Document Information

Analyzed document	Managerial Economics-1.pdf (D165737180)
Submitted	2023-05-03 08:46:00
Submitted by	Mumtaz B
Submitter email	mumtaz@code.dbuniversity.ac.in
Similarity	0%
Analysis address	mumtaz.dbuni@analysis.urkund.com

Sources included in the report

SA **COM 231 Business Economics - I.pdf**
Document COM 231 Business Economics - I.pdf (D165092265) 1

Entire Document

MANAGERIAL ECONOMICS
SYLLABI-BOOK MAPPING TABLE Managerial Economics Syllabi Mapping in Book Unit 1: Definition, Nature and Scope of Business Economics,
Wealth Definition, Scarcity Definition, Growth Definition, Production Possibility Curve, Circular Flow of Economic Theory to a Firm's Level Business Problems. Unit 2: Characteristics and Classification of Human Wants-
law of Diminishing Marginal Utility, Laws of Equimarginal Utility. Unit 3: Demand Analysis and Forecasting: Meaning of Demand, Determinants of Demand, Assumptions
of Law of Demand, Exceptions to Law of Demand, Reasons for Change in Demand, Elasticity of Demand,
Demand Forecasting, Law of Supply, Elasticity of
Supply. Unit 4:
Cost and Revenues: Money, Real and Opportunity Costs, Fixed and Variable Costs, Average and Marginal Costs, Average and Marginal Revenues. Unit 5: Production Function, Cost-output Relationship, Law of Variable Proportions, Law of Increasing Returns, Law of Diminishing Returns. Unit 6: Pricing under different Market Conditions: Nature of Markets, Pricing under Perfect, Monopoly and Monopolistic Market Conditions, Pricing in Actual Practice, Cost Plus Pricing, Transfer Pricing. Unit 7: Profit Management and Appropriation: Economic Versus Accounting Profit, Concept of True Profit, Factors in Profit Measurement, Appropriation of Profit Policy, Capitalization of Profit. Unit 8: Business Cycle: Causes and Effect of Inflation and Recession, Measures of Economic Stabilization. Unit 9: Money and Banking: Meaning of Money, Functions, Measurement of Money and Value of Money-functions of Commercial and Central Banks-credit Creation by Commercial Banks– Methods of Credit Control.
Unit 1: The Nature and Scope of Managerial Economics (
Pages 3-19) Unit 2: Analysis of Individual Demand (Pages 21-62) Unit 3: Analysis of Market Demand and Demand Elasticities (Pages 63-95) Unit 4: Demand Forecasting (Pages 97-125) Unit 5:
Theory of production (Pages 129-158) Unit 6: Theory of Cost (Pages 159-181) Unit 7: Market Structure and Pricing Decisions (Pages 183-241) Unit 8: Pricing Strategies and Practices (Pages 243-261) Unit 9:
Profit As Business Objective and Profit Planning (Pages 265-296)
Unit 10: National Income: Concept and Measurement (Pages 297-306) Unit 11: Inflation (Pages 307-334) Unit 12: Fiscal and Monetary Policies (Pages 335-359) Unit 10: National Income and Income Determination: Circular Flow of Income, National Income and Related Concepts.
CONTENTS INTRODUCTION 1
MODULE - 1

Elasticities 3.5 Summary 3.6
Answers to 'Check Your Progress' 3.7
Exercises and Questions 3.8 Further Reading
UNIT 4
DEMAND FORECASTING 97-125 4.0 Introduction 4.1 Unit Objectives 4.2
Need for
Demand Forecasting 4.3 Techniques of Forecasting Demand 4.3.1 Survey Methods; 4.3.2 Statistical Methods 4.4
Concluding Remarks 4.5 Some Case Studies of Demand Forecasting 4.5.1 Consumer Goods; 4.5.2 Intermediate Goods
4.6 Summary 4.7
Answers to 'Check Your Progress' 4.8 Exercises and Questions 4.9 Further Reading
MODULE - 2
UNIT 5 THEORY OF PRODUCTION 129-158 5.0 Introduction 5.1 Unit Objectives 5.2
Meaning of
Production and Some Concepts 5.2.1 Meaning of Production; 5.2.2 Some Concepts 5.3
Production Function 5.4 The Laws of Production 5.4.1
Short-run Laws of Production: Production with One Variable Input; 5.4.2
Long-term Laws of Production:
Laws
of Returns to Scale; 5.4.3
The
Laws of Returns to Scale 5.5
The Laws of
Returns
to Scale
Through Production Function 5.5.1
Degree of Production Function and Returns to Scale 5.6
CES Production
Function 5.7
Optimal Input Combination 5.7.1 The Budgetary Constraint and Budget Line; 5.7.2 The Least-cost Criteria; 5.7.3 Effect of
Change in Input
Price
5.8 Summary 5.9
Answers to 'Check Your Progress' 5.10 Exercises and Questions 5.11 Further Reading
UNIT 6 THEORY OF COST 159-181 6.0 Introduction 6.1 Unit Objectives 6.2
Cost Concepts 6.2.1 Some Accounting Cost Concepts; 6.2.2 Some Analytical Cost Concepts 6.3 The Theory of Cost: The
Cost-Output Relations 6.3.1
Short-run Cost-Output Relations; 6.3.2
Short-run Cost Functions and
Cost Curves; 6.3.3 Cost Curves and the Law of Diminishing Returns; 6.3.4
Some Important Cost Relationships; 6.3.5 Output Optimization in the
Short-Run; 6.3.6 Long-run Cost-Output Relations 6.4
Economies and Diseconomies of Scale 6.4.1
Economies of Scales; 6.4.2 Diseconomies of
Scales 6.5 Some Empirical Cost Functions 6.6 Summary 6.7
Answers to 'Check Your Progress' 6.8 Exercises and Questions 6.9 Further Reading
UNIT 7 MARKET STRUCTURE AND PRICING DECISIONS 183-241 7.0 Introduction 7.1 Unit Objectives 7.2 Market Structure
and Degree of Competition 7.2.1 Market Structure and Pricing Decisions 7.3 Pricing under Perfect Competition 7.3.1
Characteristics of
Perfect Competition; 7.3.2 Price Determination under Perfect Competition 7.4 Pricing under Pure Monopoly 7.4.1 Causes
and Kinds of Monopolies; 7.4.2 Pricing and Output Decision: Short-Run; 7.4.3 Monopoly Pricing and Output Decision in
the Long-Run; 7.4.4 Price Discrimination under Monopoly; 7.4.5 Necessary Conditions for Price Discrimination 7.5
Measuring Monopoly Power 7.6 Pricing and Output Decisions Under Monopolistic Competition 7.6.1 Monopolistic Vs.
Perfect Competition; 7.6.2 Product Differentiation Under
Monopolistic Competition; 7.6.3
Price and Output Decisions in the Short-Run; 7.6.4 Price and Output Determination
in the Long-Run; 7.6.5

Non-Price Competition: Selling Cost and Equilibrium; 7.6.6 Critical Appraisal of Chamberlin's Theory 7.7 Pricing and Output Decisions under Oligopoly 7.7.1 Definition, Sources and Characteristics; 7.7.2 The Oligopoly Models: an Overview; 7.7.3 Cournot's Model of
Oligopoly; 7.7.4 Kinked Demand Curve Analysis of Price Stability: Sweezy's Model; 7.7.5 Price Leadership Models; 7.7.6 Collusion Model: The Cartel
7.8 The Game Theory 7.8.1 The Nature of the Problem: Prisoners' Dilemma; 7.8.2 Application of Game Theory to Oligopolistic Strategy 7.9 Summary 7.10
Answers to 'Check Your Progress' 7.11 Exercises and Questions 7.12 Further Reading
UNIT 8 PRICING STRATEGIES AND PRACTICES 243-261 8.0 Introduction 8.1 Unit Objectives 8.2
Cost-
plus Pricing 8.2.1
Cost-plus Pricing and Marginal Rule
Pricing 8.3 Multiple Product Pricing 8.4 Pricing In Life-cycle of a Product 8.4.1 Pricing
a New Product; 8.4.2 Pricing in Maturity Period 8.4.3 Pricing a Product in Decline 8.5 Pricing
in Relation to Established Products 8.5.1
Pricing Below the Market Price; 8.5.2 Pricing at Market Price 8.5.3 Pricing Above the Existing Market Price 8.6 Transfer Pricing 8.6.1 Transfer Pricing without External Market; 8.6.2 Transfer Pricing with External Competitive Market; 8.6.3 Transfer Pricing Under Imperfect External Market 8.7 Competitive Bidding of Price 8.7.1 Major Factors in Competitive Bidding; 8.7.2 Determining the Competitive Bid 8.8 Peak Load Pricing 8.9.1 Problems in Pricing; 8.9.2 Double Pricing System 8.9 Summary 8.10
Answers to 'Check Your Progress' 8.11 Exercises and Questions 8.12 Further Reading
MODULE - 3
UNIT 9 PROFIT AS BUSINESS OBJECTIVE AND PROFIT PLANNING 265-296 9.0 Introduction 9.1 Unit Objectives 9.2 Profit as Business Objective 9.2.1 Meaning of Profit 9.3 Theories of Profit:
The Economists'Perception and Sources
of Profit 9.3.1 Walker's Theory
of Profit: Profit as Rent of Ability 9.4
Problems in Profit Measurement 9.4.1 Problem in Measuring Depreciation; 9.4.2 Treatment of Capital Gains and Losses; 9.4.3 Current vs. Historical Costs 9.5 Profit
Maximization as Business Objective 9.5.1 Profit Maximizing Conditions 9.6 Controversy over Profit Maximization Objective 9.6.1 Gap between Theory and Practice; 9.6.2 The Defence of Profit Maximization 9.7 Alternative Objectives Of Business Firms 9.7.1 Baumol's Hypothesis of Sales Revenue Maximization; 9.7.2 Marris's Hypothesis of Maximization of Firm's Growth Rate; 9.7.3 Williamson's Hypothesis of Maximization of Managerial Utility Function; 9.7.4 Cyert-March Hypothesis of Satisficing Behaviour; 9.7.5 Rothschild's Hypothesis of Long-run Survival and Market Share Goals; 9.7.6 Entry-prevention and Risk-avoidance
9.8 A Reasonable Profit Target 9.8.1 Reasons for Aiming at "Reasonable Profits" 9.9 Profit as Control Measure 9.10 Profit Planning: Break-Even Analysis 9.10.1
Break-even Analysis: Linear Cost and Revenue Function; 9.10.2 Break-even Analysis: Non-linear Cost and Revenue Functions; 9.10.3
Contribution Analysis; 9.10.4 Profit Volume Ratio; 9.10.5 Margin of Safety; 9.10.6 Profit-Volume Analysis Charts 9.11 Summary 9.12 answers to 'Check Your Progress' 9.13 Exercises and Questions 9.14 Further Reading
UNIT 10 NATIONAL INCOME: CONCEPT AND MEASUREMENT 297-306 10.0 Introduction 10.1 Unit Objectives 10.2 Definition of National Income 10.3 Measures of National Income 10.3.1
Gross National Product (GNP); 10.3.2 Gross Domestic Product (GDP); 10.3.3 Net National Product (NNP); 10.3.4 National Income:
Some Accounting Relationships 10.4 Methods of Measuring
National Income 10.4.1 Net Output or Value-Added Method; 10.4.2 Factor-Income Method; 10.4.3 Expenditure Method 10.5
Choice of Methods 10.6 Measurement of National Income in India 10.7
Summary 10.8
Answers to 'Check Your Progress' 10.9 Exercises and Questions 10.10 Further Reading
UNIT 11 INFLATION 307-334 11.0 Introduction 11.1 Unit Objectives 11.2 Definition of

Inflation 11.2.1 What is Inflation? 11.2.2 Desirable Limits of Inflation 11.2.3 Every Price Rise Is Not Inflation 11.3 Measures of Inflation 11.3.1 Measuring Inflation through Wholesale PINs 11.3.2 Measuring Inflation by GNP Deflator 11.4 Kinds of Inflation 11.5 Effects of Inflation 11.5.1 Effect of Inflation on Production and Growth 11.5.2 Effect of Inflation on Employment 11.5.3 Effect of Inflation on Income Distribution 11.5.4 Effect of Inflation on Distribution of Wealth 11.6 The Monetarist View oN Inflation 11.7 The Modern Approach To Inflation 11.7.1 Demand-Pull Inflation 11.7.2 Cost-Push Inflation 11.7.3 Interaction Between Demand-Pull and Cost-Push Factors
11.8 Inflation in Less Developed Countries: The Structuralist View 11.8.1 Structuralists' Approach to Inflation 11.9 Policy Measures to Control Inflation 11.9.1 Monetary Measures 11.9.2 Fiscal Measures 11.9.3 Price and Wage Control 11.9.4 Indexation 11.10 Summary 11.11
Answers to 'Check Your Progress' 11.12 Exercises and Questions 11.13 Further Reading
UNIT 12 FISCAL AND MONETARY POLICIES 335-359 12.0 Introduction 12.1 Unit Objectives 12.2
Fiscal Policy: Definition and Objectives 12.3
India's Taxation Policy—1950-1990 12.3.1 Formulation of Tax Policy 12.3.2 Basic Functions of Tax Policy 12.4 Tax Policy Reforms (1991) 12.4.1 Anomalies in India's Tax Policy 12.4.2
Tax Reforms in 1991 12.5 Income Taxation and the
Private Business 12.5.1 Effects of Income Taxation on Work Efforts 12.5.2 Effect Of Taxation On
Saving 12.6 Corporate Income Taxation, Business Saving and Investment 12.7
Meaning and Scope
of Monetary Policy 12.7.1 Meaning of
Monetary Policy 12.7.2 Scope of Monetary Policy 12.8 Instruments of Monetary Policy 12.8.1
Quantitative Measures of Monetary
Control 12.8.2 Qualitative or Selective Credit Controls 12.9
The Limitations of Monetary Policy 12.7 Summary 12.8
Answers to 'Check Your Progress' 12.9 Exercises and Questions 12.10 Further Reading
Introduction
Self-Instructional Material 1 NOTES INTRODUCTION
A natural curiosity of a student who begins to study
of
a subject or
a
science is to know its nature and scope. Such as it is, a student of economics would like to know 'what is economics' and 'what is
its subject matter'. Surprisingly,
there is no precise answer to these questions.
Attempts made by economists
over the past 300 years to define economics have not yielded a precise and universally acceptable definition of economics. Economists right from Adam Smith—the 'father of economics'—down to modern economists have defined economics differently depending on their own perception of the subject matter of
economics of their era.
Thus,
economics is fundamentally the study of choice-making behaviour of
the people.
The choice-
making behaviour of the people is studied in a systematic or scientific manner. This gives economics the status of a social science. However,
the
scope of economics, as it is known today, has expanded vastly in the post-War II period. Modern economics is now divided into two major branches:
Microeconomics
and Macroeconomics. Microeconomics is concerned with microscopic study of the various elements of the economic system and not with the system as a whole. As Lerner has put it, "Microeconomics consists of looking at the economy through a microscope, as it were, to see how the million of cells in body economic—the individuals or households as consumers and the individuals or firms as producers—play their part in the working of the whole economic organism.
Macroeconomics is a relatively new branch of economics.
Macroeconomics
is the study of the nature, relationship and behaviour of aggregates and averages of economic

variables.
Therefore, technique and process of business decision-making has of late changed tremendously.
The basic functions of business managers is to take appropriate decisions on business matters,
to manage and organize resources, and to make optimum use of the available
resource with the objective of achieving the
business goals. In today's world,
business decision-making has become an extremely complex task
due to
ever growing complexity of the business
world
and the business environment.
It is in this context that modern economics –
howsoever defined - contributes a great deal towards business decision- making and
performance of managerial duties and responsibilities. Just as biology contributes to the medical profession and physics to engineering, economics contributes to the
managerial profession.
This book
aims at equipping
the
management students with economic concepts, economic theories, tools and techniques of economic analysis applied to business decision- making.
MODULE - 1
NOTES 4
Self-Instructional Material The Nature and Scope of Managerial Economics
NOTES Self-Instructional Material 5
The Nature and Scope of
Managerial Economics UNIT 1 THE NATURE AND SCOPE OF
MANAGERIAL ECONOMICS Structure 1.0 Introduction 1.1
Unit Objectives 1.2 What is
Managerial Economics? 1.3 Why Do Managers Need to Know Economics? 1.3.1 How Economics Contributes to Managerial Functions 1.4 Business Decisions
and Economic Analysis 1.5 The Scope of Managerial Economics 1.5.1 Microeconomics Applied to Operational Issues 1.5.2 Macroeconomics Applied to Business Environment 1.6 Some Other Topics in Managerial Economics 1.7 The
Gap Between Theory and Practice and the
Role of Managerial Economics 1.8
Summary 1.9 Answers to 'Check Your Progress' 1.10 Exercises and Questions 1.11 Further Reading 1.0
INTRODUCTION
The
emergence of managerial economics as a separate course of management studies can be attributed to
at least three factors: (
a)
growing complexity of business decision- making process due to
changing market conditions and business environment, (b) consequent
upon,
the
increasing use
of economic logic, concepts, theories and tools of economic analysis in
the process of business decision-making,
and (c) rapid increase in demand for professionally trained managerial manpower.
Let us take a look at how these factors have contributed to the creation of 'managerial economics' as a separate branch of study.
The
business decision-making process
has become increasingly complex due to the ever- growing
complexity of
the business

world.
There was a time when business units (shops, firms, factories, mills, etc.) were set up, owned and managed by individuals or business families.
Big industries were few and the
scale of business operation was relatively small. The managerial skills acquired through traditional family training and experience were sufficient to manage small and medium-scale
business.
Although a large part of private business is still run on
a
small scale and managed in the traditional style of business management,
the industrial business world has changed drastically
in size, nature and content.
The growing complexity of the business world can be attributed to
the growth of large-scale industries,
growth of
a large variety of industries, diversification of industrial products, expansion and diversification of business activities of corporate firms,
growth of multinational corporations, and mergers and takeovers, especially after World War II. These factors have contributed to an increase in
inter-firm, inter-industry and international rivalry, competition, risk and uncertainty. Business decision-making in this kind of business environment is a very complex affair.
Family training and experience is no longer sufficient to meet managerial challenges.
NOTES 6 Self-Instructional Material
The Nature and Scope of
Managerial Economics
The
growing complexity
of business decision-making has inevitably increased the
application of economic concepts, theories and tools of
economic analysis in
this area.
The reason is that making an appropriate business decision requires
a clear understanding of market conditions, market fundamentals and the business environment. This requires an intensive and extensive analysis of
the market conditions on the product, input and financial markets. On the other hand,
economic theories, logic and tools of analysis have been developed to analyze and predict market behaviour.
The application of economic concepts, theories, logic and analytical tools in the assessment and prediction of market conditions
and business environment has proved to be of great help in business decision-making.
The contribution of economics to business decision- making has come to be widely recognized.
Consequently,
economic theories and analytical tools which are widely used in business decision-making have crystallized into a separate branch of management studies, called managerial economics
or business economics. 1.1
UNIT OBJECTIVES
z To define managerial economics
z
To discuss how managerial economics contributes to business decision-making z To narrate the scope of managerial economics z To show how economics is applied to business decisions z To point out some other topics in managerial economics 1.2
WHAT IS MANAGERIAL ECONOMICS? Managerial economics constitutes
economic theories and analytical tools that are widely applied to business decision-making.
It is, therefore useful to know, ‘what is
economics’ 1 . Economics is a social science. Its basic function is to study how people–
individuals, households, firms and nations—
maximize their gains from their limited resources and opportunities.

In economic terminology, this is called maximizing behaviour or, more appropriately, optimizing behaviour. Optimizing behaviour is selecting the best out of available options with the objective of maximizing gains from the given resources. Economics is thus a social science which studies human behaviour
in relation to optimizing allocation of available resources to achieve the given ends.
For example, economics studies how households allocate their limited resources (income) between various goods and services they consume so that they are able to maximize their total satisfaction.
It analyses how
households with limited income decide 'what to consume' and 'how much to consume'
with the aim of maximizing total utility.
Economics studies how producers, that is, the firms, decide on
the commodity to produce, the production technology, location of the firm, market or market segment to cater to, price of the product, the amount to spend on advertising (if necessary) and the strategy on facing competition, etc. It also studies how nations allocate their resources, men and material, between competing needs of the society so that economic welfare of the society can be maximized.
Economics
is obviously
a study of the choice-making behaviour of the people. In reality, however, choice-making is not so simple as it looks because the economic world is very complex and most economic decisions have to be taken under the condition of imperfect knowledge,
risk and uncertainty. Therefore, taking an appropriate decision or making an
NOTES Self-Instructional Material 7 The Nature and Scope of Managerial Economics
appropriate choice in an extremely complex situation is a very
complex affair. The economists,
in their endeavour to study the complex decision-making process, have developed a large kit of analytical tools and techniques with the aid of mathematics and statistics and have developed a large corpus of economic theories with a fairly high predictive power.
The
analytical tools and techniques, economic laws and theories constitute the body
of economics. The subject matter of economic science consists of the logic, tools and techniques of analyzing economic phenomena, evaluating economic options, optimization techniques and economic theories. The application of economic science is all pervasive. More specifically, economic laws and tools of economic analysis are now applied a great deal
in the process of business decision-making. This has led,
as mentioned earlier,
to the emergence of a separate branch of study called
managerial economics.
Managerial economics can be defined as
the study of
economic theories, logic
and tools of
economic analysis
that are used in the
process of business decision making.
Economic theories and techniques
of economic analysis
are applied to analyse business problems,
evaluate business options and opportunities
with a view to arriving at an appropriate business decision.
Managerial economics is thus constituted of that part of economic knowledge, logic, theories and analytical tools that are used for rational
business decision- making. Let us now
look at some representative definitions of
managerial economics. Some other Definitions "
Managerial
economics is concerned with
the application of economic concepts and

economics to the
problems of formulating rational
decision making" 2 . —Mansfield "
Managerial
economics ... is
the integration of economic theory with business practice
for the purpose of facilitating decision making and forward planning by management" 3 . —
Spencer and
Seigelman "
Managerial
economics
is
concerned
with the application of economic
principles and methodologies to
the
decision-making process within the firm or organization.
It seeks to establish rules and principles to facilitate
the attainment of the desired economic goals of management" 4 . —
Douglas "
Managerial economics applies the principles and methods of economics to analyse problems faced by management of a business, or other types of organisations and to help find solutions that advance the best interests of such organizations" 5 . —
Davis and Chang These definitions of managerial economics together reveal the nature of
managerial economics. 1.3
WHY DO MANAGERS NEED TO KNOW ECONOMICS?
Economics contributes a great deal towards the
performance of managerial duties and responsibilities. Just as biology contributes to the medical profession and physics to engineering, economics contributes to the
managerial profession.
All other qualifications being the same, managers with a working knowledge of economics can perform their functions more efficiently than those without it. The basic function of
the managers of a business firm
is
to achieve the objective of the firm to the maximum possible extent with the limited resources
placed at their disposal. The emphasis here is on the maximization of the objective and limitedness of the resources. Had the resources been unlimited,
like sunshine and air,
the problem of economising on resources or resource management would have never arisen. But resources, howsoever defined, are limited.
Resources at the disposal of a firm, whether finance, men or material, are by all means limited. Therefore, one of the basic tasks of the management is to optimize the use of the resources
in its effort to achieve the goals of the firm.
NOTES 8 Self-Instructional Material The Nature and Scope of Managerial Economics 1.3.1
How Economics Contributes to Managerial Functions
Economics, though variously defined, is essentially the study of logic, tools and techniques of making optimum use of the available resources to achieve the given ends. Economics thus provides analytical tools and techniques that managers need to achieve the goals of the organization they manage. Therefore, a working knowledge of economics, not necessarily a formal degree, is essential for managers. Managers are essentially practicing economists. In performing his functions,
a manager has
to take a number of decisions in conformity with the goals of the firm. Many
business decisions are taken
under the condition of risk and
uncertainty. Risk and uncertainty arise

mainly due to uncertain behaviour of the market forces, changing business environment, emergence of competitors with highly competitive products, government policy,
external influence on the domestic market and
social and political changes in the country. The complexity of the modern business world adds complexity to business decision making.
However, the degree of uncertainty and risk can be greatly reduced if market conditions are predicted with a high degree of reliability.
The prediction of the future course of business environment alone is not sufficient. What is equally important is to take appropriate business decisions and to formulate a business strategy in conformity with the goals of the firm.
Taking appropriate business decisions requires a clear understanding of the technical and environmental conditions under which business decisions are taken. Application of economic theories to explain and analyse the technical conditions and the business environment contributes a good deal to
the
rational decision-making process. Economic theories have, therefore, gained a wide range of application in the analysis of practical problems of business. With the growing complexity of business environment, the usefulness of economic theory as a tool of analysis and its contribution to the process of decision-making has been widely recognized. Baumol 6 has pointed out three main contributions of
economic theory to business ecomomics. First, 'one of the most important things which the economic (theories) can contribute to
the management science' is building analytical models which help to recognize the structure of managerial problems, eliminate the minor details which might obstruct decision-making, and help to concentrate on the main issue. Secondly, economic theory contributes to the business analysis '
a set of analytical methods' which may not be applied directly to specific business problems, but they do enhance the analytical capabilities of the business analyst.
Thirdly, economic theories offer clarity to the
various concepts used in business analysis, which enables the managers to avoid conceptual pitfalls. 1.4
BUSINESS DECISIONS AND ECONOMIC ANALYSIS
Business decision-making is essentially a process of selecting the best out of
alternative opportunities open to the firm.
The process of decision-making 7 comprises four main phases: (i) determining and defining the objective to be achieved; (
ii) collections and analysis of information regarding economic, social, political and technological environment and foreseeing the necessity and occasion for decision; (iii) inventing, developing and analysing possible course of action; and (
iv) selecting a particular course of action', from the available alternatives. This process of decision-making is, however, not as simple as it appears to be. Steps (ii) and (iii) are crucial in business decision-making. These steps put managers' analytical
NOTES Self-Instructional Material 9 The Nature and Scope of Managerial Economics
ability to test and determine the appropriateness and validity of decisions in the modern business world. Modern business conditions are changing so fast and becoming so competitive and complex that personal business sense, intuition and experience alone are not sufficient to make appropriate business decisions. Personal intelligence, experience, intuition and business acumen of the decision makers need to be supplemented with quantitative analysis of business data on market conditions and business environment. It is in this area of decision-making that economic theories and tools of economic analysis contribute a great deal.
For instance, suppose a firm plans to launch a new product for which close substitutes are available in the market. One method of deciding whether or not to launch the product is to obtain the services of business consultants or to seek expert opinion. If the matter has to be decided by the managers of the firm themselves, the two areas which they will need to investigate and analyse thoroughly are: (i) production related issues,
and (
ii) sale prospects and problems.
In
the field of production,
managers will be required to collect and analyse data on: (a) available techniques of production (b) cost of production associated with each production technique (c) supply position of inputs required to produce the planned commodity (d) price structure of inputs (e) cost structure of competitive products (f) availability of foreign exchange if inputs are to be imported

In order to assess the sales prospects,
managers
will be required to collect and analyse data on: (
a)
general market trends (
b) trends in the industry to which the planned products belongs (c) major existing and potential competitors and their respective market shares (
d) prices of the competing products (
e)
pricing strategy of the prospective competitors (f) market structure and degree of competition (g) supply position of complementary goods It is in this kind of input and output market analysis that knowledge
of economic theories and tools of economic analysis aid the process of decision-making
in a significant way.
Economic theories
state the functional relationship between two or more economic variables, under certain given conditions. Application of relevant economic theories to the problems of business facilitates decision-making in three ways. First, it gives clear understanding of various economic concepts (i.e., cost, price, demand, etc.) used in business analysis. For example, the concept of 'cost' includes 'total', 'average', 'marginal', 'fixed', 'variable', actual costs, and opportunity
cost.
Economics clarifies which cost concepts are relevant and in what context. Second, it helps in ascertaining the relevant variables and specifying the relevant data. For example, it helps in deciding what variables need to be considered in estimating the demand for two different sources of energy—petrol and electricity. Third, economic theories state the general relationship between two or more economic variables and events.
The
application of relevant economic theory provides consistency to business analysis and helps in arriving at right conclusions. Thus, application of economic theories to the problems of business not only guides, assists and streamlines Check Your Progress 1. What is managerial economics? 2. How does managerial eco- nomics contribute to man- agerial decision-making? 3. What is the scope of business decisions? 4. How can economics be applied to production-related issues?
NOTES 10 Self-Instructional Material The Nature and Scope of Managerial Economics
the process of decision-making but also contributes a good deal to the validity of decisions. 1.5
THE SCOPE OF MANAGERIAL ECONOMICS
Economics has two major branches : (i) Microeconomics, and (ii) Macroeconomics. Both micro and
macro economics are
applied to business analysis and decision- making—directly or indirectly.
Managerial economics comprises, therefore, both micro and macroeconomic theories. The parts of
micro
and macroeconomics that constitute managerial economics depend on the purpose of analysis.
In general,
the scope of managerial economics comprehends all those economic concepts, theories and tools of analysis which can be
used to
analyse the
business environment and to find
solutions to practical business problems. In other words, managerial economics is economics applied to the analysis of business problems and decision-making. Broadly speaking, it is applied
economics. The areas of business issues to which economic theories can be directly applied may be broadly divided into two categories: (a) operational or internal issues, and (b) environment or external issues. 1.5.1 Microeconomics Applied to Operational Issues
Operational problems are of internal nature. They include all those problems which arise within the business organization and
fall within the purview and control of the management. Some of the basic internal issues are: (i) choice of business and the nature of product, i.e., what to produce; (ii) choice of size of the firm, i.e., how much to produce; (
iii) choice of

technology, i.e., choosing the factor-combination; (iv) choice of price, i.e., how to price the commodity; (v) how to promote sales; (vi) how to face price competition; (vii) how to decide on new investments; (viii) how to manage profit and capital; (ix) how to manage inventory, i.e., stock of both finished goods and raw materials. These problems may also figure in forward planning. Microeconomics deals with
these questions
and the like confronted by managers of the
business enterprises. The microeconomic theories which deal with most of these questions
are following.
Theory of Demand. Demand theory explains the consumer's behaviour. It answers the
questions: How do the consumers decide whether or not to buy a commodity? How do they decide on the quantity of a commodity to be purchased?
When do they stop consuming a commodity? How do the consumers behave when price of the commodity, their income and tastes and fashions, etc., change?
At what level of demand, does changing price become inconsequential in terms of total revenue? The knowledge of demand theory can,
therefore, be helpful in the choice of commodities for production. Theory of Production and
Production Decisions. Production theory, also called "Theory of Firm,"
explains the relationship between inputs and output. It also explains under what conditions costs increase or decrease; how total output increases when units of one factor (input) are increased keeping other factors constant, or when all factors are simultaneously increased; how can output be maximised from a given quantity of resources; and how can optimum size of output be determined? Production theory, thus, helps in determining the size of the firm, size of the total output and the amount of capital and labour to be employed. Analysis of Market-Structure and Pricing Theory. Price theory explains how
prices are
determined under different market conditions; when price discrimination is desirable, feasible and profitable; to what extent advertising can be helpful in expanding sales in a competitive market. Thus, price theory can be helpful in determining the price policy
NOTES Self-Instructional Material 11 The Nature and Scope of Managerial Economics
of the firm. Price and production theories together, in fact, help in determining the optimum size of the firm. Profit Analysis and Profit Management. Profit making is the most common objective of all business undertakings. But, making a satisfactory profit is not always guaranteed because a firm has to carry out its activities under conditions of uncertainty with regard to (i) demand for the product, (ii) input prices in the factor market, (iii) nature and degree of competition in the product market, and (iv) price behaviour under changing conditions in the product market,
etc.
Therefore, an element of risk is always there even if the most efficient techniques are used for predicting future and even if business activities are meticulously planned. The firms are, therefore, supposed to safeguard their interest and avert, as far as possible, the possibilities of risk
or try to minimise it.
Profit theory guides firms in the measurement and management of profit, in making allowances for the risk premium, in calculating the pure return on capital and pure profit and also for future profit planning. Theory of Capital and Investment Decisions.
Capital like all other inputs, is a scarce and expensive factor. Capital is the foundation of business. Its efficient allocation and management is one of the most important tasks of the managers and a determinant of the success level of the firm. The major issues related to capital are (i) choice of investment project, (ii) assessing the efficiency of capital, and (iii) most efficient allocation of capital. Knowledge of capital theory can contribute a great deal in investment-decision-making, choice of projects, maintaining capital intact, capital budgeting, etc. 1.5.2 Macroeconomics Applied to Business Environment Environmental issues pertain to the general business environment in which a business operates. They are related to the overall economic, social and political atmosphere of the country.
The factors which constitute economic environment of a country include the following
factors: (
i)
the type of economic system of
the country, (ii) general trends in production, employment, income, prices, saving and investment,
etc., (iii)

structure of and trends in the working of financial institutions, e.g., banks, financial corporations, insurance companies, etc., (iv) magnitude of and trends in foreign trade, (v) trends in labour and capital markets, (vi) government's economic policies, e.g., industrial policy, monetary policy, fiscal
policy, price policy,
etc., (
vii)
social factors like
the
value system of the society, property rights, customs and habits, (viii) social organisations like trade unions, consumers' cooperatives and producers unions, (
ix) political environment
is constituted of
such factors as political system— democratic, authoritarian, socialist, or otherwise; state's attitude towards private business, size and working of the public sector and political stability,
and (
x)
the degree of openness of the economy and the influence of MNCs on the domestic markets.
It is far beyond the powers of a single business firm, howsoever large it may be, to determine
and guide the course of economic, social and political factors of the nation, although all the firms together or at least giant business houses
may
jointly influence the economic and political environment of the country. For the business community in general, however, the economic, social and political factors are to be treated as business parameters.

The environmental factors have a far-reaching bearing upon the functioning and performance of firms. Therefore, business decision-makers have to take
into account the changing economic, political and social conditions in the country and give due consideration to the environmental factors in the process of decision-making. This is essential because business decisions taken in isolation of environmental factors may not only prove infructuous, but may also lead to heavy losses.
For instance,
a decision to set up a new alcohol manufacturing unit or to expand the existing ones ignoring the impending prohibition —a political factor—would be suicidal for the firm; a decision to expand the business beyond the paid-up capital permissible under Monopoly and Restrictive Trade Practices Act (MRTP Act) amounts to inviting legal shackles
and hammer;
a decision to employ a highly sophisticated, labour-saving technology ignoring the prevalence of mass open unemployment—an economic factor—may prove to be self-defeating; a decision to expand the business on a large scale, in a society having a low per capita income and hence a low purchasing power stagnated over a long period may lead to wastage of resources. The managers of
a firm
are, therefore, supposed to be fully aware of the economic, social and political conditions prevailing in the country while taking decisions on
the wider issues of the business.
Managerial economics is, however, concerned with only the economic environment, and in particular with those economic factors which form the business climate. The study of political and social factors falls out of the purview of managerial economics. It should, however, be borne in mind that economic, social and political behaviour of the people are interdependent and interactive. For example, growth of monopolistic tendencies in the industrial sector of India led to the enactment of the Monopoly and Restrictive Trade Practices Act (1961) which restricts the proliferation of large business houses. Similarly, various industrial policy resolutions formulated until 1990 in the light of the socio-political ideology of the government restricted the scope and area of private business.
Besides, the government's continuous effort to transfer resources from the private to the public sector with a view to setting up a 'socialist pattern of society' has
restrained the expansion of private business in India. Some of the major areas in which politics influences economic affairs of the country are concentration of economic power, growth of monopoly, state of technology, existence of mass poverty and

open
unemployment, foreign trade, taxation policy, labour relations, distribution system of essential goods, etc.
In this book, we
shall be concerned with only basic macro- economics,
business cycles, economic growth and economic factors, content and logic of some relevant state
activities and
policies which form the business environment. Macroeconomic
Issues
The major macroeconomic or environmental issues which figure in business decision-making, particularly with regard to forward planning and formulation of the future strategy, may be described under the following three categories. 1.
Issues Related to
Macro Variables. There are issues that are related to
the trends in macro variables, e.g., the general trend in the economic activities of the country, investment climate, trends in output and employment, and price trends. These factors not only determine the prospects of private business, but also greatly influence the functioning of individual firms. Therefore, a firm planning to set up a new unit or
to
expand its existing size would like to ask itself; What is the general trend in the economy? What would be the consumption level and pattern of the society? Will it be profitable to expand the business? Answers to these questions and the like are sought through macroeconomic studies. 2.
Issues Related to Foreign Trade.
An economy is also affected by its trade
relations with other countries. The sectors and firms dealing in exports and imports are affected directly and more than the rest of the economy. Fluctuations in the international market, exchange rate and inflows and outflows of capital in an open economy have a serious bearing on its economic environment and, thereby, on the functioning of its business
Check Your Progress 5. What is the scope of manage- rial economics? 6. Distinguish between Micro- economics and Macro- economics. 7. How are macroeconomic issues related to business decisions? 8. What are the microeconomic issues in business decisions?
NOTES Self-Instructional Material 13 The Nature and Scope of Managerial Economics
undertakings. The managers of a firm would, therefore, be interested in knowing the trends in international trade, prices, exchange rates and prospects in the international market. Answers to such problems are obtained through the study of international trade and
the international monetary mechanism. 3.
Issues Related to Government Policies. Government policies designed to control and regulate economic activities of the private business firms affect the functioning of
the
private business undertakings. Besides, firms' activities as producers and their attempt to maximise their private gains or profits lead to considerable social costs, in terms of environmental pollution, congestion in the cities, creation of slums, etc. Such social costs not only bring a firm's interests in conflict with those of the society, but also impose a social responsibility on the firms. The government's policies and its
various
regulatory measures are designed, by and large, to minimize such
conflicts.
The
managers should, therefore, be fully aware of the aspirations of the people and give such factors a due consideration in their decisions. The forced closure of polluting industrial units set up in the residential areas of Delhi
city
and the consequent loss of business worth billion of rupees in 2000 is a recent example of the result of ignoring the public laws and the social responsibility
of
the businessmen. The economic concepts and tools of analysis help in determining such costs and benefits. Concluding Remarks. Economic theories, both micro and macro, have wide applications in the process of business decision-making. Some of the major theories which are widely applied to business analysis have been mentioned above. It must, however, be borne in mind that economic theories, models and tools of analysis do not offer readymade answers to the practical problems of individual firms. They provide only the logic and methods to find answers, not the answers as such. It depends on the managers' own understanding, experience, intelligence and
training and their competence to use the tools of economic analysis to find correct answers to the practical problems

of business. Briefly speaking, microeconomic theories including
the
theory of demand, theory of production, theory of price determination, theory of
profit and
capital budgeting, and macroeconomic theories including theory of
national income,
theory of
economic growth and fluctuations, international trade and monetary mechanism, and the study of state policies and their repercussions on the private business activities, by and large, constitute, the scope of managerial economics. This should, however, not mean that only these economic theories form the subject-matter of managerial economics. Nor does the knowledge of these theories fulfill wholly the requirement of economic logic in decision-making. An overall study of economics and a wider understanding of economic behaviour of the society, individuals, firms, and state would always be desirable and more helpful. 1.6
SOME OTHER TOPICS IN MANAGERIAL ECONOMICS
As mentioned earlier, managerial economics is essentially the study of economic analysis applied to problems of business undertakings. There are, however, certain other disciplines which provide enormous aid to the economic analysis. The study of managerial economics, therefore, also includes the study of certain topics from other disciplines from which economic analysis borrows
its tools.
The most important disciplines on which economic analysis draws heavily are mathematics, statistics and operations analysis. Other important disciplines associated with managerial economics are management theory and accounting.
NOTES 14 Self-Instructional Material The Nature and Scope of Managerial Economics
Mathematical Tools. Businessmen deal primarily with concepts that are essentially quan- titative in nature, e.g., demand, price, cost, product, capital, wages, inventories, etc. These variables
assume different meanings in different contexts.
What is needed is to have clarity of these concepts in order to have, as far as possible, accurate estimates of these economic variables. The use of mathematical logic in the analysis of economic variables provides not only clarity of concepts, but also a logical and systematic framework within which quantitative relationships may be explored. Mathematical tools are widely used in 'model' building for exploring the relationship between related economic variables. Math- ematical logic is, therefore, a great aid to economic analysis. Furthermore, the major problem a businessman faces is how to minimize cost or how to maximize profit or how to
optimize sales under certain constraints. Mathematical concepts and techniques are widely used in economic logic with a view to finding answers to these questions. Besides, certain mathematical tools and optimization techniques, relatively more sophisticated and advanced, designed during and after
the World War II have found wide ranging application to the
business management, viz., linear programming, inventory models and game theory. A working knowledge of these techniques and other mathematical tools is essential for managers. These topics, therefore, fall very much within the scope of managerial economics.
The tools of analysis and optimization techniques widely used in the process of decision-making will be discussed in Units 3 and 4. Statistics. Similarly,
statistical tools are
a great aid in business decision-making. Statistical techniques are used in collecting, processing and analysing business data, testing
the
validity of economic laws with the real economic phenomenon before they are applied to business analysis.
A good deal of business decisions are based on probable economic events.
The statistical tools e.g., theory of probability, forecasting techniques and regression analysis help the decision-makers in predicting the future course of economic events and probable outcome of their business
decisions. Thus, the scope of business economics also includes the study of statistical tools and techniques that are applied to analyse the business data and to forecast economic variables. The mathematical and statistical techniques are the tools in the armoury of decision-makers that solve the complex problems of business. Operations Research (OR). OR is an inter-disciplinary solution finding techniques. It combines economics, mathematics and statistics to build models for solving specific business problems and to find a quantitative solution thereto. Linear programming and goal programming are two widely used OR in business decision-making. Management Theory and Accountancy.

Management theory and accounting are the other disciplines which are closely associated with managerial economics. Management theories bring out the behaviour of the firm in their efforts to achieve certain predetermined objectives. With a change in conditions, both the objectives of firms and managerial behaviour change. An adequate knowledge of management theory is, therefore, essential for a managerial economist. Accounting, on the other hand, is the main source of data regarding the functioning and performance of the firm. Besides, certain concepts used in business accounting are different from those used in pure economic logic. It is the task of the managerial economist to seek and provide clarity and synthesis between the two kinds of concepts to be used in business-decisions.

It would prevent ambiguity and incoherence

in business decisions. The scope of managerial economics is thus, very wide. It is difficult to do justice to the entire subject matter in one volume like this.

In this book, we have covered only that part of microeconomic theory which has direct application to business decisions, as mentioned above. In addition, some broad aspects of macroeconomic theory, international trade and government policies which often figure in business decision- making have also been covered.

NOTES Self-Instructional Material 15

The Nature and Scope of Managerial Economics 1.7 THE

GAP

BETWEEN THEORY AND PRACTICE

AND THE ROLE OF

MANAGERIAL ECONOMICS We have noted above that application of theories to the process of business decision-making contributes a great deal in arriving at appropriate business decisions. In this section, we highlight the gap between the theoretical world and the real world and how managerial economics bridges

the gap between the two worlds. The Gap Between Theory and

Practice

It is widely known that there exists a gap between theory and practice in all walks of life, more so in the world of economic thinking and

behaviour. A theory which appears logically sound may not be directly applicable in practice. For example, when there are economies of scale, it seems theoretically sound that if inputs are doubled, output will be, more or less,

doubled and if inputs are trebled, output will be, more or less, trebled. This theoretical conclusion may not hold good in practice. This gap between theory and practice has been very well illustrated in the form of a story by a classical economist, J.M. Clark. 8 He writes, “There is a story of a man who thought of getting the economy of large scale production in plowing, and built a plow three times as long, three times as wide, and three times as deep as an ordinary plow and harnessed six horse [three times the usual number] to pull it, instead of two. To his surprise, the plow refused to budge, and to his greater surprise it finally took fifty horses to move the refractory machine... [and] the fifty could not pull together as well as two.” The gist of the story is that managers—assuming they have abundant resources—may increase the size of their capital and labour, but may not obtain the expected results. The man in the story did not get the expected result

most probably

because he was either not aware of or he ignored or could not measure the resistance of the soil to a huge plow. This incident clearly shows the gap between theory and practice.

In fact, the real economic world is extremely complex. The reason is that in an economy, everything is linked to everything else.

Economic decisions and economic activities of economic entities—individuals, households, firms, and the government are, therefore, interlinked and interdependent. Change in one important economic variable generates a wave of changes, beginning with a change in the directly related areas which create counter-changes. In economic terminology, a change in one economic variable causes change in a large number of related variables. As a result, the entire economic environment changes. Changing economic environment changes people's economic goals, motivations and aspirations which, in turn, change

economic

decisions. In fact, decision-making becomes a continuous process. The entire system looks ‘hopelessly chaotic’. Under the condition of changing environment and

changing

economic decisions, it is extremely difficult to predict human behaviour. On the contrary, economic theories are rather simplistic because they are propounded on the basis of economic models

which are based

on simplifying assumptions: economic models assume away the interdependence of economic variables. In fact, through

economic
models, economists create a simplified world with its restrictive boundaries
from which
they derive their own conclusions. It is another thing that some economic, rather econometric, models are more complex than the real world itself. Although economic models are said be an extraction from the real world, how close is the extraction
to reality depends on how realistic are the assumptions of the model. The assumptions of economic models are often claimed to be unrealistic. The most common
NOTES 16 Self-Instructional Material The Nature and Scope of Managerial Economics
assumption of the economic models is the ceteris paribus assumption, i.e., other things remain constant. For example, consider the law of demand. It states that demand for a commodity changes in reverse direction of the change in its price, other things remaining constant. The 'other things' include consumers' income, prices of substitute and complementary goods, consumer's tastes and preferences, advertisement, consumer's expectations about the commodity's future price, 'demonstration effect', and 'snob effect', etc. In reality, however, these factors do not remain constant. Since 'other things' do not remain constant, the ceteris paribus assumption is alleged to be the most unrealistic assumption.
Economic theories are, no doubt, hypothetical in nature but not away from reality. Economic theories are, in fact, a caricature of reality. In their abstract form, however, they do look divorced from reality. Besides, abstract economic theories cannot be straightaway applied to real life situations. This should, however, not mean that economic models and theories do not serve any useful purpose. "Microeconomic theory facilitates the understanding of what would be a hopelessly complicated confusion of billions of facts by constructing simplified models of behaviour which are sufficiently similar to the actual phenomenon
to be of
help in understanding them". 9 Nevertheless, it cannot be denied that there is apparently a gap between economic theory and practice. This gap arises mainly due to the inevitable gap between the abstract world of economic models and the real world. Managerial Economics Fills the Gap.
There is undeniably a gap between economic theory and the real economic world.
But, at the same time, it is also a mistaken view that economic theories can be directly applied to business decision-making. As already mentioned,
economic theories do not offer a custom-made or readymade solution to business problems. What
economic theories
actually do is to
provide a framework for logical economic thinking
and analysis. The need for such a framework arises because the real
economic world is too complex to permit considering every bit of
economic
facts that influence economic decisions.
In the words of Keynes, "The objective of [economic] analysis is not to provide a machine, or method of blind manipulation, which will furnish an infallible answer, but to provide ourselves with an organized and orderly method of thinking out particular
problem..." 10 . In the opinion of Boulding,
the objective of economic analysis is to present the 'map' of reality rather than a perfect picture of it 11 .
In fact, economic analysis presents us with a road map; it guides us to the destination;
it does not carry us to the destination.
Managerial economics can also be compared with medical science. Just as the knowledge of medical science helps in diagnosing the disease and prescribing an appropriate medicine, managerial economics helps in analysing the business problems and in arriving at an appropriate decision. Let us now see how managerial economics bridges this gap. On one side, there is the complex business world and, on the other, are abstract economic theories. "The big
gap between the problems of logic that intrigue economic theorists and the problems of policy that plague practical management needs to be bridged in order to give executive access to the practical contributions that economic thinking can make to top management policies" 12 . Managerial decision-makers deal with the complex, rather chaotic, business conditions of the real world and they have to find their way to their destination, i.e., achieving the goal that they set for themselves. Managerial economics applies economic logic and analytical tools to sift wheat from the chaff. The economic logic and tools of analysis guide them in (i) identifying their problems in achieving their goal, (ii) collecting the relevant data and related facts, (iii) processing and analyzing the facts, (iv) drawing
the

relevant conclusions, (v) determining and evaluating the alternative means to achieve the goal, and (vi) taking a decision. Without application of economic logic and tools of analysis, business decisions are most likely to be irrational and arbitrary which are often counter-productive.
Check Your Progress 9.
What other topics from other subjects are used in economic analysis and, thereby, in business decision-making? 10. What is the use of mathe- matics in economic analysis? 11. What is the use of statistics in business decision-making? 12. How does managerial econo- mics fill the gap between economic theories and busi- ness practices in real life?
NOTES Self-Instructional Material 17 The Nature and
Scope of
Managerial Economics 1.8 SUMMARY z
Managerial
economics is
the study of economic concepts, theories and tools of analysis that are
applied to business decision-making.
z Economics can contribute a great deal to business decision-making. It offers clarity to economic concepts needed in business analysis; it provides a method of making models to arrive at a reasonable conclusion; and economic theories show the probable results of an action taken. z The scope of managerial economics includes both micro and macroeconomics. Macroeconomics applied to operational issues like choice of product, production, price determination, demand assessment, etc., whereas macroeconomics tools and theories are applied to environmental issues, e.g., overall market conditions, effects of government policy, economic condition of the economy as a whole, general price conditions, etc. z Apart from micro and macroeconomics, some topics from subjects are also used in business decision-making and hence are part of managerial economics, e.g., mathematical tools, statistics, operational research, management theory, etc. 1.9 ANSWERS TO 'CHECK YOUR PROGRESS' 1. Managerial economics is the study of economic concepts, logic, laws and theories and tools of economic analysis that are applied to business decision-make to find an appropriate solution to business problems. 2. Economics contributes to business decision-making by offering conceptive clarity to economic variables used in business decisions; it helps in model building for a scientific analysis of business problems; and economic theories provide a set of analytical tools for analyzing the business problems and finding and appropriate solution. 3. The scope of managerial decisions is very wide encompassing issues related to choice of product, choice of technology for production, choice of market segments, pricing of the product and sales promotion, etc. 4. Production related issues
are—
what to produce, how to produce and for whom to produce.
Theories of
production and cost are applied to solve these problems. 5. The scope of managerial economics includes both micro and macroeconomics. Microeconomics deals with theories of demand, production, cost, pricing and investment and macroeconomics deals with environmental issues. 6. See answer to Q. 5. 7. The macroeconomic issues related to business decisions include trends in the economy, structural changes in the economy, the general trends in the price level, and government's monetary and fiscal policies. 8. See answer to Q. 5. 9. The other topics that are included in business analysis and business decision-making include mathematical economics, statistics, operations research, management theory and accounting. 10. The mathematical techniques that are used in economic analysis are graphical techniques, simple algebra and optimization techniques. 11. Statistical techniques are used to work out weighted means, to project the demand, product and cost and the market trends.
NOTES 18 Self-Instructional Material The Nature and Scope of Managerial Economics 12. Most economic theories are abstract in nature whereas business decisions are practical and real-life problems. Managerial economics fills the gap when economic theories are used to analyse business problems and do not find to solution of practical problems. 1.10 EXERCISES AND
QUESTIONS 1.
Managerial economics is the discipline which
deals with the application of 'economic theory to business
management'.
Comment. 2.
What are the major areas of business
decision-making? How does economic theory contribute to managerial decisions? 3.
Discuss the nature and scope of managerial economics. What are the other related disciplines? 4. "
Managerial economics
bridges the gap between economic theory and business

practice". Explain with examples. 5.
Managerial economics is
essentially the application of microeconomic theory of business decision making. Discuss the statement. 6.
Other than microeconomic theories, what are the other related topics in managerial economics? How do they contribute to managerial economics? 7. "Managerial economics is applied microeconomics". Elucidate. 8.
What are the basic functions of a manager? How does managerial economics
help him in achieving his organizational goals? 9.
Write a note on
the nature and scope of managerial
economics. 10. "
Managerial economics is
the integration of economic theory with business practice
for the purpose of facilitating decision-making and forward planning by management?"
Explain. 11.
How does the study of managerial economics
help a business manager in decision- making?
Illustrate your answer with examples from production and pricing issues. 12.
What are the operational issues in business management? How does microeconomics contribute to decision-making in the operational issues? 13. What
is meant by business environment? What branch of economics is related to the environmental issues of private business? 14.
What are the basic functions of business managers? How does economics help business managers in performing their functions? 15.
What are the major macroeconomic issues related directly to business decision- making? What is their significance in business decisions? 1.11 FURTHER READING
Davis, R. and S. Chang, Principles of Managerial Economics, Prentice Hall, N.J., 1986, Ch. 1. Haynes, W.W., Managerial Economics : Analysis and Cases, Business Publications, Inc., Texas, 1969, Ch. 1. Mansfield, E. (ed.) Managerial Economics —Theory, Application and Cases, 3rd Edn., W.W. Norton and Co., Inc., New York, 1996, Ch. 1. Salvatore, D., Managerial Economics, McGraw-Hill, New York, 1989, Ch. 1. Spencer, M.H. and L. Siegelman, Managerial Economics, Richard, D. Irwin, Inc., Illnois, 1969, Ch. 1. Webb, Samuel, C., Managerial Economics, Houghton Mifflin, Boston, 1976, Ch. 1.
NOTES Self-Instructional Material 19 The Nature and Scope of Managerial Economics References 1. It may be surprising that there is no final answer to this question. It is surprising because economics is the oldest social science and it has grown in terms of literature and application over the past two and a quarter centuries beginning with Adam Smith's The Wealth of Nations (1776), perhaps, much faster than any other social science. Economics has been defined differently at the different stages of development. There is as yet no universal definition of economics, perhaps, be- cause 'economics is [still] an unfinished science' (Zeuthen) and "Economics is still a young science" (Schultz). 2. E. Mansfield, ed., Managerial Economics and Operations Research, W.W. Norton and Co., Inc., New York, 1966, p. 11. 3. M.H. Spencer and L. Seigelman, Managerial Economics, Irwin Illinois,1969, p.1. 4. Evan J. Douglas, Managerial Economics : Analysis and Strategy, Prentice-Hall, N.J., 1987, p. 1. 5. Ronnie
Davis and Semoon Chang, Principles of Managerial Economics, Prentice- Hall,
N.J., 1986, p. 3. 6. W. J. Baumol, 'What Can Economic Theory Contribute to Managerial Economics' in AER., Vol. 51, No. 2, May 1961. 7. See also Herbert A. Simon, 'The Decision-making Process in Mansfield' (ed.), op. cit. 8. Studies in the Economics of Overhead Costs, University of Chicago, 1923, p. 116, quoted in K.K. Seo, Managerial Economics, Text, Problems, and Short Cases, Richard, D. Irwin, Inc., Homewood, Ill, 1984, p. 325. 9. A.P. Lerner, 'Microeconomic Theory' in Perspective in Economics—Economists Looks at Their Field of Study by A.A. Brown, E. Neuberger, and M. Pakmastier (eds), Mc Graw-Hill, NY, p. 36. 10. J.M. Keynes, The General Theory of Employment Interest and Money, Harcourt Brace, New York, 1936, p. 297. 11. K.E. Boulding, Economic Analysis, Harper and Bros., New York, 1948, p. 14. 12. Joel Dean, Managerial Economics, Prentice-Hall of India, New Delhi, 1977, p. vii.
NOTES Self-Instructional Material 21 Analysis of Individual Demand UNIT 2 ANALYSIS OF INDIVIDUAL
DEMAND Structure 2.0 Introduction 2.1 Unit Objectives 2.2 Meaning of Demand 2.3 The Basis
of Consumer Demand: The Utility 2.3.1 The
Meaning
of
Utility; 2.3.2
Total Utility; 2.3.3 Marginal Utility 2.4
The Law of Diminishing Marginal Utility 2.4.1

Why Does the
MU Decrease? 2.5
Cardinal and Ordinal Concepts of Utility 2.5.1
Cardinal Utility; 2.5.2 Ordinal Utility; 2.5.3 The Two Approaches to Consumer Demand Analysis 2.6 Analysis of Consumer Behaviour: Cardinal Utility Approach 2.6.1 Consumer's Equilibrium; 2.6.2
Derivation of Individual Demand for a Commodity; 2.6.3 The Law of Demand; 2.6.4 Shift in Demand Curve; 2.7
Analysis of Consumer Behaviour: Ordinal Utility Approach 2.7.1 Assumptions of Ordinal Utility Theory; 2.7.2
The
Meaning and Nature of Indifference Curve; 2.7.3
The Marginal Rate of Substitution (MRS); 2.7.4
Properties of Indifference
Curve; 2.7.5 Budgetary Constraint and the Budget Line 2.8 Consumer's Equilibrium 2.8.1 Effects of Change in Income on Consumer Demand; 2.8.2
Effects of Change in Prices on Consumption; 2.8.3 Income and Substitution Effects of Price Change 2.9
Derivation of Individual Demand Curve 2.10 Comparison of Cardinal and Ordinal Utility Approaches 2.11 The Revealed Preference Theory 2.12 Summary 2.13
Answers to 'Check Your Progress' 2.14 Exercises and Questions 2.15 Further Reading 2.0
INTRODUCTION Objectives of business firms may be different but their basic business activity is the same. They all produce
or
buy
and sell goods and services that are in
demand. Demand is,
in fact,
the basis of all productive activities. Just as 'necessity is the mother of invention', demand is the mother of production. Increasing demand for a product offers a high business prospects in future and decreasing demand for a product reduces the
business prospect. For example, increasing demand for computers, cars, mobile phones in India has enlarged the business prospect for both domestic and foreign companies. On the other hand, declining demand for black and white TV sets and manual
NOTES 22 Self-Instructional Material Analysis of Individual Demand typewriters is forcing the
companies to switch over to modern substitutes or go out
of business.
It is, therefore, essential for business managers to have a clear understanding of
the following aspects of demand for
their products: (i) What are the sources of demand? (ii)
What are the determinants of demand? (iii) How do the buyers decide the quantity of a product to be purchased? (iv) How do
the buyers respond to change in product prices, their income and prices of the related goods? (v) How can the total or market demand for a product be assessed and
forecast? These questions are answered by the Theory of
Demand. In this and the following Units we will discuss the theory of individual and market demand. Let us begin with the meaning of demand. 2.1 UNIT OBJECTIVES z To introduce the concept of demand
z
To explain the concept utility and to explain the law of diminishing marginal utility z To show consumer's equilibrium by using both cardinal and ordinal utility approaches
z
To explain the derivation of the demand curve by using cardinal and ordinal utility approaches 2.2
MEANING OF DEMAND Conceptually,
the term 'demand' implies a 'desire' for a commodity backed by the ability and willingness to pay for it. Unless a person has adequate purchasing power or resources and the preparedness to spend his resources, his desire for a commodity would not be considered as his demand.
For example, if a man wants to buy a car but he does not have sufficient money to

pay for it, his want is not his demand for the car. And, if a rich miserly person wants to buy a car but is not willing to pay, his desire too is not his demand for a car. But if a man has sufficient money and is willing to pay, his desire to buy a car is an effective demand. The desires without adequate purchasing power and willingness to pay do not affect the market, nor do they generate production activity.

A want with three attributes – desire to buy, willingness to pay and ability to pay – becomes effective demand.

Only an effective demand figures in economic analysis and business decisions. The term ' demand' for a commodity (i.e., quantity demanded) always has a reference to 'a price', 'a period of time' and 'a place'.

Any statement regarding the demand for a commodity without reference to its price, time of purchase and place is meaningless and is of no practical use. For instance, to say 'the demand for TV sets is 50,000' carries no meaning for a business decision, nor does it have any use in any kind of economic analysis. A meaningful statement regarding the demand for a commodity should, therefore, contain the following information: (a) the quantity demanded, (b) the price at which a commodity is demanded, (c) the time period over which a commodity is demanded, and (d) the market area in which a commodity is demanded. For example, saying that 'the annual demand for TV sets in Delhi at an average price of Rs. 15,000 a piece is 50,000' is a meaningful statement.

NOTES Self-Instructional Material 23 Analysis of Individual Demand 2.3 THE BASIS OF CONSUMER DEMAND: THE UTILITY

The consumers demand a commodity because they derive or expect to derive utility from that commodity. The expected utility from a commodity is the basis of demand for it.

Though 'utility' is a term of common usage, it has a specific meaning and use in the analysis of consumer demand.

We will, therefore, describe in this section the meaning of utility, the related concepts and the law associated with utility.

2.3.1 The Meaning of Utility

The concept of utility can be looked upon from two angles—from the commodity angle and from the consumer's angle.

Looked at it from a commodity angle, utility is the want-satisfying property of a commodity.

Looked at it from a consumer's angle, utility is the psychological feeling of satisfaction, pleasure, happiness or well-being which a consumer derives from the consumption, possession or the use of a commodity. There is a subtle difference between the two concepts which must be borne in mind. The concept of a want-satisfying property of a commodity is 'absolute' in the sense that this property is ingrained in the commodity irrespective of whether one needs it or not. For example, a pen has its own utility irrespective of whether a person is literate or illiterate. Another important attribute of the 'absolute' concept of utility is that it is 'ethically neutral' because a commodity may satisfy a frivolous or socially immoral need, e.g., alcohol, drugs on prostitution.

On the other hand, from a consumer's point of view, utility is a post-consumption phenomenon as one derives satisfaction from a commodity only when one consumes or uses it. Utility in the sense of satisfaction is a 'subjective' or 'relative' concept because (i) a commodity need not be useful for all—cigarettes do not have any utility for non- smokers, and meat has no utility for strict vegetarians; (ii) utility of a commodity varies from person to person and from time to time;

and (iii) a commodity need not have the same utility for the same consumer at different points of times, at different levels of consumption and at different moods of a consumer. In consumer analysis, only the 'subjective' concept of utility is used.

Having explained the concept of utility, we now turn to some concepts about utility used in utility analysis, viz. total utility and marginal
utility. 2.3.2

Total Utility Assuming that utility is measurable and additive,
total utility may be defined as the sum of the utilities derived
by a consumer from the various units of goods and services he consumes. Suppose a consumer consumes four units of a commodity, X, at a time and derives utility as u 1 , u 2 , u 3 and u 4 . His total utility (TU x)
from commodity X can be measured as follows. TU x = u 1 + u 2 + u 3 + u 4 If a consumer consumes n number of commodities, his total utility, TU n ,
will be
the sum of total utilities derived form each commodity. For instance, if the consumption goods are X, Y and Z and their total respective utilities are U x , U y and U z , then TU n = U x + U y + U z 2.3.3

Marginal Utility Marginal utility is another most important concept used in economic analysis. Marginal utility may be defined
in a number of ways. It is defined as the utility derived from the

marginal
unit consumed. It may also be
defined as
the addition to the total utility resulting from the consumption (
or accumulation)
of one additional unit.

Marginal Utility (MU)
thus refers to the change in the Total Utility (i.e., ΔTU) obtained
from the consumption of an additional unit of a commodity.

It may be expressed as MU = TU Q Δ Δ where TU = total utility, and ΔQ = change in quantity consumed by one unit.

Another way of expressing marginal utility (MU), when the number of units consumed is n, can be as follows. MU of nth unit =
TU n – TU n–1 2.4

THE
LAW OF DIMINISHING MARGINAL UTILITY

The law of diminishing marginal utility
is
one of the
fundamental laws of economics.
This law
states that
as the
quantity consumed of a commodity increases, the utility derived from each successive unit
decreases, consumption of all other
commodities
remaining
the same.

In simple words, when a person consumes more and more units of a commodity per unit of time, e.g.,
ice cream, keeping the consumption of all other commodities constant, the utility which he derives from
the
successive units of consumption goes on diminishing. This law applies to all kinds of consumer goods— durable and non-durable sooner or later.

Let us assume that utility is measurable in quantitative terms and illustrate
the
law of diminishing marginal utility.

The law of diminishing marginal utility
is

illustrated numerically in Table 2.1 and graphically in Fig. 2.1. Table 2.1: Total and Marginal Utility Schedules No. of units Total Marginal Consumed
utility
utility 1 30 30 2 50 20 3 60 10 4 65 5 5 60 –5 6 45 –15 As shown in Table 2.1, with the increase in the number of units consumed per unit of time,
the
TU increases but at a diminishing rate. The diminishing MU is shown in the last
Fig. 2.1:
Diminishing Marginal Utility
NOTES Self-Instructional Material 25 Analysis of Individual Demand
column.
Fig. 2.1
illustrates graphically the law of diminishing MU.
The rate of increase in TU as
the
result of increase in the number of units consumed is shown by the MU curve in Fig. 2.1. The downward sloping MU curve shows that marginal utility goes on decreasing as consumption increases. At 4 units consumed, the TU reaches its maximum level, the point of saturation, and MU becomes zero. Beyond this, MU becomes negative and
TU begins to decline. The downward sloping MU
curve illustrates the law of diminishing marginal utility. 2.4.1
Why Does the
MU Decrease? The utility gained from a unit of a commodity depends on the intensity of the desire for it. When a person consumes successive units of a commodity, his need is satisfied by degrees in the process of consumption and the intensity of his need goes on decreasing. Therefore, the utility obtained from each successive unit goes on decreasing.
Assumptions. The law of diminishing marginal utility holds only under certain conditions. These conditions are referred to as the assumptions of the law.
The assumptions of the
law of diminishing marginal utility are listed below.
First, the unit of the
consumer good must be a standard one, e.g., a cup of tea, a bottle of cold drink, a pair of shoes or trousers,
etc.
If the units are excessively small or large, the law may not hold. Second,
the consumer's taste or preference must remain the same
during the period of consumption. Third, there must be continuity in consumption. Where
a break in continuity is necessary, the time interval between the consumption of two units
must be appropriately short.
Fourth, the mental condition of the consumer must remain normal during the period of consumption.
Given these conditions, the law of diminishing marginal utility holds universally. In some cases, e.g., accumulation of money, collection of hobby items like stamps, old coins, rare paintings and books, melodious songs,
etc.
the
marginal utility may initially increase rather than decrease. But eventually it does decrease.
As a matter of fact, the law of marginal utility generally
operates universally. 2.5
CARDINAL AND ORDINAL CONCEPTS OF UTILITY
Utility is a psychological phenomenon. It is a feeling of
satisfaction, pleasure or happiness. Measurability of utility has, however, been a contentious issue.
Early economists—
classical economists, viz.,
Jeremy Bentham, Leon Walrus, Carl Menger, etc. and neo-classical economist, notably Alfred Marshall, believed that utility is cardinally or quantitatively measurable like height, weight, length, temperature and air pressure. This belief resulted in the Cardinal Utility concept.
The
modern
economists,
most notably

J.R. Hicks and R.G.D. Allen,
however,
hold
the view that utility is not quantitatively measurable—it is not measurable in absolute terms. Utility can be expressed only ordinally, relatively or in terms of 'less than' or 'more than'. It is, therefore, possible to list the goods and services in order of their preferability or desirability.
This is known as the ordinal concept of
utility.
Let us now look into the origin of the two concepts of utility and their use in the analysis of demand. 2.5.1 Cardinal Utility
Some early psychological experiments on an
individual's responses to various stimuli led classical
and
neo-classical economists to believe that utility is measurable and cardinally
Check Your Progress 1. What is meant by demand? 2. What are the two approaches to the analysis of consumer behaviour? 3. What is meant by
utility and how is it cardinally measured? 4. What is the law of diminishing marginal utility?
NOTES 26 Self-Instructional Material Analysis of Individual Demand
quantifiable.
This belief gave rise to
the concept of cardinal utility. It implies that utility can be assigned a cardinal number like 1, 2, 3, etc. Neo-classical economists built up
the theory of consumption on the assumption that utility is cardinally measurable. They
coined and
used a term 'util' meaning 'units of utility'. In their economic analysis, they assumed (i) that one 'util' equals one unit of money, and (ii) that utility of money remains constant.
It has, however, been realised
over time that absolute or cardinal measurement of utility is not possible. Difficulties in measuring utility
have proved to be insurmountable.
Neither economists nor scientists have succeeded in devising a technique or an instrument for measuring the feeling of satisfaction, i.e., utility. Nor could an appropriate measure of unit be
devised. Numerous factors affect the state of
consumer's mood, which are impossible to
determine and quantify. Utility is
therefore immeasurable in cardinal terms. 2.5.2
Ordinal
Utility
The
modern economists have discarded
the concept of cardinal utility
and have instead employed the concept of ordinal utility
for analysing consumer behaviour. The concept of ordinal utility is based on the fact that it may not be possible for consumers to express
the
utility of a commodity in absolute terms, but it is always possible for
a consumer to tell introspectively whether a commodity is more or less or equally useful
as
compared to another. For
example, a consumer may not be able to tell that an ice cream gives 5 utils and
a
chocolate gives 10 utils. But he or she can always tell whether chocolate gives more or less utility than ice-cream.
This assumption forms the basis of the ordinal
theory of consumer
behaviour. While neo-classical economists maintained that cardinal measurement of utility is practically possible and is meaningful in consumer analysis, modern economists maintain that utility being a psychological phenomenon is inherently immeasurable, theoretically
or conceptually

and quantitatively
as well. They also maintain that the concept of ordinal utility is a feasible concept and it meets the conceptual requirement of
analysing the
consumer behaviour in the absence of any cardinal measures of utility. 2.5.3
The
Two
Approaches to Consumer Demand Analysis
Based on cardinal and ordinal concepts
of utility,
there are two approaches to the analysis of consumer behaviour. (i) Cardinal Utility Approach,
attributed to Alfred Marshall and his followers, is also called the Neo-classical Approach. (ii) Ordinal Utility Approach, pioneered by J.R. Hicks, a Nobel laureate and R.G.D. Allen, is also called the Indifference Curve Analysis.
The two approaches are not in conflict with one another. In fact, they represent two levels of sophistication in the analysis of consumer behaviour. Both the approaches are important for
managerial decisions
depending on the level of sophistication required. It is important to note in this regard that in spite of tremendous developments in consumption theory based on ordinal utility, the classical demand theory based on cardinal utility has retained its appeal and applicability to the analysis of market behaviour. Besides, the study of classical demand theory serves as a foundation for understanding the advanced theories of consumer behaviour. The study of classical theory of demand is of particular importance and contributes a great deal in managerial decisions.
In the following section, we will first
discuss
the theory of consumer behaviour based on the cardinal utility approach.
Consumption theory based on the ordinal utility approach is discussed in the
subsequent
section.
NOTES Self-Instructional Material 27 Analysis of Individual Demand 2.6
ANALYSIS OF CONSUMER BEHAVIOUR: CARDINAL UTILITY APPROACH
The central theme of the consumption theory is the utility maximizing behaviour of the consumer. The fundamental postulate of the consumption theory is that all the consumers—individuals and households—aim at utility maximisation and all their decisions and actions as consumers are directed towards utility maximization. The
specific questions that the consumption theory seeks to answer are : (i) how does a consumer decide the optimum quantity of a commodity that he or she chooses to consume, i.e., how does a consumer attain his/her equilibrium?
And (
ii)
how does he or she allocate his/her disposable income between various commodities of consumption? As mentioned above, the theory of consumer behaviour
postulates that consumers seek to maximize their total utility or satisfaction. On the basis of
this postulate, consumption theory explains how a consumer attains the level of maximum satisfaction, under certain given conditions.
The cardinal utility approach to consumer analysis makes the following
assumptions. (i)
Rationality. It is assumed that the consumer is a rational being in the sense that he satisfies his wants in the order of their preference. That is, he or she buys that commodity first which yields the highest utility and
that
last which gives the least utility. (
ii)
Limited
money income. The consumer has a limited
money
income to spend on the goods and services he
or she chooses to consume. Limitedness of income, along with utility maximization objective makes the choice between goods inevitable. (
iii)
Maximization

of satisfaction. Every rational consumer intends to maximize his/ her satisfaction from his/ her given money income. (iv) Utility is cardinally measurable. The cardinalists have assumed that utility is cardinally measurable and that utility of one unit of a commodity equals the money which a consumer is prepared to pay for it or 1 util = 1 unit of money. (v) Diminishing marginal utility. Following the law of diminishing marginal utility, it is assumed that the utility gained from the successive units of a commodity consumed decreases as a consumer consumes larger quantity of the commodity. This is an axiom of the theory of consumer behaviour. (vi) Constant marginal utility of money. The cardinal utility approach assumes that marginal utility of money remains constant whatever the level of a consumer's income. This assumption is necessary to keep the scale of measuring rod of utility fixed. It is important to recall in this regard that cardinalists used 'money' as a measure of utility. (vii Utility is additive. Cardinalists assumed not only that utility is cardinally measurable but also that utility derived from various goods and services consumed by a consumer can be added together to obtain the total utility. In other words, the consumer has a utility function which may be expressed as: $U = f(X_1, X_2, X_3, \ldots X_n)$ where $X_1, X_2, \ldots X_n$ denote the total quantities of the various goods consumed. Given the utility function, total utility obtained from n items can be expressed as $U_n = U_1 (X_1) + U_2 (X_2) + U_3 (X_3) + \ldots + U_n (X_n)$ It is this utility function which the consumer aims to maximize.

