned itself mainly with policy issues which arise out of the allocation of resources – with the distribution of inputs among the various commodities and vice versa.

Welfare economics is now used in operations-research type of analyses of specific problems of government and as training material for operations researchers who can learn some of its basic concepts to avoid analytic traps. The idea of external economies and diseconomies has taught us to be aware of policies which yield optimal results for each of the various decisions of a firm taken by themselves, because by not taking into account the effects of its decisions on the rest of the company, policy making, division by division, may yield results which are far from optimal for the company as a whole. The emphasis in welfare economics has swung from its rather abstract subject matter toward the other extreme – to very applied work and concrete problems of day-to-day economic decision-making.

Utility is the satisfaction, pleasure or need-fulfilment derived from consuming some quantity of a good. Utility is thus a psychological feeling. The concept of utility formed the core of the classical theory of demand in the form of law of diminishing marginal utility. Alfred Marshall gave the final form to the theory of marginal utility.

The primary focus of utility analysis is on the satisfaction of wants and needs obtained by the consumption of goods. This is technically termed utility. The utility generated from consumption affects the decision to purchase and consume a good.

Consumer surplus or consumers' surplus is the monetary gain obtained by consumers because they are able to purchase a product for a price that is less than the highest price that they would be willing to pay.

Consumer's surplus is a concept introduced by Marshall who maintained that it can be measured in monetary units and is equal to the difference between the amount of money that a consumer actually pays to buy a certain quantity of a commodity  $x$  and the amount that he would be willing to pay for this quantity rather than do without it.

Producer surplus or producers' surplus is the amount that producers benefit by selling at a market price that is higher than the least that they would be willing to sell for.

Any attempt to construct a rigorous and universally applicable criterion for distinguishing what policy change is an economic improvement must find on the problem of interpersonal judgements

## Keywords

**Welfare economics:** Welfare economics is a branch of economics that uses microeconomic techniques to evaluate economic well-being, especially relative to competitive general equilibrium within an economy as to economic efficiency and the resulting income distribution associated with it.

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### Review Questions

1. Discuss the role of "substitutability" and "complementarity" in explaining interdependence relationships.
2. Examine the concept of consumer's surplus and producer's surplus. Of the two, which one is the best and why?
3. Briefly describe the features of "Pareto Optimality". What are the criteria for welfare judgements?

### Further Readings

Karam Pal and Surrender Kumar, *Managerial Economics*, Excel Books

Samuelson, Stephen G. Marks, William *Managerial Economics* (Hardcover – Dec 29, 2008)

Christopher R. Thomas and S. Charles Maurice, *Managerial Economics* (Hardcover – Mar 7, 2007)

Christopher R. Thomas and S. Charles Maurice, *Managerial Economics* (Hardcover – Jan 27, 2010)