NOTES 28 Self-Instructional Material Analysis of Individual Demand 2.6.1

Consumer's Equilibrium Conceptually, a consumer is said to have reached his equilibrium position when he has maximized the level of his satisfaction, given his resources and other conditions. Technically, a utility-maximizing consumer reaches his equilibrium position when allocation of his expenditure is such that the last penny spent on each commodity yields the same utility. How does a consumer reach this position? We know from assumptions 2 and 5, that the consumer has limited income and that the utility which he derives from various commodities is subject to diminishing returns. We also know that the MU schedules of various commodities may not be the same. Some commodities yield a higher marginal utility and some lower for the same number of units consumed. In some cases, MU decreases more rapidly than in case of others for the same number of units consumed. A rational and utility-maximising consumer consumes commodities in the order of their utilities. He first picks up the commodity which yields the highest utility followed by the commodity yielding the second highest utility and so on. He switches his expenditure from one commodity to the other in accordance with their marginal utilities. He continues to switch his expenditure from one commodity to another till he reaches a stage where MU of each commodity is the same per unit of expenditure. This is the state of

consumer’s equilibrium. (i) Consumer’s Equilibrium: One-Commodity Model Let us first illustrate consumer’s equilibrium in a simple
one-commodity model.
Suppose that a consumer with certain money income consumes only one commodity, X. Since both his money income and commodity X have utility 1 for him, he can either spend his
money
income on commodity X or retain it
in the form of asset. If
the marginal utility of commodity X, (MU x), is greater than marginal utility of money (
MU m) 1
as asset,
a utility-maximizing consumer will exchange his money income for the commodity. By assumption, MU x is subject to diminishing returns (assumption 5), whereas marginal utility of money (MU m)
as an asset
remains constant (assumption 6).
Therefore, the consumer will exchange
his money income on commodity X so long as MU x < P x (MU m),
P x being the price of commodity
X and MU m = 1 (constant). The utility-maximizing consumer reaches his equilibrium, i.e.,
the level of maximum satisfaction, where MU x = P x (MU m)
Alternatively, the consumer reaches equilibrium
point
where, ( )
x x m MU P
MU = 1
Consumer’s equilibrium in a single commodity model is graphically illustrated in
Fig. 2.2.
The horizontal line
P x (MU m)
shows
the constant utility of money weighted by the price of commodity X (
i.e., P x) and MU x curve represents
the
Fig. 2.2: Consumer’s Equilibrium Check Your Progress 5. Distinguish between cardinal and ordinal utility approach to the analysis of consumer behaviour. 6. What is the condition of con- sumer equilibrium according to cardinal utility approach? 7. What are the assumptions made under cardinal utility approach to analyse consumer behaviour? 8. What is meant by consumer's rationality?
NOTES Self-Instructional Material 29 Analysis of Individual Demand
diminishing marginal utility of commodity X.
The P x (MU m) line and MU x curve interest each
other at point E.
Point E indicates that at quantity OQ x consumed, MU x = P x (MU m). Therefore, the
consumer is in equilibrium at point E. At any point beyond E,
MU x < P x (MU x). Therefore, if
the consumer exchanges his money for commodity X, he will increase his total satisfaction because his gain in terms of MU x is greater than his loss in terms of MU m .
This conditions exists till he reaches point E. And,
at any point below E,
MU x >
P x (MU m). Therefore, if
he consumes more than OQ x , he loses more utility than he gains. He is therefore a net loser.
The consumer can,
therefore,
increase his satisfaction by reducing his consumption.
This means that at any point other than E, consumer’
s total satisfaction is

less than maximum. Therefore, point E is the point of equilibrium. (ii) Consumer's Equilibrium: Multiple Commodity Model The
Law of Equi-Marginal Utility
In
the previous section, we have explained consumer's equilibrium assuming that the consumer consumes a single commodity.
In real life, however, a consumer consumes multiple number of goods and services. So the question arises: How does a consumer consuming multiple goods reach his equilibrium?
In this section, we explain consumer's equilibrium in the multi-commodity case.
The law of equi-marginal utility explains the consumer's equilibrium in a multi- commodity model. This law states that a consumer consumes various goods in such quantities that the MU derived per unit of expenditure on each good is the same. In other words, a rational consumer spends his income on various goods
he consumes
in such a manner that each rupee spent on each good yields the same MU. Let us now explain consumer's equilibrium in a multi-commodity model.
For the sake simplicity of, however,
we will consider only
a two-commodity case. Suppose that a consumer consumes only two commodities, X and Y, their prices being
P_x and P_y,
respectively. Following the equilibrium rule of the
single commodity case, the consumer will distribute his income between commodities X and Y, so that
$MU_x = P_x (MU_m)$ and $MU_y = P_y (MU_m)$
Given these conditions, the consumer is in equilibrium where $MU_x \times m = 1 = MU_y \times m$ ...(2.1) Since, according to assumption (6), MU of each unit of money (or each rupee) is constant at 1, Eq. (2.1) can be rewritten as $MU_x = MU_y$ ...(2.2a) or $MU_x \times P_x = MU_y \times P_y$ ...(2.2b) Equation (2.2a)
leads to the conclusion that the consumer reaches his equilibrium when the marginal utility derived from each rupee spent on the two commodities X and Y is the same.
The two-commodity case
can be used to generalize
the rule for consumer's equilibrium for a consumer consuming a large number of goods and services with a given income and at different prices. Supposing, a consumer consumes A to Z goods and services, his equilibrium condition may be expressed as
$\frac{MU_A}{P_A} = \frac{MU_B}{P_B} = \ldots = \frac{MU_Z}{P_Z} = m$ ...(2.3) Equation (2.3) gives the Law of Equi-marginal Utility.
NOTES 30 Self-Instructional Material Analysis of Individual Demand
It is important to note that, in order to achieve his equilibrium,
what a utility maximizing consumer intends to equalize is not the marginal utility of each commodity he consumes, but the marginal utility per unit of his
money expenditure on various goods and services. 2.6.2
Derivation of Individual Demand for a Commodity
We have explained, in the preceding sections, the consumer's equilibrium in one- commodity and multi-commodity models. The theory
of consumer's equilibrium provides a convenient basis for the derivation of
the
individual demand curve for a commodity. Marshall was the first economist to explicitly derive the demand curve from the consumer's utility function. 2
Marshall gave the equilibrium condition for the consumption of
a
commodity, say X, as $MU_x = P_x (MU_m)$. Using this equilibrium condition,
consumer's equilibrium has been illustrated in Fig. 2.2.
The same logic can be used to derive consumer's demand curve for commodity X.
The derivation of individual demand for the
commodity X

is illustrated in Fig. 2.3 (a) and 2.3 (b).
Suppose that the consumer is in equilibrium at
point E 1 , where
given the price of X,
MU x = P 3 (MU m). Here, equilibrium quantity is OQ 1 . Now if price of the commodity falls to P 2 , the equilibrium condition will be disturbed making MU x < P 3 (MU m)
at OQ 1 .
Since MU m is constant, the only way to restore the equilibrium condition is to reduce MU x , by buying more of commodity X. Thus, by consuming Q 1 Q 2 additional units of X he reduces his MU x to E 2 Q 2 and
reaches a new equilibrium position at point E 2 where MU x = P 2 (MU m). Similarly, if price falls further,
he buys and
consumes more to maximize his satisfaction.
This behaviour of the consumer can be used to derive the demand curve for commodity X.
Fig. 2.3: Derivation of Demand Curve
NOTES Self-Instructional Material 31 Analysis of Individual Demand Fig. 2.3 (
a) reveals that
when price is P 3 , equilibrium quantity is OQ 1 . When price decreases to P 2 , equilibrium point shifts downward to point E 2 at which equilibrium quantity is OQ 2 . Similarly, when price decreases to P 1 and
the P (MU m) line shifts downward the equilibrium point shifts to E 1 and equilibrium quantity is OQ 2 . Note that P 3 < P 2 < P 1 and the corresponding quantities OQ 1 > OQ 2 > OQ 3 . This means that as price decreases, the equilibrium quantity increases. This inverse price-quantity relationship
is the basis of
the
law of demand which is explained below. The inverse
price and quantity relationship is shown in part (b)
of
Fig. 2.3. The price- quantity combination corresponding to equilibrium point E 3 is shown at point J. Similarly, the price-quantity combinations corresponding to equilibrium points, E 2
and E 1 are shown at points K and L, respectively. By
joining
points J, K and L
we get the individual's
demand curve for commodity X. The demand curve
D x is the usual downward sloping Marshallian demand curve.
Demand under Variable MU m We have explained above the consumer's equilibrium and derived his demand curve under the assumption that MU m remains constant. This analysis holds even if MU m is assumed to be variable. This can be explained as follows. Suppose MU m is variable—it decreases with increase in stock of money and vice versa. Under this condition, if price of a commodity falls and the consumer buys only as many units as he did before the fall in price, he saves some money on this commodity. As a result his stock of money increases and his MU m decreases, whereas MU x remains unchanged because his stock of commodity remains unchanged. As a result, his MU x exceeds his MU m . When a consumer exchanges money for commodity, his stock of money decreases and stock of commodity increases. As a result, MU m increases and MU x decreases. The consumer, therefore, exchanges money for commodity until MU x = MU m . Consequently,
demand for a commodity increases when its price falls. 2.6.3
The
Law of
Demand
The law of demand
is one of the fundamental laws
of economics.
The law of
demand states that the demand for
a commodity increases
when its price decreases and falls when its price
rises, other things remaining constant.
This is an empirical law, i.e., this law is based on observed facts and can be verified with new empirical data. As

the law states,
there is an inverse relationship between the price and quantity demanded.
This law holds under the condition that "
other things remain constant". "Other things" include other determinants of demand, viz., consumers' income, price of the substitutes and complements, tastes and
preferences of the consumer, etc. These factors remain constant only in the short run. In the long run they tend to change. The law of demand, therefore, holds only in the short run.
The law of demand is based on
the law of diminishing marginal utility.
It can be illustrated through a demand schedule, a demand
curve and a demand function. In this section, we explain the law of demand through the demand schedule and demand curve. The law of demand is explained through the demand function in Unit 7. Demand Schedule.
The law of demand can be presented through a demand schedule. Demand schedule is a series of
prices in descending (or ascending) order and the corresponding
quantities which consumers would like to buy per unit of time.
Based on the logic of demand
curve in Fig. 2.3 (b) a hypothetical demand schedule for a commodity, tea, is given in Table 2.2.
NOTES 32 Self-Instructional Material Analysis of Individual
Demand
Table 2.2: Demand Schedule for Tea Price per cup of No. of cups of tea
Points representing Tea (Rs.) demanded by a price-quantity consumer per day combination 7 1i 6 2j 5 3k 4 4l 3 5m 2 6n 1 7o Table 2.2 presents seven alternative prices of tea
and the corresponding quantities (number of cups of tea) demanded per day.
At each price, a unique quantity
is demanded. As the table shows, as price of tea per cup decreases, daily demand for tea increases. This relationship between quantity demanded of a product and its price is the basis of
the law of demand.
The Demand Curve.
The law of demand can also be
presented through a demand curve. A demand curve
is a locus of points showing various alternative price-quantity combinations.
Demand
curve
shows the quantities of a commodity which a consumer would buy at
different prices per unit of time, under the assumptions of the law of demand.
By plotting the data given in Table 2.2., we obtain an individual demand curve for tea, as shown in Fig. 2.4.
The curve DD′ is the demand curve. It shows the law
of demand.
Each point on the demand curve shows a unique price-quantity
combination. The combinations read
downward along the demand curve showing
decreasing price of tea and increasing number of cups of tea demanded. Price-quantity combinations read upwards shows increasing price of tea per cup and decreasing number of cups of tea consumed by an individual per day. Thus, the demand curve shows a functional relationship between the alternative prices of a commodity and its corresponding quantities which a consumer would like to buy during a specific period
of time, say, per day, per week, per month, per season, or per year. Fig. 2.4: Demand
Curve
for Tea
Factors Behind the Law of Demand.
As Fig. 2.4 shows, demand
curve slopes downward to the right. The downward slope of
the demand curve depicts
the law of demand,
i.e., the quantity of a commodity demanded per unit of time
increases as its price falls, and vice versa.
The

factors that make the law of demand operate
are the
following.
Substitution Effect. When the price of a commodity falls,
prices of its substitutes remaining constant, then the substitutes become relatively costlier. Or, in other words,
NOTES Self-Instructional Material 33 Analysis of Individual Demand
the commodity whose price has fallen becomes relatively cheaper. Since a utility maximizing consumer substitutes cheaper goods for costlier ones, demand for the cheaper commodity increases. The increase in demand on account of this factor is known as
the substitution effect. Income Effect. When
the price of a commodity falls,
other things remaining the same,
then
the
real income of the consumer increases. Consequently,
his purchasing power increases since he is required to pay less for
a given quantity. The increase in real income encourages the consumer to demand more
of goods
and services.
The increase in demand on account of an increase in real income is known as
the
income
effect. It should, however, be noted that the income effect is negative in case of inferior goods. In case
the
price of an inferior good (accounting for a considerable proportion of the total consumption expenditure) falls substantially, consumers' real income increases
and
they become relatively richer. Consequently, they substitute the superior goods for the inferior ones.
As a result, consumption of the
inferior goods falls. Thus, the income effect on the demand for inferior goods becomes negative.
Utility-Maximizing Behaviour. The utility-maximizing behaviour of the consumer under the condition of diminishing marginal utility is also responsible for increase in demand for a commodity when its price falls.
As mentioned above, when a person buys a commodity, he exchanges his money income
for
the commodity in order to maximize his satisfaction. He continues to buy
goods and services
so long as marginal utility of
his money (MU m) is less than the
marginal utility of the commodity (MU c). Given the price of the commodity, the consumer adjusts his purchases so that MU m = P c = MU
c When price of the commodity falls, (MU m = P c) > MU c , and equilibrium is disturbed. In order to regain his equilibrium, the consumer will have to reduce the MU c to the level of MU m . This can be done only by purchasing more of the commodity. Therefore, the consumer purchases the commodity till MU m = P c = MU c . This is another reason why demand for a commodity increases when its price decreases.
Exceptions to the Law of Demand.
The law of demand
does not
apply to the following cases. (a) Expectations regarding
further prices.
When consumers expect a continuous increase in the price of a durable commodity, they buy more of it despite
the
increase in its price with a view to avoiding the pinch of
a much higher price in future. For instane, in pre-budget months, prices generally tend to rise. Yet, people buy more storable goods in anticipation of further rise in prices due to new levies. Similarly, when consumers anticipate a further fall in future in the falling prices, they postpone their purchases rather than buying more when there is a fall in the price. (b) Status

Goods. The law of demand does not apply to the commodities which are used as a ‘status symbol’ for enhancing social prestige or for displaying wealth and riches, e.g., gold 3 , precious stones, rare paintings, antiques, etc. Rich people buy such goods mainly because their prices are high and buy more of them when their prices move up. (c) Giffen Goods. Another exception to the law of demand is the classic case of Giffen goods 4 . A Giffen good may be any inferior commodity much cheaper than its superior substitutes, consumed by the poor households as an essential commodity. If the price of such goods increases (price of its substitute remaining constant), its demand increases instead of decreasing because, in case of a Giffen good, income effect of a price rise is greater than its substitution effect. The reason is, when price of an inferior good increases, income remaining the same, poor people cut the consumption of the superior substitute so that they may buy sufficient quantity of the inferior good to meet their basic need. For instance, let us suppose that the monthly minimum consumption

Check Your Progress 9. Suppose a consumer con- sumes three goods having different prices. What is the condition for the consumer to reach an equilibrium? 10. Derive a demand curve by using the marginal utility curve. 11. What is the law of demand? 12.Why does demand for a normal product increase when its price decreases?

of foodgrains by a poor household is 20 kgs of bajra (an inferior good) and 10 kg of wheat (a superior good). Suppose also that bajra sells at Rs. 5 per kg and wheat at Rs. 10 per kg and that the household spends its total income of Rs. 2000 on these items. Now, if price of bajra increases to Rs. 6 per kg, the household will be forced to reduce the consumption of wheat by 5 kgs 5 and increase that of bajra by the same quantity in order to meet its minimum monthly consumption requirement; his expenditure on foodgrains remaining the same. The consumer substitutes bajra for wheat because he can in no other way meet his basic needs. Obviously, the household’s demand for bajra increases from 20 kgs to 25 kgs per month despite the increase in its price. 2.6.4 Shift in Demand Curve When the demand curve changes its position (retaining its slope though not necessarily), the change is known as a shift in the demand curve. For example, suppose that the original demand curve for commodity X is given as D 1 in Fig. 2.5. As shown in the figure, at price OP 2 , the consumer would buy OQ 2 units of X, other factors remaining constant. But, if any of other factors (e.g., consumer’s income or price of the substitutes) changes, it will change the consumer’s ability and willingness to buy commodity X. For example, if consumer’s disposable income increases due to decrease in income tax, he would be able to buy OQ 2 units of X instead of OQ 1 . This is true for the whole range of prices of X; consumers would be able to buy more at all other prices. This will cause an upward shift in demand curve from D 1 to D 2 . Similarly, decrease in disposable income of the consumer due to, say, rise in taxes may cause a downward shift in the demand curve from D 2 to D 1 .

Fig. 2.5: Shift in Demand Curve Reasons for Shifts in the Demand Curve. Shifts in a price-demand curve may take place owing to the change in one or more non-price determinants of the demand for a commodity.

Consider, for example, the increase in demand for commodity X by Q 1 Q 2 in Fig. 2.5. Given the price OP 2 , the demand for X might have increased by Q 1 Q 2 for any of the following reasons. (i) Increase in consumer's income so that he can buy OQ 2 of X at price OP 2 : this is income effect; (ii) Price of
the substitute of X rises so that the consumers find it gainful
to substitue Q 1 Q 2 of X for its substitute: this is substitution effect; (iii)Advertisement by the producer of the commodity X changes consumer's taste or preference
in favour of commodity X so much that the consumer subsititute Q 1 Q 2 for its substitute, again a substitution effect; (iv)Price of a complement of X falls so much that the consumer can afford OQ 2 of X; and
NOTES Self-Instructional Material 35 Analysis of Individual Demand (
v) Price remaining the same, demand for X might increase also for such reasons as X gaining fashion status improvement in its quality, change in
consumer's
technology and seasonality of the product. It is important for the business decision makers to bear in mind the distinction between changes in demand due to (i) shift in price-demand curve; and (ii) movement along the demand curve. For instance,
in Fig. 2.5, the increase in quantity demanded from OQ 1 to OQ 2 can be
explained in two different ways : one, by moving down from point A to C along the demand curve D 1 which results from a fall in price from P 2 to P 1 ; and two, through upward shift in demand curve from D 1 to D 2 . In the former case, additional demand is obtained at the cost of some revenue. In the latter case, demand increases due to a shift in the demand curve on account of some other factors, such as
increase in consumer's income, increase in the price of
substitutes, increase in population, etc. This kind of increase in demand results in increase in revenue. However, in case the demand curve is made to shift through advertisement or other sales promotion devices, the additional demand is not free of cost. Moreover, it is the latter kind of increase in demand which is hoped for and attempted by business firms.
Increase and Decrease vs Extension and Contraction of Demand. Economists sometimes distinguish between (a) increase and decrease in demand, and (b) extension and contraction in demand. Increase and decrease in demand are associated with non- price-quantity relationships of demand whereas extension and contraction of demand are associated with the price-quantity relationship of demand. For example, in Fig. 2.5, movement from point A to B is an increase in demand and movement from B to A is a decrease in demand. On the other hand, movement from A to C is an extension of demand and movement from C to A is a contraction of demand. In other words, movement along the demand curve implies extension or contraction of demand. This kind of distinction of terminology between a change in demand caused by different factors is, however, a matter of convenience. It has no theoretical basis. 2.7
ANALYSIS OF CONSUMER BEHAVIOUR:
ORDINAL UTILITY APPROACH Unlike Marshall, the modern economists—Hicks in particular have used the ordinal utility concept (
explained in Sec. 2.5)
to analyse consumer's behaviour. This is called 'ordinal utility approach'. Hicks has used a different tool of analysis called 'indifference curve' to analyse consumer behaviour.
In this section, we will first explain the 'indifference curve' and then explain consumer's behaviour through the indifference curve technique. Let us first look at the assumptions of the ordinal utility approach. 2.7.1
Assumptions of Ordinal Utility Theory 1.
Rationality.
The consumer is assumed to be a rational being.
Rationality means that
a consumer
aims at maximizing his total satisfaction given his income and prices of
the goods and services
that
he consumes and his decisions are consistent with this objective. 2.
Ordinal Utility. Indifference curve analysis assumes that utility is
only ordinally expressible. That is, the consumer is only able to tell the order of his
preference for different basket of goods. 3.
Transitivity and consistency of choice. Consumer's choices are
assumed to be
transitive. Transitivity of choice
means that

if a
consumer prefers A to B and B to C, he must prefer A to C.
Or, if he treats A = B and B = C, he must treat A = C. Consistency of choice means that if he
prefers A to B in one period, he will not prefer B
to A in another period or
even treat them as equal.
NOTES 36 Self-Instructional Material Analysis of Individual Demand 4.
Nonsatiety.
It is also assumed that the consumer is never over-supplied with goods in question. That
is,
he
has not reached the point of saturation in case of any commodity. Therefore, a consumer always prefers a larger quantity of all the goods. 5.
Diminishing marginal rate of substitution.
The
marginal rate of substitution
is
the rate at which a consumer is willing to substitute one commodity (X) for another (
Y)
so that his total satisfaction remains the same. This rate is given as DY/DX. The ordinal utility approach assumes that DY/DX goes on decreasing when a consumer continues to substitute X for Y. (
We will discuss marginal rate of substitution in
detail
in the
subsequent
sections). 2.7.2
The
Meaning and Nature of
Indifference Curve
An indifference curve may be defined as
the locus of points, each representing a
different combination of two
substitute
goods, which yield the same utility or level of satisfaction to the consumer.
Therefore, he is indifferent between any two combinations of goods when it comes to making a choice between them.
Such a
situation arises because he consumes a large number of goods and services and often finds that one commodity can be substituted for another.
It gives him an opportunity to substitute one commodity for another,
if need arises
and to make various combinations of two substitutable goods which give him the same level of
satisfaction.
If a consumer is faced with such combinations,
he would be indifferent between the
combinations. When such combinations are plotted graphically, the resulting
curve is called indifference curve. An indifference
curve is also called
Isoutility curve or
Equal utility curve.
For example,
let us suppose that a consumer makes five combinations a, b, c, d and e
of two substitute commodities, X and Y, as presented in Table 2.3. All these combinations yield the same level of satisfaction. Table 2.3: Indifference Schedule
of Commodities X and Y Combination Units of Units of Total
Commodity
Y + Commodity X = Utility a = 25 + 3 =U b = 15 + 6 =U c = 8 + 10 =U d = 4 + 17 =U e = 2 + 30 =U

Table 2.3.
is
an
indifference schedule—a schedule of various combinations of two goods,
between which a
consumer is indifferent. The last column of
the
table shows an undefined utility (U) derived from each combination
of X and Y.
The
combinations a, b, c, d and e given in Table 2.3 are plotted and joined by a smooth curve (as shown in Fig. 2.6). The resulting curve is known as an indifference curve. On this curve, one can locate many other points showing different combinations of X and Y which yield the same
level of
satisfaction. Therefore, the consumer is indifferent between
the combinations which may be located on the indifferent curve.
Indifference
Map.
We have drawn a single indifference curve in
Fig. 2.6
on the basis of
the
indifference schedule given in Table 2.3.
The combinations of the two commodities, X and Y, given in the indifference schedule or those indicated by the indifference curve are by no means the only combinations of the two commodities.
The consumer may make many other combinations with less of one or both
of
the goods— each combination yielding the
same level of satisfaction but less than the level of satisfaction indicated by the indifference curve IC in
Fig. 2.2.
As such, an indifference curve
below the one given in Fig. 2.6
can be drawn, say, through points f, g and h.
Similarly, the consumer may make
many other combinations with more of one or both the goods—each combination yielding the same satisfaction but greater than the
NOTES Self-Instructional Material 37 Analysis of Individual Demand
satisfaction indicated by IC. Thus, another indifference curve can be drawn above IC, say, through points j, k and l. This exercise may be repeated as many times as one wants, each time generating a new indifference curve.
Fig. 2.6: Indifference Curve
Fig. 2.7: The
Indifference Map
In fact, the space between X and Y axes is known as
the
indifference
plane or
commodity space. This plane is full of finite points and each point on the
plane
indicates a different combination of goods X and Y. Intuitively, it is always possible to locate any two or more points indicating different combinations of goods X and Y yielding the same satisfaction. It is thus possible to draw a number of indifference curves without intersecting or
touching the other,
as shown in Fig. 2.7. The set of indifference curves IC 1 , IC 2 , IC 3 and IC 4 drawn in this manner make the indifference map. In fact, an indifference map may contain any number of indifference curves, ranked in the order of consumer's preferences. 2.7.3
The

Marginal Rate of Substitution (
MRS)
An indifference curve is formed by
substituting one good for another.
The
MRS
is the rate at which one commodity can be substituted for another, the
level of satisfaction remaining the
same.
The MRS between two commodities X and Y, may be defined as
NOTES 38 Self-Instructional Material Analysis of Individual Demand
the quantity
of X which is required to replace one unit of Y (or quantity of Y required to replace one unit of X), in the combination of the two goods so that the total utility remains the same. This implies that the utility of X (or Y) given up is equal to the utility of additional units of Y (or X).
The MRS
is expressed as ΔY/ΔX, moving down the curve.
The Diminishing MRS
The
basic postulate of ordinal utility theory is that
MRS y,x (or MRS x,y) decreases. It means
that the quantity of a commodity that a consumer is willing to sacrifice for one additional unit of another goes on decreasing when he goes on substituting one commodity for another.
The diminishing
MRS x,y obtained from
combinations of X and Y given in Table 2.3
is
presented in Table 2.4.
Table 2.4: The Diminishing MRS between Commodities X and Y
Indifference Points Combinations Change in Y Change in X MRS y, x Y + X (– ΔY) (ΔX) (ΔY/ΔX) a 25 + 3 – – – b 15 + 6 – 10 3 – 3.33 c 8 + 10 – 7 4 – 1.75 d 4 + 17 – 4 9 – 0.44 e 2 + 30 – 2 13 – 1.54
As Table 2.4 shows, when the consumer moves from point a to b on his indifference curve (Fig. 2.6) he gives up 10 units of commodity Y and takes only 3 units of commodity X.
In this case, , 10 3.33 3 y x Y MRS X –Δ – = = = – Δ
As he moves down from point b to c, he loses 7 units of Y and gains 3 units of X, giving , 7 1.75 4 y x Y
MRS X –
Δ – = = = – Δ
The MRS y,
x goes on decreasing as the consumer moves further down along the indifference curve,
from point c through d and e.
The
diminishing marginal rate of substitution causes the indifference curves to be convex to the origin.
Why Does MRS Diminish? The MRS decreases along the IC curve because, in most cases, no two goods are perfect substitutes for one another. In case any
two goods
are perfect substitutes, the indifference curve will be a straight line
with a negative slope
and
constant MRS.
Since goods are not perfect substitutes, the subjective value attached to the additional quantity (i.e., subjective MU) of a commodity decreases fast in relation to the other commodity whose total quantity is decreasing. Therefore, when the quantity of one commodity (X) increases and
that of
the other (Y) decreases, the subjective MU of Y increases and that of X decreases. Therefore, the consumer becomes increasingly unwilling
to sacrifice more units of Y for one unit of X.

But, if he is required to sacrifice additional units of Y, he will demand increasing units of X to maintain the level of his satisfaction. As a result, the MRS decreases.
Furthermore, when combination of two goods at a point on indifference curve is such that it includes a large quantity of one commodity (Y) and a small quantity of the other commodity (X), then consumer's capacity to sacrifice Y is greater than to sacrifice X. Therefore, he can sacrifice a larger quantity of Y in favour of a smaller quantity of X.
For example, at combination a (see the indifference schedule, Table 2.3), the total stock of Y is 25 units and that of X is 5 units. That is why the consumer is willing to sacrifice 10 units of Y for 3 unit
of X (Table 2.4). This is an observed behavioural rule that the consumer's willingness and capacity to sacrifice a commodity is greater when its stock is greater and it is lower when the stock of a commodity is smaller. These are the reasons why MRS
between the two substitute goods decreases all along the indifference curve.
Check Your Progress 13. What is meant by ordinal utility? 14. Define indifference curve. 15. What is meant by marginal rate of substitution? 16.Why does MRS decrease along the indifference curve?
NOTES Self-Instructional Material 39 Analysis of Individual Demand 2.7.4
Properties of Indifference Curve Indifference curves have the following
four basic proporties: 1. Indifference curves
have a negative slope; 2.
Indifference curves are convex to the origin; 3. Indifference curves do not intersect
nor are they tangent to one another; 4.
Upper
indifference curves indicate a higher level of satisfaction. These properties of indifference curves, in fact, reveal
the
consumer's
behaviour, his choices and preferences. They are, therefore, very important in the modern theory of consumer behaviour. Let us now look into their implications. 1.
Indifference Curves
have a Negative Slope.
In the words of Hicks 6 , "so long as each commodity has a positive marginal utility, the indifference curve must slope downward to the right",
as shown in Fig. 2.2. The negative slope of
an indifference curve implies (a)
that the two commodities can be substituted for each other; and (b) that if the quantity of one commodity decreases, qunatity of the other commodity must increase so that the consumer stays at the same level of satisfaction.
If quantity of the other commodity does not increase simultaneously, the bundle of commodities will decrease as a result of decrease in the quantity of one commodity. And, a smaller bundle of goods is bound to yield a lower level of satisfaction. The consumer's satisfaction cannot remain the same if indifference curves have a positive slope (i.e., ΔY/ΔX < 0) or if slope is equal to infinity, (i.e., ΔY/ΔX = •). These situations are shown in Fig. 2.8 through inconsistent indifference curves.
Let us suppose that the consumer is initially at point e where he
is derving some utility from OQ x of X and OQ y of Y.
Fig. 2.8: Inconsistent Indifference Curves If an indifference curve has a positive slope (i.e., DY/DX < 0),
as shown by the line OB and curve JK, it implies that
the consumer is equally satisfied with larger and smaller baskets of X and Y. This means an irrational behaviour of the consumer. For example,
if the consumer moves from point e to b, the combination of the two goods increases by ea (= bc) of Y and ec (= ab) of X. Unless MU of ea and ec are equal to zero, the level of satisfaction is bound to increase whereas on an indifference curve, the total utility is supposed to remain the same. Therefore, line OB and curve JK cannot be indifference curves.
Similarly, in the case of a vertical indifference line,
aQ x ,
the movement from e to a means an increase in the quantity of Y by ea, while quantity of X remains the same, OQ x . If MU of ea < 0, the total utility will increase. So is the case if an indifference curve takes the shape of a horizontal line, like Q y c.
NOTES 40 Self-Instructional Material Analysis of Individual Demand 2.
Indifference Curves are Convex to Origin. Indifference curves are not only negatively sloped, but are also convex to the origin. The convexity of the indifference curves implies two properties: (i) the two commodities are inperfect substitutes for one another,

and (
ii)
the marginal rate of substitution (MRS) between the two goods decreases as a consumer moves along an indifference curve. This characteristic of indifference curves is based on the
postulate of diminishing marginal rate of substitution.
The postulate of diminishing MRS, as mentioned above, states an observed
fact that if a consumer substitutes one commodity (X) for another (Y),
his willingness to sacrifice more units of Y for one additional unit of X decreases, as quantity of Y decreases. There are two reasons for this: (i) no two commodities are perfect substitutes for one another, and (ii) MU of a commodity increases as its quantity decreases and vice versa, and, therefore, more and more units of the other commodity are needed to keep the total utility constant. 3. Indifference Curves can Neither Intersect nor
be
Tangent with one another. If two indifference curves intersect or are tangent with one another, it will reflect two
rather
impossible conclusions: (i) that two equal combinations of two goods yield two different levels of satisfaction, and (ii) that two different combinations—one being larger than the other—yield the same level of satisfaction. Such conditions are impossible if the consumer's subjective valuation of a commodity is greater than zero.
Besides, if two indifference curves interest, it would mean negation of consistency or transitivity assumption in consumer's preferences.
Fig. 2.9: Intersecting Indifference Curves
Let us now see what happens when two indifference curves, IC and IC¢, intersect each other at point A (Fig. 2.9). Point A falls on both the indifference curves, IC and IC¢. It means that the same basket of goods (OM of X + AM of Y) yields different levels of utility below and above point A on the same indifference curve. The inconsistency that two different baskets of X and Y yield the same level of utility can be proved as follows. Consider two other points—point B on indifference
curve IC¢ and point C on indifference curve IC both being on a vertical line.
Points A,
B and
C represent three different combinations of
commodities X and Y. Let us call these combinations as A,
B and
C, respectively. Note that combination A is common to both the indifference curves. The intersection of the two IC S implies that in terms of utility, A = B and A = C ∴
A = C
NOTES Self-Instructional Material 41 Analysis of Individual Demand
But if B = C it would mean that in terms of utility, ON of X + BN of Y = ON of X + CN of Y Since 'ON of X' is common to both the sides,
the above equation would mean
that
BN of Y = CN of Y But as Fig. 2.9 shows, BN < CN. Therefore, combinations
B and
C cannot be equal in terms of satisfaction. The intersection, therefore, violates the transitivity rule which is a logical necessity in indifference curve analysis. The same reasoning is applicable when two indifference curves are tangent with each other. 4.
Upper
Indifference Curves Represent a Higher Level of Satisfaction than the Lower Ones.
An indifference curve placed above and
to the right of
another represents a higher level of satisfaction
than the lower one.
In Fig. 2.10, indifference curve IC 2 is placed above the curve IC 1 . It represents, therefore,
a higher level of satisfaction. The reason is that
an upper indifference curve contains all along its length a larger quantity of
one or both the goods than the lower indifference curve. And a larger quantity of
a commodity
is supposed to yield a greater satisfaction than the smaller

quantity of it, provided MU < 0.
Fig. 2.10: Comparison between Lower and Upper Indifference Curves
For example, consider the indifference curves IC 1 and IC 2 in Fig. 2.10. The vertical movement from point a on the lower indifference curve IC 1 , to point b on the upper indifference curve IC 2 , means an increase in the quantity of Y by ab, the quantity of X remaining the same (OX). Similarly, a horizontal movement from point a to d means a greater quantity (ad) of commodity X, quantity of Y remaining the same (OY). The diagonal movement, i.e., from a to c, means a larger quantity of both X and Y. Unless the utility of additional quantities of X and Y are equal to zero, these additional quantities will yield additional utility. Therefore, the level of satisfaction indicated by the upper indifference curve (IC 2) would always be greater than that indicated by the lower indifference curve (IC 1). 2.7.5
Budgetary
Constraint and the Budget Line
Given the indifference map, a utility maximizing consumer would like to reach the highest possible indifference curve on his indifference map. But the consumer
is assumed to have a limited income.
The limitedness of income acts as a constraint on how high a consumer can ride on his indifference map. This is known as budgetary constraint. In a two-commodity model, the budgetary constraint, may be expressed through a budget equation as P x . Q x + P y . Q y = M

where P x and P y are prices of X and Y, respectively, and Q x and Q y are their respective quantities; M is the consumer's money income. The budget equation states that the total expenditure of the consumer on goods X and Y cannot exceed his total income, M. The quantities of X and Y
can be easily obtained from the budget equation, as shown below. Q x = x M P – y x P P Q y and Q y = y M P – x y P P Q x
These equations are also called budget equations. Given the budget equations, if M, P x and P y are known, the values of Q x and Q y and different combinations thereof can be easily calculated.
Now, Q x or Q y may be alternatively assigned any positive numerical value and the corresponding values of Q y and Q x may be obtained. When the values of Q x and Q y are plotted on the X and Y axes, we get a line with a negative slope, which is called the budget line or price line,
as shown in
Fig. 2.11. Fig. 2.11: Budget Line and Budget Space
An easier method of drawing the budget line is to mark point M/P y on the Y axis (assuming Q x = 0) and point M/P x on X-axis (assuming
Q y = 0)
and to join these points by a line. This gives the same budget line as given by the equation in Fig. 2.11.
The budget line shows the market opportunities available to the consumer given his income and the prices of X and Y. The
budget line
divides the commodity space into two parts: (i) feasibility area, and (ii) non-feasibility area. The area under the budget line (including the budget line) is feasibility area (
Fig. 2.11). For,
any combination of goods X and Y represented by a point within this area (e.g., point A) or on the boundary line (i.e., on the budget line) is a feasible combination, given M, P x and P y . The area beyond the budget line is non- feasibility area because any point falling in this area, e.g., point B, is unattainable (given M, P x and P y). Shifts in the Budget Line. The budget line
shifts upward or downward or swivels due to change in the
consumer's income and prices of the commodities. If the consumer's
Budget line

income increases, prices remaining the same,
the budget line shifts upwards remaining parallel to the original budget line.
Suppose the original budget line is given by line AB in Fig. 2.12.
If M increases (prices remaining the same), the budget line AB will shift to CD.
And, if
M decreases by the same amount, the budget line will shift backward to its original position AB.
Income remaining the same, if prices change, the budget line
Fig. 2.12: Shift in

the Budget Space changes its position. For example, if M and P y remain constant and
P x decreases
to a
half then the budget line will be AF. Similarly, M and P x remaining constant, if P y increases, the budget line shifts to EB.
Slope of the Budget Line
Another important aspect of the budget line that matters in determining a consumer's equilibrium is its slope.
The slope of the budget line (AB) in Fig. 2.12, is given
as: y x Q OA Q OB Δ = Δ Since OA = M/P y (when X = 0) and OB = M/P x (when Y = 0),
the slope of the budget line AB in Fig. 2.12 may be rewritten as OA
OB = M P M P
P
P y x x y =
Thus,
the slope of the budget line
is the same as the price ratio of the
two commodities. 2.8
CONSUMER'
S EQUILIBRIUM
As noted earlier, a
consumer attains his equilibrium when he maximizes his total utility, given his income and
market prices of
the goods and services that he consumes. The ordinal utility approach specifies two conditions for the consumer's equilibrium: (i) necessary or the first order condition, and (
ii)
supplementary or the second order condition. In a
two-commodity model, the necessary or the first order condition
under ordinal utility approach is the same as equilibrium condition under cardinal utility approach. It is given (
see section 2.2.1,
Eq. 2.2) as MU MU x y = P P
x y
Check Your Progress 17. What are the properties of an indifference curve? 18. What is meant by the budget line? Write the budget equation. 19. What factors make the budget line shift upwards and down- wards? 20. How will the budget line shift when prices of two goods change proportionality, all other things remaining constant?

Since, by implication, MU x /MU y = MRS x,y , the necessary condition of equilibrium under ordinal utility approach can be written as MRS x,y = MU MU x y = P P x y This is a necessary but not a sufficient condition of consumer's equilibrium.
The
second order or supplementary condition requires that the necessary condition be fulfilled at the highest possible indifference curve.
Consumer's equilibrium is illustrated in Fig. 2.13. The indifference curves IC 1 , IC 2 and IC 3
present
a hypothetical indifference map of the consumer. The line AB is the hypothetical budget line. Both
the budget line AB
and the indifference curve IC 2 pass through point E. Therefore, the slopes of the indifference curve IC 2 and the budget line (AB) are equal.
Thus, both the necessary and supplementary conditions are fulfilled
at point E. Therefore, consumer is in equilibrium at point E. This point can be proved as follows. We know
that between any two points on an indifferent curve, DY ◊ MU y = DX◊ MU x and, therefore, the slope of an indifference curve is given by Δ Δ Y X = MU MU x y = MRS x, y
we know also that the slope of the budget line is given by
OA OB = P P
y x As shown in Fig. 2.13,
at point E, MRS y, x = P y /
P x .
Therefore, the consumer is in equilibrium at point E.

The tangency of IC 2 with the budget line AB, indicates that IC 2 is the highest possible indifference curve which the consumer can reach, given his budgetary constraint and the prices. At equilibrium point E, the consumer consumes OQ x of X and
OQ y of Y, which yield him
the maximum satisfaction.
Fig. 2.13: Equilibrium of the Consumer
Although the necessary condition is also satisfied on two other points, J and K (
i.e., the points of intersection between the budget line AB and indifference curve IC 1),
these points do not satisfy the second order condition. Indifference curve IC 1 is not the highest possible curve on which the necessary condition is fulfilled. Since indifference curve IC 1 lies below the curve IC 2 , at any point on IC 1 , the level of satisfaction is lower than the level of satisfaction indicated by IC 2 . So long as the utility maximizing consumer has an opportunity to reach the curve IC 2 , he would not like to settle on a lower
indifference curve.
NOTES Self-Instructional Material 45 Analysis of Individual Demand
From
the information contained in Fig. 2.13, it can be proved that the level of satisfaction at point E is greater than that on any other point on IC 1 . Suppose the consumer is at point J. If he moves to point M, he will be equally well-off because points J and M are on the same indifference curve. If he moves from point J to M, he will have to sacrifice JP of Y and take
PM
of X. But in the market, he can exchange JP of Y for PE of X. That is, he gets extra ME (= PE – PM) of X. Since ME gives him extra utility,
the consumer moves to
point E which means a utility higher
than the point M. Therefore, point E is preferable to point M. The consumer will, therefore, have a tendency to move to point E from any other point on the curve IC 1 in order to reach the highest possible indifference curve, all other things (taste, preference and prices of goods) remaining the same. Another fact which is obvious from Fig. 2.13 is that, due to budget constraint, the consumer cannot move to
an indifference curve placed above and to the right of
IC 2 . For example, his income would be insufficient to buy any combination of two goods at the curve IC 3 . Note that the indifference curve IC 3 falls in the infeasibility area. 2.8.1
Effects of Change in Income on Consumer Demand
We have been concerned so far with the consumer's behaviour under the assumption that consumer's income and market prices of goods and services remain constant. Let us now drop these assumptions one by one and examine the consumer's response to the changes in his income and prices of goods. In this section, we examine the effects of changes in consumer's income on his consumption behaviour, assuming that prices of all goods and services, and consumer's tastes and preferences remain constant.
When a consumer's income changes, his capacity to buy goods and services changes too,
other things remaining the same.
These changes are shown by a parallel upward or downward shift in the consumer's budget line. As shown in Fig. 2.12, when a consumer's income decreases, his budget line shifts downward and when his income increases, the budget line shifts upward. With the changes in his income, the consumer moves from one equilibrium point to another. Such movements show the rise and fall in the consumption basket. This is called, "income effect". Fig. 2.14: Income Consumption Curve
of Normal Goods
The
effect of change in income on consumption
is illustrated in
Fig. 2.14.
The indifference curves IC 1 , IC 2 , IC 3 and IC 4
represent the consumer's indifference map.
To analyse the effect of change in income on consumption, let us suppose that the consumer has a given income and prices of goods X and Y are given and his budget
Income Consumption Curve (ICC)
NOTES 46 Self-Instructional Material Analysis of Individual Demand

line is given by AJ, and that the consumer is initially in equilibrium at E 1 on the IC 1 . Now let the consumer's income increase so that his budget line shifts from position AJ to BK and the consumer reaches a new equilibrium point, E 2 on IC 2 . Similarly, if his income increases further, he moves from equilibrium E 2 to E 3 and then to E 4 . Thus, with each successive upward shift in the budget line, the equilibrium position of the consumer moves upward. The successive equilibrium combinations of goods (X and Y) at four different levels of income are indicated by points E 1 , E 2 , E 3 and E 4 in Fig. 2.14. If these points of equilibrium are joined by a curve, we get the path of increase in consumption resulting from the increase in income. This curve is called the income consumption curve (ICC). The income-consumption curve may be defined as the locus of points representing various equilibrium quantities of two commodities consumed by a consumer at different levels of income, all other things remaining constant. The movement from point E 1 towards point E 4 indicates increase in the consumption of the normal goods X and Y. This is called income effect. Income-

Effect on Inferior Goods. The income-effect on the consumption of different kinds of commodities is not uniform. It can be positive or negative or even neutral. Whether the income effect is positive or negative depends on the nature of a commodity.

In case of normal goods, income-effect is positive and in case of inferior goods, it is negative. By definition, an inferior good is one whose consumption decreases when income increases. In Fig. 2.14, consumption of both the commodities, X and Y, increases with an increase in the consumer's income. Therefore, the income-effect on both X and Y is positive. Fig. 2.15 (a) and (b) present the case of negative income effect. In Fig. 2.15 (a), X is an inferior good—its consumption decrease when consumer's income increases. The income-effect on consumption of X is, therefore, negative. Similarly, in Fig. 2.15 (b), income-effect on Y is negative as Y is considered to be an inferior commodity. Consumption of Y decreases with increase in income. Fig. 2.15: Income-Consumption Curve of Inferior Goods In fact, whether a commodity is a 'normal good' or an 'inferior good' depends on whether income-effect on its consumption is positive or negative. If income-effect is positive, the commodity is considered to be a 'normal good' and if it is negative, the commodity is said to be an 'inferior good'. Thus, the income-consumption-curve may take various shapes depending on whether a commodity is a 'normal good' or an 'inferior good'. 2.8.2

Effects of Change in Prices on Consumption

Let us now examine the effects of change in price on consumer demand. As noted earlier, when price of a commodity changes, the slope of the budget line changes, which

Check Your Progress 21. What are the conditions for consumer's equilibrium using the ordinal utility approach? 22. Why is a consumer not in equilibrium when only the necessary condition are satisfied? 23. What is the effect of change in a consumer's income on his/ her equilibrium? 24. What is the income consum- ption curve? What does it show?

NOTES Self-Instructional Material 47 Analysis of Individual Demand

disturbs the consumer's equilibrium. A rational consumer adjusts his consumption basket with a view to maximizing his satisfaction under the new price conditions.

The change in consumption basket is called price-effect.

Price-Effect. The price-effect may be defined as the total change in the quantity consumed of a commodity due to a change in its price.

To examine the price-effect, let us introduce to our two-commodity model, a change in price of commodity X, holding constant the consumer's income, his taste and preference and the price of commodity Y. The consumer's response to a change in the price of X and the resulting change in the combination of the two goods are illustrated in Fig. 2.12. Suppose that the consumer is initially in equilibrium at point E 1 . Now let the price of X fall, ceteris paribus, so that the consumer'

s budget line shifts from its initial position LR to the position LS. As a result, the consumer reaches a higher indifference curve IC 2 and his new equilibrium point is E 2 . Here, his consumption of X increases by UR. This is the price-effect on the consumption of commodity X. As shown in Fig. 2.16, with a successive fall in the price of X, consumer's equilibrium shifts from E 2 to E 3 and from E 3 to E 4 . By joining the points of equilibrium E 1 , E 2 , E 3 and E 4 , we get a curve called price-consumption-curve (PCC). Price-consumption-curve is a locus of points of equilibrium on indifference curves, resulting from the change

Fig. 2.16: Price-Consumption Curve

in the price of a commodity. The price-consumption-curve (PCC) shows the change in consumption basket due to a change in the price of commodity X. It can be seen from Fig. 2.16 that the quantity of X consumed goes on increasing whereas that of Y first decreases and then increases. 2.8.3

Income and Substitution Effects of Price Change As noted above, the change in consumption basket due to change in the price of consumer goods is called 'price effect'.

Price-effect combines two effects: (i) income-effect,

and (ii)

substitution-effect. Income-effect

results from the increase in real income due to a

decrease in the price of a commodity. Substitution-effect arises due to

the

consumer's

inherent tendency to substitute cheaper goods for the relatively expensive ones.

Income-effect arises

due to

change in real income caused by the change in price of

the

goods consumed by the consumer. Income effect is reflected by the movement along the income-consumption-curve which has a positive slope. Substitution-effect, on the other hand, casues a movement along the price-consumption-curve which generally has a negative slope.

In this section, we will discuss the methods of measuring the total price-effect (PE), income effect (IE) and substitution effect (SE). There are two approaches of

NOTES 48 Self-Instructional Material Analysis of Individual Demand

decomposing the total price-effect into income and substitution-effects, viz., (i) Hicksian approach, and (ii) Slutsky'

s

approach.

Hicksian Approach.

The

Hicksian method of separating income and substitution effects

of a price change is illustrated

in Fig. 2.17. Let the consumer be in equilibrium initially at point P on indifference curve IC 1 and budget line MN, where he consumes PX 1 of Y and OX 1 of X. Now let

the price of X fall, price of Y remaining the same, so that

the new budget line is

MN¢¢. The new budget line (MN´´) is tangent to IC 2 at point Q.

At this point, the consumer buys an

additional quantity (X 1 X 3) of X. That is, total price effect = X 1 X 3 .

Fig. 2.17: Income and Substitution Effects: Hicksian Approach

Now the problem is how to split the price-effect (X 1 X 3) into income and substitution effects. We know that

X 1 X 3 = IE + SE. Given this equation, if either of the two effects is known, the other can be easily measured. The general practice is to first measure income-effect of the price-effect and then deduct it from the price effect to find the substitution-

effect. The Hicksian method of eliminating income-effect is to reduce

the

consumer's income (by way of taxation) so that he returns to his original indifference curve IC 1 ,

to

an

equilibrium point conforming to the new price ratio. This has been done by

drawing an imaginary budget line (M'N') parallel to MN¢¢ and tangent to indifference curve IC 1 .

The budget line
M'N'
is
tangent to indifference curve IC 1 at point R. Point R is thus the income-adjusted equilibrium of the consumer at the new price ratio of X and Y, after the elimination of the real income-effect caused by the fall in the price of X. The shift in equilibrium from Q to R
means that the consumer cuts his comsumption of X by X 2 X 3 due to fall in his income. This gives, by implication, the measure of income-effect (X 2 X 3)
caused by the increase in real
income of the consumer
due to fall in price of X.
The
income
effect of a change in the price of a commodity
may thus
be defined as the
change in quantity demanded of
the
commodity resulting exclusively from a change in the
real income, all other things remaining the same.
With income effect measured at X 2 X 3 , the substitution effect (SE) can be easily obtained as SE = PE – IE
or, by substitutions
as X 1 X 2 = X 1 X 3 – X 2 X 3 . In Fig. 2.17,
the movement of the consumer from P to R shows his response to the change in relative price ratio, his real income being held constant at its original level. The consumer's movement from point P to R means an increase in quantity demanded of X by X 1 X 2 . This change in quantity demanded is called substitution-effect. The substitution effect may thus
be defined as the change in quantity demanded, resulting from a change in
relative price after real
income-effect of price change is eliminated.
NOTES Self-Instructional Material 49 Analysis of Individual Demand
The outcome of the above exercise may be summarized as follows:
Price Effect= X 1 X 3 Income effect=
X 1 X 3 –
X 1 X 2 = X 2 X 3 Substitution Effect = X 1 X 3 – X 2 X 3 = X 1 X 2
Income and Substitution
Effect:
Slutsky's
Approach. Slutsky's method of measuring income and substitution effects is similar to the Hicksian method.
There is however an important difference between Hicks' and Slutsky's
methods of measuring
the real income-effect of a fall
in
the price of a commodity.
The
Hicksian
method considers the real income-effect of a fall in the price of a commodity
equal to an amount which, if taken away from the consumer,
brings him back to his original indifference curve
though his consumption basket is changed. According to the Slutskian mehod,
the
real income-effect of a fall in the price of a commodity must equal
only that amount which if taken away from the consumer leaves with him an adequate income to buy the original combination of two goods after the change in price ratio.

That is, Slutsky's method brings the consumer back not only to the original indifference curve but also to the original point of equilibrium. In simple words, under Hicksion method consumer's income has to be so reduced that he moves back to his original IC curve whereas, under Slutsky's method consumer's income has to be so reduced that he moves back not only to the original indifference curve but also to his
original equilibrium point (P). The Slutskian method of splitting the total price-effect into income and substitution effects is demonstrated in Fig. 2.18. The consumer is
shown to be
in equilibrium at point P on indifference curve IC 1 . When price of X falls, other things remaining the same, the consumer moves to another equilibrium point Q on indifference curve IC 3 . The movement from point P to Q increases
the
consumer's purchase
of X by X 1 X 3 . This is the
total price-effect
caused by the fall in the price of X in Slutskey's method is the same as in Hicksian method.
Fig. 2.18: Income Substitution Effects: Slutsky's Approach Now
the problem is to measure the substitution and income effects.
To measure the substitution-effect, the income-effect has to be eliminated first.
According to the Slutskian approach, a
consumer's real income is so reduced that he is
still
able to purchase his original combination of the two goods (i.e., OX 1 of X and PX 1 of Y) at the new price ratio. This
is
accomplished by drawing an imaginary budget line, M¢N ¢ through
the point P.
Since the whole commodity space is full of indifference curves, one of the indifference curves (IC 2) is tangent to the imaginary budget M¢N ¢
at point R. The
NOTES 50 Self-Instructional Material Analysis of Individual Demand
movement from point Q to R shows
a fall
in the consumption of X by X 2 X 3 . This is
the
income effect.
We may now easily find out the substitution effect (SE) by subtracting the income effect (IE) from the total price effect (PE), as given below. Substitution Effect = PE – IE = SE = X 1 X 3 – X 2 X 3 = X 1 X 2
In Fig. 2.18, the movement form P to R and the consequent increase
in the quantity purchased of X (i.e., X 1 X 2) is
the
substitution effect. Similarly, the consumer's movement from R to
Q and the consequent increase in the quantity purchased of X is
the
income-effect. Hicksian Approach Verses Slutskian Approach. Fig. 2.19 compares the Hicksian and Slutskian approaches of splitting price-effect into substitution and income effects and also their results.
The Slutskian approach attempts to hold only apparent real income constant which is obtained by adjusting
the
consumer's real income by the amount of 'cost-difference' so that the consumer is left with an income just sufficient to buy the original combination of the goods. The Hicksian approach, however, holds constant the real income expressed in terms of
the
original level of satisfaction so that the consumer is able to stay on the original indifference curve.
To express the difference graphically, Hicksian method puts the consumer on the original indifference curve whereas Slutskian method makes the consumer move to an upper indifference curve.
Fig. 2.19: Hicksian Approach vs. Slutskian Approach
Let us compare the two methods in Fig. 2.19. Let
the consumer be in equilibrium at point P on indifference curve IC 1 . When
the

price
of X falls the consumer moves to point Q. The movement from P to Q is the total price-effect which equals X 1 X 4 of commodity X.
Upto this point, there is no difference between Slutsky and Hicks.
Beyond this point, they differ. According to the Slutskian approach, the movement from P to T is the substitution effect and
the
movement from T to Q is the income effect. According to the Hicksian approach, the movement from P to R is the substitution effect and movement from R to Q is the income effect. The substitution and income effects of Slutskian and Hicksian approaches are summed up in quantitative terms in the following table.
Method Price-effect Substitution effect Income effect Hicksian
X 1 X 4 X 1 X 2 X 2 X 4 Slutskian X 1 X 4 X 1 X 3 X 3 X 4
As Fig. 2.19 shows, there is a good deal of difference between Hicksian and Slustkian measures of income and substitution effects. But it can be shown that if
the change in
NOTES Self-Instructional Material 51 Analysis of Individual Demand
price is small the difference between the Slutskian and Hicksian measures would be small and if ΔP tends to be zero, the difference would also be zero.
Apart from the above difference between the two methods, there are some other differences also.
While the Hicksian approach is considered as a 'Highly persuasive solution' to the problem of splitting price-effect into substitution and income effects, the Slutskian approach is intuitively 'perhaps less satisfying' 7 . But the merit of the Slutskian approach is that substitution and income effects can be directly computed from the observed facts, whereas the Hicksian measure of these effects cannot be obtained without the knowledge of a consumer's indifference map.
Both the methods, have however, their own merits. The merit of the Slutskian method, which Hicks calls the 'cost-difference' method, lies in its property that it makes
income effect
easy to handle. Hicks
has
himself recognised this merit of the Slutskian method. The merit of Hicksian method or 'compensating variation method' is that it is a more convenient method of measuring the substitution effect. In Hicks' own words, "The merit of the cost-difference method is confined to [its] property ... that its income effect is peculiarly easy to handle. The compensating variation method [i.e., his own method] does not share in this particular advantage; but it makes up for its clumsiness in relation to income-effect by its convenience with relation to the substitution effect." 8
Predictability
of Income and Substitution Effects. Let us now look into the need for separating the income and substitution effects. As Hicks 9 has pointed out, "substitution effect is absolutely certain; it must always work in favour of an increase in demand for a commodity when the price of that commodity falls." Thus, the behaviour of substitution effect is predictable; it follows directly from the principle of diminishing marginal rate of substitution. On the contrary, 'income effect is not so reliable' 10 and its behaviour is unpredictable in general. In fact, whether income-effect is positive or negative depends on whether a commodity is treated by the consumer as a 'superior' or
an '
inferior' good. Since the subjective valuation of a commodity may vary from person to person, the response of the consumer in general to a change in real income becomes uncertain and unpredictable. It is quite likely that in some cases, substitution effect works in
a
positive direction, income-effect works in a negative direction. In such cases a systematic analysis of price-demand relationship becomes an extremely difficult task. It becomes necessary, therefore, to eliminate the unpredictable income effect so that the behaviour of the
predictable substitution effect can be
known. Apart from its analytical importance, the knowledge of 'how powerful is the substitution effect' is essential for formulating an appropriate pricing strategy. 2.9 DERIVATION OF INDIVIDUAL DEMAND CURVE
The basic purpose of the entire exercise in indifference curve technique is to construct the individual demand curve for a commodity. As stated earlier,
the
individual demand curve shows the relationship between the quantity demanded by an individual
of a commodity (say X) and its price (P x)

under the
ceteris paribus assumption. Thus, to draw an individual demand curve, we need different levels of P x and the corresponding Q x . This information can be obtained from the price-consumption curve. The price- consumption curve (PCC), in Fig. 2.20 (a), contains the information required for constructing the individual demand curve for X.
In Fig. 2.20 (a),
X-axis measures the
quantity of commodity X whereas Y-axis measures
consumer's money income (M). Commodity Y has been replaced by money income (M) only for the sake of simplicity. As Fig. 2.20 (a) shows, with P x decreasing from say, P 1 to P 2 and then to P 3 , the budget line rotates
anti-clockwise,
for
MN 1 to MN 2 and then to MN 3 . As a result, the consumer moves from equilibrium point E 1 to E 2 and
NOTES 52 Self-Instructional Material Analysis of Individual Demand
finally to point E 3 on the PCC. The shift in equilibrium indicates rise in consumption of X following the fall in P x . Fig. 2.20: Derivation of Individual Demand Curve From the information contained in
Fig. 2.20 (
a), we may construct a demand schedule as given in the following
table. The demand curve may be constructed by plotting the demand schedule given below. Price Equilibrium Quantity demanded of X P 1 = OM/ON 1 E 1 OX 1 P 2 = OM/ON 2 E 2 OX 2 P 3 = OM/ON 3 E 3 OX 3 (
Note that OM = money income, and ON 1 > ON 2 > ON 3 . Therefore, P 1 < P 2 < P 3 and OX 1 > OX 2 > OX 3).
The demand curve may be constructed directly from Fig. 2.20 (a). This
has been shown in Fig. 2.20 (b). Let the vertical axis of panel (b) measure the price of commodity X and P 1 , P 2 and P 3 represent the three price levels we have considered in part (a). If we draw horizontal lines from P 1 , P 2 , and P 3 , we get the three price levels in part (b). We know from panel (a) that at price OM/OX 1 (= P 1), the quantity consumed is OX 1 . If we extend the ordinate E 1 X 1 to the X-axis of part (b), it intersects the line P 1 = OM/ ON 1 at point e 1 . By repeating this process for equilibrium points E 2 and E 3 in Fig. 2.20 (a), we get points e 2 and e 3 in Fig. 2.20 (b).
By joining the points e 1 , e 2 , and e 3 we get the
demand curve
D x . This demand curve is the same as the Marshallian demand curve. Possible Shapes of the
Demand Curve. The precise shape and slope of a demand curve depends on the direction in which income and substitution effects work as a result
NOTES Self-Instructional Material 53 Analysis of Individual Demand
of fall in the price of a commodity. In fact, the substitution effect is always negative but income-effect is uncertain. Therefore, given the negative substitution effect, the shape and nature of demand curve depends on the direction and magnitude of the income-effect. There are four possible combinations of substitution and income effects for a fall in the commodity price
and the corresponding nature of the demand curve. These may be summarised as follows: 1.
When substitution-effect is negative and income-effect is positive, quantity demanded of X increases as P x decreases. The demand curve, therefore, slopes downward to the right. This is a case
of '
normal goods'. 2. If income-effect is negative but less than the (negative) substitution effect (as it happens in case of inferior goods) the demand curve slopes downward to the right more steeply than usual. 3. If income-effect is zero, the demand curve follows the substitution effect, i.e., as price decreases, demand increases. The demand curve has a negative slope, but is relatively flatter.
Fig. 2.21: Demand Curve for a Giffen Good 4.
If income-effect is negative and more powerful than the substitution-effect (as it happens in the case of Giffen goods) the demand curve becomes backward bending, as shown in Fig. 2.21.
But it is most unlikely that any demand curve will slope downward to the left throughout its whole length 11 . It will be so only over that range of price changes over which
the

negative income-effect is stronger than the substitution effect. Therefore, the most likely shape of the demand curve 12 for a Giffen good is one shown in Fig. 2.21. The demand curve for Giffen good slopes downward till price falls to P 2 . But if price falls further, the income-effect may become negative and so powerful that it outweighs the substitution effect. Then the demand curve for a Giffen good becomes a backward sloping one. If price continues to fall, say below P 1 , the demand may once again increase for the Giffen good. This seems to be most likely shape of the demand curve for a Giffen good. 2.10

COMPARISON OF CARDINAL AND ORDINAL UTILITY APPROACHES Having outlined the indifference curve technique, let us now compare the cardinal and ordinal utility approaches to consumer's analysis and look into the relative merits of the two approaches.

Check Your Progress 25. How does a change in price affect a consumer's equili- brium? 26. What is meant by PCC? What does it show? 27.How can income and substitution effects of price effect can be measured? 28. Derive a demand curve for a commodity by using the indifference curve approach.

Similarity between the Two Approaches. Some of the assumptions made under the two approaches are the same. Both cardinal and ordinal approaches assume rationality
and utility maximizing behaviour of the consumer.

The diminishing marginal utility assumption of the cardinal utility approach is implicit in the diminishing marginal rate of substitution assumption of the ordinal utility approach.

Equilibrium Conditions are Identical.

Both cardinal and ordinal utility approaches arrive at an identical equilibrium condition. The necessary (or the first order) equilibrium condition of
the cardinal utility approach, i.e., MU MU P P x y y x = and the first order (or necessary) equilibrium condition of the ordinal utility approach given as

MRS x,y = P P x y

are in fact, one and the same because MU x /MU y = MRS x,y . The second order equilibrium condition of the cardinal utility approach is that the total expenditure must not exceed
the consumer's total income.

This is similar to the second order condition of the ordinal utility approach, i.e., the first order equilibrium condition must be fulfilled at the highest possible indifference curve
on his indifference map.

Thus, in spite of the fact that cardinal and ordinal approaches are based on different assumptions regarding measurability of utility, both arrive at the same conclusion
with respect to consumer behaviour.

Superiority of Indifference Curve Approach. In spite of their similarity in some respects, indifference curve analysis is in many respects superior to the cardinal utility approach. The indifference curve analysis has made major advances in the theory of consumer analysis at least in
the following respects. First,
the assumptions of the indifference curve approach are less stringent or restrictive than those of the cardinal utility approach.

While cardinal utility approach assumes cardinal measurability of utility, the ordinal approach assumes only ordinal expression of utility.

Besides, unlike the
cardinal utility approach, the ordinal utility approach does not assume contancy of utility of money. The Marshallian assumption of constancy of marginal utility of money is incompatible with demand functions involving more than one good.

Second,
indifference curve approach provides a better criterion for the classification of goods into substitutes and complements. This is considered as one of the most important contributions of the ordinal utility approach.

The
cardinal utility approach uses the sign of cross-elasticity for the purpose of classifying goods into substitutes and complements. The cross-elasticity between two goods, X and Y, is given by

e x,y = Δ Δ Q P P Q y x x y .

If cross-elasticity has a positive sign, it means X and
Y are
substitutes for each other and if elasticity has a negative sign, it means they are complements. This method of classifying goods into substitutes and compliments is somewhat misleading. For,

as shown in the above measure of cross-elasticity, it
uses the total effect of a price change (DP x) on quantity demanded (DQ y) without compensating for the change in real income caused by the change in the price of the commodity (i.e., DP x). On the contrary,
the indifference curve analysis suggests measuring cross-elasticity after compensating for the changes in real income resulting from
the change in P x . According to Hicks, goods X and
Y are
substitutes for each other if cross-elasticity measured after eliminating the income effect is positive.
NOTES Self-Instructional Material 55 Analysis of Individual Demand
Although the
Hicksian criterion for classifying goods into substitutes and complements is theoretically superior to
the cross-elasticity method (unadjusted for real income-effect) and provides greater insight into the price-effect, it is impracticable. The reason is
estimating income and substitution effects of a price-change is an extremely difficult task
in the absence of an empirial indifference curve.
On the other hand, the usual cross- elasticity method is feasible because it requires only the knowledge of
the
market demand function which is empirically estimable. Third, indifference curve analysis provides a more realistic measure of consumer's surplus compared to one provided by Marshall.
The
Marshallian concept of 'Consumer's surplus' is based on the assumptions that utility
is
cardinally measurable in terms of money and that utility of money remains constant. Neither of these two assumptions is realistic. Indifference curve analysis measures consumer's surplus in terms of ordinal utility.
The
Hicksian measure of consumer's surplus is of great importance in welfare economics and in the formulation and assessment of government policy. 2.11
THE REVEALED PREFERENCE THEORY The cardinal and ordinal utility approaches to demand analysis, discussed in the preceding sections, are based on some concept of utility cardinal or ordinal. The cardinal approach assumes absolute or cardinal measurability of utility and ordinal approach assumes relative or ordinal or instrospective measurability of utility. While measurement of cardinal utility is not practicable, the introspective utility is non-observable. Thus, both these approaches involve problems of measurability. In an attempt to overcome this problem, Samuelson 13 proposed in 1947 another theory of demand called '
Revealed Preference Theory' of consumer behaviour. The main merit of the revealed preference
theory is that the 'law of demand' can be directly derived from the revealed preference axioms without using indifference curves and most of the restrictive assumptions.
What is needed is simply to record the observed behaviour of the consumer in
the market. The consumer reveals his behaviour by the
basket of goods a consumer buys at different prices. Besides, the revealed preference theory is also capable of establishing the existence of indifference curves and their convexity. For its merits, revealed preference theory is treated as the 'third root of the logical theory of demand'. Assumptions. Samuelson's revealed preference hypothesis is based on the following straight forward assumptions: 1.
Rationality. The consumer is assumed to be a rational being.
In his order of preferences,
the
prefers a larger basket of goods to the smaller ones. 2. Transitivity. Consumer's preferences are assumed to be transitive. That is, given alternative baskets of goods, A, B and C, if he considers A < B and B < C, then he considers A < C. 3.
Consistency. It is also assumed that
during the analysis
consumer's taste remains constant and consistent. Consistency implies that if a consumer, given his circumstances, prefers
A to B he will not prefer B to A under the same conditions. 4.
Effective Price Inducement. Given the collection of goods, the consumer can be induced to buy a particular collection by providing him sufficient price incentives. That is, for each collection, there exists a price line which makes it attractive for the consumer. Revealed Preference Axiom. The revealed preference axiom can be stated as follows.

Given the budgetary constraint and alternative baskets of goods having the same price, if a consumer chooses a particular basket, he reveals his preference for
the
basket. For
NOTES 56 Self-Instructional Material Analysis of Individual Demand example, suppose
there are two alternative baskets A and B of two goods X and Y. Both the baskets being equally expensive, if a consumer chooses basket A rather than basket B, he reveals his preference for basket A. If a consumer chooses a particular basket he does so either because he likes it more or it is less expensive than the other. In the above example, if the consumer chooses A rather than B because
A
is cheaper, then the preference for A is not revealed because the consumer might regret not having been able to buy basket B. But, if both
the
baskets are equally expensive, then there is only one plausible explanation that
he
likes A more than B. In this case, the consumer reveals his preference for A.
Fig. 2.22: Revealed Preference The revealed preference axiom
has been
illustrated in Fig. 2.22. The
consumer's budgetary constraint has been shown by his budget line MN. If
he chooses a particular bundle of X and Y represented by point A
on the budget line, it implies that he prefers point
A to any other point on the budget line, say point B. Since point B is on the budget line it is as
much expensive as A. If the consumer chooses point A, it means that
A is revealed preferred to B and B is revealed inferior to A. Any point below the budget line, like point C, represents a smaller and cheaper basket of X and Y and hence is not revealed inferior to A. Therefore, any point above the budget line, like point D, represents a larger and more expensive basket of goods than indicated by point A. Hence it cannot be inferior to A.
Derivation of
Demand Curve. Having explained the revealed preference axiom and noted its assumptions, we may now derive some of the results about consumer's behaviour. We shall first examine the income and substitution effects and then derive the law of demand, by using revealed preference theory. Let us
assume that the initial budget line of the consumer is
given by M 1 N 1 in Fig. 2.23 and the consumer chooses a bundle of goods X and Y indicated by point A, (i.e., a bundle of AX 1 of Y and OX 1 of X). Since all the bundles represented by the various points on the line M 1 N 1 are equally expensive, the consumer, by choosing bundle A, reveals his preference for it.
Let us now suppose that
the price of X falls, price of Y remaining the same, so that
the budget line
M 1 N 1 shifts to M 1 N 3 and the consumer
shifts to the point C. This shift results from the two effects of price change, viz., income and substitution effects.
Let us now decompose the income and substitution effects of the price effect
by using the Slutskian method.
This has been done by drawing a budget line M 2 N 2 through point A. Since the budget line passes through point A, it implies that the bundles X and Y indicated by point A
are still available to the consumer. The consumer will, therefore, not choose any
point between A and M 2 as they are inferior to the bundle
NOTES Self-Instructional Material 57 Analysis of Individual Demand of goods indicated by point A. Hence he will buy either the bundle represented by point A or any other point, say B, on the AN 2 segment of the budget line. Note that if he continues to buy the collection at point A, substitution effect will be zero. And, if he chooses point B, substitution effect is X 1 X 2 . Thus, demand for X increases as a result of decrease in its price. A series of similar points can be traced by assuming subsequent decrease in the price of X, each point showing increase in demand for X due to fall in its price. This establishes the law of demand, i.e., as price of X falls, the quantity demanded of X increases. Having derived the law of demand, the Marshallian demand curve with a negative slope can easily be drawn. Fig. 2.23: Substitution and Income Effects: Revealed Preference Approach. Appraisal
of Revealed Preference Theory.

Samuelson's revealed preference theory is
a major contribution to the theory of demand.
The revealed preference theory has certain advantages over the Marshallian and Hicks-Allen approaches. One, unlike the Marshallian demand theory and Hicks-Allen indifference curve analysis, it can be used to derive demand curves directly without using the utility concept. Two, in its approach to consumer analysis, it uses behaviourist method which is empirically observable in the market whereas Marshallian psychological method or Hicksian introspective method are not empirically verifiable. Three, revealed preference theory abandons most of the restrictive assumptions of the indifference curve analysis, e.g., the assumption of rationality or utility maximization and continuity, etc. It can be used to construct indifference curves under weaker assumptions. Four, revealed preference theory provides also
a basis for constructing the index number of cost of living. The
discussion on the revealed preference theory takes us to the end of individual demand analysis. In the next Unit, we will take up market demand analysis. 2.12 SUMMARY
z
There are two approaches to consumer demand analysis, viz.,
cardinal utility approach and ordinal utility approach. Cardinal utility approach
assumes utility is measurable in cardinally quantitative terms, whereas ordinal utility approach assumes utility is measurable only ordinally, i.e., in relative terms (more or less), not cardinally.
NOTES 58 Self-Instructional Material Analysis of Individual Demand
z
Cardinal utility approach relies on the law of diminishing marginal utility (MU). According to this law, MU goes on decreasing as a consumer consumes more and more units of a commodity. MU equals the price. Consumer's demand curve is drawn on the basis of MU curve and consumer's equilibrium with changing price.
z
Ordinal utility approach is based on the assumption that utility is measurable only ordinally
and that is what required to analyse consumer behaviour. According to ordinal utility approach, a consumer consuming two goods can make combinations of the two goods such that each combination yields the same utility.
Such combinations of two goods when graphed produces a curve called indifference curve.
z
Indifference
curve (C) has three properties: (i) it is convex to origin, (ii) it neither interacts with another nor is tangent, and (iii) upper IC shows a higher level of satisfaction. z Another important tool that ordinal utility approach uses is
the Budget Line drawn on the basis of a given income (M) of the consumer and prices of the two goods P x and P y . The budget line
drawn by using a Budget Equation as M = Q x . P x + Q y . P y . z The consumer finds his/her equilibrium at a point where IC
is tangent to the budget line. At the point of tangency, MRS given by the slope of the
IC equals the price ratio given by the slope of the tangent line. Thus, a consumer is in equilibrium MRS = P y /P x and this condition is satisfied at the highest possible IC. (or downwards) and the consumers moves upwards (or downwards) from one equilibrium point to another. Joining the equilibrium points gives the income consumption curve (IIC). z When price of one good, say X, changes, all other things remaining constant, budget line shifts upward or downward. Accordingly consumer's equilibrium shifts upwards or downwards. Joining the equilibrium points gives the price consumption curve (PCC). z The data revealed by PCC forms the basis of drawing consumer's demand curve.
z
By using indifference curve technique, one can find the income and substitution effects of the price effect. There are two methods of measuring income and substitution effects, viz., Hicksian and Slutsky's method. (For detailed analysis, see the text.) Of consumer "behaviour". This theory states that the consumer knows his/her preferences or choice of goods and he/she reveals his/her preferences to the market. This theory ignores the utility route—cardinal or ordinal for consumer analyse. 2.13 ANSWERS TO 'CHECK YOUR PROGRESS' 1. Demand is the quantity that a consumer is willing to buy and has the ability and willingness to pay. 2. The two approaches to consumer analysis are (i) cardinal utility approach assuming utility is measurable cardinally, and (ii) ordinal utility approach assuming utility is measurable only ordinally. 3. Utility is the satisfaction, pleasure or happiness that a consumer derives from consumption of the commodity. According to cardinal utility approach, utility is measured by the amount of money a consumer is willing to pay for one unit of a commodity. 4. The law of diminishing MU states that as a consumer goes on consuming
more and more units of a commodity, the utility derived from
the additional unit goes on diminishing. 5. See answer to Q. 2.
NOTES Self-Instructional Material 59 Analysis of Individual Demand 6. According to cardinal utility approach,

a consumer consuming one good say X, is in equilibrium where MU x = P x ,
and a consumer consuming several goods, say X, Y and Z, is in equilibrium where y x z x y z MU MU MU P P P = = . 7. Assumptions under cardinal utility approach are (i) rationality, (ii) a given income, (iii) objective as utility maximization, (iv) utility cardinally measurable, (v) constant utility of money, and (vi) additive utility. 8. Rationality means that consumer spends his/her first penny on the commodity that yields as maximum utility. 9. (See answer to Q. 6.) 10. (See the text section 2.6.2.) 11. The law of demand implies that price and quantity are inversely related. As price increases, quantity demand decreases and vice versa,
all other things remaining constant. 12. The demand for a product increases when its price decreases
because of (i) income effect price fall, (ii) substitution effect, (iii) intention to maximise utility. 13. Ordinal utility is the utility of one good in terms of utility of another good, especially its substitute. Accordingly, goods can be ordered or listed in order of their relative utility, this is known as ordinal
utility. 14.
An indifference curve is a
locus of points showing different combinations of two goods, each combination yielding the same level of satisfaction. 15.
Marginal rate of substitution (MRS) is the rate at which
the consumer, given his basket of two goods, substitutes one good for another in such proportions that the total satisfaction remains unaffected. MRS is expressed as – ΔY/ΔX moving down on the IC. 16. MRS decreases for two reasons: (i) as stock of one good goes on decreasing, the ability and willingness to sacrifice it goes on decreasing and vice versa, and (ii) as stock of a good goes on increasing, its MU (howsoever judged) goes on decreasing. So its larger quantity is required to substitute a given quantity of the other good. 17. There are three properties of
indifference curves: (i)
they
are convex to origin; (ii) they neither intersect nor are they tangent to
one another,
and (iii) upper ICs show a higher level of satisfaction
than the lower ones. 18.
Budget line shows the various combinations of two goods that can be bought
given
the consumer's income and the prices of the two goods. Given the consumer'
s money income as M, prices of two goods (X and Y) as P x and P y respectively, budget equation is written
as M = P x . Q x + P y . Q y 19. Change in
consumer's income and in prices of the two goods make the budget line shift upward or downward depending on the direction of change. 20. When prices of goods change proportionately, budget line shifts upward when prices decrease proportionately, and shifts downwards when prices increase proportionately, remaining parallel to the original budget line. 21. According to the ordinal utility approach, there are two conditions for consumer's equilibrium: (i) necessary condition — MRS = P x /P y , a supplementary condition— he first condition is satisfied at the highest IC. 22. Necessary condition can be satisfied at lower ICs which does not maximise the satisfaction. Therefore, cannot be in equilibrium. 23.Change in consumer's income makes his/her budget line shift upwards or
NOTES 60 Self-Instructional Material Analysis of Individual Demand downwards. As a result, consumer's equilibrium point shifts upwards or downwards. When income increases, budget line shifts upwards and equilibrium points shifts upwards, and other way round. 24. Income consumption curve is drawn by joining consumer's equilibrium point shifting with change in income. It shows the change in the combination of two goods (consumer basket) with change in his/her income, all other factors remaining constant. 25. Change in price changes consumer's budget line and, therefore, his/her equilibrium points shifts from one budget line to another. When price decreases, budget line shifts upward and consumer's equilibrium shifts to upper budget line. 26. PCC means price consumption curve. PCC is drawn by joining the equilibrium points shifting with change in price of one good. PCC shows the change in combination of two goods due to change in the price of one good,
all other things remaining
the same. 27. For the method of measuring income and substitution effects,
by Hicksian method, see section 2.8.3, Fig. 2.17. 28. For derivation of demand curve, see section 2.9, Fig. 2.20. 2.14 EXERCISES AND QUESTIONS 1. How does the analysis of demand contribute to business decision making? Give your answer with reference to the responsibilities of a sales manager. 2. What is meant by utility? How does it figure in the analysis of consumer demand? 3. What is the law of diminishing marginal utility? Explain and illustrate the law with the help of MU-schedule and MU-curve. 4. What is meant by consumer's equilibrium? Derive an individual demand curve from MU-curve. 5. What is

the law of demand? Explain with the help of
demand schedule and demand curve.
What are the exceptions to this law? 6.
Why does a
demand curve slope downward to the right? Can a demand curve slope upward to the right
under any condition? 7. Distinguish between total and marginal utility. What is the role of equi-marginal utility principle in analysing consumer behaviour? 8. Distinguish between cardinal and ordinal concepts of utility. Which of the two is a more useful concept in demand analysis from a manager's point of view? 9.
What is an indifference curve? What are its properties or characteristics? What role does it play in consumer analysis? 10.
Define the marginal rate of substitution. What is the law behind the diminishing marginal rate of substitution? 11.
What are the conditions for a consumer's equilibrium? Explain and illustrate consumer's equilibrium using indifference curve technique. 12. Distinguish between income and substitution effects of a price change. Discuss
the Hicksian and Slutsky's methods of separating income and substitution effects of the price effect. 13.
Explain and illustrate price-consumption-curve and income-consumption-curve. Also, derive the demand curve from the price consumption curve. 14.
Suppose marginal utility schedule of consumption of 6 units is given as follows. Units consumed 1 2 3 4 5 6 MU 100 80 60 40 20 0 Find (a) Consumer's equilibrium at price Rs. 60
NOTES Self-Instructional Material 61 Analysis of Individual Demand (b) Demand curve for the commodity. 15. Prove that a consumer is in equilibrium where MU MU x y = P P x y 16. What is a budget line? What is its role in the determination of consumer's equilibrium? 17. Show that the first order condition of consumer equilibrium under cardinal and ordinal utility approaches are the same. 18. Explain and illustrate
Hicksian and Slutskian methods of decomposing income and substitution effects of price effect. 19.
Derive a Marshallian demand curve from price-consumption-curve. Does this demand curve differ from one derived from a MU-curve? 20. Suppose a consumer consumes only two goods, X and Y. Under which of the following conditions will he be in equilibrium? (a) MU
x /MU y = P y /P x (b) MU x /MU y = P x /P y (
c) MU y /MU x = P x /P y 21. Explain the concept of marginal rate of substitution (MRS). What is the significance of MRS in determining the shape of an indifference curve? 22. Explain the revealed preference theory. In what way is the revealed preference theory superior to cardinal and ordinal approaches to the analysis of consumer behaviour? 2.15 FURTHER READING

Boulding, K.E., Economics Analysis : Microeconomics, Vol. 1, 4th Edn., New York, Harper and Row, 1966,
Chs. 11 and 12. Baumol,
W.L., Economic Theory and Operations Analysis, 4th Edn., New Delhi, Prentice Hall of India, 1985,
Ch. 9. Browning, E.K. and J.M. Browning, Microeconomic Theory and Application, Scott, Foresman & Co., London, 3rd Edn., Chs. 2 and 3. Dwivedi, D.N., Microeconomic Theory, Vikas Publishing House, New Delhi, 1997. Chs. 6 and 7.
Ferguson, C.E., Microeconomic Theory, 3rd Edn., Illnois, Richard D. Irwin, Inc., 1972, Chs. 1-4 Hirshleifer, J., Price Theory and Applications, New Delhi, Prentice Hall of India, 1987, Part II. Koutsoyiannis, A., Modern Microeconomics, Macmillon, 1979, Ch. 2.
Marshall, A., Principles of Economics, 8th Edn., London, Macmillan & Co., 1920,
Book III, Ch. IV and Book V, Chs. I and II. (For additonal readings, also see Chs. 7 and 9) References 1.
The utility of money income can be viewed in terms of its purchasing power, liquidity, asset function, social prestige, etc. 2.
Alfred Marshall, Principles of Economics, Mathematical Appendix II. 3. Goods of this category are also purchased and stocked to store the value. 4. Named after Robert Giffen (1837–1970), a British Statistician.
NOTES 62 Self-Instructional Material Analysis of Individual Demand 5. This can be worked out as follows. Suppose that the household substitutes x kgs of bajra for the same quantity of wheat, so that (20 + x) + (10 – x) = 30 kgs. Since the consumer spends only Rs. 2000, his pattern of consumption expenditure, at the new price of bajra (i.e., Rs. 6 per kg) will be 6 (20 + x) + 10 (10 – x) = Rs. 2000. By solving this equation for x, we get x = 5 kgs. 6.
Value and Capital, 1956, p. 13. 7. W.J. Baumol, Economic Theory and Operations Analysis, Fourth Edition, New Delhi. 8. J.R. Hicks, A Revision of Demand Theory, Oxford, 1969, p. 69. 9. J.R. Hicks, Value and Capital, p. 32. 10. J.R. Hicks, Value and Capital, p. 32. 11. A.W. Stonier and D.C. Hague, A Textbook of Economic theory, London, Longman, 1972, p. 71. 12. Stonier and Hague, op. cit. p. 71. 13.
Samuelson, Foundation of Economic Analysis, Cambridge, Mass., Harvard Univer- sity Press, 1947, Chs. 5 and 6; and "Consumption Theory in Terms of Revealed Preference," Economica, November 1948, pp. 243–53. Samuelson had however conceived the idea much earlier in his paper "A Note on the Pure theory of Consumer's Behaviour," Economica, February and August 1938.

NOTES Self-Instructional Material 63 Analysis of Market Demand and Demand Elasticities UNIT 3 ANALYSIS OF MARKET DEMAND AND DEMAND ELASTICITIES Structure 3.0 Introduction 3.1 Unit Objectives 3.2 Analysis of Market Demand 3.2.1 Meaning of Market Demand; 3.2.2 Types of Demand; 3.2.3 Determinants of Market Demand 3.3 Demand Function 3.3.1 Linear Demand Function; 3.3.2 Non-linear Demand Function; 3.3.3 Multi-variate or Dynamic Demand Function 3.4 Elasticities
of Demand 3.4.1 Importance of the Elasticity Concept; 3.4.2
Price Elasticity of Demand; 3.4.3 Measuring Price Elasticity from a Demand Function; 3.4.4 Price Elasticity and Total Revenue; 3.4.5 Price Elasticity and Marginal Revenue; 3.4.6
Determinants
of
Price
Elasticity of Demand; 3.4.7 Cross-Elasticity of Demand; 3.4.8 Income-Elasticity of Demand; 3.4.9
Advertisement or Promotional Elasticity
of
Sales; 3.4.10 Elasticity of
Price Expectations; 3.4.11
Some Estimates of Demand
Elasticities 3.5 Summary 3.6 Answers to 'Check Your Progress' 3.7
Exercises and Questions 3.8 Further Reading 3.0 INTRODUCTION
From the analysis of individual demand, we move on in this Unit to analyse the market demand for a product.
The analysis of total demand for a firm's product plays a crucial role in business decision-making.
For its
successful operation the firm has to plan for future production,
the
inventories of raw materials and advertisement, and setting up sales outlets. Therefore, the information regarding the magnitude of the current and future demand for the product is indispensable. Theory of demand provides an insight into these problems. From the analysis of market demand, business executives can know (i) the factors which determine the size of demand, (ii) elasticities of demand, i.e., how responsive or sensitive is the demand to the changes in its determinants, (iii) possibility of sales promotion through manipulation of prices, (iv) responsiveness of demand to advertisement expenditure, and (v) optimum levels of sales, inventories and advertisement cost, etc.
In this Unit, we have discussed the meaning of market demand, types of demand and their distinctive features, determinants of demand for a product, elasticities of demand and their measurement, i.e., measurement of degree of sensitiveness or respon- siveness of demand to the changes in its determinants.
NOTES 64 Self-Instructional Material Analysis of Market Demand and Demand Elasticities 3.1 UNIT OBJECTIVES z To analyse market demand, its types and its determinants z To introduce demand function and its application
z
To explain the concept measurement of different kinds of demand elasticities
z
To show the relationship between price elasticity of demand and average and marginal revenues z To show the application of demand elasticities in business decisions 3.2 ANALYSIS OF MARKET DEMAND 3.2.1 Meaning of Market Demand The market demand is
the sum of individual demands for a product at a price per unit of time. We may recall that the quantity demanded of a commodity by an individual per unit of time, at a given price, is known as 'individual demand' for that commodity. The aggregate of individual demands for a product is called market demand for the product. In other words,
the total quantity that all the consumers/users of a commodity
are willing to buy
per unit of time
at a given price, all other things remaining the same, is called 'market demand' for
the
that product. Horizontal summation of individual demand schedule produces the market demand schedule. For example, suppose
there are three consumers A, B and C of a commodity X and that their individual demands are given
as in Table 3.1. The last column presents the market demand schedule, i.e., the aggregate of individual demands by the three consumers at different prices.
The market demand curve can be obtained by plotting the market demand
schedule, i.e., the quantity demanded (last column) at different prices (in the first column).

Table 3.1: Price and Quantity Demanded Price of X Quantity of X demanded by Market A B C demand 10 5 1 0 6 8 7 2 0 9 6 10 4 1 15 4 14 6 2 22 2 20 10 4 34 0 27 15 8 50 Fig. 3.1: Derivation of Market Demand Curve
NOTES Self-Instructional Material 65 Analysis of Market Demand and Demand Elasticities The demand schedules of A, B and C are plotted as
D a , D b and D c in Fig. 3.1.
Horizontal summation of these individual demand curves gives the market demand curve as shown by D m .
The market demand curve
can also be obtained by plotting the total demand
given in the last column against the corresponding price in the first column.
Graphically,
market demand curve is horizontal summation of individual demand curves. The
graphical derivation of
the market demand curve through the horizontal summation of the individual demand curves
is illustrated in Fig. 3.1. 3.2.2
Types of Demand
The demand for various goods is generally classified on the basis of the
the consumers of a product, suppliers of the product, nature of goods, duration of consumption of a commodity, interdependence of demand, period of demand and nature of use of the goods (intermediate or final). We have have discussed here the major types of demand that figure in business decisions. Individual and Market Demand. As mentioned earlier,
the quantity of a commodity which an individual is willing to buy at a particular price
during a
specific time period, given his money income, his taste and prices of
other commodities (particularly substitutes and complements), is called 'individual's demands for a commodity'. As explained, above,
the total quantity which all the consumers of a commodity are willing to buy at a given price per time unit,
given their money income, taste and prices of other commodities (mainly substitutes) is known as 'market demand for the commodity'. In other words, the market demand for a commodity is the sum of individual demands by all the consumers (or buyers) of the commodity, over a time period and at a given price, other factors remaining the same. (See also the previous section).
Demand for Firm's Product
and Industry's Products. The quantity of a firm's product that can be disposed of at a given price over a time period connotes the demand for the firm's product. The aggregate of demand for the product of all the firms of an industry is known as the market demand or demand for industry's product.
This distinction between the two demand is not of much use in a highly competitive market—since it merely signifies the distinction between a sum and its parts. However, where market structure is oligopolistic, a distinction between the demand for a firm's product and for the industry's product is useful from the managerial point of view. For, in such markets, products of each firm are so differentiated from the products of the rival firms that consumers treat each product as different from the other. This gives firms an opportunity to manoeuver the price, capture a larger market share through advertisement and, thereby, to enhance their own profit. For instance, markets for motor cars, radios, TV sets, refrigerators, scooters, toilet soaps, toothpastes etc. belong to this category of markets. In the case of monopoly and perfect competition, the distinction between demand for a firm's product and that of the industry is not of much use from managerial point of view. In case of monopoly, the industry is a one-firm industry and the demand for the firm's product is the same as that of the industry. In case of perfect competition, products of all firms of the industry are homogeneous; consumers do not distinguish between products of different firms; and price for each firm is determined by the market forces (i.e., demand and supply for the industry as whole). Firms have only little opportunity to manoeuvre the prices permissible under local conditions and advertisement by a firm becomes effective for the whole industry. Therefore, conceptual distinction between demand for a firm's product and for that of the industry is not of much use in business decisions-making.
NOTES 66 Self-Instructional Material Analysis
of
Market Demand and Demand Elasticities
Autonomous and Derived Demand. An Autonomous demand or direct demand for a commodity is one that arises on its own out of a natural desire to consume or possesses a commodity. An autonomous demand is independent of the demand for any other commodity. For

example, consider the demand for commodities which arise directly from the biological or physical needs of human beings, e.g., demand for food, clothes, shelter
etc.
Demand for the these goods and the like is autonomous demand. Autonomous demand may also arise as a result of 'demonstration effect' of a rise in income, increase in population and advertisement of new products.
On the other hand, the demand for a commodity that arises because of the demand for some other commodity, called 'parent product', is called derived demand. For instance, demand for land, fertilizers and agricultural tools and implements is a derived demand because these goods are demanded
because food is demanded.
Similarly, demand for steel, bricks, cement etc. is a derived demand—derived from the demand for house and other buildings.
In general, the demand for producer goods or industrial inputs is a derived one. Also the demand for complementary goods (which complement the use of other goods) or for supplementary goods (which supplement or provide additional utility from the use of other goods) is a derived demand. For instance, petrol is a complementary good for automobiles and a chair is a complement to a table. Consider some examples of supplementary goods. Butter is a supplement to bread; mattress is a supplement to cot; and sugar is a supplement to tea-for some, it is a complement. Therefore, demand for petrol, chair and sugar would be considered as derived demand. The conceptual distinction between autonomous deamand (i.e., demand for a 'parent product') and derived demand would be useful from a businessmen's point of view to the extent that the former can serve as an indicator of the latter. Demand for Durable and Non-durable Goods. Demand is also often classified under
demand for durable and non-durable goods. Durable goods are those whose
total utility or
usefulness is not exhausted in a single or short-run use. Such goods can be used repeatedly or continuously over a period of time. Durable goods may be consumer goods as well as producer goods. Durable consumer goods include clothes, shoes, houses, furniture, utensils, refrigerator scooters, cars, etc. The durable producer goods include mainly the items under 'fixed assets', such as building, plant, machinery, office furniture and fixtures
etc. The durable goods, both consumer and producers goods, may be further classified as 'semi-durables' (e.g., clothes and furniture) and 'durables' (e.g., residential and factory building cars etc.).
Non-durable goods on the other hand are those which can be used or consumed only once (e.g., food items) and their total utility is exhausted in a single use.
This category of goods too may be grouped under non-durable consumer goods and nondurable producer goods. All food items, drinks, soaps, cooking fuel, (gas, kerosene, coal etc.), lighting, cosmetics etc., fall in the former category. In the latter, fall goods such as raw materials, fuel and power, finishing materials and packing items etc. The demand for non-durable goods depends largely on their current prices, consumers' income and fashion and is subject to frequent change whereas the demand for the durable good is also influenced by their expected price, income and change in technology. The demand for durable goods changes over a relatively longer period. There is another point of distinction between the demand for durable and non-durable goods. Durable goods create replacement demand whereas nondurable goods do not. Also, the demand for nondurable goods increases (or decreases) lineally whereas the demand for durable goods increases (or decreases) exponentially due to an increase in stock of durable goods and hence accelerated depreciation.
Check Your Progress 1.How is market demand defined? 2. Distinguish between autono- mous and derived demand. 3. What is the difference between consumer durables and non-durables? 4. Distinguish between short- term and long-term demand for a product.
NOTES Self-Instructional Material 67 Analysis of Market Demand and Demand Elasticities
Short-term and Long-term Demand Short-term demand refers to the demand for goods that are demanded over a short period. In this category are found mostly the fashion consumer goods, goods of seasonal use,
inferior substitutes during the scarcity period of superior goods,
etc. For instance, the demand for fashion wear is short-term demand though the demand for generic goods (trousers, shoes, ties, etc.) continues to remain a long-term demand. Similarly demand for umbrella, raincoats, gum-boots, cold-drinks, ice-creams etc., is
of seasonal nature. The demand for such goods lasts till the season lasts.
Some goods of this category are demanded for a very short period (1–2 weeks), e.g., New Year Greeting cards, candles and crackers on the occasion of Diwali.
Although some goods are used only seasonally they are of durable nature, e.g., electric fans, woollen garments, etc.
The demand for such goods is of a durable nature but

it
is subject to seasonal fluctuation. Sometimes, demand for certain goods suddenly increases because of scarcity of their superior substitutes. For example, when supply of cooking gas suddenly decreases, demand for kerosene, cooking coal and charcoal increases. In such cases, additional temporal demand is of a short-term nature.
The
long-term demand, on the hand,
refers to the demand which exists over a long period. The change in long-term demand is perceptible only after a long period. Most generic goods have long-term demand. For example, demand for consumer and producer goods, durable and nondurable goods is long-term demand,
though their different varieties or brands may only have a short-term demand. Short-term demand depends, by and large, on the price of commodities, price of their substitutes, current disposable income of the consumer, their ability to adjust their consumption pattern and their susceptibility to advertisement of a new product. The long-term demand depends on the long-term income trends, availability of better substitutes, sales promotion, consumer credit facility, etc. The short-term and long-term concepts of demand are useful in designing new products for established producers and choice of products for the new entrepreneurs, in pricing policy, and in determining and phasing the advertisement expenditure. 3.2.3
Determinants of
Market
Demand The knowledge of the determinants of market
demand for a product and the nature of relationship between the demand and its determinants proves very helpful in analysing and estimating demand
for the product. It may be noted at the very outset that a host of factors determine the demand for a product. In general, however, following are the factors which determine,
by and large,
the market demand for a product: 1. Price of the product, 2. Price of the related goods—substitutes, complements and supplements, 3. Level of consumer's income, 4. Consumer's taste and preference, 5. Advertisement of the product, 6. Consumer's expectations about future price and supply position, 7. Demonstration effect and '
band-wagon
effect', 8. Consumer-credit facility, 9. Population of the country (for the goods of mass consumption), 10. Distribution pattern of national income, etc.
To this list, one may add such factors as off-season discounts and gifts, number of uses of a commodity, level of taxation and the general social and political environment of the country (especially with respect to demand for capital goods).
NOTES 68 Self-Instructional Material Analysis of Market Demand and Demand Elasticities All these factors are, however, not equally important. Besides, some of them are not even quantifiable. For example, consumer's preferences, utility, demonstration effect, expectations, etc., are difficult to measure. Nevertheless, we will discuss here both quantifiable and nonquantifiable determinants of
the demand for a product. 1. Price of the Product The price of a product is one of the most important determinants of its demand in the long run and the only determinant in the short run.
The price of a product and its quantity demanded are inversely related. The law of
demand (
discussed in the previous Unit)
states that the quantity demanded of a product which its consumers/users would like to buy
per
unit of time, increases when its price falls and decreases when its
price
increases, other factors remaining constant. The assumption 'other factors remaining constant' implies that income of the consumers, prices
of the substitutes and complementary goods, consumer's taste and
preference and number of consumers, remain unchanged.
The
price-demand relationship assumes a much greater significance in the oligopolistic market in which the outcome of price-war between a firm and its rival determines the level of success of the firm. The firms have to be fully aware of price elasticity of demand for their own product and that of the product of the rival firms. 2.
Price of the
Related Goods The
demand for a commodity is also affected by the changes in the price of its related goods.

Related goods
may be substitutes or complementary goods. Substitutes.
Two commodities are deemed to be substitutes for one an
other if change
in the
price of one affects the demand for
the other in the
same direction.
For
instance, commodities X and Y are
considered as substitutes for one an
other if a rise in the price of X increases demand for Y and vice versa. Tea and coffee, hamburgers and hot-dog, alcohol and drugs are some examples of substitutes
in the case of consumer goods. Fig. 3.2: Demand for Substitutes and Complements By definition, the relation between demand for a product and price of its substitute is of positive nature. Assuming goods X and Y to be substitutes for one another, the demand function for X and Y with respect to the price of their substitutes can be written as follows. D x = f(P y), ΔD x /ΔP y < 0 and D y = f(P x), ΔD y / ΔP x < 0 When price of a substitute good (say, coffee) of a product (tea) falls (or increase), the
demand for the product falls (or increases). The demand-price relationship of this nature is given in Fig. 3.2 (a).
Price of coffee (Rs.)
NOTES Self-Instructional Material 69 Analysis of Market Demand and Demand Elasticities
Complements.
A commodity is deemed to be a complement for
another when it complements the use of the other or when the use of the two goods goes together
so that their demand changes (increases or decreases) simultaneously.
For example, petrol is a complement to cars and scooters,
butter and jam to bread, milk and sugar to tea and coffee,
mattress to cot, etc. In economic sense,
two goods are termed as complementary
to
one another if an
increase in the price of one causes a decrease in
demand for
the other.
By definition, there is an inverse relation between the demand for a good and the price of its complement.
For instance, an increase (or decrease) in the price of petrol causes a decrease (or an increase) in the demand for car and other petro- leum vehicles, other things remaining the same. The demand function for car (D c) in relation to petrol price (P p) can be written as D c = f(P p), DD c /DP p > 0 The
relationship
between the demand for a product (car) and the price of its complement (
petrol) is given in Fig. 3.2 (b). 3.
Consumer's Income Income is the basic determinant of quantity of a product demanded since it determines the purchasing power of the consumer. That is why people with higher current disposable incomes spend a larger amount on
consumer goods and services than those with lower income.
Income-demand relationship is of a more varied nature than that between demand and its other determinants.
While other determinants of demand, e.g., product's own price and the price of its substitutes are more significant in the short- run, income as a determinant of demand is equally important in both short run and long run.
The relationship between the demand for a commodity, say X, and the
household income (Y), assuming all other factors to remain constant, is expressed by a demand function such as D x = f(Y), DD x /DY < 0 Before we proceed to discuss income-demand relationships, it will be useful to note that consumer goods of different nature have different
relationship with income
of different categories of consumers.
The managers need, therefore, to be fully aware of the goods they are dealing with and their relationship with the income of consumers, particularly in regard to the assessment of both existing and prospective demand for a product.

For the purpose of income-demand analysis, consumer goods and services may be grouped under four broad categories, viz. (a) essential consumer goods, (b) inferior goods, (c) normal goods, and (d) prestige or luxury goods. Let us now look into the relationship between income and the different goods.

The relationship between income and the different consumer goods is presented through Engel curves. 1 (a) Essential consumer goods (ECG). The goods and services in this category are called 'basic needs' and are consumed by all persons of a society, e.g., foodgrains, salt, vegetable oils, matches, cooking fuel, minimum clothing and housing. Quantity demanded of this category of goods increases with increase in consumer's income but only upto a certain limit, even though the total expenditure may increase in accordance with the quality of goods consumed, other factors remaining the same.

The relationship between goods of this category and consumer's income is shown by the curve ECG in Fig. 3.3. As the curve shows, a consumer's demand for essential goods increases only until his income rises to OY 2 . It tends to saturate beyond this level of income. (b) Inferior goods (IG).

Inferior and superior goods are widely known to both consumers and sellers. For instance, every consumer knows that millet is inferior to wheat and rice; bidi (indigenous cigarette) is inferior to cigarette, coarse textiles are inferior to refined ones, kerosene is inferior to cooking gas; travelling by bus is inferior to travelling by taxi, so on and so forth. In an economic sense, however, a commodity is deemed to be inferior if its demand decreases with the increase in consumer's income

NOTES 70 Self-Instructional Material Analysis of Market Demand and Demand Elasticities beyond a certain level of income. The relation between income and demand for an inferior good is shown by the curve IG in Fig. 3.3 under the assumption that other determinants of demand remain the same. Demand for such goods rises only upto a certain level of income (say, OY 1) and declines as income increases beyond this level. (c) Normal goods. Technically, normal goods are those which are demanded in increasing quantities as consumers' income rises. Clothing, household furniture and automobiles are some of the important examples of this category of goods.

The nature of relation between income and demand for the goods of this category is shown by the curve NG in Fig. 3.3. As the curve shows, demand for such goods increases with the increase in income of the consumer, but at different rates at different levels of income. Demand for normal goods increases rapidly with the increase in the consumer's income but slows down with further increases in income.

Fig. 3.3: Income Demand Curves

It may be noted from Fig. 3.3, that upto a certain level of income (Y 1) the relation between income and demand for all types of goods is similar. The difference is only of degree. The relation becomes distinctly different beyond the Y 1 level of income. From a managerial point of view, therefore, it is important to view the income-demand relations in the light of the nature of product and the level of consumer's income. (d) Luxury and Prestige goods. What is and what is not a luxury good is a matter of consumer's perception of the need for a commodity. Conceptually, however, all such goods that add to the pleasure and prestige of the consumer without enhancing his earning fall in the category of luxury goods. For example, stone-studded jewellery, costly brands of cosmetics, luxury cars, accommodation in 5-star hotels, travel by first-class reailway AC cars, upper class air travel, etc. can be treated as luxury goods. A special category of luxury goods is that of prestige goods, e.g., precious stones, ostentatious decration of buildings rare paintings and antiques, diamond-studded jewellery and watches, prestigious schools, etc.

Demand for such goods arises beyond a certain level of consumer's income, i.e., consumption enters the area of luxury goods.

Producers of such items, while assessing the demand for their product, should consider the income changes in the richer section of the society, not only the per capita income (see curve, LG in Fig. 3.3). 4. Consumer's Taste and Preference Consumer's taste and preference play an important role in determining the demand for a product. Taste and preference generally depend, on life-style, social customs, religious values attached to a commodity, habit of the people, the general levels of living of the society and age and sex of the consumers. Change in these factors changes consumers' NOTES Self-Instructional Material 71 Analysis of Market Demand and Demand Elasticities taste and preferences. As a result, consumers reduce or give up the consumption of some goods and add new ones to their consumption pattern. For example, following the change in fashion, people switch their consumption pattern from cheaper, old-fashioned goods over to costlier 'mod' goods, so long as price differentials are commensurate with their preferences. Consumers are prepared to pay higher prices for 'mod goods' even if their virtual utility is virtually the same as that of old-fashioned goods. This piece of information is useful for the manufacturers of goods and services subject to frequent changes in fashion and style, at least in two ways: (i) they can make quick profits by designing new models of their product and popularising them through advertisement, and (ii) they can plan production better and can even avoid over-production if they keep an eye on the changing fashions. 5. Advertisement Expenditure Advertisement costs are incurred with the objective of promoting sale of the product. Advertisement helps in increasing demand for the product in at least four ways: (a) by informing the potential consumers about the availability of the product; (b) by showing its superiority over the rival product; (c) by influencing consumer's choice against the rival products; and (d) by setting new fashions and changing tastes. The impact of such effects shifts the demand upward to the right. In other words, other factors remaining the same, as expenditure on advertisement increases, volume of sales increases to an extent. The relationship between sales (S), and advertisement outlays (AD) is expressed by the function S = f(AD). The relation between advertisement outlay and sales is shown in Fig. 3.4. Fig. 3.4: Advertisement and Sale Assumptions The relationship between demand and advertisement cost shown in Fig. 3.4 is based on the following assumptions: (a) Consumers are fairly sensitive and responsive to various modes of advertise- ment, (b) The rival firms do not react to the advertisements made by a firm, (c) The level of demand has not already reached the saturation point. Once demand reaches the saturation point, advertisement makes only marginal impact on demand, (d) Advertisement cost added to the price does not make the price prohibitive for consumers, compared to the price of substitutes, (e) Other determinants of demand, e.g., income and tastes, etc. are not operating in the reverse direction. In the absence of these conditions, the effect of advertisement on sales may be unpredictable. 6. Consumer's Expectations Consumer's expectations regarding the future prices, income, and supply position of goods, etc. play an important role in determining the demand for goods and services in

Check Your Progress 5. What are determinants of mar- ket demand for a product? 6. How does change in price of substitute goods affect the demand for a product? 7. What is the effect of increase in income on the demand for an inferior good? 8. What is demonstration effect? How does it influence the demand for a product?

NOTES 72 Self-Instructional Material Analysis of Market Demand and Demand Elasticities

the-short run. If consumers expect a high rise in the price of a storable commodity, they would buy more of it at its high current price with a view to avoiding the pinch of a high price rise in future. On the contrary, if consumers expect a fall in the price of certain goods, they postpone their purchase of such goods with a view to taking advantage of lower prices in future, mainly in

the
case of non-essential goods. This behaviour of consumers reduces the current demand for goods whose prices are expected to decrease in
the
future.
Similarly, an expected increase in income increases demand. For example, announcement of 'dearness allowance', bonus, revision of pay-scale, etc., induces increase in current purchases. Besides, if scarcity of certain goods is expected by the consumers/users
on account of a
reported fall in future production, strikes on a large scale, diversion of civil supplies towards military use etc., the current demand for such goods
tends to
increase, more so if their prices show an upward trend. Consumers demand more for future consumption and profiters demand more to make money out of an expected scarcity. 7.
Demonstration
Effect When new commodities or new models of existing ones appear in the market, rich people buy them first. For instance, when a new model of a car appears in the market, rich people would mostly be the first buyers. Colour TV sets and VCRs were first seen in affluent households.
Some people buy goods or new models of goods because they have
a genuine need for them
or have excess purchasing power. Some others do so because they want to exhibit their affluence.
But once new commodities are
in vogue, many households buy them not because they have a genuine need for them but because their neighbours have bought these goods. The purchases made by the latter category of the buyers arise out of such feelings as jealousy, competition
and
equality in the peer group, social inferiority and the desire to raise their social status. Purchases made on account of these factors are the result of what economists call 'demonstration effect' or the '.' These effects have a positive effect on demand. On the contrary, when a commodity becomes
the
thing of common use, some people, mostly rich, decrease or give up the consumption of such goods. This is known as the '
Snob Effect'. It has a negative effect on the demand for the related goods 2 . 8.
Consumer-Credit Facility
Availability of credit to the consumers from the sellers 3 , banks, relations and friends, or from other source encourages the consumers to buy more than
what they would buy in the absence of credit availability. That is why consumers who can borrow more can consume more than those who cannot borrow.
Credit facility mostly affects the demand for durable goods, particularly those
which require bulk payment at the time of purchase.
The
car-loan facility may be one reason why Delhi has more cars than Calcutta, Chennai and Mumbai all put together.
The managers who are assessing the prospective demand for their products should, therefore, take into account the availability of credit to the consumers. 9.
Population of the Country The total domestic demand for a product
of mass consumption
depends also on the size of the population. Given the price, per capita income, taste and preference etc., the larger the population, the larger the demand for a product. With an increase (or decrease) in the size of population
and with the employment percentage remaining the same, demand for the product tends to increase (or decrease). The global perception that India offers the most vast market in the world is based on the fact that she has the second largest population albeit with a low purchasing power. 10. Distribution of National Income The level of national income is the basic determinant of the market demand for a product—the higher the national income, the higher the demand for all normal goods and
NOTES Self-Instructional Material 73 Analysis of Market Demand and Demand Elasticities
services. Apart from its level, the distribution pattern of national income is also an important determinant of a product. If national income is unevenly distributed, i.e., if a majority of the

population belongs to the lower income groups, market demand for essential goods including inferior ones, will be the largest whereas the demand for other goods will be relatively
lower. 3.3
DEMAND
FUNCTION In mathematical language,
a function is a symbolic statement of relationship between
the dependent and the independent variables.
Demand function states the relationship between the demand for a product (the dependent variable) and its determinants (the independent variables).
Let us consider a very simple case of demand function. Suppose all the determinants of demand for commodity X, other than its price, remain constant. This is a case of a short-run demand function. In the case of a short-run demand function,
quantity demanded of X, (D x) depends on its price (P x). The demand function can then be stated as 'demand for commodity X, (D x) depends on its price (Px)'. The same statement may be symbolically written as D x = f (P x) ...(3.1) In this function,
D x is a dependent and P x is an independent variable. The function (3.1) reads 'demand for commodity X (
i.e.,
D x) is the function of its price (P x). It implies that a change in P x (the independent variable) causes a change in D x (the dependent variable).
The function (3.1) however does not reveal
the change in D x for a given percentage change in P x , i.e., it does not give the quantitative relationship between D x and P x . When
the
quantitative relationship between D x and P x is known, the demand function may be expressed in the form of an equation.
The general form of a linear
demand function is written as D x = a – bP x ...(3.2) where 'a' is a constant,
denoting total demand at zero price and b = ΔD/ΔP 4 , is also a constant—it specifies the change in D x in response to a change in P x . The form of a demand function
depends on the nature of demand-price relationship. The two most common forms of demand-price relationship are linear and non-linear. Accordingly, the demand function may assume a linear 5 or a non-linear form. 3.3.1 Linear Demand Function A demand function is said to be linear when
it results in a linear demand curve. Eq. (3.2) represents a linear form of the demand function. Assuming that in an estimated demand function
a = 100 and b = 5, function (3.2) can be written as D x = 100 – 5P x ...(3.3)
By substituting numerical values for P x , a demand schedule may be prepared as given in Table 3.2. Table 3.2: Demand Schedule P x D x = 100 – 5 P x D x 0 D x = 100 – 5 × 0 100 5 D x = 100 – 5 × 5 75 10 D x = 100 – 5 × 10 50 15 D x = 100 – 5 × 15 25 20 D x = 100 – 5 × 20 0 This demand schedule when plotted gives a linear demand curve as shown in Fig. 3.5. Note that the linear demand curve has a constant slope (DP x /DD x).
NOTES 74 Self-Instructional Material Analysis of Market Demand and Demand Elasticities Fig. 3.5: Linear Demand Function Fig. 3.6: Non-Linear Demand Function
From the demand function, one can easily obtain the price function. For example, given the demand function (3.2), the price function may be written as
follows. P x = a D b x – P x = a b b – 1 D x Assuming a/b = a 1 and 1/b = b 1 , the price function may be written as P x = a 1 – b 1 D x ...(3.4) 3.3.2
Non-linear Demand Function A demand function is said to be non-linear or curvilinear when the slope of the demand curve, (ΔP/ΔD) changes all along the curve.
A
non-linear demand function yields a demand curve instead of a demand line, as shown in Fig. 3.6. A non-linear demand function takes the form of a power function
of the form given below. D x = aP x –b ...(3.5) and D x = a P c b x + – ...(3.6) where a < 0, b < 0 and c < 0. It should be noted
that the exponent of the price variable in a non-linear demand function (3.5) is the coefficient of price elasticity of demand. 3.3.3 Multi-variate or Dynamic Demand Function We have discussed above a single variable demand function, i.e., one
with price as a single independent variable. This may be termed as

a short-term demand function. In the long run, however, neither the individual nor the market demand for a product is determined by any one of its determinants because other determinants do not remain constant.
The long-run demand for a product depends on the composite impact of all its determinants operating simultaneously. Therefore,
for the purpose of estimating long-term demand for a product, all its relevant determinants are taken into account. They are then expressed in a functional form. The
function describes the relationship between the demand (a dependent variable) and its determinants (the independent variables).
A demand function
of this kind is called a multi-variate or dynamic demand function. For instance, consider this statement: the
demand (D x) for a commodity X, depends on its price (P x), consumer's income M, price of its substitute
Y, (P y), price of complementary goods (P c) and Check Your Progress 9. What is meant by demand function? What is a short-run demand function? 10. What is the difference between a linear and non-linear demand function? 11. Suppose a demand function is given as D = 50 – 2P. Find demand at P =10. 12. What is a multi-variate demand function? What is its signifi- cance in business decision- making?
NOTES Self-Instructional Material 75 Analysis of Market Demand and Demand Elasticities
consumer's taste (T) and advertisement expenditure (A). This statement can be expressed in a functional form as, D x = f (P x , M, P y , P c , T, A) ...(3.7) The function (3.7) describes the demand for commodity X
which depends on such determinants as P x , M, P y , P c , T and A. If the relationship between D x , and the quantifiable independent variables, P x , M, P y , P c and A is of linear form, the estimable form of the demand function is expressed as D x = a + bP x + cM + dP
y + gP c + jA ...(3.8) where 'a' is a constant term and constants b, c, d, e, g
and j are the coefficients of relation between D x and the respective independent variable. In a market demand function for a product, other independent variables, viz., size of population (N) and a measure of income distribution, i.e., Gini-coefficient, (G)
may also be included. 3.4 ELASTICITIES OF DEMAND 3.4.1 Importance
of the Elasticity Concept We have earlier discussed the nature of relationship between demand and its determinants. From managerial
point of view, however,
the knowledge of
nature of relationship alone is not sufficient. What is more important is the extent of relationship or
the
degree of responsiveness of demand to
the
changes in
its determinants.
The
degree of responsiveness of demand to the change in
its determinants
is
called elasticity of demand.
The
concept of elasticity of demand
plays a crucial role in business-
decisions
regarding manoeuvering of prices
with a view to making larger profits. For instance, when cost of production is increasing, the firm would want to pass the rising
cost on to the consumer by raising the price. Firms may decide to change the price even without
any change in the
cost of production.
But whether raising price following the rise in cost or otherwise proves beneficial
depends on: (a) the price-elasticity of demand for the
product,
i.e., how high or low is the proportionate change in its demand in response to a certain percentage change in its price; and (

b)
price-elasticity of demand for its substitute, because when the price of a product increases
the demand for its substitutes increases automatically even if their prices remain unchanged. Raising
the
price will be beneficial only if (i) demand for a product is less elastic; and (ii) demand for its substitute is much less elastic.
Although most businessmen are
intuitively aware of the elasticity of demand of the goods they make, 6 the use of precise estimates of elasticity of
demand will add precision to their business decisions.
In this section, we will discuss
various methods of measuring elasticities of demand. The concepts of demand elasticities used in business decisions are:
(i) Price elasticity, (ii) Cross-elasticity; (iii) Income elasticity;
and (iv) Advertisement elasticity, and (v)
Elasticity of price expectation. 3.4.2
Price
Elasticity of Demand
Price
elasticity of demand is
generally defined as the
responsiveness or sensitiveness of demand for a commodity
to
the changes in its
price.
More precisely,
elasticity of
demand is the percentage change in
demand
as a result of
one per cent change in
the price of the
commodity.
A formal
definition of price elasticity of demand (e p) is given
as
NOTES 76 Self-Instructional Material Analysis of Market Demand and Demand Elasticities
e p = Percentage changein quantity demanded Percentage changein price A general formula 7 for calculating coefficient
of price elasticity,
derived from this definition
of elasticity,
is given as follows: e p = Q P Q
P Q P Q P Δ Δ Δ ÷ = × Δ = Q P P Q Δ × Δ ...(3.9)
where
Q =
original quantity demanded, P =
original price, ΔQ = change in quantity demanded and ΔP = change in price.
It is important to
note here that a minus sign (–) is generally inserted in the formula before the fraction with view to making
the elasticity coefficient a non-negative value. 8
The elasticity can be measured between two points on a demand curve (called arc elasticity) or
on
a point (called point elasticity).
Arc
Elasticity.
The
measure of elasticity of demand between any two finite points on a demand curve
is known as arc elasticity. For example, measure of elasticity between points j and k (Fig. 3.7) is the measure of arc
elasticity. The movement from point j to k on the demand curve (D x) shows a fall in

the price from Rs. 20 to
Rs. 10
so that ΔP = 20 – 10 = 10. The fall in price causes an increase
demand from 43 units to 75 units so that ΔQ = 43 – 75 = – 32.
The elasticity between points j and k (moving from j to k) can be calculated
by substituting these values into the elasticity formula
as follows: e p = –
Q P P Q
Δ · Δ (with minus sign) = 32 20 1.49 10 43 – – · = ...(3.10) This
means that a one percent decrease in price of commodity X results in a 1.49 per cent increase in demand for it.
Fig. 3.7:
Linear Demand Curve
Problem in using arc elasticity. The arc elasticity
should be measured, interpreted and used carefully, otherwise it may lead to wrong decisions.
Arc elasticity coefficients differ between the same two finite points on a demand curve if direction of change in price
NOTES Self-Instructional Material 77 Analysis of Market Demand and Demand Elasticities
is revsersed. For instance, as estimated in Eq. (3.10),
the elasticity between points J and K — moving from J to K
equals 1.49. It may be wrongly interpreted that the elasticity of demand for commodity X between points J and K equals 1.49 irrespective of direction of price change. But it is not true. A reverse movement in the price, i.e., the movement from point K to J implies a different elasticity co-efficient (0.43). Movement from point K to J gives P = 10, ΔP = 10 – 20 = –10, Q = 75
and ΔQ = 75 – 43 = 32. By substituting these values into the elasticity formula, we get
e p = – 32 10 . 10 75 – = 0.43 ...(3.11) The measure of elasticity coefficient in Eq. (3.11) for the reverse movement in price is obviously different from one given
by Eq. (3.10).
It means that the elasticity depends also on the direction of change
in price. Therefore, while measuring price
elasticity, the
direction of price change should be carefully noted.
Some Modifications. Some modifications have been suggested in economic literature to
resolve the problems associated with arc elasticity. First, the problem arising due to the change in the direction of price change may be avoided by using the lower values of P and Q in the elasticity formula, so that e p = – . l l P Q P Q Δ Δ where P l = 10 (the lower of the two prices) and Q l = 43 (the lower of the two quantities). Thus, e p = – 32 10 . 10 43 = 0.74 ...(3.12) This method is however devoid of the logic of calculating percentage change because the choice of lower values of P and Q is arbitrary—it is not, in accordance with the rule of calculating percentage change. Second, another method suggested to resolve this problem is to use the average of upper and lower values of P and Q in fraction P/Q. In that case the formula is e p = – 1 2 1 2 ( )/2 ( )/2
P P Q P Q Q +
Δ · Δ + or e p = – 1 2 1 2 1 2 1 2 ( ) 2 . ( ) 2
Q Q P P P P Q Q – + – + ...(3.13) where subscripts 1 and 2
denote lower and upper values of prices and quantities.
Substituting the values from our example, we get, e p = – 43 75 (20 10) 2 . 20 10 (43 75) 2 – + – + = 0.81.
This method has its own drawbacks as the elasticity coefficient calculated through this formula, refers to the elasticity mid-way between P 1 P 2 and Q 1 Q 2 . The
elasticity co- efficient (0.81)
is not applicable for the whole range of price-quantity combinations at different points between J and K on the demand curve (Fig. 3.7)—it only
gives a mean of the elasticities between the two points.
Point Elasticity
Point elasticity on a linear demand curve. Point elasticity is also a way to resolve the problem in measuring the elasticity. The concept of point elasticity is used for measuring price elasticity where change in price is infinitesimally small.
NOTES 78 Self-Instructional Material Analysis of
Market Demand and Demand Elasticities
Fig. 3.8: Point Elasticity
Point elasticity

is the elasticity of demand at a finite point on a demand curve,
e.g., at point P or B on the linear demand curve MN (Fig. 3.8). This is in contrast to the arc elasticity between points P and B. A movement form point B towards P implies change in price (DP) becoming smaller and smaller, such that point P is almost reached. Here the change in price is infinitesimally small. Measuring elasticity for an infinitesimally small change in price is the same as measuring elasticity at a point. The formula for measuring point elasticity is given below. Point elasticity (e p) = P Q Q P ∂ · ∂ ...(3.14) Note that Q P ∂ ∂ has been substituted for Q P
Δ Δ
in the formula for arc elasticity. The derivative Q P ∂ ∂ is reciprocal of the slope of the demand curve MN. Point elasticity is thus the product of price-quantity ratio at a particular point on the demand curve and the reciprocal of
the slope of the demand line.
The reciprocal of the slope of the straight line MN at point P is
geometrically given by QN PQ .
Therefore, Q P ∂ ∂ = QN PQ Note that
at point P, price P = PQ and Q = OQ. By substituting these values in Eq. (3.14), we get e p =
PQ QN QN OQ PQ OQ · = Given the numerical values for QN and OQ, elasticity at point P can be easily obtained. We may compare here the arc elasticity between points J and K and point elasticity at point J in Fig. 3.3. At point J, e p = QN OQ = 108 43 43 – = 1.51 Note that e p = 1.51 is different from various measures of arc elasticities (i.e., 1.49, 0.43, 0.7, 0.81).
As we will see
below, geometrically, QN/OQ = PN/PM. Therefore, elasticity of demand at point P (Fig. 3.8) may be expressed as e p = PN PM
NOTES Self-Instructional Material 79 Analysis of Market Demand and Demand Elasticities
Proof. The fact that e p = PN/PM can be proved as follows. Note that in Fig. 3.8, there are three triangles—DMON, DMRP and DPQN—and –
MON, –MRP and –PQN are right angles. Therefore, the other corresponding angles of the three triangles will always be equal and hence, DMON, DMRP and DPQN are similar.
According to geometrical properties of similar triangles, the ratio of any two sides of a triangles arc always equal to the ratio of
the corresponding sides of the other triangles. By this rule, between DPQN and DMRP, QN PN = RP PM Since RP = OQ, by substituting OQ for RP
in the above equation, we get QN PN =
OQ PM It follows that QN OQ = PN PM It
may thus be concluded
that price elasticity of demand at point P (Fig. 3.8) is given by e p = PN PM
It may thus be concluded that the
price elasticity of demand
at any point on a linear demand curve is equal to the ratio of lower segment to
the upper segments of the line, i.e., e p = Lower segment Upper segment
Point elasticity on a non-linear demand curve. The ratio DD/DP in respect of a non- linear demand curve is different at each point. Therefore, the method used to measure point elasticity on a linear demand curve cannot be applied straightaway. A simple modification in technique is required. In order to measure point elasticity on a non-linear demand curve, the chosen point is first brought on a linear demand curve. This is done by drawing a tangent through the chosen point. For example, suppose we want to
Fig. 3.9: Price and Demand
measure elasticity on a non-linear demand curve, DD (Fig. 3.9) at point P. For this purpose, a tangent MN is drawn through point P. Since demand curve DD and the line
NOTES 80 Self-Instructional Material Analysis of Market Demand and Demand Elasticities
MN pass through the same point (P),
the slope of the demand curve and that of the line at this point
is the same. Therefore,
the elasticity of demand curve at point P will be equal to that of the line at this point. Elasticity of the line at point P can be measured
as e p =
P P Q
P ∂ · ∂ = PQ QN QN OQ PQ OQ · = As proved above, geometrically, QN OQ =
PN PM .

Fig. 3.10:
Point Elasticities of
Demand
To conclude, at midpoint
of a linear demand curve, e p = 1,
as shown at point
P in
Fig. 3.10.
It follows that
at any point above the point P, e p < 1,
and at any point below the
point P, e p > 1.
According to this formula, at the extreme point N,
e p = 0, and at extreme point M, e p
is undefined because division by zero is undefined. It must be noted here that these results are relevant between points M and N
and that the elasticities at the extreme points M and N are, in effect, undefined. 3.4.3
Measuring Price Elasticity from a Demand Function
The price elasticity of demand for a product can be measured directly from the
demand function.
In this section, we will describe the method of measuring price elasticity of demand
for a
product from the demand function—both linear and nonlinear. It may be noted here that if a demand function is given, arc elasticity can be measured simply by assuming two prices and working out ΔP and ΔQ. We will, therefore, confine ourselves here to point elasticity of demand with respect to price. Price Elasticity from a Linear Demand Function.
Suppose that a linear demand function is given as Q = 100 − 5P Given the demand function, point elasticity can be measured for any price. For example, suppose we want to measure elasticity at P = 10.
We know that
e p = Q P P Q δ δ · The term dQ/dP in the elasticity formula is
the slope of the demand curve. The slope of the demand curve
can be found by differentiating the demand function.
That is,
Check Your Progress 13. What is meant by elasticity of demand? 14. What
is meant by price elas- ticity of demand? How is it measured? 15. Suppose price elasticity co- efficient is 1.5. What does it mean? 16. Distinguish between point elasticity and arc elasticity of demand.
 Q
P δ δ = (100 5) 5
P P δ δ − = − Having obtained the slope of the demand curve as dQ/dP = − 5, e p at P = 10 can be calculated as follows. Since,
P = 10, Q = 100 − 5(10) = 50. By substituting these values into the elasticity formula, we get, e p = (− 5) 10 50 = −1
Similarly at P = 8, Q = 100 − 5(8) = 60
and e p = − 5 (8/60) = − 40/60 = − 0.67 and at P = 15, Q = 100 − 5(15) = 25, and e p = − 5(15/25) = − 75/25 = − 3 Price Elasticity from a Nonlinear Demand Function. Suppose a nonlinear demand function of multiplicative form is given as follows Q = aP −b ... (3.15) and we want to compute the price elasticity of demand. The formula for computing the price elasticity is
the same, i.e., e p =
Q
P P Q δ δ · What we
need to compute the price-elasticity coefficient is to find first the value of the first term, dQ/dP, i.e.,
the slope of the demand curve. The slope can be obtained by
differentiating the demand function, Thus, Q P δ δ = − baP −b-1 ...(3.16) By substitution, e p can be expressed as e p = − baP −b−1 P Q = b baP Q − − ...(3.17) Since Q = aP − b , by substitution, we get e p = b b baP aP − − − = −b ... (3.18)
Equation (3.18) shows that when a demand function is of a multiplicative or power form, price elasticity coefficient equals the power of the variable P. This means that price elasticity in the case of a multiplicative demand function remains constant regardless of a change in price. 3.4.4 Price Elasticity
and Total Revenue

A firms aiming at enhancing its total revenue would like to know whether increasing or decreasing the price would achieve its goal. The price-elasticity coefficient of demand for its product at different levels of its price provides the answer to this question. The simple answer is that if
e p < 1,
then decreasing
the price will increase the total revenue and if
e q > 1,
then increasing the price will increase the
total revenue. To prove this point, we need to know the total revenue (TR) and marginal revenue (MR) functions and measures of price-elasticity are required. Since TR = Q.P, we need to know P and Q. This information can be obtained through the demand function.
Let us recall our demand function (3.2) given as
Q = 100 – 5P
NOTES 82 Self-Instructional Material
Analysis of Market Demand and Demand Elasticities
Price function (P) can be derived from the demand function as P = 20 – 0.2P ...(3.19) Given the price function,
TR can be obtained as TR = P . Q = (20 – 0.2Q)Q = 20Q – 0.2Q 2
From this TR-function, the MR-function can be derived as MR = TR Q ∂ ∂ = 20 – 0.4Q
The TR-function is graphed in panel (a) and
the demand and MR functions are presented in panel (b) of Fig. 3.11. As the figure shows, at point P on the demand curve, e = 1 where output, Q = 50. Below point P, e > 1
and above
point P, e < 1. It can be seen in panel (a) of Fig. 3.11 that TR increases
so long as
e < 1; TR reaches its maximum level where e = 1; and it decreases when e > 1. Fig. 3.11: Price Elasticity and Total Revenue
The relationship between price-elasticity and TR is
summed up in Table 3.3. As the table shows, when demand is perfectly inelastic (
i.e.,
e p = 0 as
in
the case of a vertical demand line) there is no decrease in quantity demanded when price is raised and vice versa. Therefore, a rise in price increases the total revenue and vice versa.
In case of an inelastic demand (
i.e.,
e p > 1),
quantity demanded increases by
less than the proportionate decrease in price and hence the total revenue falls when price falls. The total revenue increases when price
increases because quantity demanded decreases by less than
the proportionate increase in price.
NOTES Self-Instructional Material 83 Analysis of Market Demand and Demand Elasticities
If demand for a product is unit elastic (e p = 1)
quantity demanded increases (or decreases) in the proportion of decrease (or increase) in the price.
Therefore, total revenue remains unaffected. If demand for a commodity
has e p < 1,
change in quantity demanded is greater than the proportionate change in price.
Therefore,
the
total revenue increases when price falls and vice versa. The case of infinitely elastic demand
represented by a horizontal straight line
is rare. Such a demand line implies that a consumer has the opportunity to buy any quantity of a commodity and the seller can sell any
quantity of a
commodity, at a given price. It is the case of
a

commodity being bought and sold in a perfectly competitive market.
A seller, therefore, cannot charge a higher or a lower price.
Table 3.3: Elasticity, Price-change and Change in TR
Elasticity Change in Change in Co-efficient Price TR e = 0 Increase Increase Decrease Decrease
e > 1 Increase Increase Decrease Decrease e = 1 Increase No change Decrease No change e < 1 Increase Decrease Decrease Increase e = •
Increase Decrease to zero Decrease Infinite increase* *
Subject to the size of the market. 3.4.5
Price Elasticity and Marginal Revenue The relationship between price-elasticity and the total revenue (TR) can be known more precisely by finding the relationship between price-elasticity and marginal revenue (MR). MR is the first derivative of TR-function and
TR = P.Q (where P = price, and Q = quantity sold). The
relationship between price-elasticity, MR and TR is shown below. Since TR = P.
Q, MR = ( ) P Q
P P Q Q Q ∂ · ∂ = + ∂ ∂ = 1 Q P P P Q ⎛ ⎞ ∂ + · ⎜ ⎟ ⎝ ⎠ ∂ ⎛ ⎞ ⎜ ⎟ ⎝ ⎠ ...(3.20)
Note that
Q P P
Q ∂ · ∂ in Eq. (3.20) is the reciprocal of elasticity. That is, Q P P Q ∂ · ∂ = – 1 p e By substituting – 1 e for Q P P Q ∂ · ∂ in Eq. (3.20), we get MR = 1 1 p P e ⎛ ⎞ – ⎜ ⎟ ⎝ ⎠ ...(3.21)
NOTES 84
Self-Instructional Material Analysis of Market Demand and Demand Elasticities
Given this
relationship between MR
and price-elasticity of demand, the decision-markers can easily know whether it is beneficial to change the price. If e = 1, MR = 0. Therefore, change in price will not cause any change in TR. If e > 1, MR > 0, TR decreases when price decreases and
TR increases when price increases. And,
if e < 1, MR < 0, TR increases if price decreases and
vice versa.
Price Elasticity, AR and MR. Given the Eq. (3.21), price elasticity (
e p)
can be expressed in terms of AR and MR. We know that P = AR. So Eq. (3.21) can be written as MR = 1 1 p AR e ⎛ ⎞ – ⎜ ⎟ ⎝ ⎠ MR = AR – p AR e By rearranging the terms, we get MR – AR = –
p AR e or MR AR AR – = – 1 p e
The reciprocal of this equation gives the measure of elasticity (e), i.e., AR MR AR – = – e p or e p = AR AR MR – 3.4.6 Determinants of
Price Elasticity of Demand We have noted above that price-elasticity of a product may vary between zero and infinity. The price-elasticity of a product within this range depends
on the following factors: 1.
Availability of Substitutes. One of the most important determinants of elasticity of demand for a commodity is the availability of
its
close substitutes. The higher the degree of closeness of
the substitutes, the greater the elasticity of demand for the commodity.
For instance, coffee and tea may be considered as close substitutes for one another. If price of one of these goods increases,
the other commodity becomes relatively cheaper. Therefore, consumers buy more of
the relatively cheaper good and less of the costlier one, all other things remaining the same.
The elasticity of demand for both these goods will be higher.
Besides, the wider the range of
the substitutes, the greater the elasticity. For instance, soaps, toothpastes, cigarettes, etc., are available in different brands, each brand being a close substitute for the other.
Therefore, the price- elasticity of demand for each brand is much greater than
that for
the generic
commodity. On the other hand, sugar and salt do not have close substitutes and hence their price-elasticity is lower. 2.

Nature of Commodity.
The nature of a commodity also affects the price- elasticity of its demand. Commodities can be grouped as luxuries, comforts and necessities.
Demand for luxury goods (e.g.,
high-price refrigerators, TV sets, cars, decoration
items,
etc.) is more elastic than the demand for
neces- sities
and comforts
because consumption of luxury goods can be dispensed with or postponed when their prices rise. On the other hand, consumption of necessary goods, (e.g., sugar, clothes, vegetables) cannot be postponed and
Check Your Progress 17. Suppose
demand function is given as Q = 100 – 5P. Find
the elasticity of demand between price 12 and 10. 18.What is the relationship between price elasticity and total revenue? 19.
What
is
the relationship between price elasticity and marginal revenue? 20.
What are the determinants of price elasticity of demand?
NOTES Self-Instructional Material 85 Analysis of Market Demand and Demand Elasticities
hence their demand is inelastic. Comforts have more elastic demand than necessities and less elastic than luxuries.
Commodities are also categorized
as durable goods and perishable or non-durable goods.
Demand for durable goods is more elastic than that for
non-durable
goods, because when the price of the former increases, people either get the old one repaired instead of replacing it or buy a '
second hand'. 3.
Weightage in the total consumption.
Another factor that influences the elasticity of demand is
the proportion of income which consumers spend on a particular commodity.
If proportion of income spent on a commodity is large, its demand will be
more elastic
and vice versa.
Classic examples of such commodities are salt, matches, books, pens, toothpastes, etc.
These goods
claim a very small proportion of income. Demand for these goods is generally inelastic because increase in the price of such goods does not substantially affect
the consumer's budget.
Therefore, people continue to purchase almost the same quantity even when their prices increase. 4.
Time factor
in adjustment of consumption pattern.
Price-elasticity of demand depends also on the time consumers need to adjust
their consumption pattern
to a new price: the longer the time allowed, the greater the elasticity.
The reason is that over a period of time, consumers are able to adjust their expenditure pattern to price changes. For instance, if
the
price of TV sets is decreased, demand will not increase immediately unless people possess excess purchasing power. But over time, people may be able to
adjust their expenditure pattern so that they can buy a
TV set
at
a lower (new) price. Consider another example. If price of petrol is reduced, the demand for petrol
is unlikely to increase significantly. Over time, however, people
may be encouraged by

low petrol prices to buy automobiles resulting in a significant rise in demand for petrol. 5.
Range of commodity use. The range of uses of a commodity also influences the price-desticity its demand. The wider the range of the
uses of a product, the higher the elasticity of demand for the decrease in price.
As the price of a multi-use commodity decreases, people extend their consumption to its other uses. Therefore, the demand for such a commodity generally increases more than
the proportionate increase
in its price. For instance, milk can be taken as it is
and in the form of curd, cheese, ghee and butter-milk.
The demand for milk will therefore be highly elastic for decrease in price.
Similarly, electricity can be used for lighting, cooking, heating and for industrial purposes. There- fore, demand for electricity
has a greater elasticity. However, for the increase in price,
the commodity has
a lower elasticity because the consumption of a normal good cannot be cut down substantially beyond a point when the price of the commodity increases. 6.
Proportion of market supplied. The
elasticity
of market demand also depends on the proportion of the market supplied at the ruling price. If less than half of the market is supplied at the ruling price,
price-elasticity of demand will be higher than 1
and
if more than half of the market is supplied e > 1.
That is, the
demand
curve is more elastic
over the upper half than over the lower half. 3.4.7
Cross-Elasticity of Demand
The
cross-elasticity is the measure of responsiveness of demand for a commodity to the changes in
the price of its substitutes and complementary goods. For instance,
cross-
elasticity
of demand
for tea is the percentage change in its quantity demanded
with respect
to the change in the price of
its substitute, coffee.
The formula for
NOTES 86 Self-Instructional Material Analysis of Market Demand and Demand Elasticities
measuring cross-elasticity of demand for tea (e t,c)
and the same for coffee (e c,t) is
given below. e t,c = Percentage
change in
demand for tea ( ) Percentage changein price of coffee ( )
t c Q P = .
c t t c P Q Q P Δ Δ ...(3.22) and
e c,t = . t c c t P Q Q P Δ Δ ...(3.23)
The same formula is used to measure the
cross-elasticity of demand for a good
with respect to a
change in the price of
its complementary goods. Electricity to electrical gadgets, petrol to automobile, butter to bread, sugar
and milk
to tea and coffee, are
the examples of complementary goods.

It is important to note that
when two goods are substitutes for one another, their demand has positive cross-elasticity because
increase
in the
price of one increases the demand for
the
other.
And,
the
demand for complementary goods has negative cross-elasticity, because increase in the price of
a good decreases the demand for
its complementary goods. Uses of Cross-Elasticity.
An important use of cross-elasticity
is that it is used
to define substitute goods. If cross-elasticity between two goods is positive, the two goods may be considered as substitutes of one another.
Also,
the greater the cross-elasticity, the closer the substitute. Similarly,
if cross-elasticity of demand for two related goods is negative, the two
may be considered as complementary of
one another: the
higher the negative cross-elasticity, the higher the degree of complementarity.
The concept of cross-elasticity is of vital importance in changing price of products having substitutes and complementary goods. If cross-elasticity in response to the price of substitutes is greater than one, it would be inadvisable to increase the price; rather, reducing
the price may prove beneficial. In case of complementary goods also, reducing the
price may be helpful in maintaining the demand in case the price of the complementary good is rising. Besides, if accurate measures of cross-elasticities are available,
the firm can forecast the demand for its product and can adopt necessary safeguards against
fluctuating
price
of substitutes and complements. 3.4.8
Income-Elasticity of Demand
Apart from the price of a product and its substitutes, consumer's income is
another basic
determinant of demand for a product. As noted earlier, the relationship between
quantity demanded and income is
of
positive nature, unlike the negative
price-demand relationship. The demand for goods and services increases with increase in consumer's income and vice-versa.
The responsiveness of demand to the changes in income is known as income-elasticity of demand. Income-elasticity of demand for a product, say X, (i.e., e y) may be defined as:
e y =
q q q q X X X Y
Y
X Y Y Δ Δ = · Δ Δ ...(3.24) (
where X q = quantity of X demanded; Y = disposable income; ΔX q =
change in quantity of X
demanded; and ΔY = change in income) Obviously,
the formula for measuring income-elasticity of demand is the same as that for measuring the price-elasticity.
The only change in the formula is that the variable
NOTES Self-Instructional Material 87 Analysis of Market Demand and Demand Elasticities '
income' (Y) is substituted for the variable 'price' (P). Here, income refers to the disposable income, i.e., income net of taxes. All other formulae for measuring price- elasticities may by adopted to measure the income-elasticities, keeping in mind the difference between them and the purpose of measuring income-elasticity.

Unlike price-elasticity of demand, which is always negative 9 , income-elasticity of demand is always positive 10 because of a positive relationship between income and
quantity demanded of a product. But
there is an exception to this rule.
Income-elasticity
of demand for an inferior good is negative, because of the inverse substitution effect. The demand for inferior goods decreases with increase in
consumer's income
and vise- versa.
The reason is that
when income increases, consumers switch over to the consumption of superior substitutes, i.e., they substitute superior
goods for inferior ones. For instance, when income rises, people prefer to buy more of rice and wheat and less of inferior foodgrains; buy more of meat and less of
potato, and travel more by plane
and less by train.
Nature of commodity and income-elasticity.
For all normal goods, income-elasticity is positive though the degree of elasticity varies
in accordance with the nature of commodities. Consumer
goods
of the three categories, viz., necessities, comforts and luxuries have different elasticities.
The general pattern of income-elasticities of different goods for increase in income and their effect on sales are given in Table 3.4.
Table 3.4:
Income-
Elasticities Consumer goods Co-
efficient of Effect on Sale income-elasticity 1.
Essential goods Less
than one (e y > 1)
Less than proportionate change in sale 2. Comforts Almost equal to unity Almost proportionate (
e y ≅ 1)
change in sale 3.
Luxuries Greater
than unity More than proportionate (e y < 1) increase
in
sale
The
income-elasticity of demand for different categories of goods may, however, vary from household to household and from time to time, depending on
the
choice and preference of the consumers, levels of consumption and income, and their susceptibility to 'demonstration effect'. The other factor which may cause deviation from the general pattern of income-elasticities is the frequency of increase in income. If
frequency
of rise in income is high, income-elasticities will conform to the general pattern.
Uses of Income-elasticity in Business Decisions. While price and cross elasticities are of greater significance in
the pricing of a product
aimed at maximizing the total revenue in the short period, income-elasticity of a product
is of a greater significance in production planning and management in the long run,
particularly
during the period of a business cycle.
The concept of income-elasticity can be used
in estimating
future demand provided that
the rate of increase in income and income-elasticity of demand for the
products are known. The knowledge of income elasticity can thus be useful in forecasting demand, when

a change in personal incomes
is expected, other things remaining the same. It also helps in avoiding over-production or under- production. In forecasting demand, however, only the relevant concept of income and data should be used.
It is generally believed
that the demand for goods and services increases with increase in
GNP depending on the marginal propensity to consume. This may be true in the context of aggregate national demand, but not necessarily for
a particular
product. It is quite likely that increase in GNP flows to a section of consumers who do not,
or are not in a position to,
consume the product in which a businessman is interested. For instance, if the major proportion of incremental GNP goes to those who can afford a
NOTES 88 Self-Instructional Material Analysis of
Market Demand and Demand Elasticities
car, the growth rate in GNP should not be used to calculate
income-elasticity
of demand for bicycles. Therefore, the income of only a relevant class or income-group should be used. Similarly, where the product is of a regional nature, or if there is a regional division of market between the producers, the income of only the relevant region should be used in forecasting the demand.
The concept of income-elasticity may also be used to define the 'normal' and 'inferior' goods. The goods whose income-elasticity is positive for all levels of income are termed 'normal goods'. On the other hand, goods whose income-elasticities
are negative beyond a certain level of income are termed 'inferior goods'. 3.4.9
Advertisement or Promotional Elasticity
of
Sales
The expenditure on advertisement and on other sales-promotion activities does help in promoting sales, but not
in
the same degree at all levels of the total sales.
The concept of advertisement elasticity is useful in determining the optimum level of advertisement expenditure.
The concept of advertisement-elasticity assumes a greater significance in deciding on
advertisement expenditure, particularly when
the government imposes restriction on advertisement cost or
there is competitive advertising by
the rival firms. Advertisement-elasticity (
e A) of sales may be defined as e A =
S/S S A A/A A S Δ Δ = · Δ Δ where S = sales; ΔS = increase in sales; A = initial advertisement cost, and ΔA = additional expenditure on advertisement.
Interpretation of advertisement-elasticity. The advertisement elasticity of sales varies between
e A = 0 and e A = •.
Interpretation of some measures of advertising elasticity is given below. Elasticities Interpretation
e A = 0 Sales do not respond to the advertisement expenditure.
e A < 0
but > 1
Increase in total sales is less than proportionate to the increase in advertisement expenditure.
e A = 1
Sales increase in proportion to the increase in expenditure on advertisement.
e A <
Sales increase at a higher rate than the rate of increase of adver- tisement expenditure. Determinants of advertisement-elasticity. Some
of the important factors which determine advertisement
elasticity are the following: (i) The level of total sales. In the initial stages of sale of a product, particularly of one which is newly introduced in the market,
the advertisement-elasticity is greater than unity. As sales increase, the

elasticity decreases. For instance, after the potential market is supplied, the function of advertisement is to create additional demand by attracting more consumers to the product, particularly those who are slow in adjusting their consumption expenditure to provide for new commodities. Therefore,
demand increases at a rate lower than the rate of increase in
advertisement expenditure. (
ii) Advertisement by rival firms. In a highly competitive market, the effectiveness of advertisement by
a firm is also determined by the relative effectiveness of advertisement by the rival
firms. (iii) Cumulative effect of past advertisement. In case expenditure incurred on advertisement in the initial stages is not adequate enough to be effective, elasticity may be very low. But over time, additional doses of advertisement
Check Your Progress 21.What is meant by cross elasticity of demand? Write the formula for measuring cross elasticity. 22. What are the uses of cross elasticity in business decision- making? 23.What factors affect the advertisement-elasticity of demand? 24.How is price expectation related to demand elasticity?
NOTES Self-Instructional Material 89 Analysis of Market Demand and Demand Elasticities
expenditure may have a cumulative effect on the promotion of sales and advertising elasticity may increase considerably.
(iv) Other factors. Advertisement elasticity is also affected by other factors affecting the demand for a product, e.g., change in products' price,
consumer's
income, growth of substitutes and their prices. 3.4.10
Elasticity of Price-Expectations Sometimes, mainly during the period of price fluctuations, consumer's
price expectations play a much more important role in determining demand
for a commodity
than any other factor. The concept of price-expectation-elasticity
was devised and popularised by J.R. Hicks in 1939. The
price-expectation-elasticity refers to the expected change in future price as a result of change in current prices of a product. The elasticity of
price-expectation is defined and measured by the formula given below. e x = / / f f f c c c c f P P P
P
P P P P Δ Δ = · Δ Δ ...(3.25) where P c and P f
are current and future prices, respectively.
The coefficient e x
gives the measure of expected percentage change in future price as a result of 1 per cent change in present price. If e x < 1,
it indicates that future change in price will be greater than the present
change
in price, and vice versa. If
e x = 1,
it indicates that the future change in price will be equal to the change in the current price.
The concept of elasticity of price-expectation is very useful in formulating future pricing policy. For example, if e x < 1, it indicates
that
sellers will be able to sell more in the future at higher prices. Thus, businessmen may accordingly determine their future pricing policy. 3.4.11
Some Estimates of Demand
Elasticities In this section, we present a summary of some estimates of demand elasticities, made in the United States and Britain. Table 3.5: Price Elasticities of Demand for Selected Products in the US Commodity Price elasticity of Income demand elasticities Tomatoes 4.60 — Restaurant meals 1.63 1.40 Glassware 1.34 — Taxi Service 1.24 — Radio & TV Service 1.19 — Furniture 1.01 1.48 Housing 1.00 — Alcohol 0.92 1.54 Movies 0.87 — Foreign Air Travel 0.77 — Shoes 0.70 1.40 Auto Repair 0.36 — Medical Insurance 0.31 0.92 Gasoline and oil 0.14 0.48 Owner Occupied Housing — 1.49 Source: H. Houthakker and L.D. Taylor, Consumer Demand in the United States: Analysis and Projections, Mass., Harvard University Press, 2nd Edn. quoted from Mansfield, E., op. cit.

NOTES 90 Self-Instructional Material Analysis of Market Demand and Demand Elasticities Table 3.6: Price Elasticities of Demand for Car Models 1. Chevrolet Impala Relative price elasticity – 14.79 Cross-elasticity w.r.t. Pontiac Catalina 19.30 2. Pontiac Catalina Relative price elasticity – 16.99 Cross elasticity w.r.t. Chavrolet Impala 5.09 3. Plymouth Fury Relative price elasticity – 4.59 Cross elasticity w.r.t. Chevrolet Impala 4.22 Pontiac Catalina 0.49 Ford Calaxy 6.82 Source : F.O. Irvine, Jr., "Demand Equations for Individual New Car Models Estimated Using Transition Prices with Implications for Regulatory Issues." South Eco. Jl., (4.9), January 1983. Table 3.7: Demand Elasticities of Electricity Variable Residential Commercial Industrial use use use Electricity price – 0.794 – 0.916 – 1.404 Per capita income 0.714 1.249 – 0.450 Price of natural gas 0.159 – 0.193 – 0.293 Source : R. Halvorsen "Demand for Electricity Energy in the United States," South Eco. Jl., (43), April 1976. Table 3.8: Price and Income Elasticities of Some Selected Consumer Goods in Britain Consumer Goods Price Income Elasticity Elasticity Food 0.00 0.21 Clothing 0.92 2.00 Housing 0.31 0.03 Fuel 0.28 1.67 Drinks and Tobacco 0.60 1.22 Transport and Communication 1.21 1.23 Source : Deaton and Muellbauer, 1980 3.5 SUMMARY • This unit deals with market demand and demand elasticities. •
Market demand is defined as sum of individual demand for a product at a given price per unit of time. •
Market demand is generally classified as (i) short-term demand and (ii) long-term demand. Short-term demand is linked to only the price of the product whereas long-term demand is assessed on the basis of all other determinants of demand. • The long-term determinants of demand include (i) price of the product, (ii) consumer's income, (iii) prices of the substitute and complementary goods, (iv) taste and preferences, (v) advertisement, (vi) price expectations, (vii) consumer credit facilities, (viii) demonstration effects, and (ix) population. • The nature and
extent of relationship between demand for a product and its determinants
are
expressed through a demand function. For example, the relationship
NOTES Self-Instructional Material 91 Analysis of Market Demand and Demand Elasticities between price and demand is expressed as Q = A – bP. Here, the minus sign shows the nature and 'b' gives the extent of relationship. • Elasticity is an important concept used in business decision-making, especially in regard to changing the price, all
other factors remaining constant. •
Elasticity of demand
is
the degree of responsiveness of demand to change in
its determinants.
The
formula for estimating price elasticity of demand is
given as
Price Elasticity (e p) = 0 0 . PQ P Q Δ Δ , where P 0 is original price and Q 0 is original quantity demanded. • Income Elasticity (e y) = 0 0 . YQ Y Q Δ Δ , where Y = Consumer's income • Cross Elasticity ( ) p s e = 0 0 . S S P Q P Q Δ Δ , where P s = Price of substitute good • Elasticity (e a) = 0 0 . AQ A Q Δ Δ , where A = Advertise expenditure • Price Expectation Elasticity (e px) = . f
c c f P P P P Δ Δ , where subscripts c and f indicate current and future prices respectively. 3.6
ANSWERS TO 'CHECK YOUR PROGRESS' 1.
Market demand is defined as the sum of individual demands for a product per unit of time
given the price. 2. Autonomous demand is one that arises due to biological or physical need or desire to consume a product whereas derived demand arises due to consumption or use of some other goods, e.g., demand for petrol arises due to the use of automobiles. Demand for petrol is a derived demand. 3. Consumer durables are those which are used over time, e.g., clothes, house, car,
etc.
Non-durable goods are those which can be consumed only once, e.g., food items,
travel tickets, and petrol, etc. 4. Short-term demands are those which exist in a short period, e.g., demand for New Year Greeting cards, crackers for Deepawali, fashion goods, umbrellas etc. Long- term demands are those which last for a long period. 5.
The determinants of demand for a product are (i)
price of the product, (ii) price of its substitutes and complements, (iii) consumer's income, (iv) taste and
preferences, (v)

advertisement, (vi) price expectations, (vii) number of consumers, (viii) demonstration effect, and (ix) availability of consumer credit. 6. The change in the price of a product changes demand of substitutes in the same direction. For example, when price of coffee increases, demand for tea—a substitute of coffee—increases and vice-versa. 7. When consumer's income increases, the demand for inferior goods decreases. For example, when income increases demand for jwar and bajra (inferior food- grains) decreases and for cheaper goods decreases. 8. When consumers imitate consumption of superior sections of the society, this is called demonstration effect. 9. A demand function demand for a product and its determinants. A short-run demand function links demand for a product to its price, assuming other determinants to remain constant. The short-run demand function is written as D = f (P). 10. A linear demand function shows a constant relationship between demand for a product and its changing price. It is expressed as D – a – bP. Here 'b' shows the
NOTES 92 Self-Instructional Material Analysis of Market Demand and Demand Elasticities constant relation between D and P. If relation between demand and price keeps changing, it produces a non-linear demand function. 11. Given demand function as D = 50 – 2P, quantity demanded at P = 10 equals D = 50 – 2 × 10 = 30. 12. A multi-variate demand function includes all determinants of demand written as D x = f (P x , P s , I, T, A, C .....) where P x = Price of good X, P s = price of substitute, I = income, T = taste, A = advertisement, and C = consumer credit. Its significance lies in that it gives the nature and extent of relation between
demand and its determinants. 13.
Elasticity of demand is the
responsiveness of demand to change in its determinants.
For example,
price elasticity
of demand is the measure of
the degree of responsiveness of demand
to change in
price. 14.
Price elasticity of
demand
is
measured
by the
following formula: (
e
p) = 0 0 . PQ P Q Δ Δ . 15. If price elasticity coefficient is 1.5, it means that if price change by one percent, demand changes by 1.5 percent. 16. Point elasticity
is the measure of elasticity of demand curve whereas arc elasticity is the measure of elasticity between any two points on the demand curve. 17. Given the demand function Q = 100–5P, if P =10, then Q = 100–5(10) = 50 and at P =12, Q = 100–5(12) = 40. If price decreases from 12 to 10, then ΔP = 2 and ΔQ = 40–50 = –10. Thus, (e p) = – 0 0 . PQ P Q Δ Δ = 10 10 . 2 40 = 1.25. 18. If e =1, total revenue does not change total revenue with change in price; if e > 1, increase in price increases total revenue and decrease in price decrease total revenue; and if e < 1, increasing price decrease total revenue and decreasing price increases total revenue. 19. The relationship between price elasticity and marginal revenue (MR) is given by the following rules 1 1 p MR P e ⎛ ⎞ = – ⎜ ⎟ ⎝ ⎠ . 20. Price elasticity of demand depends on (i) nature of commodity, (ii) availability of substitute, (iii) percentage of expenditure to total income, (iv) number of com- modity use, and (v) time required for adjustment in consumption. 21. Cross elasticity of demand is the elasticity of demand in respect of price of the substitute good. Suppose X and Y are two substitute goods, then (e ps) = . y y x P Q P Q Δ Δ . 22.
Cross elasticity of demand is used in assessing the change in demand for a product due to change in the price of substitute. 23. Advertisement elasticity depends on (i) the
total sales, (ii) advertisement by rival firms, (iii) cumulative effect of past advertisement. 24.
When people expect prices to decrease price elasticity becomes lower. So is the case with expectation of rising prices because people tend to buy more even if prices are raised.
NOTES Self-Instructional Material 93 Analysis of Market Demand and Demand Elasticities 3.7 EXERCISES AND QUESTIONS 1.
What are the determinants of market demand for a commodity? How do the changes in the following factors affect the demand for a

commodity? (a) Price, (b) Income, (c) Price of the substitute, (d) Advertisement, and (e) Population. Also describe the nature of relationship between demand for a product and these factors. (Consider one factor at a time assuming other factors remain constant). 2. Distinguish between: (i) demand function and demand schedule, (ii) individual demand and market demand, and (iii) demand for normal goods and inferior goods. 3. Define and distinguish between: (a) Arc elasticity and point elasticity, (b) Price elasticity and cross-elasticity, and (c) Income elasticity and price elasticity. 4. When prices of both substitutes and complements of a commodity, say X, rise, what happens to the demand for X : (a) rises, (b) falls, (c) remains constant, or (d) all of the above possibilities exist? 5. List the major purposes of demand analysis from the standpoint of management. Can management manipulate all the variables which affect demand? 6. (a) Distinguish between linear and non-linear demand functions. (b) What is the difference between the following demand functions? (i) Q x = 1 – 5 P x ; (ii) Q x = 100 – 2P 2 x (iii) Q x = Ap –b and (iv) Q x = (a/p + c) – b 7. What is meant by demand schedule, demand curve and demand function? Show how market demand is calculated from individual demand curves. 8. Which of the following commodities has the most inelastic demand and why? (a) Soap, (b) Salt, (c) Penicillin, (d) Cigarettes and (e) Ice-cream. 9.
Explain the following concepts separately: (i)
Income
elasticity of demand, (ii) Price elasticity of demand, and (iii)Elasticity of
price expectations.
What useful information do these concepts of elasticity
provide to management? 10. Given the demand function: Q d = 12 – P (a) find the demand and marginal revenue schedules, (b) plot the AR and MR schedules, (c) find marginal revenue when P = 10, 6 and 2, and (d) estimate the elasticity coefficient of the demand curve, when the total revenue is at the maximum. 11. Define elasticity of price expectation (E e). In the context of an environment of business recession, state briefly the implication of: (i) E e < 1, (ii) E e = 1, (iii) 0 > E e < 1, (iv) E e = 0 and (v) E e > 0. 12. A publishing company plans to publish a book. It finds from the sales data of other publishers of similar books that the demand function for the book can be expressed as Q = 5000 – 5P. Find out: (a) Demand schedule and demand curve, (b) Number of books sold when P = Rs. 25,
NOTES 94 Self-Instructional Material Analysis of Market Demand and Demand Elasticities (c) Price for selling 2500 copies, (d) Price for zero sales, (e) Point-elasticity of demand at price Rs. 20, and (f) Arc elasticity for a
fall in price from Rs. 25 to Rs. 20 and for a rise in price from Rs. 20 to Rs. 25. 13. Suppose the
demand function for a product is given as Q = 500 – 5P.
Find out: (i) Quantity demanded at price Rs. 15, (ii) Price to sell 200 units, (iii) Price for zero demand, and (iv) Quantity demanded at zero price. 14. Which of the following statements is true ? (i) If price elasticity = 1, MR = 0 (ii) If price elasticity < 1, MR < 0 (iii) If price elasticity > 1, MR > 0 (Ans. All Three) 15. Suppose individual demand schedules for A, B and C are given as follows: Price A's B's C's (Rs.) demand demand demand 5 80 40 20 10 40 20 10 15 20 10 5 20 10 5 0 25 0 0 0 Find (i) market demand schedule, (ii) market demand curve, (iii) elasticity when price
falls from Rs. 15 to Rs. 10, and (iv) elasticity when price rises from Rs. 10 to Rs. 15. 3.8
FURTHER READING
Baumol, William J.
Economic Theory and Operations Analysis, Prentice-Hall of India Pvt. Ltd., New Delhi, 1985.
Bilas, Richard, A., Microeconomic Theory, McGraw-Hill, New York, 1971. Brigham,
Eugene F. and James L. Pappas, Managerial Economics, Dryden Press, Hinsdale, Illinois (
latest edition). Douglas, Evans J., Managerial Economics: Theory and Practice and Problems, Prentice-Hall Inc., New Jersey. Ferguson, C.E., Microeconomics Theory, Richard D. Irwin, Home Wood, Ill. Leftwich, Richard H., The Price System and Resource Allocation, Dryden Press, Hinsdale, Ill. Mansfield, Edwin, Microeconomics: Theory and Application, W.W. Norton, New York. Nicholson, Walter, Intermediate Microeconomics and Its Application, Dryden Press, Hinsdale. Spencer, Milton H., Managerial Economics, Richard D. Irwin, Home-wood Ill.
Watson, Donald S., Price Theory and Its Uses, Houghton Mifflin, Boston.
Price Theory in Action, Houghton Miffln, Boston. Webb, Samuel C., Managerial Economics, Houghton Mifflin, Boston.
NOTES Self-Instructional Material 95 Analysis of Market Demand and Demand Elasticities References 1. Named after 19th century German Statistician, Christian Lorenz Ernst Engel. 2. For details see, Harvey Leibenstein, "Bandwagon, Snob, and Veblen Effect in the Theory of Consumer's Demand", Qly. Jl. Of Eco., 65 (May 1950). 3. Sellers provide 'buy now pay later' facility. 4. ΔD/ΔP is, in fact, reciprocal of the slope of a linear demand curve. 5. For example, Phillip L. Paalberg and Robert Thompson have estimated the US demand function for wheat as follow. Q w = 87.9041 – 0.0924 P w where Q w = demand for wheat and P w is wheat price (See their paper " Interrelated Products and the Effects of an Import Tariffs" in Agri. Eco. Res., 32, (October 1980). Quoted in J.R. Davis and Seemon Chang. Principles Managerial Economics, Prentice-Hall, 1968, p. 13. 6. Edwin
Mansfield, op. cit., p. 52. 7. The elasticity formula

is derived as follows: 1 2 1 1 1 1 2 1 1 1 100 100
p Q Q Q Q Q P Q e P P P P Q
P P –
Δ × Δ = = = · – Δ Δ × where P 1 is old price, P 2 is new price Q 1 is quantity demanded at P 1 and Q 2 is quantity demanded at P 2 . 8. Price-elasticity of demand calculated without a minus sign will always be a negative value because either DP or DQ will carry a negative sing due to inverse relationship between price and quantity demanded. This gives a negative value of elasticity whereas in the concept of elasticity, a negative value has no meaningful interpretation expect that it indicates inverse relationship between P and Q. The negative elasticity coefficient is rather misleading. The 'minus' sign is, therefore, inserted as a matter of 'linguistic' convenience, to make the coefficient of elasticity non-negative. Sometimes, 'it is also advised to ignore the negative sing in the numerator and denominator of the elasticity formula. The elasticity in Eq. (4.9) ignores the negative sign. 9. Except in case of Giffen's goods. 10. With an exception of inferior goods.
NOTES
Self-Instructional Material 97 Demand Forecasting UNIT 4 DEMAND FORECASTING Structure 4.0 Introduction 4.1 Unit Objectives 4.2 Need for
Demand Forecasting 4.3 Techniques of Forecasting Demand 4.3.1 Survey Methods; 4.3.2 Statistical Methods 4.4 Concluding Remarks 4.5 Some Case Studies of Demand Forecasting 4.5.1 Consumer Goods; 4.5.2 Intermediate Goods 4.6 Summary 4.7 Answers to 'Check Your Progress' 4.8 Exercises and Questions 4.9 Further Reading 4.0
INTRODUCTION Majority of business decisions are taken under the condition of uncertainty. For example, a general issue that most large-scale firms are confronted with is 'how much to produce'. This question arises because firms are required to plan and schedule their production well in advance. Planning and scheduling production requires some prior knowledge of the demand for the product. Otherwise, their will either is large-scale under-production or over-production. In both the cases, the firm stands to lose. In order to avoid this kind of situation, firms, both big and small, make some demand forecasting—predicting the future demand for their product. In this Unit, we discuss the need for and methods of demand forecasting. 4.1 UNIT OBJECTIVES z To show the importance of demand forecasting z
To
discuss elaborately the techniques of demand forecasting z To point out applicability and limitations of various methods of demand forecasting 4.2 NEED FOR DEMAND FORECASTING Demand forecasting is estimating and predicting future demand for a product. An estimate of future demand for a product

86%	MATCHING BLOCK 1/1	SA	COM 231 Business Economics - I.pdf (D165092265)

is essential for planning and scheduling production, purchase of raw materials, acquisition of finance and advertising. It is

much more important where large-scale production is being planned and production
involves a long gestation period. The information regarding future demand is also essential for the existing firms to be able to avoiding under or over-production. Most firms are,
in fact, very often confronted with the question as to what would be the
future demand for their product because they will have to acquire inputs and plan their production accordingly. The firms are hence required to estimate the future demand for their product. Otherwise, their functioning will be shrouded with uncertainty and their objective may be defeated.
NOTES 98 Self-Instructional Material Demand Forecasting
This problem may not be of a serious nature for small firms which supply a very small fraction of the total demand, and whose product caters to the short-term, seasonal demand or
to
demand of a routine nature. Their past experience and business skills may suffice for their purpose
in
planning and production. But, firms working on a large scale find it extremely difficult to obtain fairly accurate information regarding the
future market demand. 1 In some situations, it is very difficult to obtain information needed to make even short-term demand forecasts and extremely difficult to make long-term forecasts
or
to determine how changes in specific demand variables like price, advertisement expenditure, credit terms, prices of competing products, etc., will affect demand. It is nevertheless indispensable for the large firms to have at least
a rough
estimate of the demand prospects. For, demand forecast plays an important role in planning

to acquire
inputs, both men and material (raw material and capital goods), organizing production, advertising the product, and in
organizing sales channels. These functions can hardly be performed satisfactorily in an atmosphere of uncertainty regarding demand prospects for the product. The prior knowledge of market-size, therefore, becomes an extremely important element of decision-making by the large- scale firms.
In
this Unit, we will discuss some important methods of estimating and forecasting demand. The techniques of forecasting are many, but
the choice of a suitable method is a matter of purpose, experience and expertise.
To a large extent, it also depends on the nature of the data available for the purpose. In economic forecasting, classical methods use historical data in a rather rigorous statistical manner for making future projections. There are also less formal methods where the analyst's own judgement plays a greater part in picking, choosing and interpreting the available data than the statistical tools he uses. 4.3
TECHNIQUES OF FORECASTING DEMAND The various techniques of demand forecasting are listed in
the chart
on the next page.
In this section, we have described demand forecasting methods and their limitations. 4.3.1
Survey Methods
Survey
methods are generally used where the purpose is to make short-run forecast of
demand. Under this method,
consumer surveys are conducted
to collect information about their intentions and future purchase plans.
This method includes: (
i) survey of potential consumers
to elicit information on their intentions and plan; (
ii)
opinion polling of experts, i.e., opinion survey of market experts and sales representatives and through market studies and experiments.
The following techniques are used to conduct the survey of consumers and experts. (i)
Consumer Survey
Methods–Direct Interviews.
The consumer survey method of demand forecasting involves direct interview of the potential consumers.
It
may be in the form
of (a) complete enumeration, (b) sample survey,
or (
c)
end-use method.
These consumer survey methods are used under different conditions and for different purposes. Their advantages and disadvantages are described below.
The most direct and simple way of assessing future demand for a product is to interview the potential consumers or users and to ask them what quantity of the product they would be willing to buy at different prices over a given period, say, one year. This
NOTES Self-Instructional Material 99 Demand Forecasting
method is known as direct interview method. This method may cover almost all the potential consumers or only selected groups of consumers from different cities or parts of the area of consumer concentration. When all the consumers are interviewed, the method is known as complete enumeration survey or comprehensive interview method and when only a few selected representative consumers are interviewed, it is known as sample survey method. In the case of industrial inputs, interviews or postal inquiry of only end-users of
a
product may be required. Let us now describe these methods in detail. (
a)
Complete Enumeration Method. In this method, almost all potential users of the product are contacted and
are

asked about their future plan of purchasing the product in question. The quantities indicated by the consumers are added together to obtain the probable demand for the product.
For example, if
a majority of
n out of
m number
of households in a city report the quantity (q) they are willing to purchase of a commodity, then total probable demand (D p) may be calculated as D p = q 1 + q 2 + q 3 + ... + q n = 1 n i i q = ∑
where q 1 , q 2 , q 3 etc. denote demand by the individual household 1, 2, 3, etc.
This method has certain limitations. It can be used successfully only in case of those products whose consumers are concentrated in a certain region or locality. In case of a widely dispersed market, this method may not be physically possible or may prove very costly in terms of both money and time.
Besides, the demand forecast through this method may not be reliable for many reasons: (i) consumers themselves may not know their actual demand in future and hence may be unable or unwilling to answer the query; (ii) even if they answer, their answer to hypothetical questions may be
only hypothetical and not real; (iii)
consumer's
response may be biased according to their own expectations about the market conditions;
and (
iv)
their plans may change with a change in the factors not included in the questionnaire. (b) Sample Survey Method
Under this method, only a few potential
consumers and users selected from the relevant market through a sampling method are surveyed.
Method of survey may be direct interview or mailed questionnaire to the sample- consumers. On the basis of the information obtained, the probable demand may be estimated through the following formula:
D p = R S H
H (
H . A D)
where D p =
probable demand forecast; H = census number of households from the relevant market;
H s = number of households surveyed or sample
households; H R =
number of households reporting demand for the product; A D = average expected consumption by the reporting households (= total quantity reported to be consumed by the reporting households ÷ numbers of households).
This method is simpler, less costly, and less time-consuming than the comprehensive survey method. This method is generally used to estimate short-term demand from business firms, government
departments and
agencies and also by the households who plan their future
purchases. Business firms, government departments and other such organizations budget their expenditure at least one year in advance. It is, therefore, possible for them to supply a fairly reliable estimate of their future purchases. Even the households making annual or periodic
budget
of their expenditure can provide reliable information about their purchases. The sample survey method is widely used to forecast demand. This method, however, has some limitations similar to those of complete enumerations or exhaustive survey
NOTES 100 Self-Instructional Material Demand Forecasting
Chart : Techniques of Demand Forecasting TECHNIQUES
OF DEMAND FORECASTING Survey Methods Consumer Survey Direct Interview Opinion Poll Methods
Complete Enumeration End-Use Method Sample Survey Expert Opinion Method Market Studies & Experiments Simple Method Delphi Method Market Test Laboratory Tests Statical Methods Trend Projection Econometric Methods Barometric Methods Lead-Lag Indicators Diffusion Indices Regression Methods Simultaneous Equations Simple Multivariate Graphical Method Box-Jenkins Method Trend Fitting or Least Square Method
NOTES Self-Instructional Material 101 Demand Forecasting
method.

The forecaster, therefore, should not attribute more reliability to the forecast than is warranted. Besides, the sample survey method can be used to verify the demand forecast made by using quantitative or statistical methods. Although some authors suggest 2 that this method should be used to supplement the quantitative method for forecasting rather than to replace it, this method can be gainfully used where the market is localized. Sample survey method can be of greater use in forecasting where quantification of variables (e.g., feelings, opinion, expectations, etc.) is not possible and where consumer's behaviour is subject to frequent changes. (

c) The

End-Use Method. The end-use method of demand forecasting

has a considerable theoretical and practical value, especially in forecasting demand for inputs. Making forecasts by this method requires building up a schedule of

probable aggregate future demand for inputs by consuming industries and various other sectors. In this method, technological, structural and other changes which might influence the demand, are taken into account in the very process of estimation. This aspect of the end-use approach is of particular importance. Stages in the

end-use method. The end-use method of demand forecasting consists of four distinct stages of estimation.

In the first stage, it is necessary to identify and list all the possible users of the product in question.

This is, of course, a difficult process, but it is fundamental to this method of forecasting. Difficulty arises because published data on the end-users is rarely available. Despatch records of the manufacturers, even if available, need not necessarily enumerate all the final users. Records of the sales pattern by individual firms or establishments are difficult to be assembled. In several cases,

the distribution

of the products covers such a wide network and there are so many wholesale and retail agencies in the chain, that it would be virtually impossible to organize and collect data from all these sources so as to know all the

final

end-uses of the product. Where relevant and adequate data is not available, the managers need to have a through knowledge of the product and its uses. Such knowledge and experience need to be supplemented by consultations and discussions with manufacturers or their association, traders, users, etc. Preparation of an exhaustive list of all possible end-users

is, in any case, a necessary step. Despite every effort made to trace all the

end—users,

it is quite likely that some of the current uses of the product are overlooked. In order to account for such lapses, it may be necessary at the final stage of estimation to provide some margin for error. A margin or allowance is also necessary to provide for possible new applications

of the product in the future. The second stage of this method involves fixing suitable technical 'norms' of consumption of the product under study. Norms have to be established for each and every end-use.

Norms are usually expressed in physical terms either per unit of production of the complete product or in, some cases, per unit of investment or per capita use. Sometimes, the norms may

have to be on value basis.

But value-based norms should be avoided as far as possible because it might be rather difficult to specify later the types and sizes of the product in question if value norms are used.

The establishment of norms is also a difficult process mainly due to lack of data. For collecting necessary data, the questionnaire method is generally employed. The preparation of a suitable questionnaire is of vital importance in the end-use method, as the entire subsequent analysis has to be based on and conclusions to flow mainly from the information collected through the questionnaires. Where estimating future demand is called for in great detail, such as by types and sizes of the concerned product, framing of the questionnaire requires a good knowledge of all the variations of the product. For a reliable forecast, it is necessary that response is total; if not, then as high as possible.

Having established the technical norms of consumption for the different industries and other end-uses of the product, the third step is the application of the norms. For this purpose, it is necessary to know the desired or targeted levels of output of the

individual

Check Your Progress 1. What is the importance of demand forecasting in business decision-making? 2. What are the different tech- niques of demand forecasting under Survey method? 3. What is the difference between complete enumeration and sample survey method? 4. Describe briefly the Delphi method of demand forecasting.

industries for the reference year and also the likely development in other economic activities which use the product and the likely output targets.

The fourth and final stage
in the end-use method is to aggregate the
product-wise
or use-wise content of the item for which the demand is to be forecast. This aggregate result gives the estimate of demand for the product as a whole for the
terminal
year in question.
By the very nature of the process of estimation described here, it is obvious that the end-use approach results in what may be termed as a "derived" demand. The end-use method has two exclusive advantages.
First, it is possible to work out the future demand for an industrial product in considerable details by types and size.
In other methods, the future demand can be estimated only at aggregate levels. This is because past data are seldom available in such details as to provide the types and sizes of the product demanded by the economy. Hence, projections made by using the past data, either by the trend method, regression techniques or by historical analogies produce only aggregate figures for the product in question. On the other hand,
by probing into the present use-pattern of consumption of the product, the end-use approach provides every opportunity to determine the types, categories and sizes likely to be demanded in future. Second, in forecasting demand by the end-use approach, it is possible to trace and pinpoint at any time in future as to where and why the actual consumption has deviated from the estimated demand. Besides, suitable revisions can also be made from time to time based on such examination.
If projections are based on other methods and if actual consumption falls below or rises above the estimated demand, all that one can say is that the economy has or has not picked up as anticipated. One cannot say exactly which use of the product has not picked up and why. In the case of end-use method, however, one can. (ii)
Opinion Poll Methods
The opinion poll methods aim
at collecting opinions of those who are supposed to possess knowledge of the market, e.g., sales representatives, sales executives, professional marketing experts and consultants.
The opinion poll methods include: (
a) Expert-opinion
method,
z
Simple method z Delphi method, and (
b) Market studies and experiments. (a) Expert-Opinion Method There are two methods of collecting expert opinion—a simple method and
Delphi method. Under simple
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 too is simple and inexpensive, it has its own limitations. First, estimates provided by the sales representatives or professional experts are reliable only to an extent depending on their skill to analyse the market and their experience. Second, demand estimates may involve the subjective judgement of the assessor which may lead to over or under-estimation. Finally, the assessment of market demand is usually based
NOTES Self-Instructional Material 103 Demand Forecasting
on inadequate information available to the sales representatives 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, etc., fall outside their purview.
Delphi Method 3 .
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 gives the impression that sophisticated techniques, e.g., 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. (
b)
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, viz., 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 4 . 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 consumer's responsiveness to the changes made in prices, packages and displays, etc. 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, experimental methods cannot be afforded by small firms. Second, being a costly affair,
experiment
are usually carried out on a scale too small to permit generalization with a high degree of reliability. Third, experimental methods are based on short-term and controlled conditions which may not exist in an uncontrolled market. Hence the results may not be applicable to the uncontrolled long-term conditions of the market.
NOTES 104 Self-Instructional Material Demand Forecasting
Fourth,
changes in socio-economic conditions during the field experiments, such as local strikes or lay-offs, advertising programme by competitors, political changes, 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." 5 Despite these limitations, however, the market experiment method is often used to provide an alternative estimate of demand and also "as a check on results obtained from statistical studies." Besides, this method generates elasticity
coefficients which
are necessary for statistical analysis of demand relationships. For example, an experiment of this kind was conducted by Simmons Mattress Company (US). It put on sale two types of identical
mattress—
one with Simmons label and the other with an unknown name at the same price and then at different prices for determining the cross-elasticity. It was found that at the equal price, Simmons mattress sold 15 to 1; and at a price higher by 5 dollars it sold 8 to 1,
and

at a price higher by 25 per cent, it sold almost 1 to 1. 6 4.3.2
Statistical
Methods In the foregoing sections, we have described survey and experimental methods of estimating demand for a product on the
basis of information supplied by the consumers themselves and on-the-spot observation of consumer behaviour.
In this section, we will explain
statistical methods which utilize historical (
time-series) and cross-
section
data for estimating long-term demand. Statistical methods are considered to be superior
techniques of
demand estimation for the following reasons. (
i) In the statistical methods, the element of subjectivity is minimum, (ii) Method of estimation is scientific, as it is based on the theoretical relationship between the dependent and independent variables, (iii) Estimates are relatively more reliable, and (
iv) Estimation involves smaller cost. Statistical methods
of demand projection include the following techniques: (1) Trend Projection Methods, (2) Barometric Methods,
and (3)
Econometric Method. 1.
Trend Projection Methods
Trend projection method is a 'classical method' of business forecasting. This method is essentially concerned with the study of movement of variables through time. The use of this method requires a long and reliable time-series data. The trend projection method is used under the assumption that the factors responsible for the past trends in the variable to be projected (e.g., sales and demand) will continue to play their part in future in the same manner and to the same extent as they did in the past in determining the magnitude and direction of the variable. This assumption may be quite justified in many cases.
However, since cause-and-effect relationship is not revealed by this method, the projections made on the trend basis are considered by many as a mechanical or a 'naïve' approach. Nevertheless, "There is nothing uncomplimentary in the adoption of such an approach. It merely represents one of the several means to obtain an insight of what the future may possibly be and whether or not the projections made using these means are to be considered as most appropriate will depend very much on the reliability of past data and on the judgement that is to be exercised in the ultimate analysis." 7
NOTES Self-Instructional Material 105 Demand Forecasting
In projecting demand for a product, the trend method is applied to time-series data on sales.
Firms
of a
long standing may obtain
time-series data on sales from their own sales department. New firms can obtain necessary data from the older firms belonging to the same industry.
There are three techniques of trend projection based on time-series data. (
a) Graphical method, (b) Fitting trend equation or least square method,
and (
c)
Box-Jenkins method. In order to explain these methods, let us suppose that a local bread manufacturing company wants to assess the demand for its product for the years 2002, 2003 and 2004. For this purpose, it uses time-series data
of
its total sales over the past 10 years. Suppose its time-series sales data is given as in Table 4.1. Table 4.1: Time-Series Data on Sale of Bread Year Sales of Bread ('000 tonnes) 1992 10 1993 12 1994 11 1995 15 1996 18 1997 14 1998 20 1999 18 2000 21 2001 25
Let us first use the graphical method and project demand for only one year, 2004. (
a) Graphical Method. Under this method, annual sales data is plotted on a graph paper and a line is drawn through the plotted points. Then a free hand line is so drawn that the total distance between the line and the points is minimum. This is illustrated in Fig. 4.1 by the dotted lines.
The dotted line M is drawn through the mid-values of variations and
line S
is a straight trend line. The solid, fluctuating line shows the actual trend, while the dotted lines show the secular trend. By extending the trend lines (market M and S), we can forecast an approximate sale of 26,200 tonnes in 2004.

Although this method is very simple and least expensive, the projections made through this method are not very reliable. The reason is that the extension of the trend line involves subjectivity and personal bias of the analyst. For example, an optimist may take a short-run view, say since 1999, and extend the trend line beyond point P towards O, and predict a sale of 30,000 tonnes of bread in 2004. On the other hand, a conservative analyst may consider the fluctuating nature of sales data and expect the total sale in 2004 to remain the same as in 2001 as indicated by the line PC. One may even predict a fall in the sale to 25,000 tonnes, if one over-emphasises the fluctuating nature of sales in one's judgement. This is indicated by the line PN.

NOTES 106 Self-Instructional Material Demand Forecasting

Fig. 4.1: Trend Projection (

b) Fitting Trend Equation: Least Square Method.

Fitting trend equation is a formal technique of projecting the trend in demand.

Under this method, a trend line (or curve)

is fitted

to the time-series sales data with the aid of statistical techniques.

The form of the

trend equation that can be fitted

to the time-series data is determined either by plotting the sales data (as shown in Fig. 4.1)

or by trying different forms of trend equations for the best fit.

When plotted, a time-series data may show various trends.

We will, however, discuss here only

the most common types of trend equations, viz., (i) linear, and (ii) exponential trends. (

i)

Linear Trend.

When a

time-series data reveals a rising trend in sales, then a straight- line trend equation of the following form is fitted:

$S = a + bT$ ...(4.1)

where S = annual sales, T = time (years),

a and b are constants. The parameter b gives the measure of annual increase in sales. The coefficients

a and b are estimated by solving the following two equations

based on the principle of least square.

$\Sigma S = na + b\Sigma T$ ...(i) $\Sigma ST = a\Sigma T + b\Sigma T^2$ ...(ii) The terms included in equations (i) and (ii) are calculated using sales data given in Table 4.1 and presented in Table 4.2. By substituting numerical values in equations (i) and (ii), we get $164 = 10\ a + 55\ b$ ...(iii) $1024 = 55\ a + 385\ b$ ...(iv) By solving equations (iii) and (iv), we get the trend equation as $S = .26 + 1.48T$

NOTES Self-Instructional Material 107 Demand Forecasting

Table 4.2: Estimation of Trend Equation Year Sales T T^2 ST 1992 10 1 1 10 1993 12 2 4 24 1994 11 3 9 33 1995 15 4 16 60 1996 18 5 25 90 1997 14 6 36 84 1998 20 7 49 140 1999 18 8 64 144 2000 21 9 81 189 2001 25 10 100 250 n = 10 ΣS = 164 ΣT = 55 ΣT^2 = 385 ΣST = 1024 Having estimated the trend equation, it is quite easy to project the sales for 2002, 2003 and 2004 i.e., for the 11th, 12th and 13th year, respectively. The calculation procedure is given below. 2002 S 2 = 4.26 + 1.48 (11) = 24,540 tonnes 2003 S 3 = 4.26 + 1.48 (12) = 26,020 tonnes 2004 S 4 = 4.26 + 1.48 (13) = 27,500 tonnes

Treatment of the Abnormal Years. Time series data on sales may, more often than not, reveal abnormal years. An abnormal year is one in which sales are abnormally low or high. Such years create a problem in fitting the trend equation and lead to under or over- statement of the projected sales. Abnormal years should, therefore, be carefully analysed and data be suitably adjusted. The abnormal years may be dealt with (i) by excluding the year from time-series data, (ii) by adjusting the sales figures of the year to the sales figures of the preceding and succeeding years, or (iii) by using a 'dummy' variable. (

ii)

Exponential Trend. When

sales (or any dependent

variable) have

increased over the past years at an increasing rate

or at a constant percentage

rate, then the appropriate trend equation to be used is

an exponential trend equation of any of the following forms. (1)

$Y = ae^{bT}$ ...(4.2) or

its semi-logarithmic form log

$Y = \log a + bT$ ...(4.3)

This form of trend equation is used when growth rate is constant. (2)
Double-log trend of
the form Y = aT b ...(4.4) or its double logarithmic form log
Y = log a +
b log T ...(4.5) This form of trend equation is used when growth rate is increasing. (3) Polynomial trend of the form Y = a + bT + cT 2 ...(4.6) In these equations a, b and c are constants,
Y is sales, T is time
and e = 2.714. Once the parameters of the equations are estimated, it becomes quite easy to forecast demand for the years to come. The trend method is quite popular in business forecasting because of its simplicity.
It is simple to apply because only time-series data on sales are required. The analyst is supposed to possess only a working knowledge of statistics. Since data requirement of this method is limited, it is also inexpensive. Besides, the trend method yields fairly reliable estimates of the future course of demand.
Check Your Progress 5. What is the statistical method of demand forecasting? What are its advantages? 6.What are the statistical methods generally used in demand forecasting? 7. What is the difference between linear and exponential trend demand projection based on time-series data? 8. Under what condition is the exponential trend method is used for demand forecasting?
NOTES 108 Self-Instructional Material Demand Forecasting
Limitations The first limitation of this method arises out of its
assumption that the past rate of change in the dependent variable will persist in the future
too. Therefore, the forecast based on this method may be considered to be reliable only for the period during which this assumption holds. Second, this method cannot be used for short-term estimates. Also it cannot be used where trend is cyclical with sharp turning points of troughs and peaks. Third, this method, unlike regression analysis, does not bring out the measure of relationship between dependent and independent variables. Hence, it does not yield the necessary information (e.g., price and income elasticities) which can be used for future policy formulations. These limitations need to be brone in mind while making the use of this method. (
c) Box-Jenkins Method. Box-
Jenkins method 8 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.
When sales data of various commodities are plotted, many commodities will show a seasonal or temporal variation in sales. For examples, sale of woollen clothes will show a hump during months of winter in all the years under reference. The sale of New Year Greeting Cards will be particularly
very
high in the last week of December every year. Similarly the sale of desert coolers is very high during the summers each year. This is called seasonal variation. Box-Jenkins technique is used for predicting demand where time- series sales data reveal this kind of seasonal variation. According to the Box-Jenkins approach, any stationary time-series data can be analysed by the following three models: (i) auto-regression model, (ii) moving average model,
and (iii) autoregressive-
moving average
model. The three models are, in fact, the three stages of Box-Jenkins method. The
auto regressive-moving average model is the final form of the
Box-Jenkins model. The purpose of the three models of Box-Jenkins method is to explain movements in the stationary series with minimized error term, i.e., the unexplained components of stationary series. The steps and models of the Box-Jenkins approach are described briefly here with the purpose of
acquainting the reader with this approach
rather than providing the entire methodology. 9
Steps in Box-Jenkins Approach. 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, i.e., subtracting observed value of one period from the observed value of the preceding year. After trend is elimated, 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. 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.
NOTES Self-Instructional Material 109 Demand Forecasting (i)
Auto-regressive Model. In
the general form of
autoregressive model, the behaviour of a variable in a period is linked to the behaviour of the variable in future periods. The general form of the autoregressive model is given below.
$Y_t = a_1 Y_{t-1} + a_2 Y_{t-2} + \ldots + a_n Y_{t-n} + e_t$ ...(4.7)
This model states that the value of Y in period t depends on the values of Y in periods t – 1, t – 2 ... t – n. The term e_t is the random portion of
Y_t
that is
not explained by the model. If estimated value of one or some of the coefficients $a_1, a_2, \ldots$
a_n
are different from zero, it reveals seasonality in data. This completes the second step.
The model (4.7), however, does not specify the relationship between the value of Y_t and residuals (e_t) of previous periods. Box-Jenkins method uses moving average method to specify the relationship between Y_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.
(ii) Moving Average Model. The moving average model estimates Y_t in relation to residuals (
e_t)
of the previous years. The general form of moving average model is given below.
$Y_t = m + b_1 e_{t-1} + b_2 e_{t-2} \ldots + b_p e_{t-p} + e_t$ ...(4.8)
where m is mean of the stationary time-series and $e_{t-1}, e_{t-2}, \ldots e_{t-p}$ are the residuals, the random components of Y in t – 1, t – 2, ... t – p periods, respectively. (iii) 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.
$Y_t = a_1 Y_{t-1} + a_2 Y_{t-2} + \ldots + a_n Y_{t-n} + b_1 e_{t-1} + b_2 e_{t-2} + \ldots + b_p e_{t-p} + e_t$ ...(4.9) Clearly,
Box-Jenkins method of forecasting demand is a sophisticated and complicated method. Without the aid of computers it is rather an impracticable method.
Moving Average Method: An Alternative Technique As noted above, the moving average model of Box-Jenkins method is a part of a complicated technique of forecasting demand in period t on the basis of its past values. There is a simple,
or
rather a naïve, yet useful method of using moving average to forecast demand. This
simple
method assumes that demand in a future year equals the average of demand in the past years. The formula of simple moving average method is expressed as
$D_t = \frac{1}{N}(X_{t-1} + X_{t-2} + \ldots + X_{t-n})$ where D_t =
demand in period t; X
$t-1, t-2 \ldots t-n$ = demand or sales in previous years; N = number of preceding years.
According to this method, the likely demand for a product in period t equals the average of demand (sales) in several preceding years. For example, suppose that the number of refrigerators sold in the past 7 years in a city is given as Table 4.3 and we want to forecast demand for refrigerators for the year 2002. Table 4.3: Sale of Refrigerators: 1991-97 Year 1995 1996 1997 1998 1999 2000 2001 Sales ('000) 11 12 12 13 13 15 15 Given this sales data, demand for 1998 will be computed as follows. $D_{2002} = \frac{1}{7}(15 + 15 + 13 + 13 + 12 + 11) = 13$
NOTES 110 Self-Instructional Material Demand Forecasting
Thus, the demand for refrigerators for 2002 is forecast at 13,000 units. Now suppose that the actual sales of refrigerators in the city in 2002 turns out to be 15,000 refrigerators against the forecast figure of 13,000. Given the actual sales figure for 2002,
the demand for 2003 can be forecast as
$D_{2003} = \frac{1}{7}(15 + 15 + 15 + 13 + 13 + 12 + 12) = 13.57$ Note that, in the moving average method, the sale of 2002 is added and the sale of 1995 (the last of the preceding years) is excluded from the formula.
This
moving average method is simple and can be used to make
only

short term forecasts. This method has a serious limitation, which has to be born in mind while using this method.

In the case of rising trend in sales, this method yields an underestimate of future demand, as can be seen in the above example. And, in case of declining trend in sales, it may yield an overestimate of future demand. One way of reducing the margin of over and under-estimate is to take the average of fluctuations and add it to the moving average forecasts. This method is, in fact, more suitable where sales fluctuate frequently within a limited range. 2. Barometric Method of Forecasting

The barometric method of forecasting follows the method meteorologists use in weather forecasting. Meteorologists use the barometer to forecast weather conditions on the basis of movements of mercury in the barometer. Following the logic of this method, many economists use economic indicators as a barometer to forecast trends in business activities.

This method was first developed and used in the 1920s by the Harvard Economic Service. This technique was, however, abandoned as it had failed to predict the Great Depression of the 1930s. 10 The barometric technique was however revived, refined and developed further in the late 1930s by the National Bureau of Economic Research (NBER) of the US. It has since then been used often to forecast business cycles in the US. 11

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 example, 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.

The basic approach of barometric technique is to construct an index of relevant economic indicators and to forecast future trends on the basis of movements in the index of economic indicators. The indicators used in this method are classified as: (a) leading indicators, (b) coincidental indicators, and (c) lagging indicators.

A time-series of various indicators is prepared to read the future economic trend. The leading series consists of indicators which move up or down ahead of some other series. Some examples of the leading series are: (i) index of net business (capital) formation; (ii) new orders for durable goods; (iii) new building permits; (iv) change in the value of inventories; (v) index of the prices of the materials; (vi) corporate profits after tax.

The coincidental series, on the other hand, are the ones that move up or down simultaneously with the level of economic activity. Some examples of the coincidental series are: (i) number of employees in the non-agricultural sector; (ii) rate of unemployment; (iii) gross national product at constant prices; (iv) sales recorded by the manufacturing, trading and the retail sectors.

Check Your Progress 9. What is Box-Jenkins method of demand forecasting? 10. What are the three different models that are often used in Box-Jenkins method? 11. What is an autoregressive model? What form of equa- tion is used in this model? 12. What is barometric method of demand forecasting? What kind of indicators are used in barometric method?

The lagging series, consists of those indicators which follow a change after some time- lag. Some of the indices that have been identified as lagging series by the NBER are: (i) labour cost per unit of manufactured output, (ii) outstanding loans, and (iii) lending rate for short-term loans.

The time series of various indicators are selected on the basis of the following criteria: (i) Economic significance of the indicator: the greater the significance, the greater the score of the indicator. (ii) Statistical adequacy of time-series indicators: a higher score is given to an indicator provided with adequate statistics. (iii)

Conformity with overall movement in economic activities. (iv) Consistency of series to the turning points in overall economic activity. (v) Immediate availability of the series,
and (vi)
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, 1/2 to constant series and zero to falling series. The diffusion index is obtained by the ratio of the number of 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 per cent. It may be noted that the most important is the diffusion index of the leading series.
However, there are problems of identifying the leading indicator for the variable under study.
Also, lead time is not of an invariable nature.
Leading indicators can be used as inputs for forecasting aggregate economic variables, GNP, aggregate
consumer's
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 forecast is not always easily available. 3. Econometric Methods
The econometric
methods combine statistical tools with economic theories to estimate economic variables and to forecast the intended economic variables. The forecasts made through econometric methods are much more reliable than those made through any other method. The econometric methods are, therefore, most widely used to forecast demand for a product, for a group of products and for the economy as a whole.
Our concern here is primarily to explain econometric methods used
for forecasting demand for a product.
An econometric
model may be a single-equation regression model or it may consist of a system of simultaneous equations. Single-equation regression serves the purpose of demand forecasting in the case of most commodities.
But, where relationships between economic variables are
complex and
variables are so interrelated that unless one is determined, the other cannot be determined, a single-equation regression model does not serve the purpose. In that case, a system of simultaneous equations is used to estimate and forecast the target variable.
The econometric methods are briefly described here under two basic methods. (1) Regression Method,
and (2)
Simultaneous Equations Model. (1)
Regression Method.
Regression analysis is the most popular method of demand estimation. This method combines economic theory and statistical techniques of
NOTES 112 Self-Instructional Material Demand Forecasting
estimation. Economic theory is employed to specify the determinants of demand and to determine
the nature of the relationship between the demand for a product and
its determinants.
Economic theory thus helps in determining the general form of demand function. Statistical techniques are employed to estimate the values of parameters in the estimated equation.
In regression technique of demand forecasting,
the analysts estimate the demand function for a product. In the demand function, the quantity to be forecast is a 'dependent variable' and the variables that affect or determine the demand (the dependent variable)

are called ‘independent’ or ‘explanatory’ variables. For example, demand for cold drinks in a city may be said to depend largely on ‘per capita income’ of the city and its population. Here demand for cold drinks is a ‘dependent variable’ and ‘per capita income’ and ‘population’ are the ‘explanatory’ variables.’ While specifying the demand functions for various commodities, the analyst may come across many commodities whose demand depends, by and large, on a single independent variable. For example, suppose in a city demand for such items as salt and sugar is found to depend largely on the population of the city. If this is so, then demand functions for salt and sugar are single-variable demand functions. On the other hand, the analyst may find that demand for sweets, fruits and vegetables, etc. depends on a number of variables like commodity’s own price, price of its substitutes, household
income,
population, etc.
Such demand functions are called multi-variable demand functions. For single-variable demand functions, simple regression equation is used and for multiple variable functions, multi-variable equation is used for estimating demand function. The single-variable and multi-variable regressions are explained below. (
a) Simple or Bivariate Regression Technique.
The simple regression technique has already been discussed in Unit 5. To recapitulate,
in simple regression technique, a single independent variable is used to estimate a statistical value of the ‘dependent variable’, that is, the variable to be forecast. The technique is similar to trend fitting. An important difference between the two is that in trend fitting the independent variable is ‘time’ (t) whereas in a regression equation, the chosen independent variable is the single most important determinant of demand. Besides, the regression method is less mechanical than the trend fitting method of projection. Suppose we have to forecast demand for sugar for 2003-04 on the basis of 7-year data given in Table 4.4. When this data is graphed, it will produce a continuously rising trend in demand for sugar with rising population. This show a linear trend. Now,
the
demand for sugar in 2003-4 can be obtained by estimating a regression equation of the form. Y = a + bX ...(4.10) where Y is sugar consumed, X is population, and a and b are
constants.
For an illustration, consider the hypothetical data on quarterly consumption of sugar given in Table 4.4 Table 4.4: Quarterly Consumption of Sugar Year Population Sugar Consumed (millions) (’000) tonnes 1995-96 10 40 1996-97 12 50 1997-98 15 60 1998-99 20 70 1999-2000 25 80 2000-01 30 90 2001-02 40 100
Equation (4.10) can be estimated by using the ‘least square’ method. The procedure is the same as shown in Table 4.2. That is, the parameters a and b can be estimated by
NOTES Self-Instructional Material 113 Demand Forecasting
solving the following two linear equations: ΣY i = na + bΣX i ...(i) ΣX i Y i = ΣX i
a + bX 2 i ...(ii) The procedure of calculating the terms in equations (i) and (ii) above is presented in Table 14.5. Table 4.5: Calculation of Terms of the Linear Equations Figures in million Year Population Sugar X 2 XY (
X) consumed (Y) 1995-96 10 40 100 400 1996-97 12 50 144 600 1997-98 15 60 225 900 1998-99 20 70 400 1400 1999-2000 25 80 625 2000 2000-01 30 90 900 2700 2001-02 40 100 1600 4000
Σn = 7 ΣX i = 152 ΣY i = 490 ΣX i 2 = 3994 ΣX i Y i = 12000
By substituting the values from Table 4.5 into equations (i) and (ii), we get 490 = 7a + 152b ...(iii) 12,000 = 152a + 3994b ... (iv) By solving equations (iii) and (iv), we get a = 27.44 and b = 1.96 By substituting values for a and b in Eq. (4.10), we get the estimated regression equation as Y = 27.44 + 1.96 X ...(4.11)
Given the regression equation (4.11), the demand for sugar for 2003-04 can be easily projected if population for 2003-04
is
known. Supposing population for 2003-04 is projected to be 70 million, the demand for sugar in 2003-04 may be estimated as Y = 27.44 + 1.96(70) = 137 million tonnes. The simple regression technique is based on the assumptions (i) that independent variable will continue to grow at its past growth rate, and (ii) that the relationship between the dependent and independent variables will continue to remain the same in the future as in the past. (For further details
and on the reliability of estimates consult a standard book on Statistics). (b)
Multi-
variate Regression. The multi-variate regression equation is used where demand for a commodity is deemed to be the function of many variables or in cases in which the number of explanatory variables is greater than one. The procedure of multiple regression analysis may be

briefly described here. The first step in multiple regression analysis is to specify the variables that are supposed to explain the variations in demand for the product under reference. The explanatory variables are generally chosen form the determinants of demand, viz., price of the product, price of its substitute, consumer's income and their taste and preference. For estimating the demand for durable consumer goods, (e.g., TV sets, refrigerators, houses, etc.), the other explanatory variables which are considered are availability of credit and rate of interest. For estimating demand for capital goods (e.g., machinery and equipment), the relevant variables are additional corporate investment, rate of depreciation, cost of capital goods, cost of other inputs (e.g., labour and raw materials), market rate of interest,
etc.
NOTES 114 Self-Instructional Material Demand Forecasting
Once the explanatory or independent variable are specified, the second step is to collect time-series data on the independent variables. After necessary data is collected, the next step is to specify the form of equation which can appropriately describe the nature and extent of relationship between the dependent and independent variables. The final step is to estimate the parameters in the chosen equations with the help of statistical techniques. The multi-variate equation cannot be easily estimated manually. They have to be estimated with the help of computer. Specifying the Form of Equation. The reliability of the demand forecast depends to a large extent on the form of equation and the degree of consistency of the explanatory variables in the estimated demand function. The greater the degree of consistency, the higher the reliability of the estimated demand and vice versa. Adequate precaution should, therefore, be taken in specifying the equation to be estimated. Some common forms of multi-variate demand functions are given below.
Linear function Where the relationship between demand and its determinants is given by a straight line, the most common form of equation for estimating demand is
$Q_x = a - bP_x + cY + dP_y + jA$ ...(4.12)
where Q_x =
quantity demanded of commodity X; P_x = price of commodity X;
Y = consumer's income, P_y = price of the substitute; A = advertisement expenditure; a is a constant (the intercept), and b, c, d and j are the parameters expressing the relationship between demand and
P_x , Y, P_y and A, respectively.
In a linear demand function, quantity demanded is assumed to change at a constant rate with a change in independent variables P_x , Y, P_y and A. The parameters (regression
co- efficients)
are estimated by using the least square method. After parameters are estimated, the demand can be easily forecast if data on independent variables for the reference period is available. Suppose, the estimated equation for sugar takes the following form:
$Q_s = 50 - 0.75P_s + 0.1Y + 1.25P_y + 0.05A$ ...(4.13) The numerical values in this equation express the quantitative relationship 12 between demand for sugar and the variables with which they are associated. More precisely, regression coefficients give the change in demand for sugar as a result of unit change in the explanatory variables. For instance, it reveals that a change of one rupee in the sugar price results in a 0.75
unit (say,
tonne) change in sugar demand and a change of one rupee in income leads to a 0.1
unit (
tonne) change in sugar demand, and so on. Power function It may be noted that in linear equation (4.12) the marginal effect of independent variables on demand is assumed to be constant and independent of change in other variables. For example, it assumes that the marginal effect of change in price is independent of change in income or other independent variables, and so on.
But there may be cases in which it is intuitively or theoretically
found that the marginal effect of the independent variables on demand is neither constant nor independent of the value of all other variables included in the demand function. For example, the effect of rise in sugar price may be neutralised by a rise in consumers income. In such cases, a multiplicative form of equation which is considered to be 'the most logical form of demand function' is used for estimating demand for a product. The multiplicative form of demand function or power function is given as
$Q_x = a P_x^{-b} Y^c P_y^d A^j$ ...(4.14)
The algebraic form of multiplicative demand function can be transformed into a log- linear form for convenience in estimation, as given below. log
$Q_x = \log a - b \log P_x + c \log Y + d \log P_y +$

j log A ...(4.15) The log-linear demand function can be estimated by the least square regression technique. The estimated function yields the intercept a and the values of the regression coefficients. After regression coefficients are estimated and data on the
NOTES Self-Instructional Material 115 Demand Forecasting
independent variables for the years to come are obtained, forecasting demand becomes an easy task. Reliability of estimates As mentioned earlier, statistical methods are scientific, devoid of subjectivity, and they yield fairly reliable estimates. But the reliability of forecast depends also on a number of other factors. A very important factor in this regard is the choice of the right kind of variables and data. Only those independent variables which have causal relationship between the dependent and independent variables should be included in the demand function. The relationship between the dependent and independent variables should be clearly defined. Besides, the reliability of estimates also depends on the form of demand function used. The forecaster should, therefore, bear in mind that there is no hard and fast rule and an a priori basis of determining the most appropriate form of demand function. The demand function to be estimated is generally determined by testing different forms of functions. Whether a particular form of functions is a good fit is judged by the coefficient of determination, i.e., the value of R 2 . The value of R 2 gives the proportion of the total variation in the dependent variable explained by the variation in the independent variables. The higher the value of R 2 , the greater the explanatory power of the independent variables. Another test is the expected sign of
co- efficients
of independent variables. What is more important, therefore, is to carefully ascertain the theoretical relationship between the dependent and the independent variables.
Some case studies based on multiple regression analysis will be presented at the end of this Unit. (2) Simultaneous Equations Model. In explaining this model, it will be helpful to begin with a comparison of simultaneous equation method with regression method.
We may recall that regression technique of demand forecasting consists of a single equation. In contrast, the simultaneous equations model of forecasting involves estimating several simultaneous equations. These equations are, generally, behavioural equations, mathematical identities and market-clearing equations. Furthermore, regression technique assumes one-way causation, i.e., only the independent variables cause variations in the dependent variable, not vice versa. In simple words, regression technique assumes that a dependent variable affects in no way the independent variables. For example, in demand function D = a – bP used in the regression method, it is assumed that price affects demand, but demand does not affect price. This is an unrealistic assumption. On the contrary, forecasting through econometric models of simultaneous equations enables the forecaster to take into account the sumultaneous interaction between dependent and independent variables. The simultaneous equations method is a complete and systematic approach to forecasting. This technique uses sophisticated mathematical and statistical tools which are beyond the scope of this book 13 . We will, therefore, restrict ourselves here only to the basic features of this method of forecasting. The first step in this technique is to develop a complete model and specify the behavioural assumptions regarding the variables included in the model. The variables that are included in the model are called (i) endogenous variables, and (ii) exogenous variables. Endogenous variables. The variables that are determined within the model are called endogenous variables.
Endgenous
variables are included in the model as dependent variables, i.e., the variables that are to be explained by the model. These are also called ‘controlled’ variables. It is important to note that the number of equations included in the model must equal the number of endogenous variables. Exogenous variables. Exogenous variables are those that are determined outside the model.
Exogenous variables
are inputs of the model. Whether a variable is treated as endogenous or exogenous depends on the purpose of the model. The examples of
NOTES 116 Self-Instructional Material Demand Forecasting exogenous variables are ‘money supply; ‘tax rates’, ‘government spending’, ‘time’, and ‘weather’, etc. The exogenous variables are also known as ‘uncontrolled’ variables. The second step in this method is to collect the necessary data on both endogenous and exogenous variables. More often than not, data is not available in the required form. Sometimes data is not available at all. In such cases, data has to be adjusted or corrected to suit the model and, in some cases, data has even to be generated from the available primary or secondary sources. After the model is developed and necessary data are collected the next step is to estimate the model through some appropriate method. Generally, a two-stage least square method is used to predict the values of exogenous variables. Finally, the model is solved for each endogenous variable in terms of exogenous variables. Then by plugging the values of exogenous variables into the equations, the objective value is calculated and prediction is made.

This method is theoretically superior to the regression method. The main advantage of this method is that it is capable of capturing the influence of interdependence of the variables. But, its limitations are similar to those of the regression method. The use of this method is sometimes hampered by non-availability of adequate data.

Example

For an example, consider a simple macroeconomic model, given below:

$Y_t = C_t + I_t + G_t +$

X

t ...(4.16) where Y_t = Gross national product, C_t = Total consumption expenditure, I_t = Gross private investment, G_t = Government expenditure,

X

t =

Net exports (X – M) where M = imports and subscript t represents a given time unit.

Equation (4.16)

is an identity, which may be explained with a system of simultaneous equations. Suppose in Eq. (4.16)

$C_t = a + bY_t$ ...(4.17) $I_t = 20$ ...(4.18) $G_t = 10$ ...(4.19)

$X = 5$ ...(4.20)

In the above system of equations, Y_t and C_t are endogenous variables and I_t, G_t and X_t are exogenous variables. Equation (4.17) is a regression equation that has to be estimated. Equations (4.18), (4.19) and (4.20) show the values of exogenous variables determined outside the model.

Suppose we want to predict the value of Y_t and C_t simultaneously. Suppose also that when we estimate equation (4.17),

we get $C_t = 100 + 0.75 Y_t$ ...(4.21)

Now, using this equation system, we may determine the value of

Y_t as $Y_t = C_t + 20 + 10 + 5 = C_t + 35$ Since $C_t = 100 + 0.75 Y_t$, by substitution, we get $Y_t = 100 + 0.75 Y_t + 35$ then $Y_t – 0.75 Y_t = 100 + 35$ $0.25 Y_t = 135$ and $Y_t = 135/0.25 = 540$

Check Your Progress 13. How is the econometric method different from other methods of demand forecasting? 14. Why is demand forecasting through econometric method more reliable than forecasts made by other methods? 15. What is regression method of demand forecasting? 16. Under what conditions are bivariate and multi-variate regression methods used for demand forecasting?

We may now easily calculate the value of C_t (using $Y_t = 540$). Since $C_t = 100 + 0.75 Y_t = 100 + 0.75 (540) = 505$ Thus, the predicted values are $Y_t = 540$ and $C_t = 505$ Thus, $Y_t = 505 + 20 + 10 + 5 = 540$

It is important to note here that the example of the econometric model given above is an extremely simplified model. The econometric models used in actual practice are generally very complex. They include scores of simultaneous equations. 4.4

CONCLUDING REMARKS

There are several methods and techniques available for forecasting demand for a product. All the methods have their own limitations and advantages,

merits

and demerits, in varying degrees. The applicability and usefulness of a method depends on the purpose of forecasting and availability of reliable and relevant data. The analyst should, therefore, choose a method or a technique of demand forecasting which is relevant to the purpose, convenient to handle, applicable to the available data and also inexpensive. It may be added that mere possession of the right tools does not necessarily ensure an accurate forecast. Equally important is the analyst's own judgement. In fact, the role of judgement cannot be over-emphasised.

The analyst's own judgement

is required at all stages of demand forecasting. Any estimate relating to a future period in itself is a judgement and involves a series of judgements. Analyst's judgement is required in the first place to ensure that the method used in making the estimate is appropriate to the task. Also, when a statistical series is generated, its interpretation requires judgement. Besides, several components and elements used in forecasting are often in conflict and are so balanced that they leave little room for choice. Nevertheless, one or the other has to be judged as being appropriate for use under the given circumstances. Furthermore, events relating to economic activity take place sometimes suddenly and sometimes in an uneven manner. Without adequate information about the current situation, there are bound to be errors of judgement in statistical projections. Most people, if they lack the correct perspective, cannot fathom the significance of even current information unless it is properly related to all concerned activities. Therefore, interpreting the current information or data and making proper use of the same for future projection also calls for judgement. Finally, is should be appreciated that forecasting is merely an attempt to utilize the generally accepted methods or techniques for knowing the future demand for a product. By the very nature of the problem, there can be no guarantee of accuracy in any specified methodology or system of indicators. Hence, it would be unreasonable to be dogmatic about the results obtained or to say that any one particular method is superior to others. As time proceeds, opportunities are provided for testing the validity of any forecast. A person who has done a forecast should be prepared to recede from a position previously taken whenever it is known that economic and other conditions which formed the basis for the previous forecast have changed. The only sound procedure is to correct the previous forecast in as objective a manner as possible. There is need for continual revision so that forecast gets closer to reality.

NOTES 118 Self-Instructional Material Demand Forecasting 4.5

SOME CASE STUDIES OF DEMAND FORECASTING In this section, we briefly describe some studies in demand forecasting. Not many case studies with Indian data are available on the various methods of demand forecasting. The case studies that are available mostly use the regression method. The cases described below include some on consumer goods and some on intermediate goods. 4.5.1 Consumer Goods Eggs. Egg are one of the popular items of food for non-vegetarians and semi- vegetarians. Sidhu 14 estimated demand function for eggs for Ludhiana district of Punjab for various occupational groups in rural and urban areas. We will consider here only

the results for all groups combined. In his aggregated demand functions he considered the following variables: 1. Quantity of eggs consumed (the dependent variable), 2. Size and composition of family, 3. Family income, 4. Occupation, and 5.

Number of earning members in the family. In his annual demand function he included only two variables viz., (i) quantity of eggs consumed, and (ii) per capita disposable income, for lack of data and problems of specification. He estimated the following forms of demand function: (i) Y = a + bX (Linear) (ii) Y = aX b (Exponential) The estimated

function,

respectively, are: (i) 3.0085 + 0.0619 X R 2 = 0.6569 (13.5301) (0.0030) (ii) –2.0119 (1.2108) X R 2 = 0.5276 (0.2739) (0.0769) The linear function gave a 'consistently better fit to the data'. But, for the urban households in which both husband and wife were employed the 'Cobb-Douglas' form of function gave a better fit. Sidhu has also calculated the income-elasticities of demand for eggs, based on both linear and exponential demand functions. The estimated income elasticities (e y) are (i) e y = 0.9876 (Linear) (ii) e y = 1.2108 (Exponential) Both these elasticities are statistically significant. Now, if per capita income projections are available the demand for eggs can be forecast for the successive years. Soap. Balakrishna 15 has estimated demand functions for various durable and non- durable consumer goods and has, by using different methods, forecast demand thereof for the late sixties and the early seventies. We pick up only a few to illustrate the practical forecast. For the purpose of forecasting the future demand for soap in India, the two variables which affect the consumption significantly, namely, growth in population and increase in per capita income can be chosen for regression. Unfortunately, the true consumption levels for soap in the past years are not available. Table 4.6 shows the consumption built

NOTES Self-Instructional Material 119 Demand Forecasting

up only on the basis of indigenous production from the organized sector and from imports. Regression equation Y = – 425.5541 + 1.1756 x 1 + 6.4544 x 2 where Y is consumption of soap x 1 is population, and x 2 is per capita income. Coefficient of multiple correlation R 1.23 = 0.844. In India, quite a substantial portion of the demand for soap is met from the production in the small-scale sector and therefore any projection based on the data furnished in Table 4.6 cannot be truly meaningful. Nevertheless, a multiple regression equation was obtained with the data contained in Table 4.6 as shown below. Table 4.6: Apparent Consumption of Soap in India 16 (Tonnes) Total Apparent Years Production Import (6 + 3) Export consumption (4–5) (1) (2) (3) (4) (5) (6) 1950-51 77,255 174.5 77,429.5 282.3 77,147.2 1951-52 87,747 122.3 87,869.3 1,606.2 86,263.1 1952-53 86,772 117.0 86,889.0 — 86,889.0 1953-54 82,492 96.7 83,584.7 634.3 82,954.4 1954-55 90,765 62.8 90,827.8 566.0 90,261.8 1955-56 104,304 100.2 104,402.2 472.0 103,930.2 1956-57 115,198 251.6 115,449.6 310.5 115,139.1 1957-58 112,689 110.3 112,799.3 293.9 121,006.7 1958-59 127,195 43.2 127,234.2 365.9 126,872.3 1959-60 134,799 45.0 134,844.0 464.5 134,379.5 1960-61 143,805 21.7 143,826.7 628.1 143,198.6 1961-62 147,922 13.5 147,935.5 591.6 147,343.9 1962-63 151,721 1.4 151,722.4 563.1 151,159.3 1963-64 164,468 0.5 164,468.5 640.4 163,828.1 1964-65 164,402 1.5 164,403.5 920.6 163,482.9 1965-66 164,130 1.2 164,131.2 1,932.0 162,199.2 The analysis of variance for the multiple regression is as follows: Source of Degree of Sum of Mean sum of F.Ratio Variation freedom squares squares Due to regression 2 2233.26 1116.63 Residual about Regression 5 872.66 174.53 6.3979 Total 7 3105.9 Since F is significant at 5
percent level, we
may accept the hypothesis that the regression of Y on x 1 and x 2 is jointly linear. The coefficient of multiple correlation 0.848 indicates that the variables together explain 72 per cent of all the variance in consumption of soap during the period under review. Since the variables are logically consistent so as to be related to the dependent variable, soap, projections have been made using the above equation and the results are given below:
NOTES 120 Self-Instructional Material Demand Forecasting
Years ‘000 tonnes 1965-66 133.25 1970-71 170.42 1975-76 192.62 The projection for the year 1965-66 as given above is lower than the result obtained by the trend method. Projection on per capita basis. A rational method for projecting the consumption levels into the future is on per capita basis. By and large, it is reasonable to assume that the future per capita consumption
levels for
non-durable consumer goods will not be less than that obtaining at present in which case the anticipated increase in population will alone determine the aggregate consumption in the future. The future population levels would have, of course, to be determined first by the trend method. The projections given above are based on this assumption and procedure. 4.5.2 Intermediate Goods Steel. Table 8.7 furnishes the available data on the consumption of finished steel in India from 1950-51 onwards. The following techniques of forecasting were applied to forecast the demand for steel on the basis of its past apparent consumption and the various economic indicators. (a) Trend method. In the trend method, both the linear and non-linear projections have been attempted. The two equations, their parameters and the projections for the various years are now given: Equations: (a) Y = 471.54 + 286.07t (Y = a + bt) (b) Y = 1791.3t 3 + 223.3t + 22.6 Year (a) Linear (b) Non-linear (million tonnes) 1965-66 — 5.630 1970-71 5.907 9.230 1975-76 7.337 14.190 In 1965-66, the actual consumption of finished steel was 4.90 17 million tonnes, consisting of 4.45 million tonnes from domestic production and 0.492 million tonnes of imports less exports of 0.045 million tonnes. It is obvious that the trend method has failed to give reliable results in this case even with regard to a very near future year. The explanation may lie in the fact that constraints in foreign exchange have depressed imports of steel in the
immediate past
years. Nevertheless, the fact that the trend method has not given a close result even for 1965-66 and also the wide divergence between the results by the two sets of equations in the trend method call for further probe by other methods. (b) Regression method. Taking up the regression method next, two independent projections—one with a single variable (industrial output) and the other with
also
national income give the following results. The correlation in both the cases is 0.94, which is quite high. Year Regression on Regression on industrial output national income (
million tonnes) 1965-66 4.095 4.134 1970-71 5.757 5.656 1975-76 7.972 7.916
NOTES Self-Instructional Material 121 Demand Forecasting

The correlation with industrial output is significant as the industries sector accounts for nearly 60 to 65 per cent of the total consumption of steel in India and, therefore, the results obtained on this basis should be more realistic. But, the forecast obtained by this regression is nearly a million tonnes short compared to the actual consumption in 1965- 66. The estimates for the future years by the regression method are also lower than those obtained by the trend method. Table 4.7: Consumption of Finished Steel in India ('000 tonnes) Years Indigenous Imports Total Exports Apparent Production of Cols. and Consumption 2 + 3 Re-exports 1 2 3 4 5 6 1950-51 1044.7 154.0 1198.7 7.7 1191.0 1951-52 1100.4 57.7 1198.1 7.7 1154.9 1952-53 1105.0 68.5 1173.5 3.2 1171.1 1953-54 1103.1 156.7 1259.8 2.4 1256.4 1954-55 1263.4 293.3 1556.0 5.0 1551.7 1955-56 1296.8 659.2 1956.7 2.4 1953.6 1956-57 1370.0 1114.4 2484.4 0.1 2484.3 1957-58 1361.1 679.3 2041.2 0.3 2040.9 1958-59 1354.2 294.7 1658.9 Neg. 1648.9 1959-60 1907.1 366.4 2273.5 0.3 2273.2 1960-61 2459.1 476.5 2935.6 1.0 2934.6 1961-62 3006.2 389.7 3395.1 2.3 3393.6 1962-63 3986.7 242.0 4228.7 7.1 4221.6 1963-64 4297.7 301.4 4599.1 13.2 4585.9 1964-65 4431.8 410.2 4842.0 4842.0 For the purpose of forecasting the consumption of finished steel using multiple regression model, the data on the two variables, namely, industrial output and construction, (which are closely related and which account for more than 80 per cent of the total consumption of steel), together with data on national income was used. The multiple correlation coefficient and the regression equation estimated with the available data are given below: (i) Regression equation y = 7.91752 x 1 + 15.26547 x 2 + 1.0092 x 3 – 6635888 where y is the consumption of steel x 1 = index of industrial output x 2 = index of construction activity x 3 = national income (ii) Coefficient of multiple correlation = 0.9255 Sum of Degree of Mean sum squares freedom of squares Regression 5,128,218.09 3 179,406.03 Residual about regression 858,781.09 8 107,347.63 F = 15.924 is highly significant. The coefficient of multiple correlation r 1.123 indicates that the three variables together explain 74 per cent of all the variance in steel consumption during the years which have been considered for establishing the

NOTES 122 Self-Instructional Material Demand Forecasting

correlation. The estimated future consumption using the above regression equation is given below. Years Steel consumption in million tonnes 1965-66 4,406 1970-71 6,590 1975-76 9,777 It is interesting to observe that the estimate of 1965-66 by multiple regression is closer to the actual consumption in that year than those obtained either by the trend or by regression on a single variable, like industrial output or national income. (c) End-use method. Taking up next the results of an end-use study that was carried out in 1963 for steel consumption, 18 the aggregate figures were as follows, for 1965- 66 and 1970-71. The demand for 1975-76 was not estimated in that study. 1965-1966 1970-71 Finished steel 6.902 135.94 Crude steel 9.735 18.287 There is a difference of two million tonnes between the end-use estimate for 1965- 66 and the actual consumption of finished steel in that year. A probe into the actual output in 1965-66, of the industries and other sectors which consume steel, would reveal the factors accounting for the shortfall. It was found that the shortfall was mostly in the industrial sector. 4.6 SUMMARY

An estimate of future demand for a product is essential for production planning, purchase of inputs and sales promotion. The methods used for demand forecasting are classified under two categories: (i) Survey methods, and (ii) Statistical methods. Survey methods include (a) Consumer survey, and (b) Opinion poll methods. Consumer survey method includes complete enumeration, sample survey or end-use method. Opinion poll method includes expert opinion survey and market studies and experiments. Expert opinion survey may be a simple method or Delphi method. Statistical methods include (a) trend projection method using graphical method, trend fitting or Box-Jenkins techniques; (b) barometric methods using lead-lag indicators or diffusion indices; and (c) econometric methods. Econometric methods combine economic theory with statistical techniques to estimate the future demand. Statistical techniques used for the purpose of estimating future demand include bivariate or multivariate regression technique. Under complex conditions, however, econometric method uses 'simultaneous equation' method for demand forecasting. 4.7 ANSWERS TO 'CHECK YOUR PROGRESS' 1. The importance of demand forecasting lies in the fact that knowledge about the future level of demand is essential for production planning and scheduling, for determining the level of investment, for purchase of inputs and for sales promotion. 2. Under survey method, broadly two survey methods are used:

z consumer survey, and z

opinion poll method.

NOTES Self-Instructional Material 123 Demand Forecasting Consumer survey may take the form of (i) complete enumeration; (ii) sample survey, and (iii) end use method.

Opinion poll method includes (a) survey of expert opinion including Delphi method, and (b) market experimentation. 3. Complete enumeration method of survey is used where the number of consumer is small. Where number of consumers is large, sample method is used. 4. Under Delphi method, first opinion of different experts is collected on future demand and then the opinions are cross checked by exchanging expert opinions. 5. Statistical method uses statistical techniques for demand forecasting. This method is scientific, based on real-life data, shuns subjectivity, and results are more reliable. 6. Statistical methods generally used for demand forecasting include (i) trend projection method including graphical and trend projection method, (ii) exponential trend method, and (iii) Box-Jenkins method. 7. Both linear and exponential trend method use time-series data for demand forecasting. Linear trend method is used if data shows a nearly constant increase in demand per unit of time whereas exponential trend method is used where data shows increase in demand at increasing rate. 8. Exponential trend method is used when time-series data reveals increase in demand per unit of time at an increasing rate. 9. Box-Jenkins method of demand forecasting is used when time series data does not show a long-term trend in demand for a product. This method is used for short-run or seasonal projection of demand. 10. Box-Jenkins method uses either auto-regression or moving average method, or a combination of the two methods. 11. The auto-regressive method uses the following model for demand forecasting D = a 1 D t-1 + a 2 D t-2 + a n D t-n + l t where D is demand, a 1 , a 2 , and an are constants coefficients. 12. Barometric method uses the indicators, the barometers, of future demand. This method uses (i) leading indicators, (ii) coincidental indicators, and (iii) lagging indicators, depending on availability and relevance of indicators. 13. While other methods use time series data, assuming time is the demand determinant, econometric method combines economic theory and statistical techniques for demand forecasting. This a complex method, but produces the most reliable results. 14. Economic method produces more reliable results because demand forecast is based on theoretically tested demand determinants, and uses a scientific statistical technique for demand forecasting. 15. Regression method is the most popular method as it uses economic theory for the formulation of regression equation to be estimated. Economic theory specifies
the nature of relationship between the demand for a product and
its determinants.
Regression technique qualifies the relationship. That is why results are most reliable. 16. Bivariate regression equation is used when there is only the most prominent determinant of demand, whereas when more than one such determinant is there, then a multivariate regression equation is used to estimate demand.
NOTES 124 Self-Instructional Material Demand Forecasting 4.8 EXERCISES AND QUESTIONS 1. What is the purpose of demand forcasting? Describe the uses and limitations of the trend methods of forecasting demand. 2. Discuss critically the different methods of demand forecasting. 3. Outline the trend projection method of demand forecasting. What are its limitations? 4. What are the possible consequences if a large-scale firm places its product in the market without having estimated the demand for its product? 5.
What would be the appropriate variables for estimating demand for (a) steel, (b) sugar, (c)
petrol and (d) toys by the regression method? 6. "
The concept of elasticity of demand and demand forecasting are versatile tools of economic analysis." Discuss the validity of this statement
with appropriate examples. 7. Plot the following data on a graph and find the trend equation for sales: Year 1970 1971 1972 1973 1974 1975 1976 Total sales (units) 1150 1020 3050 3000 950 3060 4030 8. Demand function for the product of a shoe-manufacturing company is given as Q = −0.70 P + 0.45 A (where P = price per pair and A = advertisement cost per unit). The company sells 50,000 pairs of shoes per annum at Rs. 60 per pair. What will be the annual sales if the company spends Rs. 1 lakh on advertisement. (Note that advertisement cost increases price) 9. Explain the regression method of demand forecasting. Compare this method with trend method. 10. You are given the following data: X 3 6 8 10 13 13 13 14 Y 8 6 10 12 12 14 14 20 Estimate the regression equation Y = a + bX (Ans. Y = 0.8125 + 3.875 X) 11. Why is demand forecasting essential? Is demand forecasting equally important for small and big, and old and new business ventures? 12. What independent variables are relevant, in your opinion, for forecasting demand for (a) cement, (b) tooth pastes, (c) electricity and (d) textbooks? 13. What are the different techniques of survey methods? Under what conditions are complete enumeration and sample survey methods are chosen? 14. What is the Delphi method? What is the use of this method in demand forecasting? 15. Explain barometric method of demand forecasting. What is the difference between lead and lag indicators? 16.
An Economic Research Centre has published data on GDP and demand for
refrigerators as given below. Year 1990 1991 1992 1993 1994 1995 1996 GDP (bill. Rs.) 20 22 25 27 30 33 35 Refrigerators (mill. units) 5 6 8 8 9 10 12 (a) Estimate regression equation R = a + bY where R = refrigerator and Y = GDP. (b) Forecast demand for regrigerators in the years 1997 and 1998. The Research centre has projected GDP for 1997 and 1998 at Rs. 38 billion and Rs. 40 billion, respectively.
Ans. (a) R = – 3.108 + 0.4145 Y (b) R 1997 = 12.68 million R 1998 = 13.51 million

NOTES Self-Instructional Material 125 Demand Forecasting 4.9 FURTHER READING Ashton. David, and Leslie Simister, eds., The Role of Forecasting in Corporate Planning, Staples Press, London, 1970, Chs. 1–3, 8–9. Brigham, Eugene F., and James L. Pappas, Managerial Economics, The Dryden Press, Hinsdale, Illinois, 1976. Douglas, Evan J., Managerial Economics: Theory, Practice and Problems, Prentice Hall, Inc., N.J., 1970, Ch. 5. Wolfe, H.D., Business Forecasting Methods, Holt, Rinehart and Winston, Inc., 1966. Reddy, Mehender, J., Demand Forecasting, Light and Life Publications, New Delhi, 1981. References 1. Eugene F. Brigham and James L. Pappas, Managerial Economics, The Dryden Press, Hinsdale, Illinois, 1976, p. 129. 2. For example, Eugene F. Brigham and James L. Pappas, op. cit., pp. 548–49. 3. The origin of "Delphi method" is traced to Greek mythology. In ancient Greece, Delphi was an oracle of Apollo and served as a medium of consulting deities. In modern times, Delphi method was developed by Olaf Helmer at the Rand Corpo- ration of the US, as a method of obtaining a consensus of panelists without direct interaction between them. (J.R. Davis and S. Chang, Managerial Economics, Prentice-Hall, N.J., 1986, p. 191). 4. Eugene F. Brigham and James, L. Pappas, op. cit., p. 135. 5. Samuel C. Webb, Managerial Economics, Houghton Miffln Company, Boston, 1976, p. 156. 6. J. Dean, Managerial Economics, Englewood Cliffs, N.J., Indian Edn., 1960, p. 181. 7. S. Balakrishna, Techniques of Demand Forecasting for Industrial Products, p. 4. 8. This method was suggested by G.E.P. Box and G.M. Jenkins in their book, Time Series Analysis, Forecasting and Control, Holdan-Day, San Francisco, 1970. 9. Computer programmes on Box-Jenkins method are available for use. 10. O. Lange, Introduction to Econometrics, 2nd Edn., Oxford Pergamon Press, 1962, pp. 85-95. 11. A summary of use and findings of this method can be had from R. Davis and Semoon Chang, Principles of Managerial Economics, Prentice-Hall, NJ, 1986. 12. Estimated values of parameters, –0.75, 0.1, 1.25 and 0.05 are, respectively, the regression coefficients of demand with respect to P x , Y, P y and A. 13. For detailed discussion on the use of econometric methods in business decision, see J.W. Elliott, Econometric Analysis for Management Decisions (Homewood, Irwin, 1973). 14. D.S. Sidhu, Demand and Supply of Eggs: An Economic Analysis (S. Chand & Co., New Delhi, 1974). The study was made for 1968-69. 15. S. Balakrishna, op. cit. 16. Reporduced from Balakrishna, op. cit. 17. This does not take into account the steel content of imported machinery and other finished goods made from steel. 18. "Reappraisal of Steel Demand", 1963, National Council for Applied Economics Research, New Delhi.

MODULE - 2

NOTES 128 Self-Instructional Material Theory of Production

NOTES Self-Instructional Material 129 Theory of Production UNIT 5 THEORY OF PRODUCTION Structure 5.0 Introduction 5.1 Unit Objectives 5.2 Meaning of Production and Some Concepts 5.2.1 Meaning of Production; 5.2.2 Some Concepts 5.3 Production Function 5.4 The Laws of Production 5.4.1 Short-run Laws of Production: Production with One Variable Input; 5.4.2 Long-term Laws of Production: Laws of Returns to Scale; 5.4.3 The Laws of Returns to Scale 5.5 The Laws of Returns to Scale Through Production Function 5.5.1 Degree of Production Function and Returns to Scale 5.6 CES Production Function 5.7 Optimal Input Combination 5.7.1 The Budgetary Constraint and Budget Line; 5.7.2 The Least-cost Criteria; 5.7.3 Effect of Change in Input Price 5.8 Summary 5.9

Answers to ‘Check Your Progress’ 5.10 Exercises and Questions 5.11 Further Reading 5.0 INTRODUCTION Whatever the objective of business firms,
achieving optimum efficiency in production or minimising cost for a given production is one of the
prime concerns of the business managers. In fact, the very survival of a firm
in a competitive market depends on their ability to produce
goods and services
at a competitive cost. Therefore, managers
of business firms endeavour to minimize the production cost or, maximise output from a given quantity of inputs. In their effort to minimize the cost of production, the fundamental questions which managers are faced with are: (i) How can production be optimized
so that cost is
minimized? (ii)
How does output change when
quantity of inputs is increased? (
iii)
How does technology matter in reducing the cost of production? (
iv)
How can the least-cost combination of inputs be achieved? (
v) Given the technology, what happens to the rate of return when more plants are added to the firm?
The
theory of production provides a theoretical answer to these questions through
economic
models
built under hypothetical conditions.
The
production theory may therefore not provide solutions to real-life problems.
But
it does provide tools and techniques to analyse the
input- out relationships which provide guidelines for finding
solutions to practical business problems.
This unit is devoted to the discussion of the theory of production,
pending the theory of costs till the next unit. Production theory deals with quantitative relationships, i.e.,
technical and technological relations, between inputs, especially labour and capital, and between output
and inputs.
NOTES 130 Self-Instructional Material Theory of Production 5.1 UNIT OBJECTIVES
z
To introduce and explain some basic concepts used in production analysis
z To introduce production function as a tool production analysis z To explain and illustrate laws of production z
To show how firms can find optimum combination of inputs 5.2 MEANING OF PRODUCTION AND SOME CONCEPTS
5.2.1 Meaning of
Production
In economics,
the term ‘production’ means a process by which
resources (men, material, time, etc.) are transformed into a different and more useful commodity or service. In general,
production means transforming inputs (labour, machines, raw materials, time, etc.) into an output
with value added. This
concept of production is however limited to only ‘manufacturing’.
In
economic sense, production process may take a variety of forms
other than manufacturing.
For example, transporting a commodity
from one place to another where it can be
consumed or used in the process of production is production. For example, a sand dealer collects and transfers the sand from the river bank to the construction site;
a coal miner does virtually nothing more than

transporting coal from coal mines to the market place. Similarly, a fisherman only transports fish to the market place. Their activities too are ‘production’.

Transporting men and materials from one place to another is a productive activity: it produces service. Storing a commodity for future sale or consumption is also ‘production’. Wholesaling, retailing, packaging, assembling are all productive activities. These activities are just as good examples of production as manufacturing.

Cultivation is the earliest form of productive activity. Besides, production process does not necessarily involve physical conversion of raw materials into tangible goods. Some kinds of production involve an intangible input to produce an intangible output.

For example, in the production of legal, medical, social and consultancy services both input and output are intangible; lawyers, doctors, social workers, consultants, hair-dressers, musicians, orchestra players are all engaged in producing intangible goods. 5.2.2

Some Concepts

Input and Output.

An input is a good or service that goes into the process of production. In the words of Baumol, “An input is simply anything which the firm buys for use in its production or other proceses.” 1 An output is any good or service that comes out of production process.

The term ‘inputs’ needs some more explanations. Production process requires a wide variety of inputs, depending on the nature of product. But, economists have classified input as (i) labour, (ii) capital, (iii) land, (iv) raw materials; and (v) time.

All these variables are ‘flow’ variables, since they are measured per unit of time.

Fixed and Variables Inputs. Inputs are classified as (i) fixed inputs or fixed factors, and (ii) variable inputs or variable factors.

Fixed and variable inputs are defined in economic sense and in technical sense. In economic sense, a fixed input is one whose supply is inelastic in the short run. Therefore, all of its users together cannot buy more of it in the short-run. In technical sense, a fixed factor is one that remains fixed (or constant) for a certain level of output. A variable input is defined as one whose supply in the short-run in elastic, e.g., labour and raw material, etc. All the users of such factors can employ a larger quantity in the short-

run. Technically, a variable input is one that changes with the change in output.

In the long run, all inputs are variable.

Short-Run and Long-Run. The reference to time period involved in production process is another important concept used in production analysis. The two reference periods are short run and long run. The

short run refers to a period of time in which
the supply of
certain inputs (e.g., plant, building, machinery, etc.) is fixed or
is
inelastic. In the short-run therefore, production of a commodity can be increased by increasing the use of
only variable inputs like labour and raw materials.
It
is important to note that 'short-run' and 'long run' are economists' jargon. They do
not refer to any
fixed
time
period. While in some industries
short run
may be a matter of few weeks or few months, in some others (e.g., electric and power industry), it may mean three or more years.
The
long run refers
to
a period of time in which the supply of all the inputs is elastic, but not enough to permit a change in technology. That is, in the long run, all the inputs are variable. Therefore, in the long-run, production of a commodity can be increased by employing more of both variable and fixed inputs.
The economists use another term, i.e., very long
run which
refers to a period in which the technology of production is supposed to change. In
the
very long run, the production function also changes. The technological advances
result in a larger output from a given quantity of inputs. 5.3
PRODUCTION FUNCTION Production function is a
tool of analysis used to explain the
input-output relationship. A
production function describes the technological relationship between inputs and output in
physical terms.
In its general form, it tells that production of a commodity depends on certain specific inputs.
In its specific form, it presents the quantitative relationships between
inputs and output. Besides,
the production function represents the technology of a firm, of an industry
or of the economy as a whole. A production function may take the form of a schedule or table, a graphed line or curve, an algebraic equation or a mathematical model. But each of these forms of a production function can be converted into its other forms.
Before we illustrate the various forms of a production function, let us note how a complex production function is simplified and the number of inputs in the production function (
used as independent variables) is reduced to a manageable number, especially in theoretical analysis or models. An empirical
production function is generally very complex. It includes a wide range of inputs, viz., (i) land; (ii) labour, (iii) capital, (iv) raw material, (v)
time,
and (vi) technology. All these variables enter the actual production function of a firm.
The
long-run production function is generally expressed as Q = f(L
d , L, K, M, T, t) ...(5.1) where L d =
land and building L = labour, K = capital, M = materials, and
T =
technology, and t = time.
The
economists have however reduced the number of
variables used in a production function to only two, viz., capital (K) and labour (L),

for the sake of convenience and simplicity in the analysis of input-output relations
and production function
is expressed as Q = f(L, K) ...(5.2) The reasons for ignoring other inputs are following. Land and building (
L d),
as inputs, are
constant for the economy as a whole, and hence it does not enter into the aggregate production function. However, land
and building are not a constant variable for an individual firm or
NOTES 132 Self-Instructional Material Theory of Production
industry.
In the case of individual firms, land and building are lumped with 'capital' 2 .
In case of 'raw materials' it has been observed that this input 'bears a constant relation to output at all levels of production'. For example, cloth bears a constant relation to the number of garments. Similarly, for a given size of a house, the quantity of bricks, cement, steel, etc. remains constant, irrespective of number of houses constructed. To consider another example, in car manufacturing of a particular brand or size, the quantity of steel, number of the engine, and number of tyres and tubes are fixed per car.
This constancy of input-output relations leaves the methods
of production unaffected. So is
the case, generally, with time and space.
That is why, in most production functions only two inputs—
labour and capital—are included.
We will illustrate the tabular and graphic forms of a production function when we move on to explain the laws of production. Here, let us illustrate the algebraic or mathematical form of a production function. It is
this
form of production function which is most commonly used in
production analysis.
To illustrate the algebraic form of production function, let us suppose that a
coal-mining
firm employs only two inputs—capital (K) and labour (L)—
in its coal production activity. As such, the general form of its production function may be expressed as
Q = f (K, L) where Q = the quantity of coal produced per time unit,
K = capital, and L = labour.
The production function (5.1) implies that quantity of coal produced depends on the quantity of capital, K, and labour, L, employed to produce coal. Increasing coal production will require increasing K and L. Whether the firm can increase both K and L or only L depends on the time period it takes into account for increasing production, i.e.,
whether the firm considers a short-run or
a long-run.
By definition, supply of capital
is inelastic
in the short run
and elastic in the long run.
In the short run,
therefore, the firm can
increase coal production by increasing labour
only
since the supply of capital in the short run
is
fixed 3 .
In the long run, however, the firm can employ more of both capital and
labour
because of
supply of capital becomes elastic over time.
Accordingly,
there are
two kinds of production functions: (i) Short-run production function;
and (

ii)
Long-run
production function.
The
short-run production function or what may also be termed
as ‘single variable production function’, can be expressed as Q = f (
L) ...(5.3)
In the long-
term production function, both K and L are included and the function takes the form
as given in Eq. (5.2). Q = f (K, L) Assumptions A
production function is based on the
following assumptions: (i) perfect divisibility of both inputs and output; (
ii)
there are only two factors of production—labour (L) and capital (K); (iii) limited substitution of one factor for the other; (iv) a given
technology;
and (
v) inelastic supply of fixed factors in the short-run. If there is a change in these assumptions, the production function will have to be modified accordingly.
Check Your Progress 1. What is meant by production? 2. What is short-run and long-
run in the context of production analysis? 3. What is meant by production function? 4. What is the general form of production function?
NOTES Self-Instructional Material 133 Theory of Production The
two most important production functions used in economic literature to analyse input- output relationships are Cobb-Douglas and ‘Constant elasticity of Substitution’ (CES) production functions. Pending further discussion on these production functions for a subsequent section, we will first explain the laws of production through a simple hypothetical production function. 5.4 THE
LAWS
OF PRODUCTION
The laws of production state the relationship between output and input.
The
traditional theory of production studies the marginal input-output relationships under (i) short run, and (ii) long run conditions.
In the short run, input-output relations are studied with one variable input, other inputs held constant.
The laws of production under these conditions are called ‘The laws of Variable Proportions’ or the ‘
Laws of Returns to
a
Variable Input’.
In
the
long run input-output relations are studied assuming all the input to be variable. The log run input-output relations studied under ‘Laws of Returns to Scale’. In
the
following sub-
section, we will explain the ‘laws of return to a variables input’. The laws of ‘returns to
scale’ or what is also called ‘long-run laws of production’, will be discussed in the following subsection. 5.4.1
Short-run Laws of Production: Production with One Variable Input
By definition, some factors of production are available in unlimited supply even during the short period. Such factors are called variable factors. In the
short-run, therefore, the firms can employ an unlimited quantity of the variable factor. In other words, firms can employ in the
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
laws which bring out the relationship between varying factor proportions and output are therefore known as the Law of Returns to a
Variable Input, or what is more popularly

known
as
the
Law of Diminishing Returns.
The
Law of Returns
to a Variable Input :
The Law of Diminishing Returns.
The law of diminishing returns
states that when
more and more
units of a
variable input are
applied
to
a given quantity of fixed
inputs, the
total output may initially increase at
an
increasing rate
and then at a constant rate but it will eventually increase at diminishing rates. That
is, the
marginal increase in total output eventually
decreases when additional units of
variable factors are
applied to a
given quantity of fixed factors.
Assumptions.
The
law of diminishing returns is based on the following
assumptions: (
i) the state of technology is given, (
ii) labour is homogeneous,
and (iii)
input prices are given.
To illustrate the law of diminishing returns, let us assume (i) that the
coal-mining firm (in our earlier example) has a set of mining
machinery as its capital (K), fixed in the short run, and (ii) that it can
employ more
of
mine-
workers
to increase its coal production. Thus, the short run production function for the firm will take the following form. Q c =
f(L) Let us assume that
the labour-output relationship
in coal production is given by a hypothetical production function of
the following form.
Q c = – L 3 + 15L 2 + 10L ...(5.4) Given the production function (5.4), we may
substitute different numerical values
for
L in the function and work out a series of Q c , i.
e., the quantity of coal that can be produced with different number of workers. For example, if
L = 5, then by substitution,
Q c = – 5 3 + 15 × 5 2 + 10 × 5 = – 125 + 375 + 50 = 300
NOTES 134 Self-Instructional Material Theory of Production
A

tabular array of output levels associated with different number of workers from 1 to 12, in our hypothetical coal-production example, is given in Table 5.1 (Cols. 1 and 2). What we need now is to work out marginal productivity of labour (MP L) to find the trend in the contribution of the marginal labour and average productivity of labour (AP L) to find the average contribution of labour. Marginal Productivity of Labour (MP L) can be obtained by differentiating the production function (5.4). Thus, MP L = L Q ∂ ∂ = − 3L 2 + 30L + 10 ...(5.5) By substituting numerical value for labour (L) in Eq. (5.5), MP L can be obtained at different levels of labour employment. However, this method can be used only where labour is perfectly divisible and L 0. Since, in our example, each unit of L = 1, calculus method cannot be used. Alternatively, where labour can be increased at least by one unit, MP L can be obtained as MP L = TP L − TP L–1 The MP L worked out by this method is presented in col. 3 of Table 5.1. Average Productivity of labour (APL) can be obtained by dividing the production function by L. Thus, AP L = − + + L L L 3 2 15 10 ...(5.6) = −L 2 + 15L + 10 Now AP L can be obtained by substituting the numerical value for L in Eq. (5.6). AP L obtained by this method is given in col. 4 of Table 5.1. Tables 5.1 Three Stages of Production No. of workers Total product Marginal Average Stages of (N) (TP L) Product* Product Production (tonnes) (MP L) (AP L) (1) (2) (3) (4) (5) 1 24 24 24 I 2 72 48 36 Increasing 3 138 66 46 returns 4 216 78 54 5 300 84 60 6 384 84 64 7 462 78 66 II 8 528 66 66 Diminishing 9 576 48 64 returns 10 600 24 60 11 594 − 6 54 III 12 552 − 42 46 Negative returns * MP L = TP n − TP n–1 . MP L calculated by differential method will be different from that given in Col. 3. The information contained in Table 5.1 is presented graphically in panels (a) and (b) of Fig. 5.1. Panel (a) of Fig. 5.1 presents the total product curve (TP L) and panel (b) presents marginal product (MP L) and average product (AP L) curves.

The TP L schedule demonstrates the law of diminishing returns. As the curve TP L shows, the total output increases at an increasing rate till the employment of the 5 th worker, as indicated by the increasing slope of

the TP L curve. (See also col. 3 of the table). Beyond the 6th worker, TP L increases (until the 10th worker) but the rate of increase in TP L (i.e., marginal addition to TP L) begins to fall and turns negative 11th worker onwards. This shows the operation of the law of diminishing returns.

The three stages in production.

Table 5.1 and Fig. 5.1 present the three usual stages in the application of the laws of diminishing returns.

In stage I, TP L increases at increasing rate. This is indicated by the rising MP L till the employment of the 5th worker.

Given the production function (5.4), the 6th worker produces as much as the 5th worker. The output from the 5th and the 6th workers represents an intermediate stage of constant returns to the variable factor, labour.

In Stage II, TP L continues to increase but at diminishing rates, i.e., MP L begins to decline. This stage in production shows the law of diminishing returns to the variable factor. Total output reaches its maximum level at the employment of the 10th worker. Beyond this level of labour employment, TP L begins to decline. This marks the beginning of stage III in production. To conclude, the law of diminishing returns can be stated as follows. Given the employment of fixed factor (capital), when more and more workers are employed, the return from the additional worker may initially increase but will eventually decrease. 1

O O 1 100 200 15 300 30 400 45 500 60 600 75
Total Output (Tonnes) Marginal and Average Product 700 90 2 2 3 3 4 4 5 5 6 6 7 7
Labour Labour 8 8 9 9 10 10 11 11 12 12 TP L ( )a ( )b AP L MP L
Fig. 5.1 Total, Average and Marginal Products Factors Behind the Short-run
Laws of Returns. As shown in
Fig. 5.1,
the marginal productivity of workers (MP L) increases is Stage I, whereas it decreases in Stage II. In other words, in Stage I, Law of Increasing Returns is in operation and in Stage II, the law of Diminishing Returns is in application.
The reasons which underly the application of the laws of returns in Stages I and II may be described as follows.
One of the important factors causing increasing returns to a variable factor is the indivisibility of fixed factor (capital).
It
results in under-utilisation of capital
if labour is less than its optimum number. Let us suppose that optimum capital-labour combination is 1:6. If capital is indivisible and less than 6 workers are employed, then capital
would remain underutilised. When more and more workers are added, utilization of
capital increases
and also the productivity of additional worker.
Another
reason for increase in labour productivity is
that employment of additional workers
leads to
advantages of division
of labour, until optimum capital-
labour
combination is reached.
Once the optimum capital-labour ratio is reached, employment of additional workers
amounts to
substitution of
capital with labour. But, technically,
one factor can substitute another only upto a limited extent.
In other words,
there is
a limit to which one input can be substituted for another.
That is,
the elasticity of substitution between input is not infinite.
Hence, to replace the same amount of capital, more and
more workers will have to be employed because per worker marginal productivity decreases.
NOTES 136 Self-Instructional Material Theory of Production
Application
of
the Law of Diminishing Returns. The law of diminishing returns
is an empirical
law, frequently observed in various production activities.
This law, however, may not apply universally to all kinds of productive activities since
the law
is not as true as the law of gravitation. In some productive activities, it may operate quickly, in some its operation may be delayed;
and in some others, it may not appear at all. This law has been found to operate in agricultural production more regularly than in industrial production.
The reason is, in agriculture, natural factors play a predominant role whereas man-made factors play the major role in industrial production.
Despite the limitations of the law, if increasing units of an input are applied to the fixed factors, the marginal returns to the variable input decrease
eventually.
The Law of Diminishing Returns

and Business Decision. The law of diminishing returns as presented graphically has a relevance to the business decisions. The graph can help in identifying the rational and irrational stages of operations. It can also
provide answer to such questions as (i) how much to produce; and (ii) what
number of workers (or other variable inputs) to apply to a given fixed input so that, given all other factors, output is maximum.
Fig 5.1 exhibits
the three stages of production. Stage III shows a very high labour-capital ratio. As a result, employment of additional workers proves not only unproductive but also causes a decline in the TP. Similarly, in Stage I,
capital is presumably underutilized. So a firm operating in Stage I is required to increase labour, and a firm operating in Stage III is required to reduce labour, with a view to maximising its total production. From the firm's point of view, setting an output target in stages I and III is irrational.
The only meaningful and rational stage from the firm's point of view is Stage II in which the firm can find answer to the questions 'how many workers to employ'. Figure 5.1 shows that the firm should employ a minimum of 7 workers and a maximum of 10 workers even if labour is available free of cost. This means that the firm has a limited choice ranging from 7 to 10 workers. How many workers to employ against the fixed capital and how much to produce can be answered, only when the price of labour, i.e., wage rate, and
that of the product are known. This question is answered below.
Profit Maximization with One Variable Input.
It may be recalled from Fig. 5.1 that
an output maximizing coal-mining firm would like to employ 10 workers—since at this level of employment, the output is maximum. The firm can, however, employ 10 workers only if workers are available free of cost. But labour is not available free of cost—the firm is required to pay wages to the workers. Therefore, the question arises 'how many workers will the firm employ—10 or less or more than 10—to maximise its profit. A simple answer to this question is that the number of workers to be employed depends on the output that maximizes firm's profit, given the product price and the wage rate. This point can be proved as follows.
We
have shown in Unit 2
that
profit is maximum where MC = MR
In our example here, since labour is the only variable input, marginal cost (MC) equals marginal wages (MW), i.e., MC = MW.
As regards MR, in case of factor employment, the concept of Marginal Revenue Productivity is used. The marginal revenue productivity is the value of product resulting from the marginal unit of variable input (labour). In specific terms, marginal revenue productivity (MRP) equals marginal physical productivity (
MP_L)
of labour multiplied by the price (P) of the product, i.e., MRP=
$MP_L \times$
P
For example, suppose that the price (P) of coal is given at
Rs. 10
per quintal. Now, MRP of a worker can be known by multiplying its
MP_L (as given in Table 5.1) by
Rs.10.
For example, MRP of the 3rd worker (see Table 5.1) equals $66 \times 10 =$
Rs. 660
and of the 4th worker, $78 \times 10 = 780$. Likewise, if whole column (MP_L) is multiplied by
Rs. 10,
it gives us a table showing marginal revenue productivity of workers. Let us suppose that wage
Check Your Progress 5.
What is
the law of diminishing returns? 6. What are the three stages in production in the
short-run? 7.
What factors lead to increas- ing returns to the variable input? 8. How can the law of diminish- ing returns be applied to business decision making?

rate (per time unit) is given at Rs. 660. Given the wage rate, the profit maximising firm will employ only 8 workers because at this employment, MRP = wage rate = MRP of 8th worker 66 × 10 = Rs. 660. If the firm employs the 9th worker, his MRP = 48 × 10 = Rs. 490 > Rs. 660. Clearly, the firm loses
Rs. 180
on the 9th worker. And, if the firm employees less than 8 workers it, will not maximise profit.
To generalize, if
relevant series of MRP is graphed, it will give
a
MRP curve as shown in Fig. 5.2. Similarly, the MRP curve for any input may be drawn and compared with MC (or MW) curve. Labour being the only variable input, in our example, let us suppose that wage rate in the labour market is given at OW (Fig. 5.2). When wage rate is given, average wage (AW)
and marginal wage (MW) are equal, i.
e., AW = MW, for the whole range of employment in the short run. When AW = MW, the supply of labour is shown by a straight horizontal line, as shown by the line AW = MW. With the introduction of MRP curve and AW = MW line (Fig. 5.2), a profit maximising firm can easily find the maximum number of workers which can be optimally employed against a fixed quantity of capital. Once the maximum number of workers is determined, the optimum quantity of the product is automatically determined.
The marginality principle of profit maximization tells that profit is maximum when MR = MC. This is a necessary condition of profit maximisation. Figure 5.2 shows that MRP = MW (= MC) are equal at point P, the point of intersection between MRP and AW = MW. The number of workers corresponding to this point is ON. A profit maximising firm should therefore employ only ON workers. Given the number of workers, the total output can be known by multiplying ON with average labour productivity (AP). 5.4.2
Long-term Laws of Production:
Laws of Returns to Scale
We have discussed
in the preceding section, the technological relationship between inputs and output assuming labour to be the only variable input, capital remaining constant. This
is a short-run phenomenon.
In this section, we will discuss the relationship between inputs and output under the condition that both the inputs, capital
and labour, are variable factors.
This is a long-run phenomenon.
In the long-run, supply of both the inputs is supposed to be elastic
and firms can hire larger quantities of both labour and capital. With large employment of capital and labour, the scale of production increases.
The technological relationship between changing scale of inputs and output is explained under the laws of
returns to scales. The laws returns to scale can be explained through the production function
and isoquant curve technique.
The most common and simple tool of analysis is isoquant curve technique. We have, therefore, first introduced and elaborated on this tool of analysis. The laws of return to
scale have then been explained through isoquant curve technique. The
discussion on
the laws of returns to scale through production function follows in the next section. Isoquant Curve
The term ‘isoquant’ has been derived from the Greek word
iso meaning ‘equal’ and Latin word quantus
meaning ‘quantity’. The ‘isoquant curve’ is, therefore,
also known as ‘Equal Product Curve’ or ‘Production Indifference Curve’.
An
isoquant curve
is
locus of points representing various combinations of two inputs—capital and labour— yielding the same output.
An ‘isoquant curve’ is analogous to an ‘indifference curve’, with
Fig. 5.2 Determination of Labour Employment in the Short-Run

two points of distinction: (a) an indifference curve is made of two consumer goods while an isoquant

curve is constructed of
two producer goods (labour and capital) and (b) an indifference curve measures ‘utility’ whereas an isoquant measures output.
Isoquant curves are drawn on the basis of
the following assumptions: (i)
there are only two inputs, viz., labour (L) and capital (K), to produce a commodity X; (
ii)
the two inputs—L and K—can substitute each other but at a diminishing rate;
and (
iii)
the technology of production is given.
Given these assumptions, it is always possible to produce a given quantity of commodity X with various combinations of capital and labour. The factor combinations are so formed that the substitution of one factor for the other leaves the output unaffected. This technological fact is presented through an Isoquant Curve (IQ 1 = 100)
in Fig. 5.3. The curve IQ 1 all along its length represents a fixed quantity, 100 units of product X. This quantity of output can be produced with a number of labour-capital combinations. For
example, points
A, B, C,
and D on the isoquant IQ 1 show four different combinations of inputs, K and L,
as given in Table 5.2, all yielding the same output—100 units. Note that movement from A to D indicates decreasing quantity of K and increasing number of L. This implies substitution of labour for capital such that all the input combinations yield the same quantity of
commodity X, i.e., IQ 1 = 100.
Table 5.2 Capital Labour Combinations and Output Points
Input Combinations Output
K + L A
OK 4 + OL 1 = 100 B OK 3 + OL 2 = 100 C OK 2 + OL 3 = 100 D OK 1 + OL 4 = 100
Properties of
Isoquant.
Isoquants have the same properties as indifference curves. They are explained below in terms of inputs and outputs. (
a)
Isoquants have a negative slope. An isoquant has a negative slope in the economic region 4 or in the relevant range. The
economic region is the region on the isoquant plane in which substitution between inputs is technically inefficient. It is also known as the product maximizing region.
The negative slope of the isoquant
implies
substitutability between the inputs. It means
that if one of the inputs is reduced, the other input has to be
so increased that the total output remains unaffected.
For example, movement from A to B on IQ 1 (Fig. 5.3) means that if K 4 K 3 units of capital are removed from the production process, L 1 L 2 units of labour have to be
brought in to maintain the same level of output.
Fig. 5.3 Isoquant Curves
NOTES Self-Instructional Material 139 Theory
of Production (b)
Isoquants are convex to the origin. Convexity of isoquants implies not only the substitution
between the inputs but also diminishing marginal rate of technical substitution (MRTS) between the inputs in the economic region. The MRTS is defined as MRTS = K K Δ Δ– = slope of the isoquant
In plain words, MRTS is the rate at which a marginal unit of labour can substitute a marginal unit of capital (moving downward on the isoquant) without affecting the total output. This rate is indicated by
the slope of the isoquant. The MRTS decreases for
two reasons: (i) no factor is a perfect substitute for another,
and (
ii) inputs are subject to diminishing marginal return. Therefore,
more and more units of an input are needed to replace each successive unit of the other input.

For example, suppose various units of K (minus sign ignored) in Fig. 5.3 are equal, i.e.,
DK 1 = DK 2 = DK 3
the subsequent units of L substituting K go on increasing, i.e., DL 1 > DL 2 > DL 3 As a result, MRTS goes on decreasing, i.e., 3 3 2 2 1 1
L K L K L K
Δ Δ < Δ Δ < Δ Δ (
c)
Isoquants
cannot intersect or be tangent to each other.
The intersection or tangency between any two isoquants implies that
a given quantity of a commodity can be produced with
a smaller as well as a larger input-combination.
This is untenable so long as marginal productivity of inputs is greater than zero. In Fig. 5.4, two isoquants intersect each other at point M. Consider two other points—point J on isoquant marked 100 and point
K on isoquant marked 200.
One can easily infer that a
quantity that can be produced with the combination of K and L at point M can be produced also with factor combination at points J and K. On the isoquant 100, factor combinations at points M and J
are equal in terms of
their output.
On the isoquant 200, factor combinations at M and K are equal in terms of
their
output.
Since point M is common to both the isoquants, it follows that input combinations at J and K are equal in terms of output. This implies that
OL 2 + JL 2 = OL 2 + KL 2 Since OL 2 is common to both the sides, it means, JL 2 =
KL 2 But it
can be seen in Fig. 5.4 that JL 2 > KL 2 The intersection of the isoquants means that
that JL 2 and KL 2 are equal, which
is wrong.
That is why isoquant will not intersect or be tangent to each other.
If they do, it violates the law of production.
Fig. 5.4 Intersecting Isoquants
NOTES 140 Self-Instructional Material Theory
of
Production (
d) Upper isoquants represent higher level of output. Between any two isoquants, the upper one
represents a higher level of output than the lower one. The reason is, an upper
isoquant implies a larger input combination, which, in general, produces a larger output. Therefore, upper isoquants indicate a higher level
of
output. For instance, IQ 2 in
Fig. 5.5
will always mean a higher level of output than IQ 1 . For, any point at IQ 2 consists of more of either capital or labour or both. For example, consider point a on IQ 1 and compare it with any point at IQ 2 . The point b on IQ 2 indicates more of capital (ab), point d more of labour (ad) and point c more of both. Therefore, IQ 2 represents a higher level of output (200 units) than IQ 1 indicating 100 units. Isoquant Map and Economic Region of Production
Isoquant map.
One way to present a production function on a two-dimensional plane is to use its
isoquant map.
An isoquant map is a set of isoquants presented on a two-dimensional plane as shown by isoquants Q 1 , Q 2 , Q 3 and Q 4 in Fig. 5.6. Each
isoquant shows various combinations of two inputs that can be used to produce a given level of output.
An upper isoquant is formed by a greater quantity of one or both the inputs than
the input combination

indicated by the lower isoquants. For example, isoquant Q 2 indicates a greater input- combination than that shown by isoquant Q 1 and so on.
Since upper
isoquants indicate
a larger input-combination than the lower ones, each successive upper isoquant indicates a higher level of output than the lower ones. For example, if isoquant Q 1 represents an output equal to 100 units, isoquant Q 2 represents an output greater than 100 units. As one of the properties of isoquants, no two isoquants can intersect or be tangent to one another.
Economic region.
It is noteworthy that the whole isoquant map or production plane is not technically efficient, nor is every point on isoquant technically efficient. The reason is that, on a convex isoquant, the MRTS decreases along the isoquant. The limit to which the MRTS can decrease is zero.
A
zero MRTS implies that there is
a limit to which one input can substitute another. It also determines the minimum quantity of an input
which
must be used to produce a given output. Beyond this point, an additional employment of one input will necessitate employing additional units of the other input. Such a point on an isoquant may be obtained by drawing a tangent to the isoquant and parallel to the vertical and horizontal axes, as shown by dashed lines in
Fig. 5.6.
By joining the resulting points a, b, c and d, we get a line called the upper ridge line, Od. Similarly, by joining the points e, f, g and h, we get the lower ridge line, Oh. The ridge lines are locus of points on the isoquants where the marginal products (MP) of the inputs are equal to zero.
The upper ridge line implies that MP of capital is zero
along the line, Od.
The lower ridge line implies that MP of labour is zero
along the line, Oh.
Fig. 5.5
Comparison of Output at Two Isoquants Fig. 5.6 Isoquant Map
NOTES Self-Instructional Material 141 Theory of Production
The area between the two ridge lines, Od and Oh, is called 'Economic Region' or 'technically efficient region' of production. Any production technique, i.e.,
capital-labour
combination, within the economic region is technically efficient to produce a given output. And, any production technique outside this region is technically inefficient since it requires more of both inputs to produce the same quantity.
Other Forms of Isoquants. We have introduced above a convex isoquant which
is most widely used in traditional economic theory. The shape of an isoquant, however, depends on the degree of substitutability between the factors in the production function. The convex isoquant presented in Fig. 5.3 assumes a continuous substitutability between capital and labour but at a diminishing rate. The economists have, however, observed other
degrees of substitutability between K and L and have demonstrated the existence of three other kinds of isoquants. 1. Linear isoquants. A linear isoquant is presented by the line AB in Fig. 5.7. A linear isoquant implies perfect substitutability between the two inputs K and L. The isoquant AB indicates that a given quantity of
a product can
be produced by using only capital or only labour or by
using both. This is possible only when the two factors K and L, are perfect substitutes for one another. A linear isoquant also implies that the MRTS between K and L remains constant
throughout.
The mathematical form of the production function exhibiting perfect substitutability of factors is
given as follows. If Q = f(K, L) then =
aK + bL ...(5.7) The production function (5.7) means that the total output, Q, is simply the weighted sum of K and L. The slope of the resulting isoquant from this production function is given by – b/a. This can be proved
in the following way.
Given the production function (5.7), MP K =
a K Q = ∂ ∂ and MP L = b L Q = ∂ ∂ Since MRTS = MP MP L K
and K L MP MP = a

b–
Therefore, MRTS = –
b a =
slope of the isoquant
The production function exhibiting perfect substitutability of factors is, however, unlikely to exist in the real world production process. 2.
Fixed Factor-Proportion or L-Shaped Isoquants. When a
production function assumes a fixed proportion between K and L, the isoquant takes 'L' shape, as shown by Q 1 and Q 2 in Fig. 5.8. Such an isoquant implies zero substitutability between K and L. Instead, it assumes perfect complementarity between K and L. The perfect complementarity assumption
implies
that a given quantity of a commodity can be produced
by one and only
Fig. 5.7 Linear Isoquant

one combination of K and L and that the proportion of the inputs is fixed.
It also implies that if the
quantity of an input is increased and the quantity of
the
other input is held constant, there will be no change in output. The output can be increased only by increasing both the inputs proportionately.
As shown in
Fig. 5.8,
to produce Q 1 , OK 1 units of K and OL 1 units of L are required. It means that if OK 1 units of K are being used, OL 1 units of labour must be used to produce Q 1 units of a commodity. Similarly, if OL 1 units of labour are employed, OK 1 units of capital must be used to produce Q 1 . If units of
only K or only L are increased, output will not increase. If output is to be increased to Q 2 , K has to be increased by K 1 K 2 and labour by L 1 L 2 . This kind of technological relationship between K and L gives a
fixed proportion production function.
A fixed-proportion production function, called Leontief production function, is
given as
Q = f(K, L) = min (aK, bL) ...(5.8) where 'min' means that Q equals the lower of the two terms, aK and bL. That is, if aK < bL,
Q = bL and if bL < aK, then Q = aK.
If aK = bL, it would mean that both K and L are fully employed. Then the fixed capital labour ratio will be K/L = b/a. In contrast to
a
linear production function, the fixed proportion production function has a wide range of application in the real world.
One can find many techniques of production in which a fixed proportion of labour and capital is fixed.
For example, to run a taxi or to operate a tractor one
needs only one
worker—the driver.
In these cases, the machine- labour proportion is fixed. Any extra labour would be redundant. Similarly, one can find cases in manufacturing industries where
capital-labour
proportions are fixed. 3.
Kinked or Linear Programming Isoquants.
The fixed proportion production function (Fig. 5.8) assumes that there is only one technique of production, and capital and labour can be combined only in a fixed proportion.
It implies that to double the
production would require doubling both the inputs, K and L. The line OB (
Fig. 5.8)
represents the only production process available.

In real life, however, the businessmen and the production engineers find in existence many, but not infinite, techniques of producing a given quantity of a commodity, each technique having a different fixed proportion of inputs. In fact, there is a wide range of machinery available to produce a commodity. Each machine requires a fixed number of workers to work with. This number
is different for each
machine. For example, 40 persons can be transported from one place to another by two methods: (i) by hiring 10 taxis and 10 drivers, or (ii) by hiring a bus and 1 driver. Each of these methods is a different process of production and has a different fixed proportion of capital and labour.
Handlooms and power looms are other examples of two different factor proportions.
One can similarly find many such processes of production in manufacturing industries, each process having a different fixed-factor proportion.
Let us suppose that for producing 10 units of a commodity, X, there are four different techniques of production available. Each techniques has a different fixed factor-proportion, as given in Table 5.3.
Fig. 5.8 The
L-Shaped Isoquant
NOTES Self-Instructional Material 143 Theory of Production
Table 5.3 Alternative Techniques of Producing 100 Units of X S. No. Technique Capital Labour Capital/labour ratio 1. OA 10 2 10:2 2. OB 6 3 6:3 3. OC 4 6 4:6 4. OD 3 10 3:10
The four hypothetical production techniques, as presented in Table 5.3, have been graphically presented in Fig. 5.9. The ray OA represents a production process having a fixed factor-proportion of 10
K: 2L.
Similarly, the three other production processes having fixed capital-labour ratios 6:3, 4:6 and 3:10
have been
shown by the rays OB, OC and OD, respectively. Points A, B, C and D
represent four different production techniques.
By joining the points, A, B, C and D, we get a
kinked isoquant, ABCD.
Each of the points on the Kinked Isoquant represents a combination of capital and labour that can produce 100 units of commodity X. If there are other processes of production, many other rays would be passing through different points between A and B, B and C, and C and D,
increasing the number of kinds on the isoquant ABCD. The resulting isoquant would then resemble the typical isoquant. But there is a difference—each point on a typical isoquant is
technically feasible, but on a kinked isoquant, only kinks are the technically feasible points. The kinked isoquant is used basically in linear programming. It is, therefore,
also called linear programming isoquant or activity analysis isoquant. Elasticity of Factor
Substitution. We have
discussed above the principle of marginal rate of technical substitution (MRTS)
and have noted that MRTS
is negative and it
decreases along the isoquant.
MRTS refers only to the slope of an isoquant, i.e.,
to
the ratio of marginal changes in inputs. It does not reveal
how 'difficult' or 'easy' it is to substitute an input for another. Besides, the measurement of MRTS
depends on the units of the measurement of the factors
which does not tell much about the substitutability of factors. The economists have devised a
better
method of measuring the degree of substitutability of factors, called the Elasticity of
Factor
Substitution. The
elasticity of substitution (s) is formally defined as the percentage change in the
capital-
labour ratio (K/L) divided by the percentage change in
marginal rate
of technical substitution (MRTS), i.e.,
s =

Percentage change in Percentage change in K L MRTS or σ = (/) (/) ( ) ( ) K L
K L MRTS
MRTS ∂ ∂
Since all
along an isoquant, K/L and MRTS move in the same direction, the value of
s is always positive. Besides, the elasticity of substitution (
s)
is "
a pure number independent of the units of the
measurement
of K and L, since both the numerator and the denominator are measured in the same units".
The concept of elasticity of factor substitution is graphically presented
in
Fig. 5.10. The movement from point A to B on the isoquant IQ, gives the ratio of change in MRTS. The rays OA and OB represent two techniques of production with different factor intensities.
Fig. 5.9 Fixed Proportion Techniques of Production Check Your Progress 9. How are the laws of returns to scale different from the laws of diminishing returns? 10. What are the properties of isoquants? 11. What is meant by economic region? 12. Under what condition, is an isoquant Kinked?
NOTES 144 Self-Instructional Material Theory of Production
While process OA is capital intensive, process OB is
labour intensive. The shift from OA to OB gives the change in factor intensity. The ratio between the two changes measures the substitution elasticity.
The value of substitution
elasticity depends on the curvature of the isoquants. It varies between 0 and
μ,
depending on the nature of production function. It is, in fact,
the production function which determines the curvature of the various kinds of isoquants.
For example, in case of fixed-proportion production function yielding an L-shaped isoquant, s = 0. If production function is such that
the
resulting isoquant is linear, s = ¥. And, in case of a homogeneous production function of degree 1 of the Cobb- Douglas type,
s = 1. 5.4.3
The
Laws of Returns to Scale Having introduced the isoquants—the basic tool of analysis—we now return to
the
laws
of returns to scale. The laws of returns to scale
explain the
behaviour of
output in response to
a proportional and simultaneous change in inputs. Increasing inputs proportionately and simultaneously is, in fact, an expansion of the scale of production. When a firm expands its scale, i.e., it increases both the
inputs proportionately, then there are three technical possibilities: (i) total output may increase more than proportionately; (
ii) total output may increase
proportionately;
and (
iii)
total output may increase less than proportionately.
Accordingly,
there are
three
kinds of returns to scale: (i)
Increasing returns to scale; (
ii) Constant returns to scale,

and (
iii)
Diminishing returns to scale.
So far as the sequence of the laws of 'returns to scale' is concerned, the law of increasing returns to scale is followed by the law of constant and then by the law of diminishing returns to scale. This is the most common sequence of the laws of returns to scale.
Let us now explain the laws of returns to scale
with the help of
isoquants for a two-input and single output production system. 1.
Increasing
Returns to Scale.
When
a certain proportionate change in both the
inputs, K and L, leads to
a
more than proportionate change in output,
it exhibits increasing returns to scale.
For example, if quantities of both the inputs, K and L, are
successively doubled and the
corres- ponding
output is more than doubled, the returns to scale is said to be increasing. The increasing returns to scale is illustrated in Fig. 5.11. The movement from point a to b on the line OB means doubling the inputs.
It can be seen in
Fig. 5.11
Fig. 5.10 Graphic Derivation of Elasticity of Substitution Fig. 5.11 Increasing Returns to Scale
NOTES Self-Instructional Material 145 Theory of Production
that input-combination
increases
from 1K + 1L to 2K + 2L. As a result of doubling the inputs, output is more than doubled : it increases from 10 to 25 units i.e., an increase of 125%. Similarly, the movement from point b to point c indicates 50% increase in inputs as a result of which the output increases from 25 units to 50 units, i.e., by 200%.
This kind of relationship between the inputs and output shows increasing returns to scale.
The
Factors behind
Increasing Returns to Scale.
There are at least three plausible reasons for
increasing returns to scale. (i) Technical and managerial indivisibilities. Certain inputs, particularly mechanical equipments and
managerial skills,
used in the process of
production are available in a given size. Such inputs cannot be divided into parts to suit small scale
of production. For example, half a turbine cannot be used
and
one-third or a part of a composite harvester and earth- movers cannot be used.
Similarly,
half of a production manager cannot be employed, if part-time employment is not acceptable to the manager. Because of indivisibility of
machinery and managers, given
the state of technology,
they have to be employed in a minimum quantity even if scale of production is
much less than
the
capacity output. Therefore, when scale of production is expanded by increasing all the
inputs, the productivity of indivisible factors increases exponentially because of technological advantage.
This results in increasing returns to scale. (
ii) Higher degree of specialization.

Another factor causing increasing returns to scale is higher degree of specialization of both labour and machinery, which becomes possible with increase in scale of production. The use of specialized labour suitable to job needs and composite
machinery increases productivity per unit of inputs. Their cumulative effects contribute to the increasing returns to scale. Besides,
employment of specialized managerial
personnel, e.g., administrative manager, production managers, sales manager and personnel manager, contributes a great deal in increasing production. (
iii) Dimensional relations. Increasing returns to scale is also a matter of dimensional relations. For example, when the length and breadth of a room (15 ft. × 10 ft. = 150 sq. ft.) are
doubled, then the size of the room is more than doubled: it increases to 30 ft. × 20
ft. = 600
sq. ft. When diameter of a pipe is doubled, the flow of water is more than doubled.
In accordance with
this dimensional relationship, when the labour and capital are doubled, the output is more than doubled and so on. 2.
Constant Returns to Scale. When the change in
output is proportional to
the change in inputs,
it exhibits constant returns to scale. For example, if
quantities of both the inputs, K and L, are double and output is also doubled, then the returns to scale are said to be constant. Constant returns to scale
are illustrated in Fig. 5.12. The lines OA and OB are 'product lines' indicating two hypothetical techniques of production. The isoquants marked Q = 10, Q = 20 and Q = 30 indicate the three different levels of output.
In the figure, the movement from points a to b indicates doubling both the inputs.
When inputs are doubled, output is also doubled, i.e., output increases
from 10 to 20. Similarly, the movement from a to c indicates
trebling inputs—K increase to 3K and L to 3L—and trebling the output—from 10 to 30.
Alternatively,
movement from point b to c indicates a 50 per cent increase in
labour as well as capital. This increase in inputs results in an increase of output from 20 to 30 units, i.e., a 50 per cent increase in output. In simple words, a 50 per cent increase in inputs leads a 50
Fig. 5.12 Constant Returns to Scale
NOTES 146 Self-Instructional Material Theory of Production
per cent increase in output. This relationship between the
proportionate
change in inputs and proportional change in output may be summed up as follows. 1K + 1L ⇒ 10 2K + 2L ⇒ 20 3K + 3L ⇒ 30 This relationship between inputs and output exhibits
constant returns to scale. The constant returns to scale are attributed to the limits of
the economies of scale. 5 With expansion in the scale of production, economies arise from such factors as indivisibility of fixed factors, greater possibility of specialization of capital and labour, use of labour-saving techniques of production, etc. But there is a limit to the
economies of scale. When economies of scale reach their limits
and diseconomies are yet to
begin, returns to scale become constant.
The
constant returns to scale also take place where factors of production are perfectly divisible and where technology is such that capital-labour ratio is fixed.
When the factors of production are perfectly divisible, the production function is homogeneous of degree 1 showing constant returns to scale. 3. Decreasing Returns to Scale.
The firms are faced with decreasing return to scale when a certain proportionate change in
inputs, K and L, leads to a less than proportional change in output. For example, when inputs
are
doubled and output is less than doubled, then decreasing returns to scale is in operation. The decreasing returns to scale is illustrated in Fig. 5.13.

As the figure shows, when the inputs K and L are doubled, i.e., where capital- labour combination is increased from 1K + 1L to 2K + 2L, the
output increases from 10 to 18 units,
which
is
less that the proportionate increase. The movement from point b to c indicates a 50 per cent increase in the inputs. But, the output increases by only 33.3 per cent. This exhibits decreasing returns
to
scale. Causes of Diminishing Return to Scale The decreasing returns to scale are attributed to the diseconomies of scale. The most important factor causing diminishing return to scale is 'the diminishing return to management', i.e., managerial diseconomies. As the size of the firms expands, managerial efficiency decreases. Another factor responsible for diminishing returns to scale is the limitedness or exhaustibility of the natural resources. For example, doubling of coalmining
plant may not double the coal output because of limitedness of coal deposits or difficult accessibility to coal deposits. Similarly, doubling the fishing fleet may not double the fish output because availability of fish may decrease
in the ocean when fishing is carried out on an increased scale. 5.5
THE LAWS OF RETURNS TO SCALE
THROUGH PRODUCTION FUNCTION The laws of returns to scale may be explained more precisely through a production function. Let us assume a production function involving two variable inputs (K and L) and one commodity X. The production function may then be expressed
as
Fig. 5.13 Decreasing Return to Scale Check Your Progress 13. What is meant by marginal rate of technical substitution (MRTC)? 14. Why does MRTS decline along an isoquant? 15.What factors lead to increasing returns to scale? 16. Why do returns to scale decline?
NOTES Self-Instructional Material 147 Theory of Production
Q x = f (K, L) ...(5.9) where Q x denotes the quantity of commodity X.
Let us also assume that the
production function is homogeneous.
A production function is said to be homogeneous when all the inputs are increased in the same proportion and the proportion can be factored out. And, if all the inputs are increased by a certain proportion (say, k) and output increases in the same proportion (k), then production is said to be homogeneous of degree 1. This
kind of production function may be expressed as follows. kQ x = f(kK, kL) ...(5.10) or = k (K, L) A homogeneous production function of degree 1, as given in Eq. (5.10), implies constant
returns to
scale. Eq. (5.10) shows that increase in inputs, K and L, by a multiple of k, increases output, Q x , by the same multiple (k). This means constant returns to scale. The constant returns to scale may not be applicable
in all forms of production.
Increasing inputs K and L in the same proportion may result in increasing or diminimishing returns to scale. In simple words,
it is quite likely that if all the inputs are increased
by a certain proportion
and
output does not increase in the same proportion.
For example, if all the inputs are doubled, the output
may
not be doubled—it
may increase
by less than or more than double. Then the production function may be expressed as hQ x = f (kK, kL) ...(5.11) where h denotes h-times increase in Q x , as a result of k-times increase in inputs, K and L. The proportion h may be greater than k, equal to k, or less than k. Accordingly, it reveals
the three laws of returns to scale: (i) If h = k, production function reveals constant returns to scale. (ii) If h < k, it reveals increasing returns to scale. (iii) If h > k, it reveals decreasing returns to scale.
This aspect has been elaborated in the following section. 5.5.1 Degree of
Production Function and Returns to Scale In case of a homogeneous production function of degree 1 (Eq. 5.10), k has an exponent equal to 1, i.e., k = k 1 .
It means that if k has an

exponent equal to 1, the production function is homogeneous of degree 1. But, all the production functions need not be homogeneous of degree 1. They may be omogeneous of a degree less than 1 or greater than 1.
It means that
the exponent of k may be less than 1 or greater than 1. Let us assume that exponent of k is r,
where r ≠ 1. A production function is said to be
of degree r when all the inputs are multiplied by k and output increases by a multiple
of k r .
That is, if f(kK, kL) = k r (K, L) = k r Q ...(5.12) then function (5.12), is homogeneous of degree r. From the production function (5.13), we can again
derive the laws of returns to scale. (i) If k < 1, and r > 1, it reveals decreasing returns to scale; (ii) If k < 1, and r < 1, it reveals increasing returns to scale; and (iii) If k < 1, and
r = 1, it means constant returns to scale. For example, consider a multiplicative form of production function, i.e.,
Q = K 0.25 L 0.50 ...(5.13) If K and L are multiplied by k,
and output increases by a multiple of h
then hQ = (kK) 0.25 (kL) 0.50 By factoring out k, we get hQ = k 0.25+0.50 [K 0.25 L 0.50]
NOTES 148
Self-Instructional Material Theory of Production =
k 0.75 [K 0.25 L 0.50] ...(5.14) In Eq. 5.14, h = k 0.75 and r = 0.75. This means that r > 1 and, thus, h > k. Production function (5.13), therefore, shows decreasing returns to scale. Now consider another production function given as Q = K 0.75 L 1.25
X 0.50 ...(5.15) If K, L and X are multiplied by k, Q increases by a multiple of h
then hQ = (kK) 0.75 (kL) 1.25 (kX) 0.50 By factoring out k, we get hQ = k (0.75+1.25+0.50) [K 0.75 L 1.25 X 0.50] = k 2.5 [K 0.75 L 1.25 X 0.50] Here h = k 2.5
and r = 2.5 < 1.
So h < k. Therefore, function (5.15) gives increasing returns to scale. Similarly, if in a production function, h = k or r = 1, the
production function shows constant returns to scale. Power Function One
of the widely used production functions is the power function. The most popular production function of this category is 'Cobb-Douglas Production Function 6 of the form
Q = AK a L b ...(5.16) where A is a positive constant; a and b are positive fractions; and b = 1 – a. The Cobb-Douglas production function
is often used in its following form. Q = AK a L 1–a ...(5.17)
Properties of Cobb-Douglas Production Function. A power function of this kind has several important properties. First, the multiplicative form of the power
function (5.16) can be changed into its log- linear form as log Q = log A + a log K + b log L ...(5.18)
In its logarithmic form, the function becomes simple to handle and can be empirically estimated using linear regression analysis. Second, power functions are homogeneous and the degree of homogeneity is given by the sum of the exponents a
and b. If a + b = 1, then the production function is homogeneous of degree 1 and implies constant
returns to scale.
Third, a and b represent the elasticity coefficient of output for inputs K and L, respectively. The output elasticity coefficient (Î) in respect of capital may be defined as proportional change in output as a
result of a given change in K, keeping L constant. Thus, Î
k = Q K K Q
KK QQ · = ∂ ∂ ∂ ∂ ... (5.19)
By differentiating the production function Q = AK a L b with respect to
K and substituting the result in Eq. (5.19), we can find the elasticity coefficient.
K
Q ∂ ∂ = a AK a–1 L b Substituting
a AK a – 1 L b for ∂Q/∂K in Eq. (5.19), we get Î
k = a AK a–1 L b ⎟ ⎠ ⎞ ⎜ ⎝ ⎛ ba L AK K = a ...(5.20)
NOTES Self-Instructional Material 149 Theory of Production
Thus, output-elasticity coefficient for K is 'a'. The same procedure may be adopted to show that b is the elasticity coefficient of output for L.
Fourth, constants a and b represent the relative

distributive
share of inputs K and L in total output Q.
The share of K in Q is given by K K Q · ∂ ∂ Similarly, the share of L in Q may be obtained as L L Q · ∂ ∂ The relative share of K
in Q can be obtained as L Q ∂ ∂ K· 1 Q = aAK L K AK L
a b a b –1 . = a Similarly, it can be shown that b represents the relative share of
L in
the total output.
Finally, Cobb-Douglas production function
in its general form, Q = K a L 1–a implies that at zero cost,
there will be zero production. Some Input-Output Relationships Some of the
concepts used in production analysis can be easily derived from the Cobb-Douglas production function as shown below.
(i) Average Product (AP) of L and K: AP L = A (K/L) 1–a AP K = A (L/K) 1 (ii) Marginal Product of L and K MP L = a.A (K/L) – a = a (Q/L) MP K = (a – 1) A (L/K)a = (1 – a) Q/K (iii) Marginal Rate of Technical Substitution ⎪ ⎭ ⎫ ⎪ ⎩ ⎧ · – = = L K a a MP MP MRTS K L
kL 1 , 5.6 CES PRODUCTION FUNCTION In addition to the Cobb-Douglas production function, there are other forms of production function, viz., 'constant elasticity substitution'
production function, (CES), 'variable elasticity of substitution' (VES) production function, Leontief-type of production function, and linear- type of production functions. Of these forms of production function,
the constant elasticity substitution (CES) production function 7 is more widely used, apart from Cobb-Douglas production function. We will, therefore, discuss the CES production function briefly. The CES production function is expressed as Q = A[
aK –b + (1 – a)L –
b] –1/b ... (5.21) or Q = A[aL –b + (1 – a)K –b] –1/b (A < 0, 0 > a > 1, and b < – 1) where L = labour, K = capital, and A,
a and b are the three parameters. An important property of the CES production is that it is homogeneous of degree 1. This can be proved by increasing both the inputs, K and L, by a constant factor and finding the
NOTES 150 Self-Instructional Material Theory of Production
final outcome. Let us suppose that inputs K and L are increased by a constant factor m. Then the production function given in Eq. (5.21) can be written as follows. Q' = A[
a(mK) –b + (1 – a) (mL) –b] –1/b ...(5.22) = A[m –b {aK –b + (1 – a)L –b }] –1/b = (m –b) –1/b ×A[aK –b + (1 –a) L –b] –1/b Since the term A[aK –b + (1 –a) L –b] –1/b in Eq. (5.21) =
Q, by substitution, we get Q ' =
mQ Thus, the CES production function is homogeneous of degree 1.
Given the production function (5.21), the marginal product of capital (K) can be obtained as 1+ ⎪ ⎭ ⎫ ⎪ ⎩ ⎧ · =
β β α δ δ K Q A K Q and of labour (L) as 1 1 + ⎪ ⎭ ⎫ ⎪ ⎩ ⎧ · – = β β α δ δ L
Q A K Q The rate of technical substitution (RTS) can be obtained as 1 1 + ⎪ ⎭ ⎫ ⎪ ⎩ ⎧ – =
β α α K L RTS The advantages of the CES production function are: (i)
it is a more general form of production function, (ii) it can be used to analyse all types of returns to scale; and (iii) it removes many of the problems involved in the Cobb-Douglas production function. The CES production function has, however its own limitations. The claim that it is a general form of production function does not stand the empirical test. Also, it is difficult to fit this function to empirical data. Uzawa finds that it is difficult to generalize this function to n-number of factors. Besides, in this production function, parameter
b
combines the effects of two factors, K and L. When there is technological change, given the scale of production, homogeneity parameter b may be affected by both the inputs. This production does not provide a measure to separate the effects on the productivity of inputs.
For example, consider the following production function. Q x = 5K + 10L ...(5.23) If we assume that, initially, K = 1, L = 2, the total output may be obtained by substituting 1 for K and 2 for L in Eq. 5.23. Thus, Q x1 = 5(1) + 10(2) 25 = 5 + 20 When inputs are doubled (i.e., K = 2 and L = 4),
then Q x2 = 5(1 × 2) + 10(2 × 2) Q x2 = 5(2) + 10(4) 50 = 10 + 40 Thus, given the production function (5.23),
when inputs are doubled, the output is also doubled. Here, k = 2, and since Q x2 /Q x1 = 50/25 = 2 Therefore, h = 2 In this case, k = h. This exhibits constant returns to scale. If the production function is such that
h > k, then the production function exhibits decreasing returns to scale, and if h < k, it shows increasing returns to scale.

Check Your Progress 17.What is Cobb-Douglas production function? 18. What is meant by the degree of production function? 19. What is CES production function? 20. What is the degree of CES production function?
NOTES Self-Instructional Material 151 Theory
of Production 5.7
OPTIMAL INPUT COMBINATION
A profit maximizing firm seeks to minimize its cost for a given output or to
maximize its output
for a given total
cost.
The logic of
isoquant tells that
a given output can be produced with different input- combinations.
Given the input prices, however, only one of
the input combinations conforms to the least-cost criterion.
In this section, we will show how a firm can find the least-cost combination of inputs. To begin with, let us consider the information contained in Fig. 5.14. As
the figure
shows, 100 units of a commodity, say
X,
can be produced with all the combinations of K and L that can be
formed on the isoquant I 1 . For example, points
j, k,
and l represent three different combinations of K and L: (i) OK 3 + OL 1
at point j, (ii) OK 2 + OL 2 at point k, and (iii) OK 1 + OL 3 at point l. These three combinations
can produce 100 units of X. Therefore, any of these combinations may be technically chosen for producing 100 units of X, but
not economically. For,
given the input prices—interest and wages—the total cost of production varies from point to point, and only one of the combinations at the
isoquant I 1 gives the minimum cost, not necessarily any of j, k and l. Similarly, upper isoquants represent a higher level of output that can be produced with a higher and different combinations of inputs, with varying total cost, of course. The firm's problem is how to find the input combination that minimizes the total cost for a given level of output. 5.7.1
The
Budgetary Constraint and Budget Line The above problem can be solved by combining the firm's production and cost functions. The production function is represented by the isoquants. To construct the cost function, let us assume that the firm decides to incur a total cost C, on both K and L and that P k and P l are the unit costs of K and L, respectively. Given these conditions,
the
firm's cost function may be expressed as C = K . P k + L . P ...(5.24) From Eq. (5.24), the quantity of capital, K, and labour, L, that can be purchased out of the total cost C, can be easily obtained as shown below. K =
C P P P k l k – L and L = C P P P l k l – K This is the firm's budget equation. This equation yields a line, as shown in Fig. 5.15,
which represents the alternative combinations of K and L that can be purchased
out of
the total cost C. This line is known as isocost. This
isocost is also known as isocline, budget line, or the budget constraint line.
Fig. 5.14
Input Combination Fig. 5.15 Isocosts
NOTES 152 Self-Instructional Material Theory of Production
The derivation of isocost is shown in Fig. 5.15. Consider the isocost K 1 L 1 . This line is
drawn on the assumption that a firm has the option of spending its total cost C, either on K or L, or on both. If the total
resources are spent on K, or alternatively on L, the firms can buy either OK 1 units of K or OL 1 units of L, as shown below: OK 1 =
C P
P P k

l k – .L (where L = O) or OL 1 = C P P P l k l – ·K (where K = O) These measures of capital and labour are shown at points K 1 and L 1 , respectively. The line connecting points K 1 and L 1 gives us the
isocost line. It shows the whole range of combinations of K and L that can be bought, given the total cost and factor prices.
Given the factor prices, if total cost increases, say, to C + C¢, larger quantities of both K and L can be bought, making the isocosts shift upwards to the right, as shown by K 2 L 2 and K 3 L 3 .
It is important to note here that the slope of the isocosts (i.e., – DK/DL) gives the marginal rate of exchanges (MRE) between K and L. Since factor prices are constant, marginal rate of exchange is constant
and equal to the average
rate of exchange all along the line. 5.7.2 The Least-Cost Criteria Having introduced the isocosts, we may now combine isoquants and isocost to determine the optimal input-combination or
the least-cost combination of inputs. There are two conditions for the least-cost combination of inputs: (i) the first order condition, (ii) the second order condition. (i) The First Order Condition. The first order condition of the
least-cost input-combination can be expressed in both physical and value terms. The
Least-Cost Criteria in Physical Terms. Given the inputs, K and L, the first order condition in physical terms requires that MRE between K and L must equal the ratio of their marginal physical product, i.e., k l MP MP L K = Δ Δ– ...(5.25) where DK/DL is the marginal rate of
exchange (MRE) between K and L, and MP l /MP k is the ratio of marginal productivity of L and K.
In Eq. (5.25), –DK/DL = slope of the isocost, and MP l /MP k = slope of the isoquants. It implies
that the least-
cost combination exists at a point where isoquant is tangent to the
isocost.
The least-cost combination of K and L is graphically shown in Fig. 5.16. The isoquant I 2 = 200 is tangent to isocost, K 2 L 2 at point P. At this point, the combination of K and L equals OM of K plus ON of L. This combination of K and L is optimal as it satisfies the least-cost criterion, i.e., –
DK/DL = MP l /MP k . The first order criterion of the least- cost input-combination is also expressed in physical terms that the marginal physical-product ratio of K and L must equal
Fig. 5.16 Least-cost Combination of Inputs

their price ratio. This condition can be written as MP MP l k = P
P l k or MP P l l = MP P k k ...(5.26)
where MP l and MP k are marginal products of labour and capital, respectively,
and
P l and P k are prices of labour and capital, respectively. (
ii) The Second Order Condition.
The second order condition requires that the first order condition be fulfilled at the highest possible
isoquant.
Note that the first order
condition is satisfied also on points A and D, the points of intersection between Q 1 = 100 and isocost K 2 L 2 (
Fig. 5.16), as at these intersection points —DK/DL = MP l /MP k . But, points A and D are not on the highest possible isoquant. Therefore, these points do not satisfy the second order condition. The second order condition is satisfied at point P. It can be seen in Fig. 5.16 that points A, D and P satisfy the first order condition but point P only satisfies the second order condition. Thus, both first and second order conditions are satisfied at point P. Therefore, point P determines the optimum input combination or the least-cost combination of inputs. That point P determines the optimum input combination can be proved in non-technical terms. Note that while point P is associated with an output of 200 units,
points A and D, being on a lower isoquant, are associated with
an
output of 100 units. It means that given the total cost, a firm can produce 100 units as well as 200 units. Therefore, a profit maximizing or cost-minimizing firm chooses input combinations at point P rather than at points A or D. Least cost criterion in value terms. The physical criterion can be translated in
value terms by multiplying the factor exchange ratio with factor prices and
merginal rate of technical substitution (
MRTS) with product price (P). In fact, factor price ratios are the same as the reciprocal of factor ratios, i.e., P l /P k = DK/DL and MRTS =
MP MP MP P MP P MRP MRP l k

l k
l k = = (.) (.) ...(5.27) In Eq. (5.27),
MRP = marginal revenue productivity of the factor, and P = product price. Thus, the least-cost criterion can be put in terms of input and output prices as
P P l k = MRP MRP l k or MRP P l l = MRP P k k ...(5.28) It
may be inferred from Eq. (5.28) that least-cost or optimal input combination requires that the MRP ratio of inputs should be equal to their price
ratio. Alternatively, the MRP and factor price ratios of all the inputs must be equal. 5.7.3 Effect of Change in Input Price We have shown above the determination of
the least-cost combination of inputs assuming constant input prices.
But,
in reality, input prices do not remain constant. When input prices change, it changes the least-cost
input-combination and also the level of output, given the total cost. It may be noted at the outset that if all input prices change in the same proportion, the relative prices of inputs remain unaffected. But, when input prices change at different rates in the same direction, or change
at different rates
in the opposite direction or price of only one input changes while
price of the other input remains constant, the
NOTES 154 Self-Instructional Material Theory of Production
relative
prices of the inputs change.
A change in relative input-prices, changes both input- combination and the level of output. The change in input-combinations results from the substitution effect of change in relative prices of inputs. A change in relative prices of inputs implies that some input has become cheaper in relation to the other. The cost- minimizing firms, therefore, substitute relatively cheaper input for the costlier one. This is known as the substitution effect of change in
the
relative input prices.
To explain the effect of change in input prices on the input-combination, let us
assume that, given
the
P k and P l , and the total resources as indicated by isocost KL, the firm's optimum input- combination is given by point E, in Fig. 5.17.
Let us suppose that P l decreases (P k remaining constant) so that the relevant isocost is KW, which is tangent to isoquant I 2 at point N. At this point, firm's new optimum combination of inputs is OK 1 + OL 3 . Thus, as a result of decrease in P l , the firm reduces its K by K 1 K 2 and increases L by L 1 L 3 .
This change in input combination is price effect. The price effect combines substitution and budget effects. The price and budget effects can be separated in the following manner. In order to measure the budget effect first, let us find out how much additional labour the firm will employ if its resources increase so that the firm reaches the isoquant I 2 , input prices remaining the same. This can be established by drawing an isocost parallel to KL and tangent to I 2 , as shown by isocost K¢L¢. The isocost K¢L¢ is tangent to isoquant I 2 at point M. It means that if P k and P l remain constant and firm's budgetary resources increase, it will settle at point M
and its optimum
input-combination will be OK 3 of K + OL 2 of L. This combination may be said to have resulted from the budget effect or resources effect, or the output effect. If we deduct the budget effect on labour from the price effect, we get the substitution effect, i.e., Substitution effect = Price effect – Budget effect Since price effect = L 1 L 3 , and budget effect = L 1 L 2 , and Substitution effect = L 1 L 3 – L 1 L 2 = L 2 L 3 Thus, we find that as a result of change in price of an input, input combination of the firm changes: the firm employs more of cheaper input (L) and less of the costlier one (K). Besides, the level of output also changes. If price of an input decreases, the level of output increases, and vice versa.
This concludes our brief discussion on the traditional production theory, production function, laws of variable proportions, law of returns to scale, and the choice of least-cost input combination. These aspects have been explained in physical terms—physical quantities of inputs and outputs.
In the next unit, we will discuss the theory of cost—the monetary aspects of production theory. 5.8
SUMMARY
z
Theory of production narrates the relationship between inputs (labour and capital) and output. Fig. 5.17 Substitution Effect and Input Combination Check Your Progress 21.

What is meant by optimum combination of inputs? 22. What are the least cost criteria of an optimum input combination? 23. How is an optimum input combination affected by the change in input prices? 24.
How can the least cost combination be traced in real life?
NOTES Self-Instructional Material 155 Theory of Production
z
Input-output relations are analysed under (i) short-run and (ii) long-run conditions. In short-run
capital supply is assumed to remain constant. Therefore, in the short run, only labour is a variable input and in the long-run both are variable input.
z
Input-output relationship is expressed in the form of a production function as Q = –f (L, K)
z
Short-run input-output relations is brought out by the law of diminishing returns. The law states that if n input are used in the production of a commodity and n – 1 inputs are held constant and
more and more units of the variable inputs are used, then total output may increase initially at increasing rate, but it will increase ultimately at diminishing rates.
z The laws of returns to scale can be stated as when quantity of both the input (L and K) are increased, output may increase at increasing rate, at constant rate or at decreasing rate, depending on the technology used in production. z The optimum input combination is determined where MRTS = P K /P L . Graphically, the optimum input combination fall at the point isoquant is tangent to
the budget line. Budget line is drawn on the basis of budget equation
written as
C = K. P K + L. P L , where C = Total cost, K = Capital, L = Labour, P K = Price of Capital (interest) and P L = Wage rate. 5.9 ANSWERS TO 'CHECK YOUR PROGRESS' 1. Production is a process by which inputs are transformed into output with value added. 2.
In the context of production anslysis, short-run is a period during which supply of capital remains constant and labour is a variable factor. 3. Production function is a mathematical statement which brings out the relationship between inputs and output. 4. A
general form of
production function is expressed as Q = f (K, L), where Q = Output, K = Capital, and L = Labour. 5.
The
law of diminishing returns can be stated as, given the fixed factor (capital), when
quantity of variable input (labour) is increased, output may initially increase at an increasing rate, but it increases ultimately at diminishing rates. 6. The three states in short-run production are (i) stage of increasing returns, (ii) stage of diminishing returns, and (iii) the stage of negative returns. 7. The factors that lead to increasing returns in variable input are (i) better utilization of indivisible capital, and (iii) benefits of division of labour. 8. Given the
three stages of short-run production, the business/manager can find the profitable level of production, given the price and market conditions. 9. The laws of returns of scale apply when both capital and labour are variable factors, whereas the laws of diminishing returns come into force when labour is a variable factor and capital is a fixed factor. 10. Properties of isoquants are (i) isoquants
are convex to origin, (ii) they do not intersect nor are they tangent, (iii) upper isoquants indicate a higher level of production then the lower ones. 11. Economic region is given by the upper and lower limits in
which capital and labour can be substituted for each other
efficiently. 12. An isoquant take a Kinked shape when there is a limited number of production techniques that can be used to produce a given output—each technique having a limited range of substitutability of labour and capital.
NOTES 156 Self-Instructional Material Theory of Production 13.
Marginal rate of technical substitution (MRTS) is the rate at which
one
factor substitutes another at different combinations of inputs, the output remaining the same. It is given by –Δ K /Δ L = slope of isoquant. 14. MRTS declines along the isoquant for two reasons: (i) inputs (labour and capital are imperfect substitutes, and (ii) marginal productivity of a factor is subject to diminishing returns, making it necessary to employ a larger number of units of a factor to maintain the level of output. 15.
Factors that lead to increasing returns to scale are the factors of internal economics of scale-

managerial economics, technical economics, higher degree of specialization and dimensional gains. 16. Returns to scale decline due to diseconomies of scale, viz, managerial diseconomies, lack of communication, strategic conflicts in different departments and problems of labour management. 17. One of the most widely used production functions is the Cobb-Douglas production function written as Q = AK a L 1–a . This function was developed separately by economists C.W. Cobb and P.H. Douglas. 18. Degree of production function is the sum of the exponents of the n puts of a power function. 19. CES is the abbreviation of 'Constant Elasticity substitution' production function, written as Q = A[aK – b + (1 – a)[–b] –1/b]. 20. CES production function is homogeneous
of degree 1. 21. The optimum combination of inputs is one that results in the minimum cost of production for maximum output. 22. The least cost criteria for optimum input combination are: (i) MRTS = factor price ratio (
P K /P L),
and (ii) criterion (i) is satisfied at the highest possible isoquant. 23. Optimum combination of inputs is changed by the change in input prices. The units of a factor in input combination increases as the price of a factor decreases. 24.
In a real-life situation, the input prices are known. What one needs to find the optimum input combination is to estimate the production function and MRTS at different levels of input combination. 5.10 EXERCISES AND
QUESTIONS 1.
What is meant by production? Define production function and describe the underlying assumptions. 2.
State and illustrate the Cobb-Douglas production function. 3.
Distinguish between laws of returns to variable proportions and laws of
returns to scale. Explain the factors, which cause increasing returns to scale.
What are the reasons for the operation of the law of diminishing returns? 4.
How will you define economies of scale? What are the sources of internal and external economies? 5. (
a)
What is meant by internal and external economies of scale? (b) Discuss various types of internal economies available to a firm. 6.
Define and explain isoquants. What are the properties of isoquants? How do they compare with the properties of indifference curves? 7.
Using a map of isoquants and isocosts, show the role of change in relative input prices
and relative productivities in the determination of least-cost combination.
NOTES Self-Instructional Material 157 Theory of Production 8. Supposing price of capital, P k = Rs. 2 and price of labour, P l = Rs. 5 and Q = 20. Find (a) slope of the isocost; and (b) equation for the isocost. [Ans. (a) If labour is plotted along horizontal axis and capital along vertical axis, DP l /DP k = 2.5, (b) 20 = 2K + 5L] 9.
Suppose a short-run production function is given as follows: Q = 2X 2 + 0.2 X 3 where Q = output and
X = variable input. Find the following: (a) marginal product function, (b) average product function, and (c) value of X that maximizes Q. 10. Determine whether the following production functions show constant, increasing or decreasing returns to scale: (
a) Q = L 0.60 K 0.40 (b) Q = 5K 0.5 L 0.3 (c) Q = 4L + 2K 11.
Suppose a production function is given as Q = – L 3 + 5L 2 + 10L (
i) Which law of production is revealed by this production function? (ii) At what level of labour employment does the total production begin to decline? [Ans. (i) The law of diminishing returns (ii) Five workers] 12. (
a) What is the marginal rate of technical substitution? (b)
Illustrate graphically the substitution effect of a change in relative prices
of inputs. 13. Suppose
a short-run production function is given as Q = 10 L + 15L 2 – L 3 where Q is output and L is labour employed per unit of time. (i) Derive
MP L and AP L schedules; (ii)
Derive MP L functions; (iii) Find the output at which AP L = MP L ; and (iv) Find L for producing 600 units of output.
(Compare your answers with figures in Table 5.1). 14. Suppose a Cobb-Douglas production function is given as Q = L 0.5 K 0.5 (a) Find the degree of production 'function', and (b) Find the law of production it reveals. 15.
Define optimum input-combination. What are the criteria for the least-cost combination of inputs? Explain graphically.
16. What are the conditions for the
least-cost combination of inputs? Illustrate the maximization of output with the help of
isocosts and isoquants. 17. Show the effects of change in input prices on the isocost line. How is the optimum combination of inputs affected if (a) price of only one input decreases, and (b) prices of both the inputs decrease proportionately?
NOTES 158 Self-Instructional Material Theory of Production 18.

What is the substitution effect of change in the price of an input? Illustrate the substitution and budget effects of a change in the price of an input. 19.
Which of the following gives the condition for the least-cost combination of inputs? (a)
P L /P K = MRTS (b)
P L /P K = MP L /MP K (c) MP L /P L = MP K /P
K (
d) MP K /MP L = DL/DK (e) All of the above 5.11 FURTHER READING Baumol, William, J., Economic Theory and Operations Analysis, 3rd Edn., Chs. 9 and 10. Bilas, Richard A., Microeconomic Thoery, Richard D. Irriun, Homewood, IV, 1972, Chs. 7. Brigham, Eugene F. and James L. Pappas, Managerial Economics, 2nd Edn., Dryden Press, Hinsdale IV, 1972, Chs. 6, 8. Clower, Robert W., and John F. Due, Microeconomics, Dryden Press, Homewood IV, 1972, Chs. 8. Douglas, Evan J., Managerial Economics: Theory, Practice and Problems, Prentice-Hall Inc., N.J., 1979, Ch. 6. Ferguson, C. E., Macroeconomic Theory, 3rd Edn., Richard D. Irwin Homewood, III., 1972, Chs. 7. Leftwich, Richard, The Price System and Resource Allocation, 5th Edn., Dryden Press, Hisdale, IV, 1973, Chs. 8, 9 Mansfield, Edwin, Microeconomics: Theory and Application, W.W. Norton, New York, 1970. Spencer, Milton H., Managerial Economics, Richard D. Irwin, Homewood IV., 1968. Stigler, George J., The Theory of Price, 3rd Edn., Macmillan, New York, 1966, Chs. 6, 7. Watson, Donald S., Price Theory and Its Uses, 3rd Edn., Houghton Mifflin, Boston, 1968. Webb, Sammuel, C., Managerial Economics, Houghton Mifflin, Boston, 1976, Chs. 12, 13 and 15. References 1. W.J. Baumol, Economics Theory and Operations Analysis, op. cit., p. 267. 2. A.
Koutsoyiannis, op. cit., p. 70. 3. Supply of capital may, of course, be elastic in the short-run for an individual firm under perfect competition but not for all the firms put together. Therefore, for the sake of convenience in explaining the laws of production, we will continue to assume that, in the short-run, supply of capital remains inelastic. 4.
The concept of economic region is discussed below in detail. 5. The 'economies of scale' are discussed in detail in the following section. 6.
This production function widely referred to in economic literature
was first con- structed by Paul H. Douglas in his book, The Theory of Wages, Macmillan,
N.Y., 1924. It was developed further by C.W. Cobb and P.H. Douglas in their paper "A Theory of Production", Am. Eco. Rev., March 1928 (Suppl.) and was used by P.H. Douglas, 20 years later in his paper "Are There Laws of Production", Am. Eco. Rev., March 1948. 7. CES production function was constructed by
K. Arrow, H.B. Chenery, B.S. Minhas, and R.M. Solow, "
Capital Labour Substitution and Economic Efficiency", Review of Economics and Statistics, vol. 43 (August 1961). This production function is also sometimes called SMAC production function.
NOTES Self-Instructional Material 159 Theory of Cost UNIT 6 THEORY OF COST Structure 6.0 Introduction 6.1 Unit Objectives 6.2
Cost Concepts 6.2.1 Some Accounting Cost Concepts; 6.2.2 Some Analytical Cost Concepts 6.3 The Theory of Cost: The Cost-Output Relations 6.3.1
Short-run Cost-Output Relations; 6.3.2
Short-run Cost Functions and
Cost Curves; 6.3.3 Cost Curves and the Law of Diminishing Returns; 6.3.4
Some Important Cost Relationships; 6.3.5 Output Optimization in the
Short-Run; 6.3.6 Long-run Cost-Output Relations 6.4
Economies and Diseconomies of Scale 6.4.1
Economies of Scales; 6.4.2 Diseconomies of
Scales 6.5 Some Empirical Cost Functions 6.6 Summary 6.7 Answers to 'Check Your Progress' 6.8 Exercises and Questions 6.9 Further Reading 6.0 INTRODUCTION The cost of production is the second most important aspect in almost all business analysis and decisions. Cost data and data analysis play a very
important role in most business decisions, specially
those pertaining to (a) locating the weak points in production management; (b) minimizing the cost; (c) finding the optimum level of output; (d)
determination of
price and dealers margin; and (e) estimating or projecting the cost of business
operations. Also,
cost analysis assumes a great significance in all major business decisions because the term 'cost' has different meaning under different settings and is subject to varying interpretations. It is, therefore, essential that only the relevant concept of costs is used in business decisions.

Inputs multiplied by their respective prices and added together give the money value of the inputs, i.e., the cost of production. This unit is divided into three sections. Section 6.2 discusses various cost concepts used in business decisions and section 6.3 analyses cost-output relations. Break-even analysis is discussed in section 6.4. 6.1 UNIT OBJECTIVES z To introduce
cost concepts used in business analysis z To discuss theory of cost—the nature of relationship between cost and output, in the short-run and
in the long-run
NOTES 160 Self-Instructional Material Theory of Cost
z
To discuss economies and diseconomies of scale of production and their impact on cost behaviour z To introduce the concept of break-even and show its application in business decision-making 6.2
COST CONCEPTS
The cost concepts which are relevant to business operations and decisions can be grouped, on the basis of their nature and purpose, under two overlapping categories: (i) concepts used for accounting purposes, and (ii) analytical cost concepts used in economic analysis of business activities. We will discuss
here
some important concepts of the two categories. It is important to note here that this classification of cost concepts is only a matter of analytical convenience. 6.2.1 Some Accounting Cost
Concepts 1. Opportunity Cost and Actual Cost.
Resources available to any perosn, firm or society are scarce but have alternative uses with different returns.
Income maximizing resource owners put their scarce resources to their most productive use and thus, they forego the income expected from
the second best use of the resources. Thus,
the opportunity cost may be defined as the expected returns form the second best use of the resources
which are
foregone due to
the scarcity of resources. The opportunity cost is also called alternative cost.
Had the resource
available to a person, a firm or a society been unlimited there would be no opportunity cost.
For example, suppose that a firm has a sum of
Rs. 100,000
for which it has only two alternative uses. It can buy either a printing machine or alternatively a lathe machine both having productive life of 10 years. From the printing machine, the firm expects an annual income of
Rs. 20,000 and from the lathe, Rs. 15,000.
A profit maximizing firm would invest its
money in the printing machine and forego the expected income from the lathe. The opportunity cost of the income from printing machine is the expected income from the lathe, i.e.,
Rs. 15,000. In assessing the alternative
cost, both explicit and implicit costs are taken into account.
Associated with the concept of opportunity cost is the concept of economic rent or economic profit. In our example of expected earnings firm printing machine
and
eco- nomic
rent of the printing machine is the excess of its earning over the income expected from the lathe. That is, economic rent equals
Rs. 20,000 – Rs. 15,000 = Rs. 5,000.
The implication of this concept for a business man is that investing in
the
printing machine is preferable so long as its economic rent is greater than zero. Also, if firms know the economic rent of the various alternative uses of their resources,
it will be helpful in
the choice of the best investment avenue. In contrast to the concept of
opportunity
cost,
actual
costs are

those which are actually incurred by the firm in payment for labour, material, plant, building, machinery, equipment, travelling and transport, advertisement, etc. The total money expenses, recorded in the books of accounts are
for all practical purposes, the actual costs.
In our example, the cost of printing machine, i.e., Rs. 100,000 is the actual cost. Actual cost comes under the accounting cost concept. 2.
Business Costs and Full Costs. Business
cost
include
all the expenses which are incurred to carry
out a business. The concept of business costs is similar to the actual or real costs. Business costs "include all the payments and contractual obligations made by the firm
together with the book cost of depreciation on plant and equipment." 1
These
cost concepts
are used for calculating business profits and losses and for filing returns for income-tax and also for other legal purposes.
NOTES Self-Instructional Material 161 Theory of Cost
The concept of full cost, includes business costs, opportunity cost and normal profit.
The
opportunity cost includes the expected earning from the second best use of the resources, or the market rate of interest on the total money capital and also the value of an entrepreneur's own services which are not charged
for
in the current business. Normal profit is a necessary
minimum earning in addition to
the
opportunity cost, which a firm must receive to remain in its present occupation. 3.
Explicit and Implicit or Imputed 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, insurance premium, depreciation charges are the examples of explicit costs. These costs involve cash payment and are
recorded in normal accounting practices.
In contrast
to explicit
costs,
there are certain other costs which
do not take the form of cash outlays, nor do they appear in the accounting system. Such costs are known as implicit or imputed costs.
Opportunity cost is an
important example of implicit cost.
For example, suppose an entrepreneur does not utilize his services in his own business and works as a manager in some other firm on a salary basis. If he sets up his own business, he foregoes his salary as manager. This loss of salary is the opportunity cost of income from his own business. This is an implicit cost of his own business. Thus, implicit wages, rent, and implicit interest are the wages, rents and interest which an owner's labour, building and capital, respectively, can earn from their second best use.
Implicit costs are not taken into account while calculating the loss or
gains of the business,
but they form an important consideration in whether or not a factor would remain its present occupation. The explicit and implicit costs together make the economic cost. 4. Out-of-Pocket and Book Costs. The
items of expenditure which involve cash payments
or cash transfers,
both recurring and non-recurring,

are known as out-of-pocket costs. All the explicit costs (e.g., wages, rent, interest, cost of materials and maintenance, transport expenditure, etc.) fall in this category. On the contrary, there are certain actual business
costs which
do not involve cash payments, but a provision is
therefore made in the books of account and they are taken into account while finalising the profit and loss accounts. Such expenses are known as book costs.
In a way, these are
payments made by a firm to itself. Depreciation allowances and unpaid interest on the owner's own fund are the example of book costs. 6.2.2 Some Analytical Cost Concepts 1.
Fixed and Variable Costs. Fixed costs are
those which are
fixed in volume for a certain given output. Fixed
cost does
not vary with variation
in the output between zero and a certain
given
level
of output. In other words, costs that do not vary for a certain level of output are known as fixed costs.
The
fixed costs include (i) costs of managerial and administrative staff, (ii) depreciation of machinery, building and other fixed assets, (iii) maintenance of land, etc. The concept of fixed cost is associated with
the
short- run.
Variable
costs are
those which vary with the variation in the
total output. Variable costs include cost of raw material, running cost of fixed capital, such as fuel, repairs, routine maintenance expenditure, direct labour charges associated with the level of output, and the costs of all other inputs that vary with output. 2.
Total, Average and Marginal. Costs Total cost (TC)
is
the total expenditure incured on the production of goods and service. It
refers to the total outlays of money expenditure, both explicit and implicit, on the resources used to produce a given level of output. It includes both fixed and variable costs.
The total cost for a given output is
given by the cost function.
NOTES 162 Self-Instructional Material Theory of
Cost
Average cost (AC) is of statistical nature—it is not actual
cost.
It is obtained by dividing the total cost (TC) by the total output (Q), i.e.,
AC =
T C Q
Marginal cost (MC) is the addition to the total cost on account of producing one additional unit of the product. Or, marginal cost is the cost of the marginal unit produced. Marginal cost is calculated as TC
n – TC n–1 where n is the number of units produced.
Alternatively, given the
cost function, MC can be defined as MC = TC Q ∂ ∂
These cost concepts are discussed in
further detail in the following section.
Total, average and marginal cost concepts are used in the economic analysis of firm's
production
activities. 3.
Short-Run and Long-Run Costs. Short-run and long-run cost
concepts are related to variable and fixed costs, respectively, and often figure in economic analysis inter- changeably.
Short-run

costs are
the costs which
vary with the variation in output, the size of the firm remaining the same. In other words, short-run costs are
the same
as variable costs. Long-run costs, on the other hand, are
the costs which are incurred on the fixed assets like plant, building, machinery, etc.
It is important to note that the
running cost and depreciation of the capital assets are included in the short-run or
variable
costs.
Long-run costs are by implication the same as fixed costs. In the long-run, however, even the fixed costs become variable costs as the size of the firm or scale of production increases. Broadly speaking, 'the short-run costs are those associated with variables in the utilization of fixed plant or other facilities whereas long-run
costs are associated with the changes in the size and kind of plant.' 2 4. Incremental Costs and Sunk Costs. Conceptually, incremental costs are closely related to the concept of marginal cost but with a relatively wider connotation. While marginal cost refers to the cost of the marginal unit of output, incremental cost refers to the total additional cost associated with
the decisions to expand the output or to add a new variety of product, etc.
The concept of incremental cost is based on the fact that in the real world, it is not practicable (for lack of perfect divisibility of inputs) to employ factors for each unit of output separately. Besides, in the long run, when firms expand their production, they hire more of men, materials, machinery and equipments. The expenditures of this nature are incremental costs
and
not the marginal cost (as defined earlier). Incremental costs arise also owing to the change in product lines, addition or introduction of a new product, replacement of worn out plant and machinery, replace- ment of old technique of production with a new one, etc.
The sunk
costs are those which cannot be altered, increased or decreased, by varying the rate of output. For example, once it is decided to make incremental investment expenditure and the funds are allocated and spent, all the preceding costs are considered to be the sunk costs
since they accord to
the prior commitment and cannot be revised or reversed or recovered when there is a change in market conditions or change in business decisions. 5.
Historical and Replacement Costs. Historical
cost refers
to the cost
of an asset acquired in the past whereas
replacement
cost refers to the
outlay which has to be
made for replacing an old asset. These concepts owe their significance to the unstable nature of price behaviour. Stable prices over time, other things given, keep historical and replacement costs on par with each other. Instability in asset prices makes the two costs differ from each other.
Check Your Progress 1. What is meant by opportunity cost? What is its significance in business analysis? 2. Distinguish between explicit cost and implicit cost. 3. What is the difference between fixed cost and variable cost? 4. How do firms create social cost? Who pays the social cost?
NOTES Self-Instructional Material 163 Theory of Cost
Historical cost of assets is used for accounting purposes, in the assessment of the net worth of the firm. The replacement cost figures in business decisions regarding the renovation of the
firm. 6.
Private
and Social Costs. We have so far discussed the cost concepts that are related to the working of the firm and that are used in the cost-benefit analysis of business decisions. There are, however, certain other costs which arise due to
the
functioning of the firm but do not normally figure in the business decisions nor are such costs explicitly borne by the firms. The costs on this category are borne by the society. Thus, the total cost generated by

a
firm's working may be divided into two categories: (
i) those
paid out or provided for by the firms,
and (ii) those not paid or borne
by the firms including the use of resources freely available plus the disutility created in the process of production. The costs of the former category are known as private costs
and
of
the latter category are known as external or social costs. To mention a few examples of social cost: Mathura Oil Refinery discharging its wastage in
the Yamuna river causes water pollution. Mills and factories located in a city cause air pollution,
and so on.
Such costs are termed as
external costs from the firm's point of view and social
costs from the society's point of view. The relevance of the social costs lies in the social cost-benefit analysis of the overall impact of a firm's operation on the society as a whole and in working out the social cost of private gains. A further distinction between private cost and social cost is, therefore, in order.
Private costs
are
those which are actually incurred or provided for by an individual or a
firm on the purchase of goods and services from the market.
For a firm, all the actual costs both explicit and implicit are private costs. Private costs are internalized
costs that are
incorporated in the firm's total cost of production.
Social costs, on the other hand,
refer to the total cost borne by the society due to
production of a commodity. Social
cost
includes both private cost and the external cost. Social cost
includes (a) the cost of resources for which the firm is not compelled to pay a price, i.e., atmosphere, rivers, lakes, and also for the use of public utility services 3 like roadways, drainage system, etc., and (b) the cost in the form of 'disutility' created through air, water and noise pollution, etc. The costs of category (b) are generally assumed to equal the total private and public expenditure incurred to safeguard the individual and public interest against the various kinds of health hazards created by the production system. The private and public expenditure, however, serve only as an indicator of 'public disutility'—they do not give the exact measure of the public disutility
or the social costs. 6.3
THE THEORY OF COST: THE COST-OUTPUT RELATIONS
The theory of cost deals with the behaviour of cost in relation to a
change in output. In other words, the cost theory deals with cost-output relations. The basic principle of the cost behaviour is that the total cost increases with increase in output. This simple statement of an observed fact is of little theoretical and practical importance. What is
of importance from a theoretical and managerial point of view is not the
absolute increase in the total cost but
the direction of change in the average cost (AC) and the marginal cost (MC). The direction of change in AC and MC—whether AC and MC decrease or increase or remain constant—depends on the nature of the
cost function.
A
cost function is a symbolic statement of the technological relationship between
the cost and output. The general form of the cost function is written as
TC = f (Q),
DTC/DQ < 0 ...(6.1)
NOTES 164 Self-Instructional Material Theory
of Cost
The specific form of the

cost function depends on whether the time framework chosen for cost analysis is short-run or long-run. It is important to recall here that some costs remain constant
in the short-run while all costs are variable in the
long-run.
Thus, depending on whether cost analysis pertains to short-run or to long run,
there are two kinds of cost functions: (i) short-run cost functions, and (ii) long-run
cost
functions, Accordingly, the cost output relations are analyzed in short-run and long-run framework. In this section, we will analyse the cost-output relations
in the short-run.
The long-run cost output relations are discussed in the following section. 6.3.1
Short-Run Cost-Output Relations
Before we discuss the cost-output relations, let us first look at the cost concepts and the components used to analyse the short-run cost-output relations.
The basic analytical
cost concepts used in the analysis of cost behaviour are Total, Average and Marginal costs. The total cost (TC) is defined as
the actual cost that
must be
incurred to produce a given quantity of output. The short-run
TC is composed of two major elements: (i) total fixed cost (TFC), and (
ii) total variable cost (TVC). That is, in the short-run,
TC = TFC + TVC ...(6.2) As mentioned earlier, TFC (i.e., the cost of plant, building, etc.) remains fixed in the short-run, whereas TVC varies with the variation in the output. For a given quantity of output (Q), the average
total cost, (AC), average fixed cost (AFC) and average variable cost (AVC)
can be defined as follows. AC =
TC Q = TFC TVC Q + AFC = TFC Q AVC = TVC Q
and
AC = AFC + AVC ...(6.3)
Marginal cost (MC)
is defined as the change in the total cost
divided by the change in the
total output, i.e.,
MC = TC Q
Δ Δ ...(6.4) or
as
the first derivative of cost function, i.e., TC Q ∂ ∂
It may be added here that since ΔTC = ΔTFC + ΔTVC and, in the short-run, ΔTFC = 0, therefore, ΔTC = ΔTVC. Furthermore, under the marginality concept, where ΔQ = 1,
MC = ΔTVC. Now we turn to cost function and derivation of cost curves. 6.3.2 Short-Run Cost Functions and Cost Curves The cost-output relations are determined by the cost function and are exhibited through
cost curves.
The
shape of the cost curves depends on the nature of the cost function.
Cost
functions are derived from actual cost data of the firms.
Given the cost data, cost
functions may take a variety of forms, yielding different kinds of cost curves. The cost curves produced by linear, quadratic and cubic cost functions are illustrated below. 1.
Linear
Cost Function.
A linear cost function takes the following form. TC= a + bQ ...(6.5)
NOTES Self-Instructional Material 165 Theory of Cost (
where TC = total cost, Q = quantity produced, a = TFC, and bQ = TVC). Given the cost function (Eq. 6.5), AC and MC can be obtained as follows.
AC = TC

Q =
a bQ Q + = a Q + b
and MC =
TC b Q ∂ = ∂
Note that since 'b' is a constant, MC remains constant throughout in case of a linear cost function.
Assuming an actual cost function given as TC = 60 + 10Q ...(6.6)
the cost curves (TC, TVC and TFC) are graphed in
Fig. 6.1.
Fig. 6.1: Linear Cost Functions
Given the cost function (6.6), AC = 60 Q + 10 and MC = 10 Figure 6.1
shows the behaviour of TC, TVC and TFC. The
straight
horizontal line shows TFC and the
line marked TVC = 10Q shows the movement in TVC. The total cost function is shown by TC = 60 + 10Q.
Fig. 6.2: AC and MC Curves Derived from Linear Cost Function
NOTES 166 Self-Instructional Material Theory of
Cost
More important is to notice
the behaviour of AC and MC curves in Fig. 6.2. Note that, in case of a linear cost function, MC =
AVC and it
remains constant, while
AC continues to decline with the increase in output. This is so simply because of the logic of the linear cost function. 2.
Quadratic Cost Function.
A quadratic cost function is of the form
TC = a + bQ + Q 2 ....(6.7) where a and b are constants
and TC and Q are total cost and total output, respectively.
Given the cost function (6.7), AC
and
MC can be obtained as follows. AC =
TC Q = 2
a bQ Q Q + + ...(6.8) =
a Q + b +
Q MC = TC Q ∂ ∂ = b + 2Q ...(6.9)
Let the actual (or estimated) cost function be
given as TC = 50 + 5Q + Q 2 ...(6.10)
Given the cost function (6.10), AC = 50
Q Q + 5 and MC =
C Q ∂ ∂ = 5 + 2
Q
The cost curves that emerge from the cost function (6.10) are graphed in Fig. 6.3 (a) and (b). As shown in panel (a), while fixed cost remains constant at 50, TVC is increasing at an increasing rate. The rising TVC sets the trend in the total cost (TC). Panel (b) shows the behaviour of AC, MC and AVC in a quadratic cost function. Note that MC and AVC are rising at a constant rate whereas AC first declines and then
increases.
Output ( )Q Output ( )Q
Total Cost Average and Marginal costs 1 1 20 20 30 10 40 40 60 60 50 50 80 100 120 140 160 180 200 2 2 3 3 4 4 5 5 6 6 7 7 8 8 9 9 10 10 11 11 ( )
a ( )b FC (= 50) MC AC AVC
TC Q Q = 50 + 5 + 2 TVC
Q Q = 5 + 2 0
Fig. 6.3: Cost Curves Derived from a Quadratic Cost Function 3.
Cubic Cost Function. A cubic cost function is of the form TC = a +
bQ – cQ 2 + Q 3 ...(6.11)
where a, b and c are the parametric constants.
From
the cost function (6.11), AC and MC can be derived as follows.

AC =
TC
Q = 2 3 a bQ cQ Q
Q + − +
NOTES Self-Instructional Material 167 Theory of Cost =
a Q + b − cQ + Q 2
and MC = TC Q ∂ ∂ =
b − 2 cQ + 3Q 2
Let us suppose that the cost function is empirically estimated as TC = 10 + 6Q − 0.9Q 2 + 0.05Q 3 ...(6.12)
and TVC = 6Q − 0.9Q 2 + 0.05Q 3 ...(6.13) Fig. 6.4: TC, TFC and TVC Curves
The TC and TVC, based on Eqs. (6.12) and (6.13), respectively, have been calculated for Q = 1 to 16 and presented in Table 6.1. The TFC, TVC and TC have been graphically presented in Fig. 6.4. As the figure shows,
TFC remains fixed for the whole range of output, and hence, takes the form of a horizontal line—TFC. The TVC curve shows
that
the total variable cost first increases at a decreasing rate and then at an
increasing rate with the increase in the output. The rate of
increase can be obtained from the slope of TVC curve.
The pattern of change in the TVC stems directly from the law of increasing and diminishing returns to the variable inputs. As output increases, larger quantities of variable inputs are required to produce the same quantity of output due to diminishing returns. This causes a subsequent increase in the variable cost for producing the same output.
Table 6.1: Cost-Output Relations Q FC TVC TC AFC AVC AC MC (1) (2) (3) (4) (5) (6) (7) (8) 0 10 0.0 10.00 - - - - 1 10 5.15 15.15 10.00 5.15 15.15 5.15 2 10 8.80 18.80 5.00 4.40 9.40 3.65 3 10 11.25 21.25 3.33 3.75 7.08 2.45 4 10 12.80 22.80 2.50 3.20 5.70 1.55 5 10 13.75 23.75 2.00 2.75 4.75 0.95 6 10 14.40 24.40 1.67 2.40 4.07 0.65 7 10 15.05 25.05 1.43 2.15 3.58 0.65 8 10 16.00 26.00 1.25 2.00 3.25 0.95 9 10 17.55 27.55 1.11 1.95 3.06 1.55 (
Contd...) Check Your Progress 5. What cost concepts are used in cost analysis? 6. Distinguish between short-run average and marginal costs. 7. Suppose a cost function is given as TC = a + bQ + Q 2 . Find the AC and MC. 8. Given the cost function as TC = 50 + 5Q − Q 2 + 0.5 Q 3 , find Average Variable Cost (AVC) for Q = 10.
NOTES 168 Self-Instructional Material Theory of Cost 10 10 20.00 30.00 1.00 2.00 3.00 2.45 11 10 23.65 33.65 0.90 2.15 3.05 3.65 12 10 28.80 38.80 0.83 2.40 3.23 5.15 13 10 35.75 45.75 0.77 2.75 3.52 6.95 14 10 44.80 54.80 0.71 3.20 3.91 9.05 15 10 56.25 66.25 0.67 3.75 4.42 11.45 16 10 70.40 80.40 0.62 4.40 5.02 14.15
From Equation. (6.12) and (6.13), we may derive the behavioural equations for AFC, AVC and AC. Let us first consider AFC.
Average Fixed Cost (AFC). As already mentioned, the costs that remain fixed for a certain level of output make the total fixed cost in the short-run.
The fixed cost is represented by the constant term ‘a’ in Eq. (6.11) and a = 10. We know that AFC = TFC
Q ....(6.14) Substituting 10 for TFC in Eq. 6.14, we get AFC = 10
Q ....(6.15)
Eq. (6.15)
expresses the behaviour of AFC in relation to change in Q. The behaviour of AFC for Q from 1 to 16 is given in Table 6.1 (col. 5) and presented graphically by the AFC curve in Fig. 6.5. The AFC curve is a rectangular hyperbola.
Average Variable Cost (AVC). As defined above, AVC = TVC
Q
Given
the TVC function (Eq. 6.13), we may express AVC as follows. AVC = 2 3 6 0.9 0.05 Q Q Q
Q − + = 6 − 0.9Q + 0.05Q 2 ...(6.16) Having derived the AVC function in Eq. (6.16), we
can
easily obtain the behaviour of AVC in response to change in Q. The behaviour of AVC for Q = 1 to 16 is given in Table 6.1 (col. 6),
and graphically presented in Fig. 6.5 by the AVC curve.
Fig. 6.5: Short-run Curves
NOTES Self-Instructional Material 169 Theory of Cost
Critical Value of
AVC. From Eq. (6.10), we may compute the critical value of Q in respect of AVC. The
critical value of Q (in respect of AVC) is one that minimizes
AVC.

The AVC will be minimum when its (decreasing) rate of change equals zero. This can be accomplished by differentiating Eq. (6.16) and setting it equal to zero. Thus, critical value of Q can be obtained as Critical value of Q = AVC Q ∂ ∂ = – 0.9 + 0.10 Q = 0 0.10 Q = 0.9 Q = 9
In our example, the critical value of Q = 9. This can be verified from Table 6.1. The AVC is minimum (1.95) at output 9.
Average
Cost (AC). The average cost (AC) is defined as AC = TC
Q .
Substituting cost function given in
Eq. (6.12) for TC in the above equation, we get AC = 2 3 10 6 0.9 0.05 Q Q Q
Q + – + = 10
Q + 6 – 0.9Q + 0.05Q 2 ...(6.17) The Eq. (6.17) gives the behaviour
of AC
in response to change in Q. The behaviour of AC for Q = 1 to 16 is given in Table 6.1 and graphically presented in Fig. 6.5 by the AC curve. Note that AC curve is U-shaped.
Minimization of AC. One objective of business firms is to minimize AC of their product
or, which is the same as, to optimize the output.
The level of output that minimizes AC can be obtained by differentiating Eq. 6.17 and setting it equal to zero.
Thus, the optimum value of
Q can be obtained as follows. 2 10 0.9 0.1
AC Q Q Q ∂ = – + ∂ = 0
When simplified this equation takes the form
of a quadratic equation
as – 10 – 0.9Q 2 + 0.1Q 3 = 0
or
Q 3 – 9Q 2 – 100 = 0 ...(6.18) By solving 4 equation (6.18) we get Q = 10. Thus, the critical value of output in respect of AC is 10. That is AC reaches its minimum at Q = 10. This can be verified from Table 6.1. Marginal Cost (MC). The concept of marginal cost (MC) is particularly useful in economic analysis. MC is technically the first derivative of the TC function. Given the TC function in Eq. (6.12), the MC function can be obtained as MC = TC Q ∂ ∂ = 6 – 1.8Q + 0.15Q 2 ...(6.19) Equation (6.19) represents the behaviour of MC. The behaviour of MC for Q = 1 to 16 computed as MC = TC n – TC n–1 is given in Table 6.1 (col. 8) and graphically presented by the MC curve in Fig. 6.5. The critical value of Q with respect to MC is 6 or 7. This can be seen from Table 6.1. 6.3.3 Cost Curves and the
Law of Diminishing Returns We now return to the law of variable proportions and explain it through the cost curves. Figures 6.4 and 6.5 present the short-term law of production, i.e., the law of diminishing
NOTES 170 Self-Instructional Material Theory of
Cost returns. Let us recall
the law: it states that when more and more units of a variable input are
applied, other inputs held constant, the returns from the marginal units of the variable input may initially increase but it decreases
eventually. The same law can also be interpreted in terms of decreasing and increasing costs. The law can then be stated as, if more and more
units of a variable input are applied to a given amount of
a fixed input, the marginal cost initially decreases, but eventually increases. Both interpretations of the law yield the same information—one in terms of marginal productivity of the variable input, and the other in terms of
the marginal cost. The former is expressed through a production function and the latter through a
cost
function.
Figure 6.5
presents the short-run
laws of return in terms of cost of production. As the figure shows,
in the initial stage of production, both AFC and AVC are declining because of
some
internal economies. Since AC = AFC + AVC, AC is also declining. This shows the operation of the law of increasing returns. But beyond a certain level of output (
i.e., 9 units in our example),
while AFC continues to fall, AVC starts increasing because of a faster increase in the TVC. Consequently, the rate of fall in AC decreases.

The AC reaches its minimum when output increases to 10 units.
Beyond this level of output, AC starts increasing
which shows that
the law of diminishing returns comes into operation.
The MC curve represents the change in both the TVC and TC curves
due to change in
output.
A downward trend in the MC shows increasing marginal productivity of the variable input
due mainly to internal economy resulting from increase in production. Similarly, an upward trend in
the MC
shows increase in TVC, on the one hand, and decreasing marginal productivity of the variable input, on the other. 6.3.4
Some Important
Cost Relationships
Some important relationships between costs used in analysing
the short-run
cost- behaviour
may now be summed up as follows: (a) Over the range of output AFC
and AVC fall, AC also falls
because AC = AFC + AVC. (
b) When AFC falls but AVC increases, change in AC depends on the rate of change in AFC and AVC. (i) if decrease in AFC < increase in AVC, then AC falls, (ii) if decrease in AFC = increase in AVC, AC remains constant,
and (
iii) if decrease in AFC > increase in AVC, then AC
increase. (c)
The relationship between
AC and MC is of a varied nature.
It may be described as follows: (i)
When MC falls, AC follows,
over a certain range of
initial
output. When MC is
falling,
the rate of fall in MC is greater than that of AC, because
in
the
case of MC the decreasing marginal cost is attributed to a single marginal unit while, in case of AC, the decreasing marginal cost
is distributed over the entire output.
Therefore, AC decreases at a lower rate than MC. (
ii) Similarly, when MC increases, AC also increases but at a lower rate for the reason given
in (i) There is, however, a range of output over which the relationship does not exist. Compare the behaviour of MC and AC over the range of output from 6 units to 10 units (see Fig. 6.5). Over this range of output, MC begins to increase while AC continues to decrease. The reason for this can be seen in Table 6.1: when MC starts increasing, it increases at a relatively lower rate which is sufficient only to reduce the rate of decrease in AC—
not sufficient to push the AC up.
That is why AC continues to fall over some range of output even if MC increases. (iii) MC intersects AC at its minimum point. This is simply a mathematical relationship between MC and AC curves when both of them are obtained from the same TC function. In simple words, when AC is at its minimum,
Check Your Progress 9. Where does average cost equal marginal cost? 10. Derive AC and MC curves from cost function given as TC = 10 + 6Q − Q 2 + 0.05Q 3 . 11. Given the cost function as TC = 200 + 5Q + 2Q 2 ,
at what level of Q, AC = MC? 12. Why does short-run AC curve take U-shape?
NOTES Self-Instructional Material 171 Theory of Cost
it is neither increasing nor decreasing: it is constant. When AC is constant, AC = MC. 6.3.5
Output Optimization in the Short-Run
The technique of output
optimization has already been discussed in

unit 5.
Optimization of output in the short-run has been illustrated graphically in Fig. 6.5
at the point of interaction of AC and MC. Optimization technique is shown here algebraically by using a TC–function.
Let us suppose that a short run cost function is given as TC = 200 + 5Q + 2Q 2 ...(6.20)
We have noted above that an optimum level of output is one that equalizes AC and
MC. In other words, at optimum level of output, AC = MC. Given the cost function in Eq. (6.20),
AC = 2 200 5 2 Q Q Q + + = 200 Q + 5 + 2Q ... (6.21) and MC =
TC
Q ∂ ∂ = 5 + 4
Q ... (6.22) By equating AC and MC equations, i.e., Eqs. (6.21) and (6.22), respectively, and solving them for Q, we get the optimum level of output. Thus, 200 Q + 5 + 2Q = 5 + 4Q 200 Q = 2Q 2Q 2 = 200 Q = 10 Thus, given the cost function (6.20), the optimum output is 10. 6.3.6 Long-Run Cost-Output Relations
By definition,
long-run is a period in which
all the inputs become variable.
The
variability of inputs is based on the assumption that
in the long-run supply of all the inputs, including those held constant in the short-run, becomes elastic.
The firms are, therefore, in a position to expand the scale of their production
by hiring
a
larger quantity of all the inputs.
The long-run-cost-output relations, therefore, imply the relationship between the
changing scale of the firm
and the total output, whereas in the short-run this relationship is essentially one between the total output and the variable
cost (labour).
To understand the long-run-cost-output relations and to derive long-run cost curves it will be helpful to imagine that a long-run is composed of a series of short-run production decisions. As a corollary of this,
long-run cost
curve is
composed of a series of short- run cost curves.
We may now derive the long-run cost curves and study their relationship with output. Long-run Total
Cost Curve (LTC). In order to draw the long-run total cost curve, let us begin with a short-run situation.
Suppose that a firm having only one plant has its short-run total cost curve as given by STC 1 , in panel (a)
of
Fig. 6.6. Let us now suppose that the firm decides to add two more plants
to its size
over time, one after
the other. As a result,
two more short-run total cost curves are added to STC 1 , in the manner
NOTES 172 Self-Instructional Material Theory of Cost
shown
by STC 2 and STC 3 in Fig. 6.6(a). The LTC can now be drawn through the minimum points of STC 1 , STC 2 and STC 3 as shown by the LTC curve corresponding to each STC.
Fig. 6.6: Long-run Total
and
Average
Cost
Curves
Long-run Average Cost Curve (LAC).
The
long-run average cost curve (LAC) is
derived by combining the
short-run
average cost curves (

SAC s).
Note that there is one SAC associated with each STC.
Given the STC 1 , STC 2 , STC 3 curves in panel (a) of
Fig. 6.6
there are three corresponding SAC curves as given by SAC 1 , SAC 2 , and SAC 3 curves in panel (b) of
Fig. 6.6.
Thus, the firm has a series of SAC curves, each having a bottom point showing the minimum SAC. For instance, C 1 Q 1 is minimum AC
when the firm has only one plant. The AC decreases to C 2 Q 2 when the second plant is added
and then
rises to C 3 Q 3 after the addition of the third plant. The LAC curve can be drawn through the SAC 1 , SAC 2 and SAC 3 as shown in Fig. 6.6 (b) The LAC curve is also known as
the 'Envelope Curve' or '
Planning Curve' as it serves as a guide to the entrepreneur in his plans to expand production.
The SAC curves can be derived from the data given in the STC schedule, from STC function or straightaway from the LTC curve 5 . Similarly, LAC
and
can be derived from LTC-schedule, LTC function or form LTC-curve.
The relationship between LTC and output, and between LAC and output can now be easily derived. It is obvious from the LTC that the long-run cost-output relationship is similar to the short-run cost-output relation. With the subsequent increases in the output, LTC
first
increases at a decreasing rate, and then at an increasing rate.
As a result, LAC initially decreases until the optimum utilization of the second plant
and then it begins to increase. These cost-output relations follow the 'laws of returns to scale'. When the scale of the firm expands, unit cost of production initially
decreases, but ultimately increases as shown in Fig. 6.6(b). The decrease in unit cost is attributed to the internal and external economies and the eventual increase in cost, to the internal and external
NOTES Self-Instructional Material 173
Theory of Cost
diseconomies. The economies and diseconomies of scale are discussed in the following section.
Long-run Marginal Cost Curve (LMC).
The long-run marginal cost curve (LMC) is derived
from the short-run marginal cost
curves (SMCs). The
derivation of LMC is illustrated in Fig. 6.7 in which SACs and LAC are the same as in Fig. 6.6(b). To derive the LMC, consider the points of tangency between SACs and the LAC, i.e., points A, B and C. In the long-run production planning, these points determine the output levels at the different levels of production. For example, if we draw perpendiculars from
points A,
B and C to
the
X-
axis, the corresponding output levels will be OQ 1 , OQ 2 and OQ 3 . The perpendicular AQ 1 intersects the SMC 1 at point M.
It means that at output OQ 1 , LMC is MQ 1 .
If output increases to OQ 2 ,
LMC rises to BQ 2 . Similarly, CQ 3
measures the LMC at output OQ 3 .
A curve drawn through points M, B and N, as shown by the LMC, represents the behaviour of the marginal cost in the long-run. This curve is known
as the long-run marginal cost curve, LMC. It shows the trends in the marginal cost in response to the changes in the scale of production.
Some important inferences may be drawn from Fig. 6.7. The LMC must be equal to SMC for the output at which the corresponding SAC is tangent to the LAC. At the point of tangency, LAC = SAC.

Another important point to notice is that LMC intersects LAC when the latter is at its minimum, i.e., point B. There is one and only one short-run plant size whose minimum SAC coincides with the minimum LAC. This point is B where
SAC 2 = SMC 2 = LAC = LMC
Optimum Plant Size and Long-Run Cost Curves.
The
short-run cost curves are helpful in showing how a firm can decide on the optimum utilization of the plant—the fixed factor, or how it can determine
the least-cost-output level. Long-run cost curves, on the other hand, can be used to show how a firm can decide on the optimum size of the firm.
Fig. 6.7 Derivation of LMC Conceptually,
the
optimum size of a firm is one which ensures the most efficient utilization of resources. Practically, the optimum size of the firm is one which minimises the LAC.
Given the state of technology over time, there is technically a
unique
size of the firm and level of output associated with the least-cost concept. In
Fig. 6.7,
the optimum size consists of
two
plants which produce OQ 2 units of a product at minimum long-run average cost (LAC) of BQ 2 . The downtrend in the LAC indicates that until output reaches the level of OQ 2 , the firm is of less than optimal size. Similarly, expansion of the firm beyond production capacity OQ 2 ,
causes a rise in SMC and, therefore, in
LAC. It follows that given the technology, a firm aiming to minimize its average cost over time must choose a plant which gives minimum LAC where
Check Your Progress 13. How are long-run cost curves different from short- run cost curves? 14. What is meant by 'Envelope' or 'planning' curve? 15. Show the derivation of long- run average cost curve (LAC). 16. How is optimum size of the firm determined on the basis of the long-run cost curves?
NOTES 174 Self-Instructional Material Theory of Cost
SAC = SMC = LAC = LMC. This size of plant assures the most efficient utilization of the resource. Any change in output level, increase or decrease, will make the firm enter the area of
in optimality. 6.4
ECONOMIES AND DISECONOMIES OF SCALE
As shown in Fig. 6.7,
LAC decreases with the expansion of production scale upto OQ 2 and then it begins to rise. This behaviour of LAC is caused by the economies
and diseconomies of scale. Economies of scale result in cost saving and diseconomies lead to rise in cost. Economies and diseconomies of scale determine also the returns to scale. Increasing returns to scale operate till
economies of scale are greater than the diseconomies of scale,
and returns to scale decrease when diseconomies are greater than the economies of scale. When economies and diseconomies are in balance, returns to scale are constant. In this section, we will briefly discuss the various kinds of economies and diseconomics of scale. 6.4.1 Economies
of
Scale The economies of scale are classified as (a) Internal or Real Economies, and (b) External or Pecuniary Economies.
A.
Internal Economies Internal economies, also called 'real economies', are those which arise
from the expansion of the plant-size of the firm and are internalized.
This
means that internal economies are exclusively available to the expanding firm. Internal economies may be classified under the following categories. 6 (i) Economies in production; (ii) Economies in marketing; (iii) Managerial economies; and (iv) Economies in transport and storage. (i)Economies in Production. Economies in production arise from two sources: (a) technological advantages, and (b) advantages of division of labour and specialization. Technological advantages. Large-scale production provides an opportunity to avail
of
the advantages of technological advances. Modern technology is highly specialized. The advanced technology makes

it possible to conceive the whole process of production of a commodity in one composite unit of production. For example, production of cloth in a textile mill may comprise such plants as (i) spinning; (ii) weaving; (iii) printing and pressing; and (iv) packing, etc. A composite dairy scheme may consist of plants like (i) chilling; (ii) milk processing; and (iii) bottling. Under small-scale production, the firm may not find it economical to have all the plants under one roof. It would, therefore, not be in a position to have the full advantage of a composite technology. But, when scale of production expands and firms hire more capital and labour, their total output increases more than proportionately till the optimum size of the firm is reached. It results in lower cost of production. Advantages of division of labour and specialization. When a firm's scale of production expands, more and more workers of varying skills and qualifications are employed. With the employment of larger number of workers, it becomes increasingly possible to divide the labour according to their qualifications and
NOTES Self-Instructional Material 175 Theory of Cost
skills and to place them in the process of production where
they are best suited. This is known as division of labour. Division of labour leads to specialization. It increases productivity of labour and, thereby, reduces cost of production. Besides, specialized workers develop more efficient tools and techniques and gain speed of work. These
advantages of division of labour improve productiv- ity of labour—per unit of cost and time. (ii)
Economies in Marketing. Economies in marketing arise from the large-scale purchase of
raw-materials and other material
inputs and
large-scale
selling of the firm's own products. As to economies in
the
purchase of inputs, the large-size firms normally make bulk purchases of their inputs. The large scale
purchase entitles the firm for certain discounts which are not available on small purchases.
As such, the growing firms gain economies on the cost of their material inputs.
The economies in marketing the firm's own product are associated with (a) economies in advertisement cost; (b) economies in large-scale distribution through wholesalers, etc.; and (c) other large-sale economies. With the expan- sion
of the firm, the total production increases. But the expenditure on
adver- tising the
product does not increase proportionately. Similarly, selling through the wholesale dealers reduces the cost on distribution of the firm's production. The firm also gains on large scale distribution through better utilization of 'sales force, distribution of sample, etc.' This kind of economy however does not directly effect the production conditions. (iii)Managerial Economies. Managerial economies arise from (a) specialization
in management, and (b) mechanization of managerial functions. For a large-size firm, it becomes possible to divide its management into specialized departments under specialized personnel, such as production manager, sales manager, personnel manager, labour officers, etc. This increases the efficiency of management at all the levels of management because of the decentralization of decision-making. Large-scale firms have the opportunity to use advanced techniques of communication, telephones and telex machines, computers, and their own means of transport.
All these
lead to quick decision-making, help in saving valuable time of the management
and, thereby, improve the managerial efficiency. For these reasons, managerial cost increases less than
proportion- ately with
the increase in production scale upto a certain level. (
iv)Economies in Transport and Storage. Economies in transportation and storage costs arise from fuller utilization of transport and storage facilities. Transportation costs are incurred both on production and sales sides. Similarly, storage costs are incurred on both raw materials and finished products.
The
large-size
firms may acquire their own means of transport and they can, thereby, reduce the unit cost of transportation compared
to
the
market rate,

at least to the extent of profit margin of the transport companies. Besides, own transport facility prevents delays in transporting goods. Some large-scale firms have their own railway tracks from the nearest railway point to the factory, and thus they reduce the cost of transporting goods in and out. For example, Bombay Port Trust has its own railway tracks, oil companies have their own fleet of tankers.
Similarly, large-scale firms can create their own godowns in
the
various centres of product distribution and can save
on cost of storage. B. External or Pecuniary Economies
of Scale External or pecuniary economies accrue to the expanding firms
from the advantages arising outside the firm, e.g., in the input markets.
Pecuniary economies accrue to the large-size firms in the form of discounts and concessions on (i) large scale purchase of raw material, (ii) large scale acquisition of external finance, particularly from the
NOTES 176 Self-Instructional Material Theory of Cost
commercial banks; (iii) massive advertisement campaigns; (iv) large scale hiring of
means of transport and warehouses, etc. These benefits
are available to all the firms of
an industry—
they are not specific to any one particular firm.
Besides, expansion of an industry invites and encourages the growth of ancillary industries which supply inputs. In the initial stages, such industries also enjoy the increasing returns to scale. In a competitive market, therefore, input prices go down.
This benefit
accrues to the expanding firms in addition to discounts and concessions. For example, growth of the automobile industry helps the development of tyre industry and other motor parts.
If Maruti Udyog Limited starts producing tyres for its own cars and ancillaries, cost of
Maruti cars may go up.
Consider another example, growth of fishing industry encourages growth of firms that manufacture and supply fishing nets and boats. Competition between such firms and law of increasing returns
at least in the initial stages,
reduces the cost of inputs. Reduction in input costs is an important aspect of external economies. 6.4.2
Diseconomies of Scales
Diseconomies of scale are disadvantages that arise due to the expansion of production scale and lead to a rise in the cost of production.
Like economies, diseconomies may be internal and external. Internal diseconomies are those which are exclusive and internal to a firm—they arise within the firm.
External diseconomies arise outside the firms, mainly in the input markets.
Let us describe the nature of internal and external diseconomies in some detail. 1. Internal Diseconomies
Like everything else, economies of scale have a limit too.
This limit is reached
when the advantages of division of labour and managerial staff have been fully exploited; excess capacity of plant, warehouses, transport and communication systems, etc. is fully used;
and economy in advertisement cost tapers off.
Although some economies may still exist, diseconomies begin to overweigh the economies and the costs begin to rise.
Managerial inefficiency. Diseconomies begin to appear first at the management level. Managerial inefficiencies arise, among other things, from the expansion of scale itself.
With fast expansion of the production scale, personal contacts and communications between (i) owners and managers, and (ii) managers and labour, get rapidly reduced.
Close control and supervision is replaced by remote control management.
With the increase in managerial personnel, decision-making become complex
and delays become inevitable. Implementation of decisions is delayed due to coordination problem.
Besides, with the expansion of the scale of production, management is professionalised beyond a point. As a result, the owner's objective function of profit maximization is gradually replaced by managers' utility function, like job security and high salary, standard or reasonable profit target, satisfying functions. All these lead to laxity in management and, hence to a rise in the cost of production. Labour Inefficiency.
Another source of internal diseconomy is the
overcrowding

of labour leading to a loss of control over labour productivity.
On the other hand,
increase in the number of workers encourages
labour union activities
which
simply means the
loss of output per unit of time and hence, rise in the cost of production. 2. External Diseconomies External diseconomies are the disadvantages that originate outside the firm, in the input markets and due to natural constraints, specially in agriculture and extractive industries. With the expansion of the firm, particularly when all the firms of the industry are expanding, the discounts and concessions that are available on bulk purchases of inputs and concessional finance come to an end. More than that, increasing demand for inputs
Check Your Progress 17. What is meant by economies of scale? 18. What factors lead to internal economies of scale? 19. What is meant by external economies of scale? Why do these economies arise? 20. What are internal and exter- nal diseconomies?
NOTES Self-Instructional Material 177 Theory of Cost
puts pressure on the input markets and input prices begin to rise causing a rise in the cost of production. These are pecuniary diseconomies.
On the production side, the law of diminishing returns to scale come into force due to excessive use of fixed factors, more so in agriculture and extractive industries. For example, excessive use of cultivable land turns it into barren land; pumping out water on a large scale for irrigation causes the water table to go down resulting in rise in cost of irrigation; extraction of minerals on a large scale soon exhausts the mineral deposits on upper levels and mining further deep causes rise in cost of production; extensive fishing reduces the availability of fish and the catch, even when fishing boats and nets are increased. These kinds of diseconomies make the LAC move upward. 6.5
SOME EMPIRICAL COST FUNCTIONS In previous sections we have used some hypothetical cost functions and illustrated the behaviour of AC and MC. The question that now arise is: How do AC and MC actually behave in real life situations. The empirical studies that have investigated the actual behaviour of AC and MC in different kinds of industries, mainly in the US, UK and India, reveal that the behaviour of AC and MC in the short-run and long-run generally conforms to the theory of cost, though deviations are quite significant. Most long-run cost functions reveal the preponderance of L-shaped long-run average cost (LRAC). We present here the result of some empirically estimated cost functions to give an idea as to how AC and MC behave in actual practice. Results of Some Estimated Cost Functions Investigator Year Industry Type of Data* Result 1. Short-Run Cost Functions Johnston 1960 Electricity (US) TS AC falls at dimini- shing rate tending to equal MC Mansfield 1958 Railways (US) - MC constant and Wein Eiteman 1952 Manufacturing Q MC below AC prior and Gutherie to capacity Lester 1946 Manufacturing Q Decreasing AVC to capacity Dean 1941 Hosiery TS MC constant Dean 1941 Leather belts TS MC increasing Ezekiel 1941 Steel TS MC declining and Wylie Yntema 1940 Steel TS MC constant Dean 1936 Furniture TS MC constant 2. Long-Run Cost Function Gupta 1968 Manufacturing CS AC L-shaped in (India) 18 industries, (29 industries) U-shaped in 5 and linear in 6 Nerlove 1961 Electricity CS LRAC declining then rising Johnston 1960 Electricity (UK) E LRAC declining Moore 1959 Manufacturing E Economies of scale: declining LRAC Albert 1959 Metal E Economies of scale (Contd...)
NOTES 178 Self-Instructional Material Theory of Cost Bain 1956 Manufacturing Q Small economies of scale Gribbin 1953 Gas (UK) CS LRAC declining Lomax 1951 Gas (UK) CS LRAC declining Lomax 1952 Electricity (UK) CS LRAC declining * CS = Cross section data; TS = Time series data; E = Engineering; Q = Questionnaire; LRAC = long run average cost; MC = marginal cost Source: A.A. Walters, "Production and Cost Function": An Econometric Survey: Econometrica, 31, January-April 1963; Vinod K. Gupta, Cost Functions, Concentration, and Barries to Entry in ''Twenty-nine Manufacturing Industries in India" Journal of Industrial Economics, November 1968. 6.6 SUMMARY • This unit deals with cost concepts, cost analysis and break-even analysis. • Cost analysis pertains to cost-output relationship, i.e., cost behaviour with change in output. • For the purpose of cost analysis, costs are classified as:
fixed costs and variable costs. Fixed costs are those that remain constant for certain level of output,

e.g., capital cost. Variable costs are those that vary with variation in output, e.g., labour cost. • Cost theory analyses cost-output relations under (a) short-run conditions, and (b) long-run conditions. Under short-run conditions, capital cost is treated as the fixed cost and labour cost is treated as variable cost. Under the long-run conditions, all cost are treated as variable costs. • Short-run cost output relations are analysed in terms of (a) average fixed cost (AFC) = TFC/Q, (b) average variable cost (AVC) = TVC/Q, (c) average cost (AC) = TC/Q = TFC/Q + TVC/Q = AC = AFC +AVC. • In the short-run, AFC decreases continuously and AVC first decreases and then increases. Since AC = AFC +AVC, AC decreases upto a certain level of output and increases. When this kind of cost-output relationship is graphed, it produces a U- shaped curve. Another cost concept used in cost analysis is the marginal cost (MC) defined as ∂TC/δQ or TC n – TC n–1 . Like AC, MC decreases over a certain level of output and then it begins to increase. • The short-run cost-output relationship produces a law called the law of diminishing returns. • As regards the long-run cost-output relationship, long-run treated as the combination of short runs.

Long-run average cost curve (LAC) and long-run marginal cost curve (

LMC) are derived by combining the SAC and SMC. The LAC so derived takes the shape of a boat. It is called envelope curve or planning curve. The shape of the curve indicates the LAC decreases first with the expansion of production upto a certain scale and then begins to decline. • LAC decreases with the expansion of scale of production due to economies

of scale. Economies of scale are classified as (a) internal economies, and (b) external or pecuniary economies. Internal economies

arise from economies in production, in marketing, management, and transport and storage costs.

NOTES Self-Instructional Material 179 Theory of Cost External economies arise due to growth of industries that supply inputs and decrease in their cost of production. • Beyond a certain scale of production, economies of scale disappear and diseconomies begin to arise causing rise in LAC and LMC. 6.7 ANSWERS TO 'CHECK YOUR PROGRESS' 1. Opportunity cost is the loss of earning due to opportunity lost. Its significance lies in its use in working out the economic profit. Economic profit is defined as actual earning less opportunity cost. 2.

All costs paid out of pocket and recorded in books of accounts are explicit costs, and implicit cost are those that arise due to opportunity lost, e.g, opportunity cost, loss of interest due to capital invested in business, loss of rental value of own building used for business, etc. 3. Fixed costs are those that do not change (remain fixed) with change in output and variables costs are those that change with change in output. 4. Firms create social cost by creating environment pollution, air pollution, water pollution and causing noise, etc. It is social cost because it causes health hazard and medical cost. 5. The cost concepts which are generally used in cost analysis include (i) fixed cost, (ii) variable cost, (iii) average cost, (iv) marginal cost, (v) short-run costs, (vi) long-run costs, (vii) total cost, (viii) total variable costs, (ix) average variable costs, etc. 6. Short-run average (SAC) cost includes both average fixed cost (AFC) and average variable cost (AVC), i.e., SAC = AFC + AVC, whereas short-run marginal cost (SMC) includes only marginal change in TVC. SMC is defined as ∂TC/∂Q or TVC n – TVC n–1 . 7. Given the cost function as TC = a + bQ + Q 2 , AC = 2

a bQ Q a b Q

Q Q + + = + + , and MC = 2 ( ) 2 a bQ Q b

Q Q ∂ + + = + ∂ . 8. Given the cost function as TC = 50 + 5Q – Q 2 + 0.5Q 3 , AC= 2 3 50 5 0.5 Q Q Q

Q + – + = 50 + 5(10) – 10 2 + 0.5(10 3) = 50 + 50 – 100 + 500 = 500. 9.

Average cost (

AC) equals marginal cost (MC) at the level of output where average cost is minimum. In other words when AC is minimum, AC = MC. It shows optimum size of production. 10. For derivation of AC and MC curves, see Fig. 6.5 in the text. 11. For answer, see Section 6.3.5 of the text. 12. SAC takes U-shape because of the law of diminishing returns, i.e., the SAC decreases due to decrease in the productivity of the variable factor – labour. 13. Long-run cost curves are different from short-run cost curves. The reason is while short-run cost curves are based on the assumption that capital cost remains

NOTES 180 Self-Instructional Material Theory of Cost costs, in the long-run all costs including cost are variable. They are different also because long-run cost curves are drawn by combining several short-run cost curves. 14. Envelope or planning curve is the long-run average cost curve. It envelopes several short-run cost curves. 15. For derivation of LAC, see Section 6.3.6, Fig. 6.6 16. The optimum size of the firm in the long run is determined at the level of output at which LAC = LMC. This point is determined by the intersection of LAC and LMC. 17. Economies of scale mean the reduction in cost due to increase in scale of production. 18. Internal economies of scale arise due to economies in (a) production, (b) marketing, (c) managerial efficiency, and (d) transport and storage cost. 19. External economies arise outside the firm due economies of scale reaped by the industries which supply inputs. 20. Internal diseconomies are those that arise due to diminishing returns to scale and external diseconomies are those that arise due to increase in material cost and in transportation and storage cost. 6.8 EXERCISES AND QUESTIONS 1. Which of the following costs are paid by the firms? (a) Variable

cost (b) Explicit cost (c) Fixed cost (d) Implicit cost 2. Explain with illustration the distinction between the following: (a) fixed cost and variable
costs, (b) acquisition cost and opportunity
cost. 3.
What is opportunity cost? Give some examples of opportunity cost.
How are these costs relevant for managerial decisions? 4.
Which of the following statements is true? (a) When Q = O, (i) TC = TVC; (ii) TC < TVC; and (iii) TC > TVC; (b) When MC = O, (i) TC is falling; (ii) TC is increasing; and (ii) TC is constant. 5. When the law of diminishing returns begins to operate, then (a) TVC begins to fall at an increasing rate; (b) TVC rises at a decreasing rate; (c) TVC falls at a decreasing rate; (d) TVC rises at an increasing rate; or (e) TVC remains constant. Which of the statements is true? 6. When MC changes, AC changes (a) at the same rate, (b) at a higher rate, or (c) at a lower rate? Illustrate your answer through a diagram. 7.
Explain the relationship between marginal cost, average cost, and total cost assuming a short-run non-linear cost function? 8.
A manufacturing firm produces and sells 3,000 units of a product X, where its AC = MC and makes only normal profit. The firm get an additional order of 500 units at the ruling price. Should the firm, a profit maximizing one, accept or reject the order. Justify your answer by using imaginary cost curves.
NOTES Self-Instructional Material 181 Theory of Cost 9. Which of the following statements are true? (a) Economic rent is the same as economic profit. (b) Imputed cost is the rent of hired building. (c) When AC = MC, AC is minimum. (d) When MC is rising AC < MC. (e) Output is optimum when AC = MC. [Ans. (a), (c) and (e)] 6.9 FURTHER READING Baumol, William, J., Economics
Theory and Operations Analysis, Prentice-Hall of India Pvt. Ltd., New Delhi, 1972, 3
rd Edn., Chs. 9 and 5. Bilas, Richard A., Microeconomic Theory, McGraw-Hill, New York, 1971, 2nd Edn., Chs. 6 and 7. Brigham,
Eugene F. and James L. Pappas, Managerial Economics, The Dryden Press, Hinsdale, Illinois., 1976, 2
nd Edn., Chs. 4 and 5. Davis, R and S. Chang, Princeples of Managerial Economics, Prentice-Hall, N.J., 1986, Ch. 12. Leftwich, Richard, H., The Price System and Resource Allocation, The Dryden Press, Hinsdale, Illinois, 1973,
Chs. 8 and 9. Mansfield, Edwin, Managerial Economics, W.W. Norton, New York, 1996, Ch. 12. Nicholson, Walter, Intermediate Economics and Its Application, The Dryden Press, Hinsdale, Illinois., 1975 Chs. 3 and 5. Salvatore, D. Managerial Economics, McGraw-Hill, 1989, Ch. 9. Seo, K.K., Managerial Economics, Richard D, Irwin, Ill., Chs. 11, 13 and 14. Spencer, M.H., Managerial Economics, Richard D. Irwin, Homewood, Ill., 1968, Ch. 5. Watson, Donald S. and Mary A. Hoiman, Price Theory and Its Uses, Houghton Miffln, Boston, 1978, Chs 8-11. Webb, Samuel C., Managerial Economics, Houghton Miffln, Boston, 1976, Chs. 6-11. References 1. Donald S. Watson,
Price Theory and Its Uses, Houghton Mifflin Company, Boston, 1963, p. 126. 2. Joel Dean, Managerial Economics, op. cit., p. 262. 3.
There may be some nominal payment for the use of public utilities in the form of tax, which may not cover the full cost thereof. 4.
One method of solving quadratic equation is to factorise it and find the solution. Thus, Q 3 – 9Q 2 – 100 = 0 (Q – 10) (Q 2 + Q + 10) = 0 For this to hold, one of the terms must be equal to zero, Suppose (Q 2 + Q + 10) = 0 Then, Q – 10 = 0 and Q = 10 5. The SAC curves can be obtained by measuring the slope of STC at different levels of output. For a simple exposition of the method, see Leftwich, R.H., The Price System, and Resource Allocation, The Dryden Press, Illinois, 4th edn., Appendix to Ch. 8. 6.
For a more detailed discussion, see A. Koutsoyiannis, Modern Micro-Economics, Macmillan, 1979, pp. 128-36.
NOTES Self-Instructional Material 183 Market Structure and Pricing Decisions UNIT 7 MARKET STRUCTURE AND PRICING DECISIONS
Structure 7.0 Introduction 7.1 Unit Objectives 7.2 Market Structure and Degree of Competition 7.2.1
Market Structure and Pricing Decisions 7.3 Pricing under Perfect Competition 7.3.1 Characteristics of
Perfect Competition; 7.3.2 Price Determination under Perfect Competition 7.4 Pricing under Pure Monopoly 7.4.1 Causes and Kinds of Monopolies; 7.4.2 Pricing and Output Decision: Short-Run; 7.4.3 Monopoly Pricing and Output Decision in the Long-Run; 7.4.4 Price Discrimination under Monopoly; 7.4.5 Necessary Conditions for Price Discrimination 7.5 Measuring Monopoly Power 7.6 Pricing and Output Decisions Under Monopolistic Competition 7.6.1 Monopolistic Vs. Perfect Competition; 7.6.2 Product Differentiation Under
Monopolistic Competition; 7.6.3
Price and Output Decisions in the Short-Run; 7.6.4 Price and Output Determination
in the Long-Run; 7.6.5

Non-Price Competition: Selling Cost and Equilibrium; 7.6.6 Critical Appraisal of Chamberlin's Theory 7.7 Pricing and Output Decisions under Oligopoly 7.7.1 Definition, Sources and Characteristics; 7.7.2 The Oligopoly Models: an Overview; 7.7.3 Cournot's Model of
Oligopoly; 7.7.4 Kinked Demand Curve Analysis of Price Stability: Sweezy's Model; 7.7.5 Price Leadership Models; 7.7.6 Collusion Model: The Cartel 7.8 The Game Theory 7.8.1 The Nature of the Problem: Prisoners' Dilemma; 7.8.2 Application of Game Theory to Oligopolistic Strategy 7.9 Summary 7.10
Answers to 'Check Your Progress' 7.11 Exercises and Questions 7.12 Further Reading 7.0 INTRODUCTION
Maximization of output or minimization of cost or optimization of resource allocation is only one aspect of the profit maximizing behaviour of the firm. Another and equally
important aspect of profit maximization is to find the price from the set of prices revealed by the demand schedule that is in agreement with profit maximization objective of the firm.
It must be noted that there is only one price for each product commensurate with
NOTES 184 Self-Instructional Material Market Structure and Pricing Decisions
profit maximization, under the given conditions. The profit-maximizing price does not necessarily coincide with minimum cost of production. Besides,
the level of profit- maximizing price is generally different in different kinds of markets, depending on the degree of competition between the sellers. Therefore, while determining the price of its product, a firm has to take into account the nature
of the market. In this unit, we will
discuss the theory of
price determination
and also a firm's equilibrium in various kinds of market
structure. 7.1 UNIT OBJECTIVES z To discuss competition-based market structure
z
To discuss price determination in different kinds of markets including perfect competition, monopoly, monopoliotic competition and oligopoly
z
To introduce and discuss game theory and its application in pricing a product sold under uncertainty in competitor's behaviour 7.2
MARKET STRUCTURE AND DEGREE
OF COMPETITION In an economic sense,
a market is a system by which buyers and sellers bargain for the price of a
product, settle the price and transact their business—buy and sell a product. Personal contact between the buyers and sellers is not necessary. In some cases, e.g., forward sale and purchase, even immediate transfer of ownership of goods is not necessary. Market does not necessarily mean a place. The market for a commodity may be local, regional, national or international. What makes a market is a set of buyers, a set of sellers and a commodity. While buyers are willing to buy and sellers are willing to sell, and there is a price for the commodity.
Table 7.1: Types of Market Structure Market Structure No. of firms Nature of Control Method of and degree industry where over price marketing
of
production prevalent differentiation 1. Perfect Large no. of Financial mar- None Market Competition firms with kets and some exchange identical farm products
or auction products 2. Imperfect Competition: (a) Monopol- Many firms with Manufacturing: Some Competitive istic com- real or perceived tea, toothpastes, advertising,
petition product
differen- TV sets, shoes, quality rivalry tiation refrigerators, etc. (
b) Oligopoly Little or no pro- Aluminium, steel, Some Competitive. duct differentia- cigarettes, cars, advertising, tion passenger cars, quality etc. rivalry (c)
Monopoly A
single prod- Public utilities: Considera- Promotional ucer, without Telephones, ble but advertising if
close
substitute Electricity, etc. usually supply regulated is large Source:Samuelson, P.A. and W.D. Nordhaus, Economics, McGraw-Hill, 15th Edn., 1995, p. 152.
NOTES Self-Instructional Material 185 Market Structure
and Pricing Decisions
We are concerned in this unit with the question: How is the price of a commodity determined in

the market?
The determination of price of a commodity depends on the number of sellers and the number of
buyers. Barring a few cases, e.g., occasional phases in share and property markets, the number of buyers is larger than the number of seller.
The number of sellers of a product in a market determines the nature and degree of competition in the market. The nature and degree of competition make the structure of the market. Depending on the number of sellers and the degree of competition, the market structure is broadly classified as given in Table 7.1. 7.2.1
Market Structure and Pricing Decisions The market structure influences firms' pricing decisions
a great deal. The degree of
competition determines a firm's degree of freedom in determining the price of its product.
The degree of freedom implies the extent to which a firm is free or
independent of the rival firms in taking its own pricing decisions.
Depending on the market structure, the degree of competition varies between zero and one. And, a firm's discretion of the degree or
freedom in setting the price for its product varies between one and none in the reverse order of the degree of competition.
As a matter of rule, the higher the degree of competition, the lower the firm's degree of freedom in pricing decision and control over the price of its own product and vice versa.
Let us now see how the degree of competition affects pricing decisions in different kinds of market structures. Under perfect competition, a large number of firms compete against each other. Therefore, the degree of competition under perfect competition is close to one. Consequently, firm's discretion in determining the price of its product is close to none.
It
has to accept the price determined by the market forces
of demand and supply.
If a
firm uses its discretion to fix the price of its product above or below its market level, it loses its revenue and profit in either case. For,
if it fixes the price of its product above the ruling price, it will not be able to sell its
product, and if it cuts the price down below its market level, it will not be able to cover its average cost.
In a perfectly competitive market, therefore, firms have little or no choice in respect to price determination.
As the degree of competition
decreases,
a
firm's control over the price and its discretion in pricing decision increases. For example, under
monopolistic competition, where degree of competition is less than one, the firms have some discretion in setting the price of their products. Under monopolistic competition, the degree of freedom depends largely on the number of firms and the level of product differentiation. Where product differentiation is real, firm's discretion and control over the price is fairly high
and where its only notional, firm's pricing decision is highly constrained by the prices of the rival products.
The control over the pricing discretion increases under oligopoly where degree of competition is quite low,
lower than under monopolistic
competition. The firms, therefore, have control over the price of their products and can exercise their discretion in pricing decisions,
especially where product differentiation is prominent.
However, the fewness of the firms gives them an opportunity to form a cartel or to make some arrangement among themselves for fixation of price and non-
price competition.
In case of a monopoly, the degree of competition is close to nil.
The monopoly firm has a considerable
control over
the price of its product. A monopoly, in the true sense of the term, is free to fix any price for its product, of course, under certain constraints, viz., (i) the objective of the firm, and (ii) demand conditions.
The theory of pricing
explains pricing decisions and pricing behaviour of the firms in different kinds of market structures.

In this unit, we will describe the characteristics of and discuss price determination in different kinds of market structure, we begin with price determination under perfect competition.
Check Your Progress 1. What is meant by market structure? 2. How is the market structure classified? 3. What are the criteria used in determining the type of market? 4. How is the degree of competition determined?
NOTES 186 Self-Instructional Material Market Structure and Pricing Decisions 7.3 PRICING UNDER PERFECT COMPETITION 7.3.1 Characteristics of Perfect Competition Perfect
competition can be defined as a form of market organisation in which a
large number of small firms selling homogeneous products compete against one another for a market under a fully competitive situation.
A perfectly competitive market is one which
has the following characteristics. 1. A large number of sellers and buyers. Under perfect competition, the number of sellers
and buyers is very large.
The number of sellers and buyers is so large that the share of each seller in total supply
and
the share of each buyer in total demand is so small that no single seller can affect the market price by changing his supply, nor can
a single buyer influence the market price by changing his demand. 2. Homogeneous products. Products supplied by all firms are approximately homogeneous. Homogeneity of products means that products supplied by various firms are so identical in appearance and use that buyers do not distinguish between them nor do they prefer the product of one firm to that of another.
Product of each firm is regarded as a perfect substitute for the
product
of other firms. Hence, no firm can gain any competitive advantage over other firms.
Nor do the firms distinguish between the buyers. For example, wheat and vegetables produced by all the farmers, other things given, are treated as
ho- mogenous. 3.
Perfect mobility of factors of production. For a market to be perfectly competitive, there should be perfect mobility of resources. This means that the factors of production must be in a position to move freely into or out of an industry and from one firm to another. 4. Free entry and free exit
of firms. There is no restriction, legal or otherwise, on the
firm's entry into or exit from the industry. 5.
Perfect knowledge. There is perfect dissemination of the information about the market conditions. Both buyers and sellers are fully aware of the nature of the product, its availability or saleability and of the price prevailing in the market. 6. Absence of collusion or artificial restraint. There is no sellers' union or other kind of collusion between the sellers such as cartels or guilds, nor is there any kind of collusion between the buyers, e.g., consumers' associations or consumer forum. Each seller and buyer acts independently. The firms enjoy the freedom of independent decisions. 7. No government intervention. In a perfectly competitive market, there is no government intervention with the working of the market system. There is no licencing system regulating the entry of firms to the industry, no regulation of market prices, i.e., fixation of lower or upper limits of prices, no control over the supply of inputs, no fixation of quota on production, and no rationing of consumer demand, etc.
Perfect competition, as characterized above, is an uncommon phenomenon in the real business world. However, the actual markets that approximate
to the conditions of perfectly competitive model include the share markets, securities and bond markets, and agricultural product markets, e.g., local vegetable markets. Although perfectly
competitive markets
and
uncommon phenomena,
perfect competition model has been the most popular model used in economic theories due to its analytical value as it provides a starting point and analytical framework for pricing theory.
NOTES Self-Instructional Material 187 Market Structure and Pricing Decisions Some times
a distinction is made between perfect competition and pure competition. The difference between the two is
only a matter of degree. Perfect competition less perfect mobility of factors and perfect knowledge is regarded as pure competition. In this book, however, we shall use the two terms
interchange- ably. 7.3.2 Price Determination under Perfect Competition By definition,
perfect competition is a market setting

in which, there are a large number of
sellers of a homogeneous product.
Each seller supplies a very small fraction of the total supply.
No single seller is powerful enough to influence the market price. Nor can a single buyer influence
the market price.
Market
price in a perfectly competitive market is determined by the
market forces—market demand and
market
supply. Market demand
refers to the demand for the industry as a whole: it is
the sum of the quantity demanded by
each individual consumer or user
at different prices. Similarly, market supply is the sum of quantity supplied by the individual firms in the industry. The market price is, therefore, determined for the industry, and is given for each individual firm and for each buyer. Thus,
a
seller
in a perfectly competitive market is a 'price-taker, not a 'price-maker'.
In a perfectly competitive market, therefore, the main problem
for a profit maximizing
firm is not to determine the price of its product but to adjust its output
to
the market price so that profit is maximum. The mode of price determination—price level and its variation—
depends on the time taken by the
supply position to adjust itself to the changing demand conditions. Price determination
under perfect competition
is analysed under three different time periods: (i) market period or very short-run, (ii) short-run,
and (iii) long-run.
The short-run and long-run have already been defined (
see Unit 9, Section 19.1).
As regards
the market period or very short run, it refers to a time period
in
which quantity supplied is absolutely fixed or, in other words, supply response to price is nil.
Price determination in the
three types of perfectly competitive markets is described below. (i) Pricing in Market Period.
In a market period, the total output of a product is fixed. Each firm has a stock of commodity to
be sold. The stock of goods with
all the firms makes the total supply. Since the stock is fixed, the supply curve is perfectly inelastic, as shown by the line SQ in Fig. 7.1 (a). In this situation, price is determined solely by the demand condition. Supply remains an inactive agent.
For instance, suppose that the number of marriage houses (or tents in a city
in a marriage season is given at OQ (Fig. 7.1 (a)) and
the supply curve takes the shape of a straight line, SQ. Suppose also that the demand curve for marriage houses (
or tents) during
a
season
is given by D 1 . Demand curve and supply line intersect each other at point M, determining the rent at MQ =
OP 1 . If during a marriage season, demand for marriage houses (or tents) increases suddenly
because a
relatively
larger number of parents decide to celebrate the marriage of their daughters and sons,
then
the demand curve D 1 shift upward to D 2 . The equilibrium point—the point of intersection between demand and supply curves—shifts from point M to P, and rentals rise to PQ = OP 2 . This price becomes a parametric price for all the buyers.

 Fig. 7.1 (a): Demand Determined Price in Market Period
Fig. 7.1 (b): Supply Determined Price in Market Period Similarly, given the demand for a product, if its supply decreases suddenly for such reasons as droughts, floods (in case of agricultural products) and sudden increase in export of a product, prices of such products shoot up. For example, price of onions had shot up in Delhi from Rs. 12 per kg to Rs. 36
kg. in 1998 due to export of onion. In case of supply determined price, supply curve shifts leftward causing rise in price of the short supply
goods.
This phenomenon is illustrated in Fig. 7.1(b). Given the demand curve (D) and supply curve (S 2), the price is determined at OP 1 . Demand curve remaining the same, the fall in supply makes the supply curve shift leftward to S 1 . As a result price increases from OP 1 to OP 2 . The other examples of very short-run markets may be daily fish market, stock markets, daily milk market, coffin markets during a period of natural calamities, certain essential medicines during epidemics,
etc. (ii)
Pricing
in the Short-Run. A short run is, by definition, a period in which firms can neither change their size nor quit, nor can new firms enter the industry. While in the
market period (or very short-run) supply is absolutely fixed, in the short-run, it is possible to increase (or decrease) the supply by increasing (or decreasing) the variable inputs. In the short-run, therefore, supply curve is elastic.
The determination of market price in the short run is illustrated in Fig. 7.2 (a) and adjustment of output by the firms to the market price and firm's equilibrium
Check Your Progress 5. What is meant by perfect competition? 6. What are the characteristics of perfect competition? 7. What is meant by homo- genous product? 8. What is meant by
market period or very short-run?

are shown in Fig. 7.2 (b). Fig. 7.2 (a) shows the price determination for the industry by the
demand curve DD and supply curve SS, at price OP 1 or PQ. This price is fixed for all the firms in the industry.
Fig. 7.2: Pricing under Perfect Competition : Short-Run
Given the price PQ (= OP 1), an individual firm can produce and sell any quantity at this price. But any quantity will not yield maximum profit.
Given their cost curves, the firms are required to adjust their output to the price PQ so that they maximize their profit. The process of firm's output determination and its equilibrium are shown in Fig. 7.2 (b).
As noted earlier (Unit 2, Section 2.4),
profit is maximum at the level of output where MR = MC. Since price is fixed at PQ, firm's AR = PQ. If AR is given, MR = AR. The firm's MR is shown by AR = MR line. Firm's upward sloping MC curve intersects AR = MR at point E. At point E, MR = MC. Point E is, therefore, firm's equilibrium point. An ordinate EM drawn from point E to the horizontal axis determines the profit-maxmizing output at OM. At this output firms' MR = MC. This satisfies the necessary condition of maximum profit. The total maximum profit has been shown by the area P 1 TNE. The total profit may be calculated as Profit = (
AR – AC) Q. In Fig. 7.2 (b),
AR = EM; AC = NM;
and Q = OM. Substituting these values into the profit equation, we get Profit = (EM – NM)
OM = P 1 TNE.
Since EM – NM = EN, Profit = EN ¥ OM = P 1 TNE. This is the maximum supernormal profit, given the price and cost curves, in the short run. Firms may make losses in the short-run. While firms may make supernormal profit, there may be losses in the short run. For instance, if market price decreases to P¢Q ¢
due to downward shift in the demand curve to D ¢D ¢ [
Fig. 7.2 (a)]. This will force a process of output adjustments till firms reach a new
equilibrium at point E ¢. Here again firm's AR ¢ = MR ¢ = MC. But its AR > AC. Therefore, the firms incur a loss. But, since
in the short run, it may not be desirable to close down
the production, the firms try to minimize the loss, by adjusting their output downward to OM ¢ where it covers its MC, i.e., E ¢M ¢. The firms survive in the short run so long as they cover their MC. It is important to note here that in the short run, a firm in
the

perfectly competitive market may be in a position to earn economic profit. It may as well be forced to make losses. Once market price for the product is determined, it is given for all the firms. No firm is large enough to influence the prices. If a firm fixes the price of its product lower than the market price, it may lose a part of its total profit, or may even incur losses.

If it raises the price of its product above the market price, it may not be

in a position to sell its produce

NOTES 190 Self-Instructional Material Market Structure and Pricing Decisions

in a competitive market. The only option for a firm is to produce as much as it can sell at the given price. (iii)Pricing in the Long-Run. In contrast to the short run, in the log run, the

firms can adjust their size or quit the industry and new firms can enter the industry. If market price is such that AR < AC, then the firms make economic or super-normal profit. As a result, new firms get attracted towards the industry causing a

rightward shift in the supply curve. Similarly, if AR > AC, then firms make losses. Therefore, marginal firms quit the industry causing

a leftward shift in the supply curve. The rightward shift in the supply curve

pulls down the price and its leftward shift pushes it up. This process continues until price is so determined that AR = AC, and

firms earn only normal profit. The price determination in the long-run and

output (or size) adjustment by an individual

firm are presented

in Fig. 7.3 (a) and (b). Let us suppose that the

long-run demand curve is DD¢; the short-run supply is SS 1 and

price is determined at OP 1 .

At this price the firms adjust their

output to point M, the

equilibrium point where OP 1 = AR ¢ = MR ¢ = LMC. Firms make an economic profit of MS per unit. The supernormal profit lures other

firms into the industry. Consequently

the

industry's supply curve shifts rightward to SS 2 causing a fall in price to OP 2 .

At this price, firms are in a position to cover only LMC (= NQ 2) at output OQ 2 and are making losses because AR > LAC. Firms incurring

Fig. 7.3: Pricing under Perfect Competition: Long-run

losses cannot survive in the long-run. Such firms, therefore, quit the industry. As a result, the total production in the industry decreases causing a leftward shift in the supply curve say to the position of SS. Price is determined at OP 0 . The existing firms adjust their output to the new market price, at OQ. At the output OQ, firms are in a position to make only normal profit, since at this output, OP 0 = AR = MR = LMC = LAC (= EQ). No firm is in a position to make economic profit, nor does any firm make losses. Therefore, there is no tendency of new firms entering the industry or the existing ones going out. At this price and output, individual firms and the industry are both in long-run equilibrium. 7.4 PRICING UNDER

PURE

MONOPOLY

The term pure monopoly signifies an absolute power to produce and sell a product which has no close substitute. In other words, a monopoly market is one

in which there is only one seller of a product having no close substitute. The

cross elasticity of demand

for

Check Your Progress 9. How is the period of short- run determined? 10. How can a firm make abnor- mal profit in the short-run under perfect competition? 11. What is the difference between short-run and long- run? 12. Why do firms make only a normal profit in the long-run under perfect competition?

NOTES Self-Instructional Material 191 Market Structure and Pricing Decisions

a monopoly

product is either zero or negative. A monopolized industry is a single-firm industry. Firm and industry are identical in a monopoly setting.

In a monopolized industry, equilibrium of the monopoly firm signifies the equilibrium of the industry.

Moreover, the precise definition of monopoly has been a matter of opinion and purpose. For instance, in the opinion of Joel Deal 1 , a noted authority on managerial economics, a monopoly market is one in which 'a product of lasting distinctiveness, is sold. The monopolized product has distinct physical properties recognized by its buyers and the distinctiveness lasts over many years.' Such a definition is of practical importance if one recognizes the fact that most of the commodities have their substitutes varying in degree and it is entirely for the consumers/users to distinguish between them and to accept or reject a commodity as a substitute. Another concept of pure monopoly has been advanced by E.H. Chamberlin 2 who envisages monopoly as the control of all goods and services by the monopolist. But such a monopoly has hardly ever existed, hence his definition is questionable. In the opinion of some authors, any firms facing a sloping demand curve is a monopolist. This definition, however, includes all kinds of firms except those under perfect competition 3 . For our purpose here, we use the general definition of pure monopoly, i.e., a firm that produces and sells a commodity which has no close substitute. 7.4.1 Causes and Kinds of Monopolies

The emergence and survival of monopoly is attributed to the factors which prevent the entry of other firms into the industry and eliminate the existing ones. The barriers to entry are, therefore, the major sources of monopoly power. The major sources of barriers to entry are: (i) legal restrictions or barriers to entry of new firms; (ii) sole control over the supply of scarce and key raw materials; and (iii)efficiency and economies of scale. (i) Legal Restrictions. Some monopolies are created by law in the public interest. Most of the state monopolies in the public utility sector in India, e.g., postal, telegraph and telephone services, radio and TV services, generation and distribution of electricity, Indian Railways, Indian Airlines and State Roadways, etc., are public monopolies. Entry to these industries is prevented by law. The state may create monopolies in the private sector also, through licence or patent, provided they show the potential of and opportunity for reducing cost of pro- duction to the minimum by enlarging the size and investing in technological innovations. Such monopolies are known as franchise monopolies. (ii)Control over Key Raw Materials.

Some firms acquire monopoly power because of their traditional control over certain scarce and key raw materials which are essential for the production of certain other goods, e.g., bauxite, graphite, diamond, etc.

For instance, Aluminium Company of America had mo- nopolized the aluminium industry before World War II because it had acquired control over almost all sources of bauxite supply 4 . Such monopolies are often called 'raw-material monopolies'. The monopolies of this kind emerge also because of monopoly over certain specific knowledge of
technique of production. (
iii) Efficiency.
A primary and technical reason for
monopolies is the economy of scale.
If a firm's
long-run minimum cost of production or its most efficient scale of production almost coincides with the size of the market, then the large-size firm finds it profitable in the long run to eliminate competition
through price cutting in the short run. Once its
monopoly is established, it becomes almost impossible for the new firms to enter the industry and survive.
Monopolies created on account
NOTES 192 Self-Instructional Material Market Structure and Pricing Decisions
of this factor are known as natural monopolies. A natural
monopoly
may emerge out of the technical conditions of efficiency or
may be created by law on efficiency grounds. 7.4.2 Pricing and Output Decision: Short-Run
As under perfect competition,
pricing and output decision under monopoly are based on revenue and cost conditions. Although cost conditions, i.e., AC and MC curves, in a competitive and monopoly market are generally identical, revenue conditions
differ.
Revenue conditions, i.e., AR and MR curves, are different under monopoly
because,
unlike a competitive
firm, a monopoly
firm faces a downward sloping demand curve.
For, a monopolist can
reduce the price and sell more and can raise the price and
still retain some customers.
Precisely, since monopoly firm and monopolized industry are one and the same, the demand curve of the industry, a typically sloping downward curve,
becomes the demand curve for the firm.
When
a demand curve is sloping downward, marginal revenue (MR), curve lies below the AR curve
and the slope of the MR is twice that of AR. 5
Fig. 7.4: Price Determination under Monopoly: Short-run
The short-run revenue and cost conditions faced by a monopoly firm are presented in Fig. 7.4. Firm's average and marginal revenue curves are shown by the AR and MR curves, respectively, and its short-
run average and marginal cost curves are shown by SAC and SMC
curves, respectively. The price and output decision rule for profit maximizing monopoly
is the same as for a firm in the competitive industry.
A profit maximizing
monopoly firm chooses a price-output combination at which MR = SMC. Given the
firm's cost and revenue curves
in Fig. 7.4,
its MR and SMC intersect
each other
at point N. An ordinate drawn from point N to X-axis, determines
the profit maximizing output
for the firm at OQ.
At this output, firms' MR = SMC.
Given the demand curve AR = D,
the
output OQ can be sold

per time unit
at only one price, i.e., PQ (= OP 1). Thus the determination of output simultaneously determines the price for the monopoly firm. Once price
is fixed, the unit and total profits are also simultaneously determined.
Hence, the monopoly firm is in a state of equilibrium.
At output OQ and price PQ, the monopoly firm maximizes its
unit and total profits. Its per unit monopoly or economic profit (i.e., AR – SAC) equals (
per
PQ – MQ) = PM. Its total profit, p = OQ ¥
PM. Since OQ = P 2 M,
p = P 2 M ¥ PM = area P 1 PMP 2
as shown by the shaded
area. Since in the short run,
cost
and
revenue conditions are not expected to change, the equilibrium of the monopoly firm will remain stable.
NOTES Self-Instructional Material 193 Market Structure and Pricing Decisions
Determination of Monopoly Price and Output: Algebraic Solution. The deter- mination
of price and output by a monopoly firm in the short run
is illustrated graphically
in the previous paragraphs (
see Fig. 7.4). Here, we illustrate the determination of monopoly price and output through demand and cost functions. Suppose demand and total cost functions for a monopoly firm are given as follows. Demand function : Q = 100 – 0.2 P Price function : P = 500 – 5Q ...(7.1) Cost function : TC = 50 + 20Q + Q 2 ...(7.2) The problem before the monopoly firm is to find the profit maximizing output and price. The problem can be solved as follows. We know that profit is maximum at
an output which equalizes MR and
MC. So the first step is to find MR and MC from the demand and cost function, respectively. We have noted earlier that MR and MC are the first derivation of TR and TC functions, respectively. TC
function is given, but TR function is not. So, let us find TR function first,
TR = P.Q Since P = 500 – 5Q, by substitution, we get
TR = (500 – 5
Q) Q TR = 500Q – 5Q 2 ... (7.3) Now MR can be obtained by differentiating the
TR-
function (7.3). MR =
TR Q ∂ ∂ = 500 – 10Q
Likewise, MC can be obtained by differentiating the TC function (7.2). MC = TR Q ∂ ∂ = 20 + 2Q Now that MR and MC are known, profit maximizing output can be easily obtained. Recall that profit is maximum where MR = MC. As given above, MR = 500 – 10Q and MC = 20 + 2Q By substitution, we get profit maximizing output as 500 – 10Q = 20 + 2Q 480 = 12Q Q = 40 The output Q = 40 is the profit maximizing output. Now
profit maximizing price can be obtained by substituting 40 for Q in the price function (7.1). Thus, P = 500 – 5 (40) = 300 Profit maximizing price is
Rs. 300.
Total profit (p)
can be obtained as follows. π = TR – TC By substitution, we get π = 500Q – 5Q 2 – (50 + 20Q + Q 2) = 500Q – 5Q 2 – 50 – 20Q – Q 2 By substituting profit maximizing output (40)
for Q, we get
p = 500(40) – 5(40)(40) – 50 – 20(40) – (40 ¥ 40)
Check Your Progress 13. Define monopoly. Can there be a monopoly, when there are more than one firm? 14.What factors lead to monopoly of a firm? 15. What are the rules for profit maximization? 16. Does a monopoly firm make always a super-normal profit?
NOTES 194 Self-Instructional Material Market Structure and Pricing Decisions = 20,000 – 8,000 – 50 – 800 – 1600 = 9,550 Total maximum profit is Rs. 9,550.
Does a Monopoly Firm Always Earn Economic
Profit?
There is no certainty that a monopoly firm will always earn

an economic or supernormal profit. Whether a monopoly firm earns economic profit or normal profit or incurs loss depends on (
i) its cost and revenue conditions; (ii) threat from potential competitors; and (iii)
government policy in respect of monopoly. If a monopoly firm operates at the level of output where MR = MC, its profit depends on the relative levels of AR and AC.
Given the level of output, there are three possibilities. (i) if AR < AC, there is economic profit for the
firms, (
ii)
if AR = AC, the firm earns only normal profit, and (
iii)
if AR > AC, though only a theoretical possibility, the firm makes losses. 7.4.3
Monopoly Pricing and Output Decision in the
Long-Run The decision rules regarding optimal output and pricing
in the long-run are the same as in the short-run. In the long-run, however, a
monopolist
gets an opportunity to expand the size of its firm with a view to enhance its long-run profits. The expansion of the plant size may, however, be subject to such conditions as (a) size of the market, (b) expected economic profit, and (c) risk of inviting legal restrictions.
Let us assume, for the time being, that none of these conditions limits the expansion of a monopoly firm and discuss the price and output determination in the long run. Fig. 7.5: Equilibrium of Monopoly in the Long-run
The equilibrium of monopoly price and output determination
in the long-run is shown in Fig. 7.5. The AR and MR curves show the market demand and marginal revenue conditions faced by the monopoly firm. The LAC and LMC show the long-run cost conditions.
In
can be seen in Fig. 7.5, that monopoly's LMC and MR intersect at point P
where output is OQ 2 . This is, therefore, the profit maximi-zing output.
Given the AR curve,
the price at which the total output OQ 2 can be sold is P 2 Q 2 . Thus, in the long-run,
the output will be OQ 2 and price P 2 Q 2 .
This
output-price combination maximizes
the
monopolist's long-run profit. The total monopoly profit is shown by the area
LMSP 2 .
Compared to short-run equilibrium, the monopolist produces a larger output and charges a lower price and makes a larger monopoly profit in the long-run. In the short-run, firm's equilibrium is at
output OQ 1 which is less than long-run output OQ 2 . But the short-run equilibrium price P 1 Q 1 is greater than the long run equilibrium price P 2 Q 2 . The total short run monopoly profit is shown by the area JP 1 TK which is much smaller than the long-
NOTES Self-Instructional Material 195 Market Structure and Pricing Decisions run profit area,
LP 2 SM. This, however, is not necessary; it all depends on the cost and revenue conditions
in
the short and
long-runs.
It may be noted at the end that if there are barriers to entry, the monopoly firm may not reach the optimal scale of production (
OQ 2)
in the long-run, nor can it make full utilization of its existing capacity.
The firm's decision regarding plant expansion and full utilization of its capacity depends solely on the market conditions. If long-run market conditions, i.e., revenue and cost conditions and the absense of competition, permit, the firm may reach its optimal level of output. 7.4.4
Price Discrimination under Monopoly Price discrimination means selling the same or slightly differentiated product to different sections of consumers at different prices not commensurate with the cost of differentiation.
Consumers are discriminated on the basis of their income or purchasing power, geographical location, age, sex,

colour, marital status, quantity purchased, time of purchase, etc. When consumers are discriminated on the basis of these factors in regard to prices charged from them, it is called price discrimination. There is another kind of price discrimination. The same price is charged from the consumers of different areas while cost of production in two different plants located differently is not the same. Some common examples of price discrimination, not necessarily by a monopolist, are given below: (i) Physicians and hospitals 6 , lawyers, consultants,
etc.,
charge their customers at different rates mostly on the basis of the latter's ability to pay; (ii) Merchandise sellers sell goods to relatives, friends, old customers,
etc., at lower prices than to others and off-season discounts
for
the same set of customers; (iii)
Railways and airlines charge lower fares from the children and students, and for different class of travellers; (iv)Differential rates for cinema shows, musical concerts,
etc., (
iv)Different
prices in domestic and foreign markets, and (v) Lower rates for the first few telephone calls, lower rates for the evening and night trunk-calls; higher electricity rates for commercial use and lower for domestic consumption,
etc. 7.4.5
Necessary Conditions for
Price Discrimination
First, different markets must be separable for a seller to be able to practice discriminatory pricing.
The market for different classes of consumers must be so separated that buyers of one market are not in a position to resell the commodity in the other. Markets are separated by (i) geographical distance involving high cost of transportation, i.e., domestic versus foreign markets; (ii) exclusive use of the commod- ity, e.g., doctor's services; (iii) lack of distribution channels, e.g., transfer of electricity
from domestic use (lower rate) to industrial use (higher rate). Second,
the elasticity of demand must be different in different markets. The purpose of price discrimination is to maximize the profit by exploiting the markets with different price elasticities. It is the difference in
the elasticity which provides an
opportunity for price discrimination. If price elasticities of demand in different markets are the same, price- discrimination would
reduce the profit by reducing demand in the high price markets. Third, there must be imperfect competition in the market.
The firm must have monopoly over the supply of the product to be able to discriminate between different class of consumers, and charge different prices.
Fourth, profit maximising output
is
much larger than the quantity demand in a single market or section of consumers.
NOTES 196 Self-Instructional Material Market Structure and Pricing Decisions
Price Discrimination by Degrees.
The degree of price discrimination refers to the extent to which a seller can divide the market
or
the consumers and can take advantage of it
in extracting the consumer's surplus.
The economic literature presents
three degrees of price discrimination. (i) First degree 7 .
The first degree of price discrimination is the limit of discriminating pricing.
When a seller is in a position to know the price each consumer or consumer group is willing to pay, (i.e., he knows his buyer's demand curve for his product),
he sets the price
accordingly and tries to extract the whole consumer surplus. 8
What the seller does is that he
sets the price at its highest level—the level at which all those who are willing to buy the commodity buy at least one unit each.
After extracting the consumer surplus of this section of consumers
for the first unit of commodity,

he gradually lowers down the price, so that the consumer surplus of the users of the second unit is extracted. This procedure is continued until the whole consumer's surplus available at a price where MC = MR, is extracted. Consider the case of medical services of exclusive use. A doctor who knows or can guess the paying capacity of his patients can charge the highest possible fee from presumably the richest patient and the lowest fee from the poorest patient. (ii) Second degree. Where market size is very large, perfect discrimination is neither feasible nor desirable. In that case, a monopolist uses second degree discrimination or block pricing method. A monopolist adopting the second degree price discrimination intends to siphon off only the major part of the consumer's surplus, rather than the entire of it. The monopolist divides the potential buyers in to blocks, e.g., rich, middle class and poor, and sells the commodity in blocks—first at the highest price to the rich, then at a lower price to the middle class, and so on.

The second degree price discrimination is feasible where (i) the number of consumers is large and price rationing can be done, as in case of utility services like telephones, gallons of water, etc; and (ii) demand curve for all the consumers is identical; (iii) a single rate is applicable for a large number of buyers.

As shown in Fig. 7.6, a monopolist practicing second degree price

Fig. 7.6:

Second Degree Price discrimination, charges the highest price OP 1 for OQ 1 units and a lower price OP 2 for the next Q 1 Q 2 units, and the lowest price OP 3 for the next Q 2 Q 3 units. Thus, by adopting a block pricing system, the monopolist maximizes his revenue at TR = (OQ 1 . AQ 1) + (Q 1 Q 2 . BQ 2) + (Q 2 Q 3 . CQ 3) (iii) Third degree. When a profit maximizing monopolist sets different prices in different markets having demand curves with different elasticities, he is practising the third degree price discrimination. It happens quite often that a monopolist has to sell his goods in two or more markets, completely separated from one another, each having a demand curve with different elasticity.

A uniform price cannot be set for all the markets without losing profits. The monopolist is, therefore, required to find different price-quantity combinations that can maximize his profit in each market. For this, he equates his MC and MR in each market, and fixes price accordingly.

For example, suppose that a monopolist has only two markets, A and B. The demand curve (D a) and marginal revenue curve (MR a) given in Fig. 7.7 (a), represent the AR and MR curves in market A. And, D b and MR b in Fig. 7.7(b) represent the AR and MR curves in market B. The horizontal summation of D a and D b gives the total demand curve for the two markets, a shown by AR = D

in Fig. 7.7 (c) and the horizontal summation of MR a and MR b gives
the aggregated MR [(Fig. 7.7 (c)].
The firm's marginal cost is shown by MC which interests MR at point T. Thus,
the
optimum level of output for the firm is determined at OQ.
For, at this level of output MR = MC.
The problem that monopolist faces is that the whole of OQ cannot be sold in any one of the markets at a profit maximizing price. Therefore,
the monopolist has to allocate
output OQ between the two markets in such
proportions that the necessary condition of profit maximization is satisfied in both the markets,
i.e., MC (= TQ) must be equal to MR in both the markets. This is accomplished
by drawing a line from point T parallel to X-axis, through
MR b and MR a . The points of intersection,
S and R
on curves MR a and MR b , respectively, determine the optimum share for
markets A and B.
As shown in the Fig. 7.7, the monopolist maximizes his profit in market A by selling OQ a units at price AQ a and in market B, by selling OQ b units at price BQ b .
and
OQ a + OQ b = OQ. Fig. 7.7: Third Degree Price Discrimination
The third degree price discrimination
may be suitably practised between any two or more markets separated from each other by geographical distance, transport barriers
or
cost of transportation, legal restrictions on the inter-regional or
inter-state transportation of commodities by individuals.
Price
Discrimination:
An Algebraic Solution.
Price and output determination under third degree price discrimination has been shown graphically in Fig. 7.7. Here, we present an algebraic analysis of price and output determination by a discriminating monopoly. Let us suppose that a monopoly firm is faced with two markets, A and B, with two different demand functions as Q a = 16 – 0.5P a and Q b = 22 – P b . The demand functions yield two different price functions given below. P a = 32 – 2Q a ...(7.4) and P b = 22 – Q b ...(7.5) Suppose also that the firm's total cost function (TC) is given as TC = 10 + 2Q + Q 2 ...(7.6) The problem is how to determine the most profitable output and to allocate this output between the two markets in such a manner that profit in each market is maximum. Profit (π) is maximum where π= TR – TC is maximum ...(7.7)
Check Your Progress 17. What is meant by price dis- crimination? 18. What are the necessary con- ditions for price discrimina- tion? 19. What is the third degree price discrimination? 20.Illustrate discriminatory pricing assuming two markets with different demand curves.
NOTES 198 Self-Instructional Material Market Structure and Pricing Decisions
In our example, TC function is known, but TR is not. So we need to find TR first. For a price discriminating monopoly, total revenue (TR) equals the sum of revenue from the two markets. That is, TR = P a . Q a + P b . Q b ...(7.8)
By substituting Eqs. (7.4) and (7.5) for P a and P b , respectively, in Eqs. (7.8), we get TR = (32 – 2Q a)Q a + (22 – Q b) Q b = 32Q a – 2Q a 2 + 22Q b – Qb 2 ...(7.9) Now we can obtain total profit (p) by substituting Eqs. (7.6) and (7.9) for TC and TR, respectively, in
Eqs. (7.7). Thus, we get the profit function as π= 32Qa – 2
Q a 2 + 22Q b – Q b 2 – (10 + 2Q + Q 2) = 32Q a – 2Q a 2 + 22Q b – Q b 2 – 10 – 2Q – Q 2 ...(7.10) For profit to be maximum, Q in Eq. (7.10) must be equal to profit maximizing sales in markets A and B. That is, Q = Q a + Q b By substituting, Q a + Q b for Q in Eq. (7.10) we can rewrite it as p = 32
Q a – 2
Q a 2 + 22Q b – Q b 2 – 10 – 2 (
Q a + Q b) – (Q a + Q b) 2 = 32 Q a – 2Q
a 2 + 22Q
b – Q b 2 – 10 – 2Q a – 2Q b – Q a 2 – 2Q a Q b – Q
b 2 = 30

Q a + 20Q b – 3Q a 2 – 2Q b 2 – 2Q a Q b – 10 ...(7.11)
Eq. (7.11) represents the total profit function. A necessary condition for p to be maximum is that marginal change in profit must be equal to zero. Total profit is composed of profits in markets A and B. It implies, therefore, that for total profit to be maximum, marginal change in profit in both the markets must equal zero. The marginal change in profits in markets A and B can be expressed in terms of first derivative of the total profit-function with respect to Q a and Q b . Thus, marginal profit in market A can be expressed as a Q∂ ∂π = 30 – 6Q a – 2Q b ...(7.12) and for market B, as b Q∂ ∂π = 20 – 4Q b – 2Q a ...(7.13) The profit maximizing condition may be restated as the marginal profit functions (7.12) and (7.13) must be equal to zero. That is, for profit to be maximum in market A, 30 – 6Q a – 2Q b = 0 ...(7.14) and in market B, 20 – 4Q b – 2Q a = 0 ...(7.15) We have now two simultaneous equations-Eqs. (7.14) and (7.15) with two unknowns (Q a and Q b), which can be solved for Q a and Q b as follows. 30 – 6Q a – 2Q b = 0 ...(1) 20 – 2Qa – 4Q b = 0 ...(2) In order to solve for Q b , multiply Eq. (2) by 3 and subtract from Eq. (1). 30 – 6
Q a – 2Q b = 0 60 – 6Q a – 12Q b = 0 – + + – 30 + 10Q b = 0 10Q b = 30 Q b = 3
NOTES Self-Instructional Material 199
Market Structure and Pricing Decisions
The value of Q a can now be obtained by substituting 3 for Q b in equation (1) or (2). Thus, 30 – 6Q a – 2(3) = 0 – 6 Q a = – 24 Q a = 4 To conclude, the monopoly firm maximizes its total profit by selling 4 units in market A and 3 units in market B.
Price Determination. The profit maximizing prices can now be obtained by substituting Q a and Q b with their estimated values (4 and 3, respectively) in price functions (7.4) and (7.5), respectively. The price for market A can be obtained as P a = 32 – 2 Q a = 32 – 2 (4) = 24 and price for market B as P b = 22 – Q b = 22 – 3 = 19 Thus, in market A, price = Rs. 24
and in market B, price = Rs. 19. Profit Determination. Now that prices and sales for the two markets are known, total profit can be obtained by substituting numerical values for Q a and Q b in profit function (7.11). The profit function (7.11) is reproduced below. p = 30 Q a + 20 Q b – 3Q a 2 – 2Q b 2 – 2Q a Q b – 10
By substituting 4 for Q a and 3 for Q b , we get p = 30 (4) + 20(3) – 3(4)(4) – 2 (3)(3) – 2(4)(3) – 10 = 120 + 60 – 48 – 18 – 24 –10 = 80 The total profit is
Rs. 80.
This profit satisfies the conditions of the maximum profit. It is, therefore, maximum. 7.5
MEASURING MONOPOLY POWER Perfect competition and pure private monopolies discussed in the previous sections are rare phenomena. The real business world is, in fact, characterized largely by monopolistic competition and oligopoly. In these kinds of market structures, firms hold some monopoly power in the industry which they exercise in determining the price and output. Pricing and output decisions under monopolistic competition and oligopoly are discussed in the next two sections. Before we discuss price and output determination under these kinds of market structure, it will be useful to have first a look at the measures of monopoly power of monopolistic and oligopoly firms, suggested by some economists. The need for measuring monopoly power arises for both theoretical and practical reasons—to analyse the behaviour of monopoly firms theoretically, and to make laws for controlling and regulating monopoly power, e.g., MRTP Act. However,
measuring monopoly power has been a difficult proposition. The efforts to devise a measure of monopoly power have not yielded
a universal or non-controversial measure. As Alex
Hunter has observed, “The idea of devising a measure of monopoly power, with reference both to its general incidence and to particular situation, has been and probably always will remain, an attractive prospect for economists who wish to probe in this field” 9 . If not
NOTES 200 Self-Instructional Material Market Structure and Pricing Decisions for any other reason, for ‘sheer intellectual curiosity’ economic theorists feel compelled to work on this problem, for
they could not with good conscience go on talking about ‘great’ or ‘little’ monopoly power or about various degrees of monopoly
power
without trying to ascertain the meaning of these words. 10 Therefore, devising atleast
a ‘conceivable’ measure of monopoly, even if ‘practical’ measurement is impossible, continues to interest economists, for at least two reasons. First, apart from intellectual curiosity, people would like to know about the economy in which they live,
about the industrial structure, and about the industries from which they get their supplies and how their prices are determined. Second, growth of private monopolies has often led to economic inefficiency and exploitation of consumers. Therefore, the governments of many countries have found it necessary to formulate policies and to

devise legislative measures to control and regulate monopolies. If the government is to succeed in its policy of restraining mo- nopoly, it must have at least some practicable measure of monopoly power and monopolistic trade practices. 7.5.1 The Measures of Monopoly Power In spite of problems in measuring the power of monopoly, economists have devised a number of measures of monopoly power though none of these measures is free from flaws. Yet the various measures do provide an insight into monopoly power and its impact on the market structure. Besides, they also help in formulating an appropriate public policy to control and regulate the existing monopolies and to prevent their growth.

We discuss here briefly the various measures of monopoly power. 1. Number-of-Firms Criterion. One of the simplest measures of degree of monopoly power of firms is to count the number of firms in an industry. The smaller the number of firms, the greater the degree of monopoly power of each firm in the industry, and conversely, the larger the number of firms, the greater the possibility of absence of monopoly power. As a corollary of this, if there is a single firm in an industry, the firm has absolute monopoly power. On the contrary, in an industry characterised by perfect competition, the number of firms is so large that each firm supplies an insignificant proportion of the market and no firm has any control on the price, and, hence, no monopoly power whatsoever.

This criterion however has a serious drawback. The number of firms alone does not reveal much about the relative position of the firms within the industry because (i) 'firms are not of equal size,' and (ii) their number does not indicate the degree of control each firm exercises in the industry. Therefore, the 'number-of-firms' criterion of measuring monopoly power is of little practical use. 2. Concentration Ratio. The concentration ratio is one of the widely used criteria for measuring monopoly power. The concentration ratio is obtained by calculating the percentage share of a group of large firms in the total output of the industry. 'The number of firms chosen for calculating the ratio usually depends on some fortuitous element—normally the census of production arrangement of the country concerned'. 11 In Britain the share of the three largest firms of a census industry and in the USA, the share of the four largest firms is the basis of calculating concentration ratio 12. However, the number of firms chosen may be as large as 20 depending on the market size and purpose of enquiry.

Apart from the share of the largest firms in the industry output, "size of the firm and the concentration of control in the industry may be measured ... in terms of production capacity, value of assets, number of employees or some other characteristics." 13

Concentration ratio, although a very widely used measure of monopoly power, has its own shortcomings.

NOTES Self-Instructional Material 201 Market Structure and Pricing Decisions First, the measures of concentration ratio involve statistical and conceptual problems. For example, production capacity may not be used straightaway as it may include 'unused, obsolete or excess capacity' and the value of assets involves valuation problem as accounting method of valuation and market valuation of assets may differ. Employment figure may not be relevant in case of capital-intensive industries and their use may be misleading. The two other convenient measures are 'gross output value' or 'net output' (value added). But the former involves the risk of double counting and the latter, the omission of inter-establishment transfers. 14

Second, the measures of concentration ratio do not take into account the size of the market.

The size of the market may be national or local. A large number of firms supplying the national market may be much less competitive than the small number of firms supplying the local market. For, it is quite likely that the national market is divided among thousand sellers, each seller being a monopolist in his own area. Third, the most serious defect of concentration ratio as an index of monopoly power is that it does not reflect the competition from other industries. The degree of competition is measured by the elasticity of substitution which may be different under different classification of industries. Therefore, an industry which has concentration ratio under one may have a very low elasticity of substitution and hence a high degree of monopoly.

But, if classification of industries is altered, the same industry with a high concentration ratio may have a very low elasticity of substitution, and hence, may show a low degree of monopoly. 3. Excess Profit Criterion. J.S. Bain and, following him, many other economists have used excess profit,
i.e., profit in excess of the opportunity cost,
as a measure of monopoly power. If profit rate of a firm continues to remain sufficiently higher than all opportunity costs required to remain in the industry, it implies that neither competition among sellers nor entry of new firms prevents the firm from making a pure or monopoly profit. While calculating excess profit, the opportunity cost of owner's capital and
a
margin for the risk must be deducted from the actual profit made by the firm. Assuming no risk, the degree of monopoly may be obtained
as the ratio of
the divergence between the opportunity costs (O) and the actual profit (
R), to the latter. Thus degree of monopoly power (MP) may be expressed as MP= R O R – If (R – O)/R = 0, there exists no monopoly, and if it is greater then zero,
there is monopoly. The higher the value of (R – O)/R, the greater the degree of monopoly. Another measure of degree of monopoly based on excess profit has been devised by A.P. Lerner. 15 According to him, the degree of monopoly power (MP) may be measured
by the following formula. MP= P MC P –
where P = price, MC = marginal cost. Since for a profit maximizing firm, MR = MC, Learner's measure of monopoly power (MP) may be expressed
also as MP= P MR P –
We have discussed earlier (see Unit 7, Section 7.6.2) that
NOTES 202 Self-Instructional Material Market Structure and Pricing Decisions P/(P – MR) = e and that (P – MR)/P = 1/e
Thus, Lerner's measure of monopoly power may be expressed also as MP = 1/e. It may thus be inferred that lower the elasticity, the greater the degree of monopoly, and vice versa. Thus, monopoly power may exist even if
the
firm's AR = AC and it earns only normal profit. Lerner's formula of measuring the degree of monopoly power is considered to be theoretically most sound. Nevertheless, it has been criticized on the following grounds. First, any formula devised to measure
the
degree of monopoly power should bring out the difference between the monopoly output and competitive output or the 'ideal' output under optimum allocation of resources. The divergence between P and MC used in Lerner's formula does not indicate the divergence between the monopoly and 'ideal' output. Lerner has possibly used the diver- gence between P and MC as the substitute for the divergence between mo- nopoly and 'ideal' output. "This substitution of a price-cost discrepancy for a difference between actual and 'ideal' output is probably the greatest weakness of
a
formula which is supposed to measure deviation from the optimum allo- cation of resources." 16 Second, price-cost discrepancy may arise for reasons other than monopoly, and price and cost may be equal or close to each other in spite of monopoly power. Third, since data on MC are hardly available, this formula is of little practical use. 4. Triffin's Cross-Elasticity Criterion. Triffin's criterion seems to have been derived from the definition of monopoly itself. According to his criterion, cross- elasticity is taken as the measure of degree of monopoly. The lower the cross- elasticity of the product of a firm, the greater the degree of its monopoly power. But, this criterion
indicates only the relative power of each firm. It does not furnish a single index of monopoly power. 7.6
PRICING AND OUTPUT
DECISIONS UNDER MONOPOLISTIC COMPETITION The model of
price and output determination under monopolistic competition developed by Edward H. Chamberlin 17 in the early 1930s dominated the pricing theory until recently. Although the relevance of his made has declined in recent years, it has still retained its theoretical flavour. Chamberlin's model is discussed below.
Monopolistic competition is defined as
market setting in which a large number of sellers sell differentiated products.
Monopolistic competition has the following features: (i) large number of sellers (ii) free entry and free exit (iii)perfect factor mobility (iv)complete dissemination of market information (v) differentiated product. 7.6.1 Monopolistic vs. Perfect Competition Monopolistic competition is, in many respects, similar to perfect competition. There are, however, three big differences between the two.

Check Your Progress 21. Why is monopoly power of a firm measured? 22. What are the measures of monopoly power? 23. What is concentration ratio? What are its limitations in measuring monopoly power? 24. What is excess profit criterion for measuring monopoly power?

NOTES Self-Instructional Material 203 Market Structure and Pricing Decisions (i) Under perfect competition, products are homogeneous, whereas under monopo- listic competition, products are differentiated by brand name, trade mark, design, colour and shape, packaging, credit terms, prompt after-sales service, etc. Products are so differentiated that buyers can easily distinguish between the products supplied by different firms. Despite product differentiation, each product remains a close substitute for the rival products. Although there are many firms, each one possesses a quasi-monopoly over its product. (ii) There is another differenance between the perfect competition and monopolistic competition. While decision-making under perfect competition is independent of other firms, in monopolistic competition, firms' decisions and business behaviour are not absolutely independent of each other. (iii)Another important factor that distinguishes monopolistic competition from perfect competition is the difference in the number of sellers. Under perfect competition, the number of sellers is very large as in case of agricultural products, retail business and share markets, whereas, under monopolistic com- petition, the number of sellers is large but limited—50 to 100 or even more. 18 What is more important, conceptually, is that the number of sellers is so large that each seller expects that his/her business decisions, tactics and actions will go unnoticed and will not be retaliated by the rival firms. Monopolistic competition, as defined and explained above, is most common now in retail trade, and service sectors. More and more industries are now tending towards oligopolistic market structure. However some industries in India, viz., clothing, fabrics, footwear, paper, sugar, vegetable oils, coffee, spices, and spun yarn have the charac- teristics of monopolistic competition. Let us now explain the price and output determination models of monopolistic competition developed by Chamberlin. 7.6.2 Product Differentiation under Monopolistic Competition Monopolistic competition is similar to perfect competition in many respects. A very important factor that distinguishes monopolistic competition from perfect competition is product differentiation. Product differentiation means offering consumers a product different from the products available in the market. The general methods of product differentiation are following. Brand name, Trade mark, Quality, Design, Colour, Shape and size, Packaging, Credit facility, Alter-sale service, Warranty period. The product is given a brand name to establish the identity of a product. For example, Maruti Udyog Limited produces cars for different market segments as Maruti 800, Maruti- Suzuki 800 AC, Maruti Zen, etc. and mobile phone companies adopt different names, e.g., Airtel, Nokia, Samsung, with different kind of facilities; and so do the computer companies. The firms in a monopolistically competitive market acquire a trade mark and get it registered with the objective of preventing other firms producing the same product under the same name and to prevent imitation of the product by competing firms. The product of each firm is distinctly different in terms of quality, design, colour, shape and size with the purpose of making the product distinctly different from the product of other firms. For example, flat-screen TV sets are qualitatively different from the traditional TV sets and while some TV firms provide speaker on the side, some on the top and some firms provide speakers in the shape of separate detachable boxes. The product is presented in such colour, shape and size that the product looks more attractive than the other comparable products. Once these factors become common, new designs with extra facility is innovated and added to the product. For instance, use of remote control electronic consumer durables like TV sets, ACs and now electrical fans.

NOTES 204 Self-Instructional Material Market Structure and Pricing Decisions The quality and method of packaging is another important factor that firms adopt to differentiate their product from the competing products. For example, Nirulas supply the food products in such beautiful and hygienic packets that its products become preferable to other such suppliers of readymade food items. Many firms operating under monopolistic competition provide credit facility under such scheme as Buy now and pay later with or without interest. This becomes an important kind of product differentiation when sales slow down and market becomes intensively competitive. The method of selling products on credit is used also to promote sales. Providing "After Sale Service" to the customers of consumer durables is also a very important method of product differentiation. In highly competitive markets, the quality and prompt service including replacement of parts or the product makes product different from the competing products. Customers do value the nature and quality of "after-sale service" firms and attach importance to this factor in deciding what brand of a product to buy. It is another thing that in a country like India having a vast market customers are cheated on "after sale service". The establishment of Consumer Courts and mounting cases of consumers' complaints in Customer Courts are of this in evidence. Competitive firms differentiate their products in respect of 'warranty periods'. Competing companies offer a warranty for different periods varying form one year to different periods varying from one year to seven years. The consumer durables with longer warranty periods are in general preferable to products with shorter warranty period. 7.6.3 Price and Output Decisions in the Short-Run

Although monopolistic competition is characteristically close to perfect competition, pricing and output decisions under this kind of market are similar to those under monopoly. The reason is that a firm under monopolistic competition, like a monopolist,

faces a downward sloping demand curve 19 . This kind of demand curve is the result of (i) a strong preference of a section of consumers for the

product, and (ii) the quasi-monopoly of the seller over the supply. The strong preference or brand loyalty of the consumers gives the seller an opportunity to raise the price and yet retain some customers.

And,

since each product is a substitute for

the other, the firms can attract the consumers of other products by lowering their prices.

The short-term pricing and output determination under monopolistic competition is illustrated in Fig. 7.8.

The

short-run revenue and cost curves faced by the monopolistic firm

are given in Fig. 7.8. Fig. 7.8: Price-Output Determination under Monopolistic Competition

NOTES Self-Instructional Material 205 Market Structure and Pricing Decisions

As shown in the figure, firm's MR intersects its MC at point N. This point fulfills the necessary condition of profit-maximization at output OQ. Given the demand curve,

this output can be sold at price PQ. So the price is determined at

PQ.

At this output and price, the firm earns a maximum monopoly or economic profit

PM per unit of output and a total monopoly

profit shown by the rectangle P 1 PMP 2 . The economic profit, PM (per unit) exists in the short-run because of no possibility

of

new firms entering the industry. But the rate of profit would not be the same for all the firms under monopo- listic competition because of difference in the elasticity of demand for

their product. Some firms may earn only a normal profit if their costs are higher than those of others. For the same reason, some firms may make even losses in the short run

to the extent of their average fixed cost. 7.6.4

Price and Output Determination in the Long-Run The mechanism of price and output determination in the long run under monopolistic competition is illustrated graphically in Fig. 7.9. To begin the analysis, let us suppose that, at some point time

in the long-run,

firm's revenue curves are given as AR 1 and MR 1 and long-run cost curves as LAC and LMC. As the figure shows, MR 1 and LMC intersect at point M determining the equilibrium output at OQ 2 and price at P 2 Q 2 . At price P 2 Q 2 , the firms make a supernormal or economic profit of P 2 T per unit of output. This situation is similar to short-run equilibrium.

Let us now see what happens in the long-run. The supernormal profit brings about

in the long-run two important changes 20 in a monopolistically competitive market. Fig. 7.9(a): The Long-Run Price and Output Determination under Monopolistic Competition

First, the supernormal profit attracts new firms to the industry. As a result, the existing firms lose a part of their market share to new firms. Consequently, their demand curve shifts downward to the left until AR is tangent to LAC. This kind of change in the demand curve is shown is Fig. 7.9 (a) by the shift in AR curve from AR 1 to AR 2 and the MR curve from MR 1 to MR 2 .

Second, the increasing number of firms intensifies the price competition between the firms.

Price competition increases because losing firms try to regain or retain their market share by cutting down the price of their product. And, new firms in order to penetrate the market set comparatively low prices for their product. The price compe- tition increases the slope of the firms' demand curve 21 or, in other words, it makes the demand curve more elastic. Note that AR 2 has a greater slope than AR 1 .

The MR 2 is the MR curve corresponding to AR 2 . Check Your Progress 25.How is monopolistic competition different from perfect competition? 26. Why is product differentia- tion necessary under monopolistic competition? 27. How does a firm under monopolistic competition determine its price and output? 28. Why does monopoly profit under monopolistic competition disappear in the long-run?

NOTES 206 Self-Instructional Material Market Structure and Pricing Decisions

The ultimate picture of price and output determination under monopolistic competition 22 is shown at point P 1 in Fig. 7.9 (a).

As the figure shows, LMC intersects MR 2 at point N where firm's long-run equilibrium output is determined at OQ 1 and price at P 1 Q 1 . Note that price at P 1 Q 1 equals the LAC. It means that under monopolistic competition, firms make only normal profit in the long run. Once all the firms reach this stage, there is no attraction (i.e., super normal profit) for the new firms to enter the industry, nor is there any reason for the existing firms to quit the industry. This signifies the long-run equilibrium of the industry.

Numerical Illustration. To illustrate the price and output determination under monopolistic competition through a numerical example, let us suppose that the initial demand function for the firms is given as Q 1 = 100 – 0.5P 1 or P 1 = 200 – 2 Q ...(7.16) Given the price function (7.16), firms' TR 1 function can be worked out as TR 1 = P 1 . Q 1 = (200 – 2 Q) Q = 200Q – 2Q 2 ...(7.17)

The marginal revenue function (MR 1) can be obtained by differentiating the TR 1 function (7.17).

Thus, MR 1 = 200 – 4 Q 1 ...(7.18) Suppose also that firm's TC function is given as TC = 1562.50 + 5Q – Q 2 + 0.05 Q 3 ...(7.19) Given the TC function, LAC can be obtained as LAC = TC Q = 2 2 1562.50 5 0.05 Q Q Q Q + – + = 1562.50 Q + 5 – Q + 0.05Q ...(7.20)

We get LMC function by differentiating TC function (7.19). Thus, LMC = 5 – 2Q + 0.15Q 2 ...(7.21) Let us now work out the short-run equilibrium levels of output and price that maximize profit. The profit maximizing output can be obtained by equating MR 1 and LMC functions given in Eqs. (7.18) and (7.21), respectively, and solving for Q 1 . That is, 200 – 4Q 1 = 5 – 2Q + 0.15Q 2 ...(7.22) For uniformity sake, let us replace Q in MC function as Q 1 and solve 23 the equation (7.22) for Q 1 . 200 – 4Q 1 = 5 – 2Q 1 + 0.15Q 1 2 195 = 2Q 1 + 0.15Q 1 2 Q 1 = 30 Thus, profit maximizing output in the short run equals 30. Let us now find the equilibrium price, i.e., P 1 , LAC and supernormal profit. Price P 1 can be obtained by substituting 30 for Q 1 in the price function (7.16).

Thus, P 1 = 200 – 2 Q 1 = 200 – 2(30) = 140 The LAC can be obtained by substituting equilibrium output 30 for Q in function (7.20). Thus, LAC = 1562.50 30 + 5 – 30 + 0.05 (30 × 30) = 72.08

NOTES Self-Instructional Material 207 Market Structure and Pricing Decisions

Thus, the short-run equilibrium condition gives following data. Equilibrium output = 30 P 1 (= AR 1) = 140 LAC = 72.08 Supernormal profit = AR 1 – LAC = 140 – 72.08 = 68.92 (per unit of output)

Let us now see what happens in the long run.

As already mentioned, the existence of supernormal profit attracts new firms to the industry in the long-run. Consequently, old firms lose a part of their market share to the new firms. This causes a leftward shift in their demand curve with increasing slope. Let us suppose that given the long-run TC function, firms' demand function in the long run takes the following form. Q 2 = 98.75 – P 2 and P 2 = 98.75 – Q 2 ...(7.23) To work out the long-run equilibrium, we need to find the new TR function (TR 2) and new MR function (MR 2) corresponding to the new price function (7.23). For this, we need to first work out the new TR function (TR 2). TR 2 = P 2 .Q 2 = (98.75 – Q 2) Q 2 = 98.75Q 2 – Q 2 ...(7.24) We get MR 2 by differentiating TR function (7.24). Thus, MR 2 = 98.75 – 2Q 2 ...(7.25) The long-run equilibrium output can now be obtained by equating MR 2 with the LMC function (7.21). For the sake of uniformity, we designate Q in the LMC function as Q 2 . The long-run equilibrium output is then determined where MR 2 = LMC or 98.75 – 2Q 2 = 5 – 2Q 2 + 0.15Q 2 2 93.75 = 0.15Q 2 Q 2 = 25 One of the conditions of the long-run equilibrium is that AR or P 2 must be equal to LAC. Whether this condition holds
can be checked as follows. AR 2 = LAC 98.75 – Q 2 = 2 1562.5 Q + 5 – Q + 0.05Q 2 By substitution, we get 98.75 – 25 = 1562.5 25 + 5 – 25 + 0.05 (25) 2 73.75 = 62.50 – 20 + 31.25 = 73.75
It is thus mathematically proved that in the long-run, firm's AR = LAC and it earns only a normal profit. 7.6.5 Non-Price Competition: Selling Cost and Equilibrium In the preceding section, we have presented Chamberlin's analysis of price competition and its effect on the equilibrium output and profits
of the firms.
Chamberlin's analysis shows that price competition results in the loss of monopoly profits. All firms are losers: there are no gainers. Therefore, firms find other ways and means to non-price competition for enlarging their market share and profits. The most common forms of non-price competition are product innovation and advertisement. Product innovation and
NOTES 208 Self-Instructional Material Market Structure and Pricing Decisions
advertisement go on simultaneously. In fact, the successful introduction of a new product depends on its effective advertisement. Apart from advertisement expenses, firms under monopolistic competition,
incur other costs on competitive promotion of their sales, e.g.,
expenses on
sales personnel, allowance to dealers, discounts to customers, expenses on displays, gifts and free samples
to customers, additional costs on attractive packaging of goods, etc. All such expenses plus advertisement expenditure make up
a
firm's selling cost. Incurring selling cost increases sales, but
with varying degrees. Generally, sales increase initially at increasing rates, but eventually at decreasing rates. Consequently,
the average cost of selling (ASC) initially decreases but ultimately increases. The ASC curve is, therefore, U-shaped similar to the conventional AC curve. This implies that total sales are subject to diminishing returns to increasing
selling costs.
Selling
Cost
and Group Equilibrium. To analyse group equilibrium of firms with selling costs, let us recall that the main objective of the firm
is to maximize its total profits. When they incure selling costs, they do so with the same objective in mind. All earlier assumptions regarding cost and revenue curves remain the same. The analysis of group equilibrium is presented in Fig 7.9. Suppose APC represents
the
average production cost and price is given at OP 3 . None of the firms incurs any selling cost.
Also, let all the firms be in equilibrium at point E where they make only normal profits.
Fig. 7.9(
b):
Selling Costs and Group Equilibrium
Now suppose that one of the firms incurs selling cost so that its APC added with average selling costs (ASC) rises to the position shown by the curve APC + ASC 1 and its total sale increases to OQ 4 . At output OQ 4 , the firm makes supernormal profits of P 3 PMP 2 . This profit is, however, possible only so long as other firms do not
advertise their own products. If other firms do advertise their products
and incure the same amount of selling cost, the initial advantage to
the
firm advertising first will disappear and its output will fall to OQ 2 . In fact, all the firms

reach equilibrium at point A and produce OQ 2 units. But
their short sightedness compels them to increase their selling cost because they expect to reduce their APC by expanding their output. With increased selling cost, their APC + ASC curve shifts further upward. This process continues until APC + ASC becomes tangent to the AR = MR line.
This position is shown by
point B. Beyond point B, advertising is of no avail to any firm. The equilibrium will be stable at point B where each firm produces OQ 3
and makes
only normal profit. 7.6.6
Critical Appraisal of Chamberlin's Theory Chamberlin's theory of monopolistic competition
has been criticized on both theoretical and empirical grounds. Let us first look into its theoretical
or methodological weaknesses.
Check Your Progress 29. What is meant by non-price competition? 30. Explain and illustrate price and output determination under monopolistic compe- tition in the long-run. 31. What is selling cost? How does it affect firm's equili- brium? 32. What are the limitations of Chamberlin's theory?
NOTES Self-Instructional Material 209 Market Structure and Pricing Decisions
First, Chamberlin assumes that monopolistic competitors act independently and their price maneouvering goes unnoticed by the rival firms. This assumption has been questioned on the ground that firms are bound to be affected by decisions of
the
rival firms since their products are close substitutes for one another and, therefore, they are bound to react. Second, Chamberlin's model implicitly assumes that monopolistically competitive firms do not learn from their past experience. They continue to commit the mistake of reducing their prices even if successive price reductions lead to increase in their losses. Such an assumption can hardly be accepted. Third, Chamberlin's concept of industry as a 'product group' is ambiguous. It is also incompatible with product differentiation. In fact, each firm is an industry by virtue of its specialized and unique product. Fourth, his 'heroic assumptions' of identical cost and revenue curves are questionable. Since each firm is an industry in itself, there is a greater possibility of variations in the costs and revenue conditions of the various firms. Fifth, Chamberlin's assumption of free entry is also considered to be incompatible with product differentiation. Even if there are no legal barriers, product differentiation and brand loyalties are in themselves barriers to entry. Finally, so far as empirical validity of Chamberlin's concept of monopolistic competition is concerned, it is difficult to find any example in the real world to which his model of monopolistic competition is relevant 24 . Most markets
that exist in the real world may be classified under perfect or pure
competition, oliogopoly or monopoly. 25 It is, therefore, alleged that Chamberlin's model of monopolistic competition analyses an unrealistic market. Some economists, e.g., Cohen and Cyert, hold the position that the model of monopolistic competition is not a useful addition to economic theory because it does not describe any market in the real world. 26 Despite
the
above criticism, Chamberlin's contribution to the theory of price cannot be denied. Chamberlin
was the
first to introduce the concept of differentiated product and selling costs as a decision variable and to offer a systematic analysis of these factors. Another important contribution of Chamberlin is the introduction of the concept of demand curve based on market share as
a
tool of analysing behaviour of firms, which later became the basis of the kinked-demand curve analysis. 7.7
PRICING AND OUTPUT
DECISIONS UNDER OLIGOPOLY 7.7.1
Definition, Sources and Characteristics Definition.
In this section, we will discuss price and output determination under oligopoly. 27 Let us first look at
the market organization characterized by
oligopoly. Oligopoly
is defined as a market structure in which there are
a
few sellers selling
a
homogeneous or differentiated products. Where oligopoly firms sell a homogeneous product, it is called pure or homogeneous oligopoly.

For example, industries producing bread, cement, steel, petrol, cooking gas, chemicals, aluminium and sugar are industries characterised by homogeneous oligopoly,
And, where
firms of an oligopoly industry sell differentiated products, it is called differentiated or heterogeneous oligopoly. Automo- biles,
television sets, soaps and detergents, refrigerators, soft drinks, computers, ciga- rettes, etc. are some examples of industries characterized by differentiated or
heteroge- neous
oligopoly. Be it pure or differentiated, "
Oligopoly
is the most prevalent form of market organization in the manufacturing sector of
the industrial nations... 28 ". In non-industrial nations like
NOTES 210 Self-Instructional Material Market Structure and Pricing Decisions
India also, a majority of big and small industries have acquired the features of oligopoly market. The market share of 4 to 10 firms in 83 big and small industries 29 of India is given below. Market share (%) No. of industries 1 – 24.9 8 25 – 49.9 11 50 – 74.9 15 75 – 100 50 Total 84
As the data presented above shows, in India, in 50 out of 84 selected industries, i.e., in about 60 per cent industries, 4 to 10 firms have a for 75 per cent or more market share which gives a concentration ratio 30 of 0.500 or above. All such industries can be classified under oligopoly. Sources of Oligopoly The factors that give rise to oligopoly are broadly the same as those for monopoly. The main sources of oligopoly are described here briefly. 1. Huge capital Investment. Some industries are by nature capital-intensive, e.g., manufacturing automobiles, aircrafts, ships, TV sets, refrigerators, steel and aluminium goods, etc.,
and hence require huge investment. Therefore only a few firms
can enter these kinds of industries. In fact, a huge investment requirement works as a natural barrier to entry to the oligopolistic industries. 2. Economies of scale. By virtue of huge investment and large scale production, the large units enjoy absolute cost advantage due to economies of scale in purchase of industrial inputs, market financing, and sales organization. This gives the existing firms a comparative advantage over new firms in price com- petition. This works as a deterrent for the entry of new firms. 3. Patent rights. In case of differentiated oligopoly, firms get their differentiated product patented which gives them an exclusive right to produce and market the patented commodity. This prevents other firms from producing the patented commodity. Therefore, unless new firms have some thing new to offer and can match the existing products in respect of quality and cost, they cannot enter the industry. This keeps the number of firms limited. 4. Control over certain raw materials. Where a few firms acquire control over the entire supply of important inputs required to produce a certain commodity, new firms find it extremely difficult to enter the industry. For example, if a few firms acquire the right from the government to import certain raw materials, they control the entire input supply. 5. Merger and takeover. Merger of rival firms or takeover of rival firms by the bigger ones with a view to protecting their joint market share or to put an end to waste of competition is working, in modern times, as an important factor that gives rise to oligopolies and strengthens the oligopolistic tendency in modern industries.
Features of Oligopoly Let us now look at the important characteristics of oligopolistic industries. 1. Small number of sellers. As already mentioned, there is a small number of sellers under oligopoly. How small is the number of sellers
is not given
precisely: it depends largely on the size of the market. Conceptually, however,
the number of sellers is so small that the market share of each
firm is so large that a single firm can influence the market price
and the business strategy of its rival firms. The number may vary from industry to industry. Some examples of oligopoly
NOTES Self-Instructional Material 211 Market Structure and Pricing Decisions
industries in India and market share of the dominant firms 31 in 1997-98 is given below. Industry No. of firms Total market share (%) Ice-cream 4 100.00 Bread 2 100.00 Infant Milk food 6 99.95 Motorcycles 5 99.95 Passenger cars 5 94.34 Cigarettes 4 99.90 Fruit Juice, pulp
and
conc. 10 98.21 Fluorescent lamps 3 91.84 Automobile tyres 8 91.37 Source: CMIE, Industries and Market Share, August 1999. 2. Interdependence of decision-making. The most striking feature of an oligopolistic market structure is the interdependence of oligopoly firms. The characteristic fewness of firms under oligopoly brings the firms in keen com- petition with each other. The competition between the firms takes the form of action, reaction and counteraction in the absence of collusion between the firms.

Since the number of firms in the industry is small, the business strategy of each firm in respect of pricing, advertising, product modification is closely watched by the rival firms and it evokes imitation and retaliation. What is equally important
in strategic business decisions
is that firms initiating a new business strategy anticipate and take into account the counteraction by the rival firms. This is called interdependence of oligopoly firms. An illuminating example of strategic manoeuvering is cited
by Robert A. Meyer. 32 To quote the example, one of the US car manufacturing companies announced in
one year in the month of
September 33 an increase of $180 in the price list of its car model. Following it, a second company announced a few days later an increase of $ 80 only and a third
announced an increase of $ 91. The first company made a counter move: it
announced a reduction in the enhancement in the list price from $ 180 to $ 71. This is a pertinent example of interdependence of firms in business decisions under oligopolistic market structure. In India, when Maruti Udyog Limited (MUL), announced a price cut of
Rs. 24,000 to Rs. 36,000 in early 1999 on its passenger cars, other companies followed the
suit. However, price competition is not the major form of competition among the oligopoly firms as price war destroys the profits. A more common form of competition is non- price competition on the basis of product differentiation, vigorous advertising and provision of services. 3. Barriers to entry. Barriers to entry to an oligopolistic industry arise due to such market conditions as (i) huge investment requirement to match the production capacity of the existing ones, (ii) economies of scale and absolute cost advantage enjoyed by the existing firms, (iii) strong consumer loyalty to the products of the established firms based on their quality and service, and (iv) resistance by the established firms by price cutting. However, the new entrants that can cross these barriers can and do enter the industry, though only a few, that too mostly the branches of MNCs. 4. Indeterminate price and output. Another important feature, though controversial, of the oligopolistic market structure is the indeterminateness of price and output. The characteristic fewness and interdependence of oligopoly firms makes derivation of the demand curve a difficult proposition. Therefore, price and output are said to be indeterminate. However, price and output are said to be determinate under collusive oligopoly. But, there too, collusion may last or
NOTES 212 Self-Instructional Material Market Structure and Pricing Decisions breakdown.
An opposite view is that price under oligopoly is sticky, i.e., if price is once determined, it tends to stablize. 7.7.2 The Oligopoly Models: An Overview As already mentioned under oligopolistic conditions,
the
rival firms indulge in an intricate pattern of actions, reactions and counteractions showing a variety of behavioural patterns. As Baumol puts it, “Under [these] circumstances, a very wide variety of behaviour pattern becomes possible. Rivals may decide to get together and cooperate in the pursuit of their objectives,... or, at the other extreme, may try to fight each other to the death. Even if they enter an agreement, it may last or it may break down.” 34 The economists have, therefore, found it extremely difficult to make a systematic analysis of price and output determination under oligopoly. 35 This has, however, not deterred the economists from their efforts to
find an agreeable solution
of
the problem. In accordance with the a
wide variety of behavioural patterns, the
economists have developed a variety of analytical models based on different behavioural assumptions.
The widely
quoted models
of
oligopoly include
Cournot’s duopoly model (1838), Bertrand’s leadership model (1880), Edgeworth’s duopoly model (1897), Stackelberg’s model (1933), Sweezy’s kinked demand curve model (1939), Neumann and Margenstern Game Theory model (1944), Baumol’s sales maximization model (1959). None of these models, however, provides a universally acceptable analysis of oligopoly, though these models do provide
an insight into oligopolistic behaviour. In this section, we discuss some selected oligopoly models with the purpose of showing the behaviour of oligopoly firms and working of the oligopolistic markets. The analytical models discussed here are selected on the basis of how price and output determined under price competition,
cartel system and the dilemma that oligopoly firms face in their price and output decisions.
Specifically, we will discuss
the following oligopoly models. (i) Cournot’s duopoly model, (ii) Sweezy’s kinked demand curve model, (iii)

Price leadership models: (a)
Price leadership by low-cost firm, (
b) Price leadership by dominant firm, and (
c) Price leadership
by barometric firm, (iv) Collusive model: The Cartel Arrangement, (v) The Game Theory model of oligopoly, and (vi)Prisoner's Dilemma
Baumol's sales revenue maximization model, which merits a detailed discussion, will be discussed in the next unit. 7.7.3 Cournot'
s Model
of Oligopoly
Augustine
Cournot 36 , a French economist, was the first to develop
a
formal
oligopoly model in 1838
in the form of a duopoly model.
To illustrate his model, Cournot made the following assumptions: (a) there are two firms, each
one
owning an artesian mineral water well; (b) both the firms operate their wells at zero
marginal
cost 37 ; (c) both of them face a demand curve with constant negative slope; (
d)
each seller acts on the assumption that his competitor will not react to his decision to change his output
and price.
This is Cournot's behavioural assumption.
Check Your Progress 33. Define oligopolistic compe- tition. 34. How is oligopolistic compe- tition different from monopolistic competition? 35.What factors create oligopoly in the market? 36. Do the firms under oligopoly never reach their equilibrium?
NOTES Self-Instructional Material 213 Market Structure and Pricing Decisions
On the basis of this model, Cournot has concluded that each seller ultimately supplies one-third of the market and both the firms charge the same price. And, one-third of the market remains unsupplied.
Fig. 7.10: Price and Output Determination under Duopoly : Cournot's Model
Cournot's duopoly model is presented in Fig. 7.10. The demand curve for mineral water is given by the AR and MR by the MR curves. To begin with,
let us suppose that there are only two sellers A and B,
and that, initially,
A is the only seller of mineral water in the market.
By assumption, his MC = 0. Following the profit maximizing rule,
he sells quantity OQ where
his MC = 0 = MR, at price OP 2 . His total profit is OP 2 PQ.
Now let B enter the market. The market open to him is QM which is half of the total market. 38 That is,
he
can sell his product in the remaining half of the market. B assumes that A will not change his
price and output because he is making maximum profit, that is,
B assumes that A will continue to sell OQ at prices OP 2 . Thus, the market available to B is QM and the relevant part of
the demand curve is PM. When he draws his MR curve,
PN, it
bisects QM at point N where QN = NM. In order to maximize his revenue, B sells QN at price OP 1 . His total revenue is maximum at QRP'N
which equals his total profit.
Note that B supplies only QN = 1/4 = (1/2)/2 of the market.
With the entry of B, price falls to OP 1 . Therefore, A's expected profit falls to OP 1 RQ. Faced with this situation, A adjusts his price and outout to the changed conditions. He assumes
that B will not change his output QN and price OP 1 as he is making maximum profit.
Accordingly, A assumes that B will continue to supply 1/4 of the market.

Thus,
A assumes that
he has 3/4 (= 1 – 1/4) of the market available to him. To maximize his profit, A
supplies 1/2 of (3/4), i.e., 3/8 of the market. It is noteworthy
that A's market share has fallen from 1/2 to 3/8.
Now it is B's turn to react. Following Cournot's assumption, B assumes that A will continue to supply only 3/8 of the market and the market open to him equals 1 – 3/8 = 5/8. To maximize his profit under the new conditions, B supplies 1/2 ¥ 5/8 = 5/16 of the market. It is now for A to reappraise the situation and adjust his price and output accordingly.
This process of action and reaction continues in successive periods. In the process, A continues to lose his market share and B continues to gain. Eventually, a situation is reached when their market shares equal 1/3 each. Any further attempt to adjust output produces the same result. The firms, therefore, reach their equilibrium position where each one supplies one-third of the market
and both charge the same price.
The actions and reactions and equilibrium of the sellers A and B, according to Cournot's model, are presented in Table 7.2.
NOTES 214 Self-Instructional Material Market Structure and Pricing Decisions
Table 7.2: Determination of Market Share Period Seller A Seller B I 1 1 (1) 2 2 = 1 1 1 2 2 4 ⁄ \ = | |\ / II 1 1 3 1 2 4 8 ⁄ \ – = | |\ / 1 3 5 1 2 8 16 ⁄ \ – = | |\ / III 1 5 11 1 2 16 32 ⁄ \ – = | |\ / 1 11 21 1 2 32 64 ⁄ \ – = | |\ / IV 1 21 43 1 2 64 128 ⁄ \ – = | |\ / 1 43 85 1 2 128 256 ⁄ \ – = | |\ / --- --- --- --- --- --- N 1 1 1 1 2 3 3 ⁄ \ – = | |\ / 1 1 1 1 2 3 3 ⁄ \ – = | |\ /
Cournot's equilibrium solution is stable. For, given the action and reaction, it is not possible for any of the two sellers to increase their market share
as shown in the last row of the table.
Cournot's model of duopoly can be extended to a general oligopoly model. For example, if there are three sellers in the industry, each one of them
will be in equilibrium when each firm supplies 1/4 of the market. The three sellers together supply 3/4 of the total market, 1/4 of the market remaining unsupplied. Similarly, when there are four firms each one of them supply 1/5th of the market and 1/5th
of the market remains unsupplied. The formula for determining the share of each seller in an oligopolistic market is: Q ÷ (n + 1), where Q = market size, and n = number of sellers.
Algebraic Solution. Cournot's model
may also be presented algebraically. Let us suppose that
the
market demand function is given by linear function as Q = 90 – P ...(7.26) As noted above, under zero cost condition, profit is maximum where MC = MR = 0 and
when MR = 0, the profit maximizing output is 1/2 (
Q).
Thus, when seller A is a monopolist in the market, his profit-maximizing output (
Q A),
according to the profit maximizing rule under zero cost condition, is
determined at half of the total market. That is,
Q A = 1/2 (90 – P) ...(7.27) When another seller, B, enters the market, his profit maximizing output Q B = 1/2 [(1/2(90 – P)] ...(7.28) Thus, the respective shares of sellers, A and B are fixed at Q A and Q B .
The division of market output may be expressed as Q =
Q A + Q B = 90 –
P ...(7.29) The demand function for A may now
be expressed as
Q A = (90 – Q B) – P ...(7.30) and for B as Q B = (90 – Q
A) –
P ...(7.31) Given the demand function (7.30), the market open to A (at P = 0) is 90 – Q B . The profit maximising output for A will be
Q A = 90 2 B Q– ...(7.32)
NOTES Self-Instructional Material 215 Market Structure and Pricing Decisions and for B, it will be Q B = 90 2 A
Q – ...(7.33)

The equations (7.32) and (7.33) represent the reaction functions of sellers A and B, respectively. For example, consider equation (7.32). The profit maximizing output of A depends on the value of Q B , i.e., the output which B is assumed to produce. If B chooses to produce 30 units, (i.e., Q B = 30), then A's output = [(90 – 30)1/2] = 30. If B chooses to produce 60 units, A's output = (90 – 60)1/2 = 15. Thus, equation (7.32) is
A's reaction function. It can similarly be shown that equation (7.33) is B's reaction function. Fig. 7.11: Reaction Function and Equilibrium: Cournot Model The reaction functions of A and B are graphed in Fig. 7.11. The reaction function PM shows how A will react on the assumption that B will not react to changes in his output once B's output is fixed. The reaction function CD shows a similar reaction of B. The two reaction functions intersect at point E. It means that the assumptions of A and B coincide at point E and here ends their action and reaction. Point E is, therefore, the point of stable equilibrium. At this point, each seller sells only 30 units. The same result can be obtained by equating the two reaction equations (7.32) and (7.33). The market equilibrium takes place where Q A = Q B That is, where= 90 90 2 2 B A Q Q – – = Since, Q b = (90 – Q A)/2, by substitution, we get first term as Q A = 90 (90)/2 2 A Q – – Q A = 30 Thus, both the sellers are in equilibrium. At equilibrium, both the sellers will produce 30 units each. The market output will be 60 units. Given the market demand curve, market price will be P = 90 – Q = 90 – 60 = Rs. 30.
Criticism. Although Cournot's model yields a stable equilibrium, it has been criticised on the following grounds. First, Cournot's behavioural assumption [assumption (d) above] is naïve as it implies that firms continue to make wrong calculations about the competitor's behaviour. That is, each seller continues to assume that his rival will not change his output even though he reportedly observes that his rival firm does change its output.
NOTES 216 Self-Instructional Material Market Structure and Pricing Decisions
Second, his
assumption of zero cost of production is unrealistic though dropping this assumption does not alter his
position. 7.7.4 Kinked Demand Curve Analysis of Price Stability: Sweezy's Model
The kinked demand curve model of oligopoly was developed by Paul M. Sweezy 39 and Hall and Hitch. 40 This model is, however, famous by Sweezy's name. We will, therefore, describe in this section the kinked demand curve model as developed by Sweezy. He has tried to show through his kinked demand curve analysis that price and output once determined under oligopolistic conditions, tend to stabilize rather than fluctuating.
The kinked demand curve model developed by Paul M. Sweezy has features common to most oligopoly pricing models. This is the best known model
explaining relatively more satisfactorily
the behaviour of oligopolistic firms. The kinked demand curve analysis
does not deal with price and output determination. Rather, it seeks to establish that once a price–quantity combination is determined, an oligopoly firm
does not find it profitable to change its price even
if there is a considerable change
in cost of production.
The logic behind this proposition is as follows. An oligopoly firm believes that if it reduces the price of its product, rival firms would follow and neutralize the expected gain from price reduction. But, if it raises its price, rival firms would either maintain their prices or
may even cut their prices down. In either case,
the price raising firm stands to lose, at least a part of its market share. This behavioural assumption is made by all the firms
with respect to others.
The oligopoly firms. Therefore, oligopoly firms find it more desirable to maintain their price and output
at the existing level.
To look more closely at the kinked demand curve analysis, let us look into the possible actions and reactions of the rival firms to the price changes made by one of the firms. There are three possible ways in which rival firms may react: (i) the rival firms follow the price changes, both cut and hike; (ii) the rival firms do not follow the price changes; (iii) rival firms follow the price cuts but not the price-hikes. Fig. 7.12: Kinked Demand Curve Analysis To begin with, let us suppose that the market demand curve for a product is given by dd¢ curve and that the initial price is fixed at PQ in Fig. 7.12. Now let one of the firms change its price. If rival firms react in manner (i), i.e., they react with hike for hike and cut for cut, the price changing firm moves along the demand curve dd¢. And, if rival
NOTES Self-Instructional Material 217 Market Structure and Pricing Decisions firms do not follow the price changes, the price changing firm will move along the demand curve DD¢. Note that the firm initiating the price change faces two different demand curves conforming to two different kinds of reactions (i) and (ii). The demand curve dd¢ is based on reaction (i) and
is less elastic than the demand curve DD¢ which is based on reaction (ii). Demand curve dd¢ is less elastic because

changes in demand in response to changes in price are
restrained by the countermoves by the rival firms.
Given the two demand curves,
dd¢ and DD ¢, let us now introduce reaction (iii), a more realistic one, i.e., the rival firms follow the price-cut but do not follow the price-hike.
This asymmetrical behaviour of the rival firms, makes only a part of the two demand curves relevant
and produces a kinked demand curve. This can be established by allowing an oligopoly firm to alternatively increase and decrease its price. If a firm
increases
its price and rivals do not follow, it loses a part of its market to
its rivals. The demand for its product decreases considerably indicating a greater elasticity. The firm is, therefore, forced down from demand curve dP to DP. Thus, the relevant segment of demand curve for the
price hiking firm is DP. Now suppose alternatively, that an oligopoly firm decreases its prices. Then the rival firms, given their asymmetrical be- haviour, cut down their prices. Otherwise, they would lose their customers. This counter price-move by the rivals prevents the oligopoly firm from taking full advantage of price-cut along the demand curve PD¢. Therefore, its demand curve below point P rotates down. Thus, the relevant segments of the demand curve for price cut is PD¢. Thus, the two parts of the demand curve put together give the relevant demand curve for the firm as DPd¢ which has a kink at point P.
Let us now draw the MR curve. Recall
that MR = AR – AR/e. The MR curve drawn on the basis of this relationship, takes a shape as shown by
a discontinuous curve DJKL in Fig. 7.12. The DJ and KL segments of the MR curve correspond, respectively, to the DP and Pd¢ segments of the kinked demand curve, DPd¢. Suppose that the original marginal cost curve resembles the
curve MC 1 which intersects MR at point K. Since at output OQ, MR = MC 1 the firm makes maximum profit. Now, even if the
MC curve shifts upwards to MC 2 or any level between points J and K,
firms do not gainful to increase the price though their profit would be affected. Therefore, the firm has no motivation for increasing or decreasing its price. Thus, both price and output are established. This is what the kinked demand curve analysis seeks to establish. Algebraic Solution to Sweezy's Model. Suppose the oligopoly firm's initial market demand curve 41 (D 1), its stipulated demand curve (D 2), and its total cost function (TC) are given as follows. (i) D 1 : Q 1 = 100 – 0.5P 1 ...(7.34) (ii) D 2 : D 2 = 160 – P 2 ...(7.35) (iii)TC = 300 + 20Q + 0.5Q 2 ...(7.36) The demand functions (7.34) and (7.35) are shown by D 1 and D 2 curves in Fig. 7.14. What we need now is to work out MR 1 and MR 2 corresponding to the two demand functions, and MC from the cost function. To work out MR 1 and MR 2 , we need to find TR 1 and TR 2 . Given the demand functions (7.34) and (7.35), P 1 and P 2 can be obtained as P 1 = 200 – 2Q 1 ...(7.37) and P 2 = 160 – Q 2 ...(7.38) TR 1 and TR 2 can be worked out by using price functions (7.37) and (7.38) as follows. TR 1 = P 1 . Q 1 = (200 – 2Q 1)Q 1 = 200Q 1 – 2Q 1 2 ...(7.39) and TR 2 = P 2 . Q 2 = (160 – Q 2)Q 2 = 160Q 2 – Q 2 2 ...(7.40)
NOTES 218 Self-Instructional Material Market Structure and Pricing Decisions By differentiating TR 1 and TR 2 functions (7.39) and (7.40), we can derive the MR 1 and MR 2 functions, respectively, as given below. MR 1 = 200 – 4Q 1 ...(7.41) and MR 2 = 160 – 2Q 1 ...(7.42) The MR 1 and MR 2 functions are shown by truncated lines MR 1 and MR 2 in Fig. 7.14. As regards MC curve, it
can be obtained by differentiating the TC function (7.36). Thus, MC = 2 (300 20 0.5) TC Q Q
Q Q ∂ ∂ + + = ∂ ∂ = 20 + Q ...(7.43) Having derived the MR 1 , MR 2 and MC functions, we now illustrate the conclusions of the kinked demand curve analysis. Let us first find price (P) and quantity demanded (Q) at kink point P. At the kink point (P), price P is given and Q 1 = Q 2 . Let us assume that Q 1 = Q 2 = Q. Now Q and P at the kink can be known as follows. Since at the point of intersection of D 1 and D 2 , Q 1 = Q 2 = Q, by substituting Q for Q 1 in Q 2 in price functions (7.37) and (7.38), we get P 1 = P 2 200 – 2Q = 160 – Q Q = 40 By substituting 40 for Q in any of the P functions, we get P at the point of intersection. We know that at the intersection point P 1 = P 2 . So when we get P 1 or P 2 , we get P. Thus, P = 200 – 2Q 1 = 200 – 4(40) = Rs. 120 This can be verified from Fig. 7.13. Fig. 7.13: Sweezy's Kinked Demand Model Having worked out P and Q, let us now verify the main thesis of Sweezy's model that the variation in MC within a range will not affect the price. The upper limit of MC variation is given by point K at the MR 1 at price P and the lower limit by point M at MR 2 at the same price. Thus, Check Your Progress 37. What does Cournot's model of oligopoly assume about the behaviour of the rival firms? 38.Explain and illustrate Cournot's model of price and output determination under duopoly. 39. What is the basic assump- tion of kinked demand curve model? 40. What is the final conclusion of Sweezy's model of oli- gopoly?

NOTES Self-Instructional Material 219 Market Structure and Pricing Decisions MR 1 = 200 – 4Q 1 = 200 – 4(40) = Rs. 40 and MR 2 = 160 – 2Q 2 = 160 – 2(40) = Rs. 80 Thus, the lower and upper limits of MC variation that will not affect the price at Q = 40 lie between Rs. 40 and Rs. 80. At Q = 40, MC = 20 + 40 = Rs. 60. Now let the cost of production increase and cost function change to TC = 400 + 30Q + 0.5Q 2 Then MC = 30 + Q Given the MC function at Q = 40, MC = 30 + 40 = Rs. 70. Since MC = 70 is within the lower and upper range, price will not change. This proves Sweezy hypothesis that prices once determined tend to be stable in the oligopoly market. Criticism. A major criticism against Sweezy model is that it only explains the stability of output and price–it does not tell how the initial price is fixed at a certain level, e.g., at PQ. Besides, the price stability does not stand the test of empirical verification—there is a surprising lack of price rigidity in oligopolistic markets. Furthermore, Stigler 42 found in case of 7 oligopolistic industries that there was 'little evidence' of reluctance to the price–hike made by other firms. Stigler's finding was further supported by the findings of Simon. 43 Monopoly prices have been found to be more stable than oligopoly prices. 7.7.5 Price Leadership Models

Price leadership is an informal position of a firm in most oligopolistic industries. Price leadership may emerge spontaneously due to technical reasons or out of tacit or explicit agreement between the firms to assign a leadership role to one of them. The spontaneous price leadership may be the result of such technical reasons as size, efficiency, economies of scale or firm's ability to forecast market conditions accurately or a combination of these factors. The most typical case of price leadership is the leading role played by the dominant firm, i.e., the largest firm in the industry. The dominant firm takes lead in making price changes and the smaller ones follow. Sometimes, price leadership is barometric.

In the barometric price leadership one of the firms, not necessarily the dominant one, takes the lead generally in announcing a change in price, particularly when such a change is due but is not effected due to uncertainty in the market. The price leadership is found under both product homogeneity and product differentiation. There may be, however, price differentials commensurate with product differentiation. Price differentials may also exist on account of cost differentials. Another important aspect of price leadership is that it often serves as a means to price discipline and price stabilization. Achievement of this objective establishes an 'effective price leadership'. Such price leadership can, however, exist and work effectively only under the following conditions. (i) The number of firms is small; (ii) Entry to the industry is restricted; (iii)Products are, by and large, homogeneous; (iv)Demand for industry is inelastic or has very low elasticity; and (v) Firms have almost similar cost curves.

NOTES 220 Self-Instructional Material Market Structure and Pricing Decisions (

a) Price leadership by Low-Cost firm. The price and output decisions under the leadership of a low-cost firm is illustrated in Fig. 7.15. Suppose all the firms face identical revenue curves as shown by AR and MR curves, but they have different cost curves.

The largest firm or the low-cost firm, has its cost curves as shown by AC 1 and MC 1 whereas all the rival firms, smaller in size, have their cost curves as shown by AC 2 and MC 2 . This is so because the largest firm has the economies of scale and its cost of production is lower than that of other firms. Given the cost and revenue conditions, the low-cost firm would find it most profitable to fix its price at OP 2 (= LQ 2) and sell quantity OQ 2 . At this level of output its MC = MR and hence its profit is maximum. On

Fig. 7.14: Price Leadership by a Low-Cost Firm

the other hand, the high-cost firms would be in a position to maximize their profit at price OP 3 and quantity OQ 1 . But, if they charge a higher

price, OP 3 , they would lose their customers to the low-cost firm. The high-cost firms are, therefore, forced to accept the price OP 2 and recognize the price leadership of the low-cost firm. Note that the low-cost firm can eliminate other firms and become a monopolist by cutting
the price to OP 1 (= JQ 2). The low cost firm can sell its entire output OQ 2 at OP 1 . But
at price OP 1 , the low-cost firm will make only normal profit. It may, however,
not do so for the fear of anti-monopoly laws.
Numerical Illustration. Suppose there are two oligopoly firms—Firm 1 and Firm 2—selling homogenous products and, therefore, they face the same demand curve, but it is expressed differently for the sake of computational convenience. Their demand curves are given as follows. Firm 1 : Q 1 = 50 – 0.5 P 1 : P 1 = 100 – 2 Q 1 ...(7.44) Firm 2 : Q 2 = 50 – 0.5 P 2 : P 2 = 100 – 2 Q 2 ...(7.45) Suppose also that Firm 1 is a low-cost firm and Firm 2 is a high-cost firm. Their respective cost functions are given as follows. Firm 1 : TC 1 = 100 + 20
Q 1 + 2Q 1 2 ...(7.46) AC 1 = TC 1 /Q 1 = (100 + 20Q 1 + 2Q 1 2)/Q 1 ...(7.47) Firm 2 : TC 2 = 48 + 36Q 2 + 2Q 2 2 ...(7.48) AC 2 = TC 2 /Q 2 = (48 + 36Q 2 + 2Q 2 2)/Q 2 ...(7.49)
Let us now see how oligopoly firms will set their price and output independently acting as monopolies. Like all other firms, Firm 1 will determine its output at the level which maximizes its total profit, P 1 .We know that total profit is maximum where P 1 = TR 1 – TC 1 is maximium.
NOTES Self-Instructional Material 221 Market Structure and Pricing Decisions Firm A's TC 1 is given in Eq. (7.46) but we need to find its
TR 1 . TR 1 = P 1 .Q 1 = (100 – 2Q 1)Q 1 = 100Q 1 – 2Q 1 2 ...(7.50) By substituting TR 1 and TC 1 into the profit equation, we get the profit function for Firm 1 as Π 1 = 100Q 1 – 2Q 1 2 – (100 + 20Q 1 + 2Q 1 2) = 80Q 1 – 4Q 1 2 – 100 ...(7.51) The profit maximizing output can be obtained by taking the first derivative of the profit function (7.51) and setting it equal to zero. Thus, 1 1
Q δ δ Π = 80 – 8Q 1 = 0 ...(7.52) By solving Eq. (7.52), we get Q 1 = 10. Alternatively,
Q 1 can be obtained by finding and equating MC 1 and MR 1 . MC 1 can be obtained by differentiating TC 1 function (7.46) and MR 1 by differentiating TR 1 function (7.50).
Profit maximizing price (P 1) and average cost (AC 1) of Firm 1 can now be obtained by substituting 10 for Q 1 in price functions (7.44) and (7.47), respectively. Thus, P 1 = 100 – 2Q 1 = 100 – 2(10) = Rs. 80 and AC 1 = (100 + 20Q 1 + 2Q 1 2)/
Q 1 = [100 + 20(10) + 2(10) 2]/10 = Rs. 50 Firm 2 will also set its output at the level which
maximizes its profit, P 2 . Π 2 = TR 2 – TC 2 Firm's TC 2 is given in Eq. (7.48). Its TR, i.e., TR 2
can be obtained as follows. TR 2 = P 2 .Q 2 = (100 – 2 Q 2)Q 2 = 100Q 2 – 2
Q 2 2 By substitution, we get
profit function as Π 2 = 100Q 2 – 2Q 2 2 – (48 + 36Q 2 + 2Q 2 2) = 64Q 2 – 4Q 2 2 – 48 ...(7.53) The profit maximizing output can be obtained by
taking the first derivative of the profit function (7.53) and setting it equal to zero. Thus, 2 2 Qδ δ Π = 64 – 8Q 2 = 0 ...(7.54) By solving Eq. (7.54), we get Q 2 = 8. Profit maximizing price (P 2) and average cost (AC 2) of firm 2 can now be obtained by substituting 8 for Q 2 in price functions (7.45) and (7.49), respectively. Thus, P 2 = 100 – 2Q 2 = 100 – 2(8) = Rs. 84 and AC 2 = (64 + 64
Q 2 + 2Q 2 2)/Q 2 = [64 + 36(8) + 2(8 2)]/8 = Rs. 58 To summarize, given the market demand function and individual cost functions, the two firms will set their price and output in the absense of collusion between them as follows.
NOTES 222 Self-Instructional Material Market Structure and Pricing Decisions
Firm 1 : Q 1 = 10 and P 1 = 80 and Firm 2 : Q 2 = 8 and P 2 = 84 Under the price leadership model, however, Firm 1, a low-cost firm, acting as price leader will set the price of its product at Rs. 80 and Firm 2 will also set the price of its product at Rs. 80, the price set by Firm 1. Note that the per unit profit of Firm 2 is reduced from Rs. 26 to
Rs. 22.
But this happens when a high-cost firm has to accept the price-leadership of the
low-cost firm. (b)
Price Leadership by a Dominant Firm. Price Leadership by a
dominant firm is more common than by a low-cost firm. In the analysis of price leadership by a dominant firm, it is assumed that there exists a large size firm in the industry, which supplies a large proportion of the total market. The dominance of the large firm is indicated by the fact that it could possibly eliminate all its rival firms by price-cutting. In that case,
the large firm gains the status of a monopoly which may invite legal problems. The dominant firm, therefore, compromises with the existence of the rival firms in the market. It uses its dominance to set its price so as to maximize its profit. The smaller firms
recognise

their weak position and behave just like
a firm
in a perfectly competitive market. That is, smaller firms
accept the price set by the dominant firm.
The price leadership and market sharing between the dominant firm and the rival firms as a group
is illustrated in Fig. 7.15.
Suppose that the market demand curve is given by
DD
M
and total supply by the
small firms by the curve S S
in part (a) of the figure. The problem confronting the dominant firm is to determine its price and output that will maximize its profit, leaving the rest of the market to be jointly supplied by the small firms.
To solve this problem,
the dominat firm finds its demand curve by deduct- ing the quantity supplied jointly by the small firms at different price
from the corresponding market demand. The dominant firms considers the residual of the market share as the demand for its own product. Thus, at a given price,
the market share of the dominant firm equals the market demand less the share of small firms.
For example, when market
price is set at OP 3 , the total supply by the smaller firms is P 3 E which equals the market demand. Therefore, at price OP 3 , the market left to the dominant firm is zero. When price
falls
to OP 2 ,
the demand for dominant firm's product is
CF. Following this process, the market-share of the dominant firm at other prices can be easily obtained.
Note that the gap between demand curve DD M and supply curve P 1 S s below point E in Fig. 7.15 (a) measures the demand for the dominant firm.
Fig. 7.15: Price Leadership by a
Dominant Firm
The information so derived and plotted graphically gives P 3 D D as the demand curve for the dominant firm [Fig. 7.15 (b)]. Since the relation between AR and MR is known, the MR curve for the dominant firm can be derived as
MR D [
Fig. 7.15 (b)]. If the MC curve of the dominant firm is assumed to be given as MC D , its profit maximising output will be OQ D and price
PQ
D .

Once the dominant firm sets its price at OP¢, the small firms have to accept this price,
and then
their joint market demand curve is the horizontal straight line P¢B [in Fig. 7.15(a)],
because they can sell at this price as much as they can produce. But, in order to maximise their joint profits, small firms will produce
only
P¢A. For small firms, therefore, profit maximizing joint output is P¢A.
Numerical Illustration.

Suppose there are six firms—one of them being dominant— in an industry supplying a nearly homogeneous product. Suppose also that market demand function for the product of all the 6 firms is given as Q M = 100 – 2P ...(7.55) and the combined supply function of 5 small firms is given as Q S = 10 + P ...(7.56) Given the demand and supply functions (7.55) and (7.56) respectively, the market equilibrium without the dominant firm can be obtained by equating the demand and supply functions. Thus, the market is in equilibrium where Q S = Q M 10 + P = 100 – 2P P = 30 The market supplied by the five small firms together can be obtainted by substituting 30 for P in either the demand or supply function. Q S = 100 – 2P = 100 – 2(30) = 40 This means that 5 small firms jointly supply 40 units at P = 30. Now let us see how the dominant firm works out the demand function for its product and sets its price. The demand function for the dominant firm can be obtained by deducting the quantity (Q S = 40) supplied by the small firms from the market demand function (7.55). Thus, Q D = Q M – Q S = 100 – 2 P – 40 = 60 – 2 P ...(7.57) The dominant firm's profit maximizing output (Q D) and price (P D) can be obtained by finding its MC D and MR D and equating them.

Suppose its total cost function (TC D) is given as TC

D = 50 + 6Q D + 0.25 Q 2 D ...(7.58) The marginal cost function (MC D) of the dominant firm can be obtained by differentiating the TC D function (7.58). Thus, MC D = D

D Q TC ∂ ∂ = 6 + 0.5

Q D ...(7.59) The TR function (TR D) of the dominant firm can be obtained as follows: Given the Q D function (7.57), P D = 30 – 0.5 Q D ...(7.60) Given the price function (7.60), TR D (= P D ×Q D) can be obtained as TR D = (30 – 0.5 Q D) Q D = 30 Q D – 0.5 Q 2 D ...(7.61) Dominant firm's MR function can be obtained by differentiating the TR function (7.61), as MR D = D D

TR Q ∂ ∂ = 30 – Q D Check Your Progress 41. What is meant by price leadership by a firm in oligopoly market? 42. What is

the most common case of price leadership? 43. Describe price leadership by a low-cost firm. 44. How does a dominant firm

determine the price for its own product and for that of rival firms?

Now that the dominant firm's MC D and MR D have been obtained, we can work out the profit maximizing Q D and P D as follows. At equilibrium, MC D = MR D 6 + 0.5Q D = 30 – Q D 1.5Q = 24 Q = 16 Having obtained the equilibrium output (Q D = 16), equilibrium price P D can be obtained by substituting 16 for Q D in its price function (7.57). That is, P D = 30 – 0.5 (16) = 22 (

Rs.)

To conclude, the dominant firm fixes its output at 16 and price at

Rs. 22.

This price has to be accepted by the small firms. Thus P D = 22 becomes the market price (

P) common for both the dominant and small firms, i.e., P = 22.

The final market share of the dominant and small firms, can be worked out as follows. The total demand at price P = 22 can be obtained by substituting 22 for P in the market demand function (7.55). Total Demand = 100 – 2 (22) = 56 Of the total demand of 56 units at price Rs. 22, only 16 units will be supplied by the dominant firm and the remaining part of the market, i.e., 56 – 16 = 40, will be shared by the five small firms.

Critical Appraisal. The dominant-firm

price-leadership model, as presented above, yields a stable solution to the problem of oligopoly pricing and output determination, only if

the

small firms faithfully follow the leader. That is, small firms produce

the

right

quantity and charge the price set by the dominant firm. Besides, the model requires that the dominant firm should be both large and

a

low-cost firm. For, if a firm does not enjoy the advantage of large size and, consequent upon it, the advantage of low-cost, it cannot act as a price leader. In practice, however, one finds many cases of price leadership by a firm which is neither large nor

is

a low-cost firm. But such cases are found mostly under recessionary conditions when a relatively smaller firm reduces its price to survive in the market. Furthermore, if a leading firm loses its cost advantages, it also loses its leadership. Such cases are frequent in the real business world. Leadership also changes following the innovation of products and techniques of production by the

relatively small firms.
Besides, where there are many large firms of equal size
and
have some cost advantage, price leadership
by
any firm or group of firms becomes less probable, particularly when
the
number of small firms is smaller than that of larger firms. Under such conditions, barometric leadership emerges. Lastly, it is assumed that
the
entry of new firms is prevented either by low-cost
of the existing firms or by initial high cost of new firms.
In practice, however, many firms having the capacity to diversify their products enter the industry with relatively initial low-cost. For these reasons,
dominant–firm
leadership model is not a realistic one as it is based on unrealistic assumptions. For the same reasons, the solution given by this leadership model may not be stable. (
c) The
Barometric Price Leadership. Another form of price leadership is barometric price leadership. In this form
of
price leadership, a firm initiates well publicised changes in price which are generally followed by the rival firms.
This kind of
price leadership may not necessarily come from the largest firm of the industry. The barometric firm is,
NOTES Self-Instructional Material 225 Market Structure and Pricing Decisions
however, supposed to have a better knowledge of the
prevailing market conditions and has an ability to predict
the market conditions
more precisely than any of its competitors. These qualities of the barometric firm should have been established and recognized over time by the rival firms. The
firm having the qualifications of price leadership is regarded as a barometer which reflects the changes in business conditions and environment of the industry. The price changes announced by the barometric firm serve as a barometer of changes in demand and supply conditions in the market. The barometric leadership evolves for various reasons of which the major ones are following. First, the rivalry between the large firms may lead to cut-throat competition to the disadvantage of all the firms. On the other hand, rivalry between the larger firms may make them unacceptable as a leader. So a firm which has better predictive ability emerges as
the
price leader. Second, most firms in the industry may have neither the capacity nor the desire to make continuous calculations of cost, demand and supply conditions. Therefore, they find it advantageous to accept the price changes made by a firm which has a proven ability to make reasonably good forecasts. Third, Kaplan 44 et. al. observe that barometric price leadership often develops as a reaction to a long economic warfare in which all the firms are losers.
The Nature of Non-
Price Competition in Oligopoly Markets.
It is obvious from the above discussion that oligopolists may be reluctant to wage price wars and encroach upon each other's market share. That is,
there is an absence of price competition in the oligopolistic market structure. The absence of price competition should not mean the absence of competition among oligopoly firms. In fact, the competition among oligopoly firms takes the form of non-price competition. The forms of non-price competition are diverse. Yet, there are two important techniques of non-price competition . First, non-price competition involves product differentiation which is intended to attract new customers by creating preference for the new design and variety of product. Second, perhaps the most important technique of non-price competition is advertisement. The primary objective of advertising is to make the demand curve for the product shift upward. The sellers try to encroach on the market of other sellers through advertising. Advertising is also necessary to retain market-share
in the face of tough competition between the firms. 7.7.6 Collusion Model: The Cartel A cartel is an association of business firms formed by an explicit agreement between them. Cartel agreements represent the most complete form of collusion among the oligopolists. Under

cartel agreements, “the firms jointly establish a cartel organization to make price and output decisions, to establish production quotas for each firm, and to supervise market activities of the firms in the industry.” 45
Cartel type of collusions are formed with a view to (i) eliminating uncertainty surrounding the market; and (ii) restraining competition and thereby ensuring monopolistic gains to the cartel group. The cartel works through a Board of Control. One of the main functions of the Board is to determine the market share for each of its members. For this purpose, the Board calculates the marginal cost and marginal revenue for the industry.
MC for the industry is the summation of MCs of individual firms. On the basis of industry’s MR and MC, the total output for the industry is determined. The total output is then allocated between the member firms on the basis of their own MC. The determination of industry output is shown in Fig. 7.16 (c) and the share of each firm in Figs. 7.16 (a) and 7.16 (b). For the sake of convenience, let us suppose that there are only two
firms in the industry, Firm A and Firm B. Their cost curves are given 7.16 (a) and 7.16 (b), respectively.
NOTES 226 Self-Instructional Material Market Structure and Pricing Decisions Fig. 7.16: Market Allocation under Cartel As shown in Fig. 7.17(c), the industry output is determined at OQ and price at PQ.
The share of each firm in the industry output, OQ,
is determined at the level of their own output which equates their individual MC with the industry’s MC. The industry’s mar- ginal cost, CQ, is determined by the intersection of industry’s MC and MR at point C. The market
share of each firm can be obtained by drawing a line from point C and parallel to X-axis through mc 2 and mc 1 to the Y-axis.
The points of intersection c 1 and c 2 determine the level of output for Firm A and B, respectively. Thus, the share of each of the two firms A and B, is determined at Oq 1 and Oq 2 , respectively, where Oq 1 + Oq 2 = OQ. Their total profit can be computed as (
price – ac) ¥ firm’s output. The profit so computed is maximum for each firm. Therefore, there is no motivation for the firms to change their price and output. This shows the stability of price and output in the collusive oligopoly. 7.8 THE GAME THEORY In the preceding section, we have discussed the classical models of strategic action and reaction among the oligopoly firms and the cartel system of price and output determination. We have also noted that none of the models explains satisfactorily the strategic actions and reactions of and interaction among the oligopoly firms to find a lasting solution to their profit maximization objective. But the search for a reasonable solution to this problem
does not end here. Classical theories show, in fact, only the beginning of the effort to analyse
the determination of the profit maximizing price and output in an oligopolistic market setting. In this section, we discuss the game theory approach to explain the strategic interaction among the oligopoly firms. This approach uses the apparatus of game theory—a math- ematical
technique—to show how oligopoly firms play their game of business.
The
first systematic attempt was made in this field by von Neumann and Margenstern. 46 Though their work was followed by many others,
Martin Shubik 47 is regarded as the ‘most prominent proponent of the game-theory approach’
who ‘seems to believe that the only hope for the development of a general theory of oligopoly is the games theory. 48 Though his hope does not seem to be borne out by further attempts in this area, the usefulness of game theory in revealing the intricate behavioural pattern of the oligopoly firms cannot be denied. Here, we present an elementary description of the game theory as applied to oligopoly. 49 We will first illustrate the nature of the problem faced by the oligopoly firms in their strategy formulation. 7.8.1 The Nature of the Problem:
Prisoners’ Dilemma The nature of the problem faced by the oligopoly firms is best explained by the Prisoners’ Dilemma Game. To illustrate prisoners’ dilemma, let us suppose that there are two persons, A and B who are partners in an illegal activity of match fixing. On a tip-
Check Your Progress 45. Distinguish between price leadership by a low-cost firm and that by a dominant firm. 46. What is barometric leader- ship? 47. What is meant by non-price competition? What form of competition takes place among the rival firms? 48. Describe collusive model of price determination. Does it work?
NOTES Self-Instructional Material 227 Market Structure and Pricing Decisions
off, the CBI arrests A and B on suspicion of their involvement in fixing cricket matches. They are arrested and
lodged in separate jails with no possibility of communication between them. They are being interrogated separately by the CBI officials with following conditions disclosed to them in isolation. 1. If you confess your involvement in match fixing, you will get a 5 year im- prisonment. 2. If you deny your involvement and your partner denies too, you will be set free for lack of evidence. 3. If

one of you confesses and turns approver, and other does not, then one who confesses gets a 2 year imprisonment, and one who does not confess gets 10 year imprisonment. Given these conditions, each suspect has two options open to him : (i) to confess, and (ii) not to confess. Now, both A and B face a dilemma on how to decide whether or not to confess. While taking a decision, both have a comman objective, i.e., to minimize the period of imprisonment. Given this objective, the option is quite simple that both of them deny their involvement in
match-fixing.
But, there is no certainty that if one denies, the other will also deny: the other may confess and turn approver. With this uncertainty, the dilemma in making a choice still remains. For example,
if A denies his involvement, and B confesses (settles for a 2 year imprisonment), then A gets a 10 year jail term. So is the case with B. If they both confess, then they get a 5 year jail term each. Then what to do? That is the dilemma. The nature of their problem of decision making is illustrated in the
following
Table 7.3 in the form of a 'pay-off matrix'. The pay-off matrix shows the pay-offs of their different options in terms of the number of years in jail.
Table 7.3: Prisoners' Dilemma B's Options Confess Deny A B A B Confess 5 5 2 10 A's Options A B A B Deny 10 2 0 0
Given the conditions, it is quite likely that both the suspects may opt for 'confession', because neither A knows what B will do, nor B knows what A will do. When they both confess, each gets a 5 year jail term. This is the second best option. For his decision to confess, A might formulate his strategy in the following manner. He
reasons: if I confess (though I am innocent), I will get a maximum of 5
year's
imprisonment. But, if I deny (which I must) and B confesses and turns I will get 10
year's
imprisonment. And, that will be the worst of
the worst. It is quite likely that suspect B also reasons in the same manner, even if he too is innocent. If they both confess, they would
avoid 10 year's
imprisonment, the maximum possible jail sentence under the law. This is the best they could achieve under the given conditions.
Relevance of Prisoners' Dilemma to Oligopoly. The prisoners' dilemma illustrates the nature of problems oligopoly firms are confronted with in the formulation of their business strategy with respect to strategic advertising, price cutting and cheating in case of a cartel.
Look at the nature of problems an oligopoly firm is confronted with when it plans to increase its advertisement expenditure (ad-expenditure for short). The basic issue is whether or not to increase the ad-expenditure. If the answer is 'do not increase', then the questions are: will the rival firms increase ad-expenditure or will they not?
And
if they do, what will be the consequences for the firm under consideration? And, if the answer is 'increase', then the following questions arise: what will be the reaction of the
NOTES 228 Self-Instructional Material Market Structure and Pricing Decisions
rival firms? Will they increase or will they not
increase their ad-expenditure? What will be the pay-off if they do not and what if they do? If the rival firms do increase their advertising, what will be the pay-off to the firm? Will the firm be a net gainer or a net loser? The firm will have to find the answer to these queries under the conditions of uncertainty. It will have to anticipate actions, reactions and counteraction by the rival firms and chalk out
to
own strategy. It is in case of such problems that the case of prisoners' dilemma becomes an illustrative example. 7.8.2 Application of Game Theory to
Oligopolistic Strategy
Let us now apply the game theory to our example of 'whether or not to increase ad- expenditure', assuming that there are only two firms, A and B, i.e., the case of a duopoly. We know that in all the games, the players have to anticipate the move made by the opposite player(s) and formulate their own strategy to counter
the different possible moves by the rival.
To apply the game theory to the case of 'whether or not to increase ad-expenditure' the firm needs to know or anticipate the following: (
i)
counter moves by the rival firm in response to increase in ad-expenditure by this firm, and (ii) the pay-offs of this strategy when (a) the rival firm does not react, and (b) the rival firm does make a counter move by increasing its ad-expenditure.

After this data is obtained, the firm will have to decide
on the best possible strategy for playing the game and achieving its objective of, say, increasing sales and capturing a larger share of the market. The best possible strategy in game theory is called the 'dominant strategy'. A dominant strategy is one that gives optimum pay-off, no matter what the opponent does. Thus, the basic objective of applying the game theory is to arrive at the dominant strategy.
Suppose that the possible outcomes of the ad-game under the alternative moves are given in the pay-off matrix presented in Table 7.4.
Table 7.4: Pay-off Matrix of the Ad-Game (Increase in sales in million
Rs.)
B's Options Increase Ad Don't increase A B A B Increase Ad 20 10 30 0 A's Strategy A B A B Don't increase 10 5 15 5
As the matrix shows, if Firm A decides to increase its ad-expenditure, and Firm B counteracts A's move by increasing its own ad-expenditure,
Firm A's sales go up by
Rs. 20 million and that of Firm B by Rs. 10
million. And, if Firm A increases its advertisement and B does not, then
Firm A's sales gain is Rs. 30 million and no gain to
Firm B. One can similarly find the pay-offs of the stategy 'Don't increase' in case of both
of firms.
Given the pay-off matrix, the question arises, what strategy should Firm A choose to optimize its gain from extra ad-expenditure, irrespective of counteraction by the rival Firm B. It is clear from the pay-off matrix that Firm A will choose the strategy of increasing the ad-expenditure because, no matter what Firm B does, its sales increase by at least Rs. 20 million. This is, therefore, the dominant strategy for Firm A. A better situation could be that when Firm A increases its expenditure on advertisement, Firm B does not. In that case, Firm A'
s sales could increase by Rs 30
million and sales of Firm B do not increase. But there is a greater possibility that firm B will go for counter- advertising in anticiption of losing a part of its market to Firm A in future. Therefore,
NOTES Self-Instructional Material 229 Market Structure and Pricing Decisions
a strategy based on the assumption that Firm B will not increase its ad-expenditure involves a great of uncertainty.
Nash Equilibrium.
In the preceding section, we have used a very simple example to illustrate the application of game theory to an oligopolistic market setting, with the simplifying assumptions: (i) that strategy formulation is a one-time affair, (ii) that
one firm initiates the competitive warfare and other firms only react;
and (iii) that
there exists a dominant strategy—a strategy which gives an optimum solution.
The
real-life situation is, however, much more complex. There is a continuous one-to-one and tit-for- tat kind of warfare. Actions, reactions and counteractions are regular phenomena. Under these conditions, a dominant strategy is often non-existent. To analyse this kind of situation, John Nash 50 , an American mathematician, developed a technique, known as Nash equilibrium.
Nash equilibrium technique seeks to establish that each firm does the best it can, given the strategy of its competitors and a Nash equilibrium is one in which none of the players can improve their pay-off given the strategy of the other players.
In case of our example, Nash equilibrium can be defined as one in which none of the firms can increase its pay-off (sales) given the strategy of the rival firm.
The Nash equilibrium can be illustrated by making some modifications in the pay-off matrix given in Table 7.4. Now we assume that action and
counter-action
between Firms A and B is a regular phenomenon and the pay-off matrix that appears finally is given in Table 7.5. The only change in the modified pay-off matrix is that if neither Firm A nor Firm B increases its ad-expenditure, then
pay-offs change from (15, 5) to (25, 5).
Table 7.5: Pay-off Matrix of the Ad-Game (increase in sales in million
Rs.)
B's Options Increase AD Don't increase A B A B Increase Ad 20 10 30 0 A's Strategy A B A B Don't increase 10 15 25 5

It can be seen from the pay-off matrix (Table 7.5) that Firm A has no more a dominant strategy. Its optimum decision depends now on what Firm B does. If Firm B increases its ad-expenditure, Firm A has no option but to increase its advertisement expenditure. And, if Firm A reinforces its advertisement, Firm B will have to follow
the
suit. On the other hand, if Firm B does not increase its ad-expenditure, Firm A does the best by increasing its ad-expenditure. Under these conditions, the conclusion that both the firms arrive at is to increase ad-expenditure if the other firm does so, and 'don't increase', if the competitor 'does not increase'. In the ultimate analysis, however, both the firms will decide to increase the ad-expenditure. The reason is that if none of the firms increases advertisement, Firm A gains more in terms of increase in its sales (Rs. 25 million) and the gain of Firm B is much less (Rs. 5 million only). And, if Firm B increases advertisement expenditure, its sales increase by
Rs. 10
million. Therefore, Firm B would do best to increase its ad-expenditure. In that case, Firm A will have no option but to increase its ad-expenditure.
Thus, the final conclusion that emerges is that both the firms will go for advertisement war. In that case, each firm finds that it is doing the best given what the rival firm is doing. This is the Nash equilibrium.
However, there are situations in which there can be more than one Nash equilibrium.
For example,
if we change the pay-off in the south-east corner from (25, 5) to (22, 8) each firm may find it worthless to wage advertisement war and may settle for 'don't increase' situation. Thus, there are two possible Nash equilibria.
Check Your Progress 49.
Describe briefly the use of game theory in pricing deci- sion. 50. What is meant by prisoner's dilemma? 51. What is the relevance of pris- oners' dilemma in oligopoly theory? 52. What is Nash equilibrium?

Concluding Remarks
What we have presented here is an elementary introduction to the game theory. It can be used to find equilibrium solution to the problems of oligopolistic market setting under different assumptions regarding the behaviour of the oligopoly firms and market conditions. 51 However, despite its merit of revealing the nature and pattern of oligopolistic warfare, game theory often fails to provide a determinate solution. 52 7.9
SUMMARY
z
This unit deals with market structure and pricing decisions—how price is determined in different kinds of
markets.
z
Market structure is classified on the basis of the degree of competition under four categories—(i) perfect competition, (ii) monopoly, (iii) monopolistic competition,
and (iv) oligopoly. These kinds of markets vary in their characteristics.
Profit is maximized at the level of output where MR = MC. z The method of
price determination varies depending on the nature of the market. However, the basic objective behind price determination is the same for all the firms in all kinds of market, i.e., profit maximization. z A perfectly competitive market is one
in which there is a large number of sellers of a homogenous product
and both sellers and buyers have perfect knowledge about the market and factors of production are perfectly mobile. z Under perfect competitions, individual firms have no power to fix the price of their own product. Price under perfect competition is determined by the market demand and market supply. Price so determined is called market price. All firms have to accept the market price and adjust their production to market price so as to maximize their profit. In the long-run all firms make only normal profit.
z
In contrast to perfect competition,
a monopoly market is one in which there is only seller of a product with no close substitute.
z Under monopoly, a monopoly firm has the power to determine the price of its own product. A monopoly firm faces AR and MR curves with negative slope, and normal AC and MC curves. A profit maximizing monopoly firm fixes it production at a level where MC = MR. Once profit maximizing output is determined, price is automatically determined, given the demand (or AR) curve. z A monopoly firm often faces more than one market with different demand curves and its total profit maximizing output cannot be sold in any one market. Then the monopolist has to charge
a different price in each market. This is called price discrimination

and the firm is called discriminatory monopoly. A discriminatory monopolist fixes price in such a way that it maximizes its profit in each market. That is, it fixes its price and allocate sale for each market such that in each market MC = MR.

z

Another category of market is characterised by monopolistic competition. A monopolistically competitive market is one in which there is a fairly large number of sellers selling differentiated product. In many respects, it has features of perfect competition. What differentiate monopolistic competition from perfect competition is a smaller number of sellers and product differentiation. Product is differentiated by brand name, trade mark, different quality and design, packaging, credit facility, after sale-service, warranty, etc. Theory of price and output determination is similar to that under monopoly. However, according to Chamberlin's theory, firms under monopolistic competition earn only normal profit in the long-run. In the short-run they may earn super normal profit.

NOTES Self-Instructional Material 231 Market Structure and Pricing Decisions z Yet another category of market is oligopoly—a market in which a small number of firms sell differentiated or homogenous product. Several models have been developed by the economists, viz., Augustine Cournot, Bertrand, Edgeworth, Stackleberg, Paul M. Sweezy, W. J. Baumol, and so on. However, none of these models establish conclusively the price and output determination in oligopoly. For example, Cournot's famous model of duopoly tells that firms supply equal share of the market and charge the same price. This result has been questioned. Sweezy's model does not deal with determination price and output. This model shows only that once a price is determined by the sellers, it tends to remain stable even if there is change in cost of production.

z

There are two other famous models of oligopoly: (i) Price leadership model, and (ii) Collusive model. Under price leadership model one of the firms takes lead in pricing the product and other firms follow. The price-leading firm may be a dominant firm, a low-cost firm or a barometric firm (the firm that works as a barometer for the industry). Under collusive model, oligopoly firms make their own association, like Trader's Association, called 'cartel'. The cartel determines the profit maximizing output for the industry as a whole. This output is so divided between the firms that each firms, given its demand curve and cost curves, maximizes its profit. The cartel often does not work, mainly because of cheating. z In ultimate analysis, economists find that price under oligopoly is indeterminate. Economists show through game theory using prisoners' dilemma that price under monopoly remains changing due to competition. 7.10 ANSWERS TO 'CHECK YOUR PROGRESS' 1. Market structure refers to classification of market on the basis of number of firms in an industry and the degree and nature of competition among the firms of the industry. 2. Market structure is classified on the basis of: (a) number of firms in the industry, (b) degree of competition, (c) nature of the product whether homogeneous or differentiated, (d) freedom to enter or exit the industry, and (e) knowledge about the market conditions. 3. Criteria used in determining or specifying the nature of the market are the same as mentioned in answer to Q. 2. 4. Degree of competition in the market is determined on the basis of the number of firms and the nature of the product-homogeneity and differentiation. 5. Perfect competition is defined as a form of market organisation in which a large number of small firms selling homogenous products compete for market share under the condition that there is free entry and exit of firms and both buyers and sellers have perfect information about the market conditions. 6. The characteristics of perfect competition include: (a) a large number of small firms, (b) homogenous product, (c) perfect mobility of factors of production,

NOTES 232 Self-Instructional Material Market Structure and Pricing Decisions (

d) free entry and free exit of firms, (e) perfect knowledge about the market conditions, and (f) no government intervention with market. 7. Homogeneity of product means that products (goods and services) sold by different firms are exactly the same so that consumers do not differentiate between the products supplied by different firms. For example, sugar sold by each firm is treated to be the same. 8. Market period or very short-run is defined as the period in which total production is fixed and the stocks of goods with each firm is given. 9. Short-run is defined as a period in which firms can increase their production only by employing more labour, capital remaining fixed; neither can new firms enter the industry, nor can old firms quit. 10. In the short run, a few firms can make abnormal profit if their short-run cost of production is lower than other firms. In the long-run, all the firms become equally efficient and have the same kind of AC and MC. Therefore, abnormal profit disappears. 11. Short-run is a period in which more of only variable input (e.g., labour) can be used to increase production and capital supply remains fixed. On the other hand, long-period is one in which more and more of both inputs—labour and capital— can be used to increase the total production. 12. While some firms under perfect competition make abnormal profit, in the long-run all the firms are able to use the same technology and their cost of production is equalised. Also in the long-run new firm enter the industry causing increase in supply and reduction in market price. This eliminates the abnormal profit. 13. A monopoly firm is one which is the single seller of a product which has no close substitute.

Yes, there can be monopoly if the number of firm is larger than one, provided a firm supplies the most of the market. For example, electricity company enjoys monopoly power, though generator supplying companies are there. 14. The factors that lead to monopoly power of a firm are (a)
legal restriction on entry of new firms, (b) control over the supply of key raw materials,
and (
c) size of the firm and economies of scale. 15. Profit maximization rules can be specified as (a) firm's MR = MC, and (b) condition (a) is satisfied under the condition of rising MC. 16. It is not necessary that a monopoly firm would always make a supernormal profit. In the short-run, it may incure even losses. 17. Price discrimination means charging different prices from different categories of consumers, e.g., (a) railway charges different fares for the same distance from 2nd class and 1st class travellers even though the additional facility is not commensurate with fare differentials, and (b) Delhi Electricity company charges a higher rate for higher consumers and a lower rate from low consumers. 18. The necessary conditions for prices discrimination are (a) different market have different demand curves, and (b) transfer of product from the lower price market to high price market is either not possible or is not permissible.
NOTES Self-Instructional Material 233 Market Structure and Pricing Decisions 19. Under the third degree of price discrimination the total market is divided on the basis of their demand ensure, e.g., AR and MR curves. 20. For answer, see section 7.4.5 (iii) and Fig. 7.7 of this unit. 21. The monopoly power of a firm is measured for (a) determining the kind of the market for analysing market structure, (b) determining whether controlling monopoly power is socially required. 22. The economists have used four criteria for measuring monopoly power: (a) number of firms, (b) concentration ratio, e.g., the ratio of market share, (c) excess profit, and (d) errors elasticity. 23. Concentration ratio is the ratio of market share concentrated with a single firm. The limitation of concentration ratio as a measure of monopoly power are following: (a) Conceptual and statistical problem in measurement. (b) It does not take into account the size of the market. (c) It does not reflect the competition from other industries. 24. Excess profit criterion is based on the level of per unit abnormal profit. The method of measuring monopoly power is given as: Monopoly power = (P – MR)/P, P = Price, and MR = Marginal revenue 25. Most of the features of monopolistic competition and perfect competition are the same or similar. However, monopolistic competition differs from perfect competition in two respects. 1. Under monopolistic competition, the number of firms though large, is less than that under perfect competition. 2. While product under perfect competition is homogeneous, product under monopolistic competition are differentiated. 26. Product differentiation is necessary for gaining monopoly power in respect of the product. Otherwise, there will be no competition as in perfect competition. 27. The rule of price determination is the same, e.g., profit minimization. For details see Section 7.6.3 and 7.6.4. 28. In the short-run, firms under monopolistic competition make abnormal profit. Abnormal
profit attracts new firms to the industry in the long-run.
New firms share the market of old firms. As a result, demand curve of rims shifts left word till it is tangent to its AC curve [see Fig. 7.9 (a)] and firms make only normal profit. 29. Non-price competition takes the form of increasing sales without altering the market price. Non-price competition takes, in general, the form of advertisement for sales promotion and product innovation. 30. [For answer, see Section 7.6.4 and Fig. 7.9 (a)]. 31. Selling cost is the cost made on sales promotion, including advertisement cost, extra payment to salemen, allowance to dealers, discount to customers, cost on display and exhibition gifts, better packing, etc. 32. Chamberlin's theory of price determination under monopolistic competition has the following limitations. (a) He assumes independent decisions by firm, but it is not so in reality. (b) He assumes firms do not learn from their past experience whereas they do.

NOTES 234 Self-Instructional Material Market Structure and Pricing Decisions (c) He assumes identical cost and revenue curves, which do not exist. (d) He assumes free entry, but the entry of a new firm is resisted by the existing ones. (e) Chamberlin's model is not found valid empirically. 33. Oligopoly is a form of organisation in which a small number of firms sell homogeneous or differentiated products. Oligopoly is the most common form of market organisation. 34. The factors that differentiate oligopoly from monopolistic competition are the following: (a) Teh number of firms under monopoly is large; under oligopoly, it is very small. (b) Under monopolistic competition product are differentiated, whereas it may be either case under an oligopoly. (c) There is free entry under monopolistic competition whereas entry is restricted under oligopoly. (d) Under oligopoly decision-making is interdependent, whereas it is independent under monopolistic competition. 35. Factors that create oligopoly in the market are (a) huge capital investment, (b) economies of scale, (c) patent rights, (d) merger and takeover, and (e) entry of new firms resisted. 36. There are different points of view on whether firms under oligopoly ever reach their equilibrium. While classical and neo-classical theories show that oligopoly firms do reach their equilibrium, modern theories show that equilibrium is indeterminate. 37. Cournot's model of oligopoly assumes that each firm believes that the rival firm will not react to its change in output and price. 38. According to Cournot's model of oligopoly, the market gets ultimately divided between the firms in the ratio of the number of firms plus one and a part of the market remains unsupplied. For instance, in case of duopoly—the case of two firms—market gets divided in three (2 + 1) parts. Each firm supplies one-third of the market and one-third of the market goes unsupplied. (For details, see section 7.7.3, Fig. 7.10 of the text). 39. The basic assumption of
Kinked demand curve model of oligopoly is that each rival
firm believes that if it
cuts down the price, rival firms would follow the cut and if it raises the price, other firms would
not change their price—they may even cut down the price. 40. The final conclusion of Sweezy's kinked demand curve model is that if price and output are once determined, oligopoly firms do not find it desirable to change the price and output, even if there is considerable change in cost of production. 41. Price leadership in oligopoly means that one of the firms takes the lead in determining the price and other firms follow. Price leadership may be merge spontaneously due to technical reasons or it may be assigned to a firm by other firms. 42. The case of price leadership by a dominant firm is the most common case of price leadership. 43. In case of price leadership by a low-cost firm, a low-cost firm determines the price of its product according to profit maximization rule (MR = MC).
The high- cost firms are then forced to accept the price determined by the low-cost firm.

NOTES Self-Instructional Material 235 Market Structure and Pricing Decisions 44. Price determination by the dominant firm can be described as follows. Suppose market demand curve for all small firms and the dominant firm is given. The dominant firm then finds the joint supply curve of small firms. By combining the market demand curve and supply curve of small firms, it finds the equilibrium price. Then the dominant firm works out the demand for its own product at different prices below the equilibrium price by subtracting the supply by small firms from the market demand curve. This gives the demand curve for the dominant firm. From its demand curve it finds its MR curve. Given its cost curves (AC and MC), the dominant firm determines the price for its own product where MR = MC. The price so determined applies to the small firms. 45. Under price leadership by a low-cost firm, price is determined by the low-cost firm on the basis of market demand curve (i.e., AR) and MR and its own MC curve. In contrast, a dominant firm derives the demand curve (AR) on the basis of market demand less supply by the small firms. Given the demand curve, MR curve can be derived. Rest of the method of price determination is the same. 46. Barometric leadership is the price leadership by a firm whose decisions are taken by other firms of the industry as the barometer of the market conditions. The reason is, the barometric firm is supposed to have better knowledge about the market, more reliable data on price and production, and to have ability to make predictions about the market conditions. 47. Non-price competition means competition among the firms on the basis of factors other than price or price wars. The most common forms of non-price competition are (a) product differentiation, (b) advertisement, (c) gifts and prizes to buyers, (d) warranty and after sale services, and (e) dealer discounts, etc. 48. Collusive model of price determination is based on the assumption that firms make their own association or a cartel. The cartel is assigned the task of determining the price for the member firms. Given the firms' individual cost curves and the market demand curve, the cartel determines the price and market share in such a way that each firm maximizes its own profit. 49. The economists have found that equilibrium price and output are not determined as precisely as suggested by the price theory. Rather, price remains indeterminate. Some economists have used a mathematical technique, called the game theory, to show that the game continues until one firm beats the rival firms. 50. The prisoners' dilemma is shown by assuming two prisoners' being arrested and prisoned without proof against them. They are offered incentive to turn approver against each other. Otherwise they will be jailed for a period. They face the dilemma whether or not to turn approver. They finally decide on the safe course of keeping quiet. 51. The relevance of the prisoners' dilemma in the competitive business world is that in a highly competitive environment and changing market conditions, business firms tend to take safe decisions. 52. In the business world, there are actions, reactions and counteractions and acontinuous warfare. Under these conditions, there is no dominant strategy. One American mathematician, John Nash, developed a technique to show that each firm adopts a safe strategy and does what is best in its own interest. This is called Nash equilibrium.

NOTES 236 Self-Instructional Material Market Structure and Pricing Decisions 7.11 EXERCISES AND QUESTIONS 1. Distinguish between (i) Monopoly and Monopolistic Competition; and (ii) Oligopoly and Monopolistic Competition. 2. Why is a firm under perfect competition a price-taker and not a price-maker? 3. Why is profit maximum at a level of output where MC = MR? Is profit always maximum when MC = MR? 4. Distinguish between market period, short-run and long-run. Does the consideration of 'period' affect price policy? 5. Can a monopolist charge any price for his product? Give reasons for your answer. 6. Show that price is higher and output smaller under monopoly compared to those under perfect competition. 7. 'Equilibrium under oligopoly is indeterminate'. Comment. 8. What is kinked demand curve analysis? What purpose does it serve in economic analysis? 9. What is meant by price discrimination? State the necessary conditions for price discrimination. Illustrate the third degree price discrimination assuming two different markets. 10. Define dominant 'price leadership' model and discuss its advantages. 11. What is discriminating monopoly? Under what conditions is discrimination possible and profitable? 12. Discuss the excess-profit as a measure of 'the degree of monopoly'. What forces limit the pure monopolist's market powers? 13. Show how the firm's equilibrium, price and output of a monopoly firm are simultaneously determined in the long run. 14. What are the sources of monopoly? Under what conditions is a monopoly justified? 15.

What are the characteristics of perfect competition? Distinguish between 'pure' and 'perfect' competition. 16.

Which of the following statements are true? (a) Under perfect competitions, all firms earn only normal profit. (b) Efficiency is the source of natural monopoly. (c) The slope of MR is twice the slope of AR. (d) A monopoly firm always earns abnormal profit. (e) Oligopoly firms always earn normal profit. [Ans. (a), (b) and (c)] 17. Even though AR = AC in both monopolistic competition and perfect competition, which of the two market situations is preferable from the society's point of view and why? 18.

What is the basic difference between monopolistic competition and oligopoly? In which of the two kinds of the markets are price and output

determinate? 19. Describe the assumptions underlying the kinked demand model of oligopoly. How does the kinked demand curve lead to price rigidity in an oligopolistic market? 20. Under which of the following conditions is the profit of a firm under monopolistic competition maximum? (a) AR – AC is maximum (b) AR = AC (c) MR = MC, or (d) AR < MR.

NOTES Self-Instructional Material 237 Market Structure and Pricing Decisions 21. A monopoly firm has to supply two markets with two different demand functions as given below. P 1 = 500 – Q 1 P 2 = 300 – Q 2 where P 1 and P 2 are prices and Q 1 and Q 2 are quantities in two markets, respectively. Firms total cost function is given as TC = 50,000 – 100Q Find (a) profit maximizing output, (b) allocation of output between the two markets, (c) prices for two markets, and (d) total profit at profit maximizing output. 22. Suppose demand curve for a monopoly
firm is given as P = 405 – 4Q and its total cost (TC) function is given as TC = 40 + 5Q + Q 2 Find the
following. (a) profit maximizing output (b) profit maximizing price (c) total revenue function, and (d) average revenue function. 23.
Suppose that the demand curve for the firms under monopolistic competition is given as Q 1 = 100 – 0.5 P
And the total cost function is given as TC = 1562.50 + 5Q – Q 2 + 0.05Q 3 When some new firms enter the industry, the demand function for each firm changes to Q 2 = 98.75 – P 2 (i) Find whether there was any motivation for the new firms to enter the industry in the long-run. (ii) What is the equilibrium price and output in the long-run? (Note. Compare your answer with the problem in the text) 24. The demand curve for oligopoly firms is given as by the function D 1 = 50 – 0.5 P 1 The firms however believe that their individual demand function is D 2 = 80 – P 2 Their cost function (identical) is given as TC = 150 + 10 Q + 0.05 Q 2 . (i) Find the initial level of price and output, and (ii) What is the range of variation in MC which will not affect the price and output. 25. Suppose there are two oligopoly firms—Firm 1 and Firm 2.
Firm 1 is a low-cost firm whereas Firm 2 is a high-cost firm.
Both the firms face an identical demand curve given by the demand function as Q = 50 – 0.5P The cost functions of the two firms are given, respectively, as TC 1 = 100 + 20Q 1 +2Q 1 2 and TC 2 = 48 + 36Q 2 + 2Q 2 2 . Find the following: (a) Price and output of the firms separately prior to Firm 1 working as the price leader.
NOTES 238 Self-Instructional Material Market Structure and Pricing Decisions (b) Price and output of Firm 2 after it accepts the price leadership of Firm 1. 26. Suppose there are five firms in an oligopoly market, one of them being a dominant one. The market demand function
is given as Q M = 200 – 2P and the supply function of 4 small firms together is given as Q S = 20 + P. The
cost function of the dominant firm reads as follows TC b = 100 + 12Q + 0.25Q 2 . Find the following. (a) Total supply by 4 small firms and the supply price. (b) Price and output of the dominant firm. (c) Total market share of four small firms after dominant firm fixes its price. 7.12 FURTHER READING
Baumol William J., Economic Theory and Operations Analysis, 4th Edn., Prentice-Hall of India, New Delhi, 1985.
Bilas Richard, A., Microeconomic Theory, 2nd Edn., McGraw-Hill, 1971. Brigham Eugene F. and James L. Pappas, Managerial Economics, 2nd Edn., Dryden Press, Hinsdale Ill. 1972. Davis, R. and S. Chang, Principles of Managerial Economics, Prentice Hall, N.J., 1986. Ferguson, C.F., Microeconomic Theory, 3rd Edn., Richard D. Irwin, Homewood, Ill. 1972. Leftwich, Richard, H., The Price System and Resource Allocation, 5th Edn., Dryden Press, Hinsdale, Ill. 1973. Mansfield, Edwin, Managerial Economics :Theory, Application and Cases, W.W. Norton, New York, 3rd Edn., 1996. Spencer, Milton, H., Managerial Economics, Richard D. Irwin Homewood, Ill. 1968. Salvatore, D., Managerial Economics, McGraw-Hill, 1989. Seo, K.K., Managerial Economics, Richard D. Irwin, Ill. 1992. Watson, Donald, S., Price Theory and its Uses, 3rd Edn., Houghton Mifflin, Boston, 1968. Webb, Samuel C., Managerial Economics, Houghton Mifflin, Boston, 1976. References 1.
Managerial Economics, Prentice-Hall, Englewood Cliffs, N.J., 1951. 2.
The Theory of Monopolistic Competition, Harvard University Press, Mass, 1933. 3. D.S
Watson,
Price Theory and its Uses, Scientific Book Agency, Calcutta 1967, p. 294. 4. C.E.
Feguson,
Macroeconomic Theory, Richard D. Irwin, Illinois, 1972, p. 28 5. Proof.
Let us suppose a linear demand (
or average revenue) function
as P = a – bQ, where b is
slope of the demand curve. Then the total revenue equation will be TR = Q. P = Q (a – bQ) = aQ – bQ 2 Since MR equals the first derivative of the TR equation,
NOTES Self-Instructional Material 239 Market Structure and Pricing Decisions
TR Q ∂ ∂ =
a – 2 bQ Obviously the slope of MR curve is – 2b whereas the slope of A = – b. Thus the rate of fall in MR is twice that of AR. 6.
A study of medical doctors in the US by Ruben A. Kessel, “Price Discrimination in Medicine,” JL of Law and Eco., October 1959, reveals that charity, not profit maximization, is the objective of price discrimination. The idea behind charging a higher fee from the rich patients is to finance the treatment of poor. This is however a rare phenomenon. 7.
Joan Robinson call it ‘perfect discrimination’ from a monopolist’s point of view. 8.

Consumer surplus is the difference between the price a consumer is willing to
pay
and
price he actually pays. 9.
Alex Hunter, Measurement of Monopoly Power in 'Monopoly and Competition', ed. By Alex Hunter, Penguin Book, 1970, p. 92. 10. Fritz Maclup,
The Political Economy of Monopoly, The Johns Hopkins Press, Baltimore, 1952, p. 470. 11. A. Hunter, op. cit., p. 101. 12. Ibid. 13. Fritz Maclup, op. cit., p. 477. 14. A. Hunter, op. cit., p. 102. 15. "The Concept of Monopoly and the Measure of Monopoly Power," Review of Economic Studies, June 1934. 16.
E.H. Chamberlin, The Theory of Monopolistic Competition, Harvard University Press, Cambridge,
Mass., 1933. 17. op. cit. 18. E. Mansfield, Managerial Economics : Theory, Applications and Cases, op. cit., p. 413. 19. It is argued that the demand curve under monopolistic competition is indeterminate. However, for analytical convenience, it is assumed that the firms under monopo- listic competition face an identical downward sloping demand curve. 20. The other important change is increase in advertisement cost. 21. For a detailed analysis of 'free entry' and 'price competition' and of their combined effects, see author's Microeconomic Theory (Vikas Publishing House, New Delhi, 1997), Unit 17. 22. Whether slope of the AR increases or not is a matter of empirical verification. However, the theory of pricing under monopolistic competition assumes that at least the firms believe
that the demand curve for their product is more elastic than the market demand curve. 23.
Alternatively, Eq. (12.22) can be solved for Q 1 by setting the equation equal to zero. Thus, 0.15Q 1 2 + 2Q 1 – 195 = 0 Multiplying both sides by 20, we get an equation as = 3Q 2 + 40Q 1 – 3900 = 0 By using quadratic formula, we get Q = 40 1600 12 3900 6 – ± + × = 40 1600 46800 6 – ± +
NOTES 240 Self-Instructional Material Market Structure and Pricing Decisions = 40 220 6 – ± Q = 30 24.
K.J. Cohen, and R.M. Cyert, Theory of the Firm, New Delhi, Prentice-Hall of India, 1976,
p. 230. 25. Ibid., pp. 229-30. 26. Ibid. 27. The term 'oligopoly' has been
derived from two Greek words : Oligi meaning 'a few', and polein meaning 'sellers'. Thus, oligopoly is a market setting in which there are
only a few sellers. 28. D. Salvatore, Managerial Economics, N.Y., McGraw-Hill, 1989, p. 475. 29. On the basis of data published by the CMIE in August 1999 issue of its Industries and Market Share. 30. The 'concentration ratio' is the measure of degree by
which a small number of firms dominate the industry. It is
the percentage share of dominant (4 to 12) firms in the total sale of the industry. The US Census of manufacturing uses 4, 8 and 12 firms for working out the concentration ratio. 31. Market share of individual firms vary to a great extent. For example, in 1997-98, Hindustan Lever had a share of 74% of the ice cream market; Surya Roshni had 61% share in fluorescent lamp market; MUL had 76.1% market share in passenger cars; and ITC had 75.38% market share in cigarettes. 32.
Microeconomic Decisions, Houghton Miflin Company, Boston, 1976, p. 249. 33. The month in which automobile manufacturers introduce new models. 34.
W.J. Baumol,
Economic Theory and Operations Analysis, New Delhi, Prentice Hall of India, 4
th edn., 1985, p. 410. 35. W.J. Baumol, op. cit., p. 410 36. Augustine Cournot, Research
into the Mathematical Principles of the Theory of Wealth, Translation by Nathaniel T. Bacon, New York, Macmillan, 1897. 37. Under zero cost condition, the total revenue is the same as the total profit. 38. Note that where MR = 0, e = 1, i.e., PM/PD = 1 = QM/OQ.
This means, PM = PD and QM = OQ. 39. Paul M. Sweezy, "Demand under Conditions of Oligopoly", Jl. of Pol. Eco., August 1939, pp. 568–573. 40. R.L. Hall and C. J. Hitch, "Price Theory and Price Behaviour", Oxford University Papers, May 1939. 41. The firm's demand curve is identical to that of the rival firms. 42.
George Stigler, "The kinky Oligopoly Demand Curve and Rigid Prices", Jl. of
Pol. Eco., October 1997, pp. 432—40. 43. Julian Simon, "A further Test of the Kinky Oligopoly Demand Curve", Am. Eco. Rev., December, 1969, pp. 971—75. 44.
A.D.H. Kaplan, Joel B. Dirlam, and Robet F. Lanzillotti, Pricing in Big Business, Washington, D.C. the Brooking Institution, 1958, p. 206. Quoted in Cohen and Cyret, op. cit. 45. Leftwitch, op. cit., p. 184. 46. Von Neumann and Margenstern. Theory of Games and Economic Behaviour, 1944. 47.
See Martin Shubik, Strategy and Market Structure, John Wiley, 1959, and his Game Theory in the Social Sciences (Cambridge, Mass, MIT Press, 1982). 48. A.
Koutsoyiannis, Modern Macroeconomics, 2nd Edn., Macmillan London, 1979. p. 404.
NOTES Self-Instructional Material 241 Market Structure and Pricing Decisions 49.

For a comprehensive discussion on the game theory and its application to oligopolistic behaviour, see James W. Friedman, Game Theory with Application to Economics, NY, Oxford University Press, 1990, David Krepps, A Course in Microeconomic Theory (N.J., Princeton University Press, 1990). For a brief discussion on and application of game theory to oligopoly, see Robert S. Pindyck and Daniel L. Rubinfeld, Microeconomics. Prentice–Hall of India, New Delhi, 1995, Third Edn., Unit 13, and F.M. Scherer, Industrial Market Structure and Economic Performance, Chicago, Rand McNally, 1980, pp. 160–164. 50. The technique of finding equilibrium where there is no 'dominant strategy', called 'Nash equilibrium' was developed by John Nash, an American Mathematician, in 1951. 51.
The interested reader may refer to the advanced references (see foot note 49.) 52. E.K. Browning, and J.K. Browning, Microeconomic Theory and Application, London, Scott, Foresman & Co., 1989, 3rd Edn., p. 413.
NOTES Self-Instructional Material 243 Pricing Strategies and Practices UNIT 8 PRICING STRATEGIES AND PRACTICES Structure 8.0 Introduction 8.1 Unit Objectives 8.2 Cost-plus Pricing 8.2.1
Cost-plus Pricing and Marginal Rule
Pricing 8.3 Multiple Product Pricing 8.4 Pricing In Life-cycle of a Product 8.4.1 Pricing
a New Product; 8.4.2 Pricing in Maturity Period 8.4.3 Pricing a Product in Decline 8.5 Pricing
in Relation to Established Products 8.5.1
Pricing Below the Market Price; 8.5.2 Pricing at Market Price 8.5.3 Pricing Above the Existing Market Price 8.6
Transfer Pricing 8.6.1 Transfer Pricing without External Market; 8.6.2 Transfer Pricing with External Competitive Market;
8.6.3 Transfer Pricing Under Imperfect External Market 8.7 Competitive Bidding of Price 8.7.1 Major Factors in Competitive
Bidding; 8.7.2 Determining the Competitive Bid 8.8 Peak Load Pricing 8.9.1 Problems in Pricing; 8.9.2 Double Pricing
System 8.9 Summary 8.10 Answers to 'Check Your Progress' 8.11 Exercises and Questions 8.12 Further Reading 8.0
INTRODUCTION Pricing theory under the profit maximization hypothesis suggests that, given the revenue and cost curves, price and output are so determined that profit is
maximised. Some empiricists have, however, produced the evidence, inadequate though, that firms follow a pricing rule other than the one suggested by the marginality, rule. Besides,
in a complex business world, business firms follow a variety of pricing rules and methods depending on the conditions faced by them.
In this chapter, we will discuss some important pricing strategies and pricing practices. 8.1
UNIT OBJECTIVES z To show that pricing practices often differ from pricing theory z To discuss various pricing practices of business firms z To show how firms price their product used by themselves
NOTES 244 Self-Instructional Material
Pricing Strategies and Practices 8.2
COST-PLUS
PRICING Cost-plus pricing is also known as 'mark-up pricing', 'average cost pricing' or 'full cost pricing'. The cost-plus pricing is the most common method of pricing used by the manufacturing firms. The general practice under this method is to add a 'fair' 1 percentage of profit margin to the average variable cost (AVC). The formula for setting the price is given as P = AVC + AVC (m) ...(8.1) where AVC = average variable cost, and m = mark-up percentage, and AVC(m) = gross profit margin (GPM). The mark-up percentage (m) is fixed so as to cover average fixed cost (AFC) and a net profit margin (NPM). Thus, AVC (m) = AFC + NPM ...(8.2) The procedure for arriving at AVC and price fixation may be summarized as follows. The first step in price fixation is to estimate the average variable cost. For this, the firm has to ascertain the volume of its output for a given period of time, usually one accounting or fiscal year. To ascertain the output, the firm uses figures of its 'planned' or 'budgeted' output or takes into account its normal level of production. If the firm is in a position to compute its optimum level of output or the capacity output, the same is used as standard output in computing the average cost. The next step is to compute the total variable cost (TVC) of the 'standard output.' The TVC includes direct cost, i.e., the cost of labour and raw material, and other variable costs. These costs added together give
the total
variable cost. The 'Average Variable Cost' (AVC) is then obtained by dividing the total variable cost (
TVC) by
the 'standard output' (Q), i.e., AVC =
TVC
Q After AVC is obtained, a 'mark-up' of some percentage of AVC is added to it as profit margin and the price is fixed. While determining the mark-up, firms always take into account 'what the market will bear' and the competition in the market. 2 8.2.1
Cost-Plus Pricing
and Marginal Rule Pricing

The cost-plus pricing method appears to be a ‘rule of thumb’ totally different from the marginalist rule of pricing. Fritz Machlup has, however, shown that mark-up pricing is not incompatible with the marginalist rule of pricing. Rather, it is very much compatible with marginalist rule of pricing. According to Machlup, when we look
into the logic of mark-up pricing, it appears quite similar to the marginalist rule of pricing. We have earlier noted that profit is maximum at the level of output where MC = MR. We have also noted that the mark-up pricing method is given by P = AVC + AVC (m) or P = AVC (1 + m) ...(8.3) Let us now show that the mark-up pricing ultimately converges to the marginalist rule of pricing at least under constant cost conditions. Recall that profit is maximum where MC = MR and MR = ⎪⎭⎪⎬⎪⎩⎪⎨⎧ – e
P 1 1 ...(8.4)
NOTES Self-Instructional Material 245 Pricing Strategies and Practices
or MR = 1e P e – ⎭⎬⎩⎨ ⎪⎪ ...(8.5) By substituting Eq. (8.5) in Eq. (8.4), we may restate the necessary condition of profit maximization as MC = 1
e P e – ⎭⎬⎩⎨ ⎪⎪ ...(8.6)
If MC is constant, then MC = AVC. By substituting AVC for MC, Eq. (8.6) may be rewritten as, AVC = 1
e P e – ⎭⎬⎩⎨ ⎪⎪ ...(8.7) By rearranging the terms in Eq. (8.7), we get P = 1e AVC e – ⎭⎬⎩⎨ + ⎪⎪ or P = 1 e AVC e ⎭⎬⎩⎨ ⎪⎪ – ...(8.8) Now, consider Eq. (8.6). If MC < 0, then 1e P e – ⎭⎬⎩⎨ ⎪⎪ must be greater than 0. For 1e P e – ⎭⎬⎩⎨ ⎪⎪ to be greater than 0, e must be greater than 1. This implies that profit can be maximised only when e < 1. The logic to this conclusion can be provided as follows. Given the Eq. 8.5 and Eq. 8.6, if e = 1, MR = 0, and if e > 1, MR > 0. It means that if MR > 0 and MC < 0, or in other words, when MR
π
MC, then the rule of profit maximization breaks down. Thus, profit can be maximized only if e < 1, and MC < 0. Now if e < 1, then the term e/(e – 1) will always be greater than 1 by an amount, say m. Then 1 e e – = (1 +
m) ...(8.9)
By substituting term (1 + m) in Eq. (8.9) for e/(e – 1) in Eq. (8.7), we get P = AVC (1 + m) ...(8.10) where m denotes the mark-up rate. Note that Eq. (8.10) is exactly the same as Eq. (8.3). This means that the mark-up rule of pricing converges into the marginalist rule of pricing. In other words, it is proved that the mark-up pricing method leads to the marginalist rule of pricing. However, m in Eq. (8.3) and in (8.9) need not the same. Limitations of Mark-up Pricing Rule. The cost-plus pricing
has certain limitations, which should be borne in mind while using this
method for price fixation. First, cost-plus pricing assumes that a firm’s resources are optimally allocated and the standard cost of production is comparable with the average of the industry. In reality, however, it may not be so and cost estimates based on these assumptions may be an overestimate or an underestimate. Under these conditions pricing may not be commen- surate with the objective of the firm. Second, in cost-plus pricing, generally, historical cost rather than current cost data are used. This may lead to under-pricing under increasing cost conditions and to over- pricing under decreasing cost conditions, which may go against the firm’s objective. Third, if variable cost fluctuates frequently and significantly, cost-plus pricing may not be an appropriate method of pricing.
NOTES 246 Self-Instructional Material Pricing Strategies and Practices
Finally, it is also alleged that cost-plus pricing ignores the demand side of the market and is solely based on supply conditions. This is, however, not true, because the firm determines
the mark-up on the basis of ‘what the market can bear’ and
it does take into account the elasticity aspect of the demand for the product, as shown above. 8.3 MULTIPLE PRODUCT PRICING The price theory or
microeconomic models of price determination are based on the assumption that a firm produces a single, homogeneous product. In actual practice, however, production of a single homogeneous product by a firm is an exception rather than a rule.
Almost all firms have more than one product in their line of production.
Even
the most specialized firms produce a commodity in multiple models, styles and sizes, each so much differentiated from the other that each model or size of the product may be considered a different product.
For example, the various models of refrigerators, TV sets, radio and
car models
produced by the same company may be treated as different products for at least pricing purpose.
The
various models are so differentiated that consumers view them as different products 3 and in some cases, as perfect substitutes for each other.

It is, therefore, not surprising that each model or product has different AR and MR curves and that one product of the firm competes against the other product. The pricing under these conditions is known as multi-product pricing or product-line
pricing.
The major problem in pricing multiple products is that each product has a separate demand curve. But, since all of them
are produced under one organization by interchangeable production facilities,
they have only one inseparable marginal cost curve.
That is, while revenue curves, AR and MR, are separate for each product, cost curves, AC and MC, are inseparable. Therefore, the marginal rule of pricing cannot be applied straightaway to fix the price of each product separately. The problem, however, has been provided with a solution by E.W. Clemens. 4
The solution is similar to the one employed to illustrate third degree price discrimination. As a discriminating monopoly tries to maximize its revenue in all its markets, so does a multi- product firm in respect of each of its products.
Fig. 8.1: Multi-Product Pricing
To illustrate the multiple
product pricing, let us suppose that a firm has four different products—A, B, C and D in its line of production. The AR and MR curves for the four goods are shown in four segments of Fig. 8.1. The marginal cost for all the products taken together is shown by the curve MC, which is the factory marginal cost curve. Let us suppose that when the MRs for the individual products are horizontally summed up, the aggregate MR (not given in the figure) passes through point C on the MC curve. If a line parallel to the X-axis, is drawn from point C to the Y-axis through the MRs,

the intersecting points will show the points where MC and MRs are equal for each product, as shown by the line EMR, the Equal Marginal Revenue line. The points of intersection between EMR and MRs determine the output level and price for each product. The output of the four products are given as OQ 1 of product A; Q 1 Q 2 of B; Q 2 Q 3 of C; and Q 3 Q 4 of D. The respective prices for the four products are: P 1 Q 1 for product A; P 2 Q 2 for B; P 3 Q 3 for C, and P 4 Q 4 for D. These price and output combi- nations maximize the profit from each product and hence the overall profit of the firm.
8.4
PRICING
IN LIFE-CYCLE OF A PRODUCT
The life-cycle of a product is generally divided into five stages: (i) Introduction
or initial stage, (ii) Growth, (iii) Maturity, (iv) Saturation, and (v) Decline.
Fig. 8.2 presents the five stages of a product's life-cycle through a curve showing the behaviour of the total sales over the life cycle.
The introduction phase is the period taken to introduce the product to the market. The total sale during this period is limited to the quantity put on the market for trial with considerable advertisement. The sales during this period remain almost constant. Growth is the stage, after a successful trial, during which the product gains popularity among the consumers and sales increase at an increasing rate as a result of cumulative effect of advertisement over the initial stage. Maturity is
the stage in which sales continue to increase but at a lower rate and the total sale eventually becomes constant. During the saturation period the total sale saturates—there is neither increase nor decrease in the sales volume. After the saturation stage, comes the stage of decline in which
the total sales register a declining trend
for such reasons as (i) increase in the availability of substitutes, and (ii) the loss of distinctiveness of the product.
Fig. 8.2: Life-Cycle
of a Product The pricing strategy varies from stage to stage over the life-cycle of a product, depending on the market conditions. From the pricing strategy point of view, growth and maturity stages may be treated likewise.
We have first discussed the pricing of a product in its initial stage as pricing of a new product and then in the 'maturity' and 'decline' stage. 8.4.1
Pricing a New Product A new product may simply be either another brandname added to the existing ones or an altogether new product. Pricing a new brand for which there are many substitutes available in the market is not as big a problem as pricing a new product for which close substitutes are not available.
For, in case of
the former, market provides adequate information regarding cost, demand, and availability of market, etc. Pricing in this case depends on the nature of the market. In pricing a new product without close substitutes, however, problems arise because, for

lack of information, there is some degree of uncertainty. Thus, pricing policy in respect of a new product depends on whether or not close substitutes are available. Depending on whether or not close substitutes are available, in
Check Your Progress 1. What is the formula for cost- plus pricing? 2. Is cost plus pricing rule different from marginalist rule? 3. Describe the method of pricing multiple products of a firm. 4. What are the stages in the life cycle of a product?
NOTES 248 Self-Instructional Material Pricing Strategies and Practices
pricing
a new product, generally two kinds of pricing strategies are suggested, viz., (i) skimming price policy; and (ii) penetration price policy. (
i)
Skimming price policy. The skimming price policy is adopted where close substitutes of a new product are not available. This pricing strategy is intended to skim the cream of the market, i.e., consumer's surplus, by setting a high initial price, three or four times the ex-factory price, and a subsequent lowering of prices in a series of reduction, especially in case of consumer durables. The initial high price would generally be accompanied by heavy sales promoting expenditure. This policy succeeds
for
the following reasons. First, in the initial stage of the introduction of product, demand is relatively inelastic because of consumers' desire for distinctiveness by the consumption of a new product. Second, cross-elasticity is usually very low for lack of a close substitute. Third, step-by-step price-cuts help skimming consumers' surplus available at the lower segments of demand curve. Fourth, high initial prices are helpful in recouping the development costs. The post-skimming strategy includes the decisions regarding the time and size of price reduction. The appropriate occasion for price reduction is the time of saturation of the top-level demand or when a strong competition is apprehended. As regards the rate of price reduction, when the product is on its way to losing its distinctiveness, the price-cut should be appropriately larger. But, if the product has retained its exclusiveness, a series of small price reductions would be more appropriate. (
ii)
Penetration price policy. In contrast to skimming price policy, the penetration price policy involves a reverse strategy. This pricing policy is adopted generally in the case of new products for which substitutes are available. This policy requires fixing a lower initial price designed to penetrate the market as quickly as possible and is intended to maximize the profits in the long-run. Therefore,
the firms pursuing the penetration price policy set a low price of the product in the initial stage. As the product catches the market, price is gradually raised up. The success of penetration price policy requires the existence of the following conditions. First, the short run demand for the product should have an elasticity greater than unity. It helps in capturing the market at lower prices.
Second, economies
of large-scale production are available to the firm with the increase in sales. Otherwise, increase in production would result in increase in costs which might reduce the competitiveness of the price. Third, the
potential market for the product is fairly large and has a good deal of future prospects. Fourth,
the
product should have a high cross-elasticity in relation to rival products for the initial lower price to be effective. Finally, the
product, by nature should be such that it can be easily accepted and adopted by the consumers.
The choice between the two strategic price policies depends on (i) the rate of market growth; (ii) the rate of erosion of distinctiveness; and (iii) the cost-structure of the producers.
If the rate of market growth is slow for such reasons as lack of information, consumers' hesitation, etc., penetration price policy would be unsuitable. The reason is a low price will not
mean a large sale.
If the pioneer product is likely to lose its distinctiveness at a faster rate skimming price policy would be unsuitable: it should be followed when lead time, i.e., the period of distinctiveness is fairly long. If cost-structure
NOTES Self-Instructional Material 249 Pricing Strategies and Practices shows increasing returns over time, penetration price
policy would be more suitable, since it enables the producer to reduce his cost and prevents potential competitors from entering the market in the short-run. 8.4.2

Pricing in Maturity Period Maturing period is the second stage in the life-cycle of a product. It is a stage between the growth period and decline period of sales. Sometimes maturity period is bracketed with saturation period. Maturity period may also be defined as the period of decline in the growth rate of sales (not the total sales) and the period of zero growth rate. The concept of maturity period is useful to the extent it gives out signals for taking precaution in regard to pricing policy. However, the concept itself does not provide guidelines for the pricing policy. Joel Dean 5 suggests that the "first step for the manu- facturer whose speciality is about to slip into the commodity category is to reduce real ... prices as soon as the system of deterioration appears." But he warns that "this
does not mean that the manufacturer should declare open price war in the industry". He should rather move in the direction of "product improvement and market segmentation". 8.4.3
Pricing a Product in Decline The product in decline is one that enters the post-maturity stage. In this stage, the total sale of the product starts declining. The first step in pricing strategy in this stage is obviously to reduce the price. The product should be reformulated and remodelled to suit the consumers' preferences. It is a common practice in the book trade. When the sale of a hard-bound edition reaches saturation, paper-back edition is brought into the market. This facility is, however, limited to only a few commodities. As a final step in the strategy, the advertisement expenditure may be reduced drastically or withdrawn completely, and rely on the residual market. This, however, requires a strong will of the producer. 8.5 PRICING
IN RELATION TO ESTABLISHED PRODUCTS Many producers enter the market often with a new brand of a commodity for which a number of substitutes are available. For example, the cold drinks like Coke and Spot, were quite popular in the market when new brands of cold drinks like Limca, Thums Up, Double Seven, Mirinda, Pepsi, Teem, Campa, etc., were introduced in the market over time. So has been the case with many consumer goods. Many other models of motor cars appeared in the market despite the popularity of Maruti cars.
A new entrant to the market faces the problem of pricing his product
because of strong competition with established products. This problem of pricing of a new brand is known as pricing in relation to the established products.
In pricing a product in relation to its well established substitutes, generally three types of pricing strategies are adopted, viz., (i) pricing below the ongoing price, (ii) pricing at par with the prevailing market price, and (iii) pricing above the existing market price. Let us now see which of these strategies are adopted under what conditions. 8.5.1 Pricing Below the Market Price Pricing below the prevailing market price of the substitutes is generally preferred under two conditions. First, if a firm wants to expand its product-mix with a view to utilizing its unused capacity in the face of tough competition with the established brands, the strategy of pricing below the market price is generally adopted. This strategy gives the new
NOTES 250 Self-Instructional Material Pricing Strategies and Practices
brand an opportunity to gain popularity and establish itself. For this, however, a high cross- elasticity of demand between the substitute brands is necessary. This strategy may, however, not work if existing brands have earned a strong brand loyalty of the consumers. If so, the price incentive from the new producers must, therefore, overweigh the brand loyalty of the consumers of the established products, and must also be high enough to attract new consumers. This strategy is similar to the penetrating pricing. Second, this technique has been found to be more successful in the case of innovative products. When the innovative product gains popularity, the price may be gradually raised to the level of market price. 8.5.2
Pricing at Market Price Pricing at par with the market price of the existing brands is considered
to be the most reasonable pricing strategy for a product which is being sold in a strongly competitive market. In such a market, keeping the price below the market price is not of much
avail because the product can be sold in any quantity at the existing market rate. This strategy is also adopted when the seller is not a 'price leader'. It is rather a 'price-taker' in an oligopolistic market. This is, in fact, a very common pricing strategy—rather the most common
practice. 8.5.3 Pricing Above the Existing Market Price This strategy is adopted when
a seller intends to achieve a prestigious position among the sellers in the market. This is a more common practice in case of products considered to be a commodity of conspicuous consumption or prestige goods or deemed to be of much superior quality. Consumers of such goods prefer shopping in a gorgeous shop of a posh locality of the city. This is known as the 'Veblen Effect'. Sellers of such goods rely on their customers' high propensity to consume a prestigious commodity. After the seller achieves the distinction of selling high quality goods, though at a high price, they may sell even the ordinary goods at a price much higher than the market price. This practice is common among sellers of readymade garments.
Besides, a firm may sets a high price for its product if it pursues the 'skimming price strategy'. This pricing strategy is more suitable for innovative products when the firm can be sure of the distinctiveness of its product. The demand for the commodity must have a low cross-elasticity in respect of competing goods. 8.6

TRANSFER PRICING The
large size firms divide their operation very often into product divisions or subsidiaries. Growing firms add new divisions or departments to the existing ones. The firms then transfer some of their activities to other divisions. The goods and services produced by the new division are used by the parent organisation. In other words, the parent division buys the product of its subsidiaries. Such firms face the problem of determining an appropriate price for the product transferred from one division or subsidiary to the
other. Specifically, the problem is of determining the price of a product produced by one division of the same firm. This problem becomes much more difficult when each division has a separate profit function to maximize. Pricing of intra-firm 'transfer product' is referred to as 'transfer pricing'. One of the most systematic treatments of the transfer pricing technique has been provided by Hirshleifer. 6 We will discuss here briefly his technique of transfer pricing. To begin with, let us suppose that a refrigeration company established a decade ago used to produce and sell refrigerators fitted with compressors bought from a compressor manufacturing company. Now the refrigeration company decides to set up its own subsidiary to manufacture compressors.
Let us also assume:
NOTES Self-Instructional Material 251 Pricing Strategies and Practices (i)
both parent and subsidiary companies have their own profit functions to maximize ; (ii) the refrigeration company sells its product
in a competitive market and its demand is given by a straight horizontal line;
and (iii)the refrigeration company uses all the compressors produced by its subsidiary.
In addition, we assume that there is no external market for the compressors. We will later drop this assumption and alternatively assume that there is an external market for the compressors and discuss the technique of transfer pricing under both the alternative conditions. Let us first discuss transfer pricing with no external market. 8.6.1
Transfer Pricing without External Market Given the foregoing assumptions, the refrigeration company has to set an appropriate price for the compressors so that the profit of its subsidiary too is maximum. To deal with the 'transfer pricing' problem, let us first look into the pricing and output deter- mination of the final product, i.e., refrigerators. Since the refrigeration company sells its refrige- rators presumably in a competitive market, the demand for its product is given by a straight horizontal line as shown by the line
AR r = MR r in Fig. 8.3. Fig. 8.3: Price Determination of the Final Product (Refrigerators) The marginal cost of intermediate good, i.e., compressor, is shown by MC c curve and that of the refrigerator body by MC b . The MC c and MC b added vertically give the combined marginal cost curve, the MC t . At output OQ, for example, TQ + MQ = PQ. The MC t intersects line AR r = MR r at point P. An ordinate drawn from point P down to the horizontal axis determines the most profitable outputs of refrigerator body and compressors each at OQ. Thus, the output of both refrigerator body and compressors is simultaneously determined. Since at OQ level of output, the firm's MC t = MR r , the refrigerator company maximizes its profits from the final product, the refrigerators. Now, let us find the price of the compressors. The question that arises is: what should be the price of the compressors so that the compressor manufacturing division too maximizes its profit? The answer to this question can be obtained by applying the marginality principle which requires equalizing MC and MR in respect of compressors. The marginal cost curve for the compressors is given by MC c in Fig. 8.3. The firm therefore has to obtain the marginal revenue for its compressors. The marginal revenue of the compressors (MR c) can be obtained by subtracting the non-compressor marginal cost of the final good from the MR r 7 . Thus, MR c = MR r – (MC t – MC c) ... (8.11) For example, in Fig. 8.3, at output OQ, MR r = PQ, MC t = PQ, and MC c = MQ. By substituting these values in Eq. 8.11, we get
NOTES 252 Self-Instructional Material Pricing Strategies and Practices
MR c = PQ – (PQ – MQ) PQ – PM = MQ or, since in Fig.8.3, PQ – MQ = PM, and PM = TQ, therefore, MR c = PQ – TQ = PT and PT = MQ Fig. 8.4: Determination of Transfer Price We may recall that AR r = MR r , i.e., MR r is constant, and that MC t is a rising function. Thus, MR r – MC c will be a decreasing function. Notice the vertical distance between AR r = MR r line, and MC c curve is decreasing as shown in
Fig. 8.3.

When MR c (which equals MR r – MC c) is obtained for different levels of output and graphed, it yields a curve like MR c curve shown in Fig. 8.4. The MC c curve (which is the same as MC c curve in Fig 8.3) intersects the MR c at point P. At point P, MR c = MC c and output is OQ. Thus, the price of compressors is determined at PQ in Fig. 8.4. This price enables the compressor division to maximize its own profit. 8.6.2 Transfer Pricing with External Competitive Market We have discussed above the transfer pricing under the assumption that there is no external market for the compressors. It implies that the refrigeration company was the sole purchaser of its own compressors and that the compressor division had no external market for its product. Let us now discuss the transfer pricing technique assuming that there is an external market for the compressors. The existence of the external market implies that the compressor division has the opportunity to sell its surplus production to other buyers and the refrigeration company can buy compressors from other sellers if the compressor division fails to meet its total demand. Also assume that the external market is perfectly competitive. Determination of transfer price under these conditions is a little more complicated task. The method of transfer pricing with external market is illustrated in Fig. 8.5. Since the compressor market is perfectly competitive, the demand for compressor is given by a straight horizontal line as shown by P 2 D in which case AR = MR. The marginal cost curve of the compressors is shown by MC c . The MR c curve shows the marginal net revenue from the compressor, (See Fig. 8.5). Note that in the absence of the external market, the transfer price of compressor would have been fixed at OP 1 = P¢Q 2 i.e., the price where MR c = MC c . At this price the parent company would have bought compressors only from its subsidiary. But, since compressors are to be produced and sold under competitive conditions, the effective marginal cost of the compressor to the refrigeration company is the market price of the compressor, i.e., OP 2 . Besides, the price OP 2 is also the potential MR for the compressor division. Therefore, in order to

maximize the profit, compressor's price will be set at point P where MR c < MC c . Thus, the transfer price of compressor will be fixed at PQ 1 and the refrigeration company would buy OQ 1 compressors from the compressor division. The total output of compressors is determined at a level where MC c intersects the demand line, D (AR = MR), i.e., at point R. At point R, the total output of compressors is OQ 3 . Of this, OQ 1 is bought by the refrigeration company itself and the remaining output, Q 1 Q 3 will be sold in the external market, both at price OP 2 . At this level of output and price, the compressor division maximizes its profit. Shift in MR c and TransferPrice. Let us now consider how transfer price is determined when MR c shifts upward to the right. The MR c may shift upward because of an increase in demand causing an upward shift in AR = MR. Let the MR c in Fig. 8.5 shift to MR´ c which intersects the MC c at point B. In the absence of an external market, the refrigeration company would have set transfer price of compressors at OP 3 —a price higher than the free market price OP 2 . But, since an external market does exist in which a price, OP 2 , is given, the transfer price cannot exceed the market price or else the refrigeration company would not be in a position to maximize its profit. Nor can the transfer price be less than the market price, otherwise the compressor division would not be able to maximize its profit. Thus, if there is an external market in which market price of an intermediary product, produced by a subsidiary company is given, then the problem is to determine the quantity to be produced by the subsidiary and the quantity

Fig. 8.5 Determination of Transfer Price with External Market

to be purchased from the external market. Fig. 8.5 shows that after the shift in MR c curve to MR´ c , the demand for compressors by the refrigeration company increases to OQ 4 where AR = MR = MR´ c . But the subsidiary company cannot produce OQ 4 units of compressors, given its MC c and the market price. It will, therefore, produce OQ 3 number of compressors, which equalizes MC c with MR at point R. Given the market price, OQ 3 is the most profitable output of compressors. Therefore, the difference between the total demand and the total internal supply from the subsidiary, i.e., OQ 4 – OQ 3 = Q 3 Q 4 , will be bought in the external market, at price OP 2 = TQ 4 . Thus, the refrigeration company will buy OQ 3 compressors from its compressor division and buy Q 3 Q 4 in the external market. 8.6.3 Transfer Pricing under Imperfect External Market When the refrigerator market is imperfect, the compressor division faces a demand curve with a negative slope in the external market, instead of a straight horizontal demand line. The downward sloping demand curve makes transfer pricing a much more complicated task. To illustrate the transfer pricing technique under imperfect market

 condi-tions

in the external market, let us suppose (i) that the average and marginal revenue curves for the compressors are given by AR x and MR x , respectively, in Fig. 8.6, and (ii) that the 'marginal net revenue' from the internal use of compre- ssors and the marginal cost of producing compressors are represented by MR c and MC c , respectively. With a view to maximizing the overall profit, the refrigeration company will determine the output of compressors where MC c = MR c + MR x , i.e., where marginal cost of compressors equals the composite marginal revenue. The composite marginal revenue is obtained through horizontal summation of the MR c and MR x curves as shown by MR t in

Fig. 8.6.

Fig. 8.6: Transfer Pricing and Imperfect External Market As shown in

Fig. 8.6,
MC c intersects MR t at point P which determines the output of compressors at OQ 3 . The compressor division can maximize its profit by dividing its output between the refrigeration company and the external market so as to equalize its MC and MR in both the markets–internal and external. If a line (PP 1) is drawn from point P parallel to the horizontal axis to the vertical axis, it intersects MR x at point M and MR c at point T. The points of intersection (T and M) determine the share of refrigeration company and the external market in the total output OQ 3 . At point M, MC c = MR x and at point T, MC c = MR c . Thus, the refrigeration company, the parent body, will buy OQ 1 and sell OQ 2 in the open market. Note that OQ 1 + OQ 2 = OQ 3 . The profit maximizing price in the external market is OP 2 (= BQ 2) and the profit maximizing transfer price is set at OP 1 . With these prices and output, both refrigeration and compressor companies maximize their respective profits. 8.7
COMPETITIVE BIDDING OF PRICE In this section, we turn to a kind of pricing in which a firm is required to quote its price under uncertain cost and price conditions with a view to winning a contract or a tender. This kind of pricing is known as competitive bidding or contract pricing. Competitive bidding is a process of quoting a contract price for supplying goods or services under specified terms and conditions.
In contractual business, there are different kinds of transactions. For example, the purchaser specifies the quantity and quality of goods (or services) and the time and place of delivery along with other terms and conditions. The offer to buy certain goods or services or for construction of a building, road, dam, etc., are made known to the potential sellers or contractors through public notification inviting 'tenders'. The suppli- ers and contractors interested in the tender evaluate the offer in terms of its cost and profitability. If they find the offer profitable, they submit their tender. But the problem
NOTES Self-Instructional Material 255 Pricing Strategies and Practices here is not simply to quote a suitable supply price while submitting the tender. In fact, the foremost problem is to quote a supply price which can win the contract without unduly reducing the profit margin. For this the quoted supply price should be lower than that of the rival contractors. To bid a contract winning supply price is an extremely difficult task mainly because the prices of the rival firms or contractors are unknown. The problem becomes much more complicated if there is uncertainty about the future prices of the inputs, particularly when input prices are subject to fluctuation. Uncertainty about future cost conditions increases the degree of risk because bidding takes place at current prices and the contracted goods and services are to be produced and supplied at future input prices which may be uncertain. Despite these difficulties in bidding competitive prices contractors do quote a supply price which wins them a contract and yields profits. Let us briefly discuss the process of competitive price bidding. We assume that there are no 'bribes' and 'kickbacks'. 8.7.1 Major Factors in Competitive Bidding There are three major factors which contractors analyse in the process of competitive bidding. These are: (i) bidder's current and projected capacity to handle the contract, (ii) the overall objective of the bidder, and (iii)the expected bid of the rival contractors. Bidder's present and projected capacity to handle the contract matters a great deal in competitive bidding. Given his present capacity, the contractor may find himself with (a) excess capacity, (b) full utilization of capacity, and (c) undertaking activity in excess of capacity. The three kinds of different capacity positions put the bidder in three different positions to bid the supply price. If the bidder has an excess capacity, he may bid a price at par with his cost or even below the cost if his circumstances so demand. This kind of bidding may be motivated by the contractor's desire (i) to popularize his business, (ii) to retain the contract–giving parties, in face of tough competition, and (iii) to retain the labour and other services. Even if contractors are engaged to their capacity, they may submit their tender with a view to maintaining their reputation and to give the potential contracting bodies a feeling that they can still handle more business, though they may not really want to win the contract. If they do not want to win the contract, they usually bid a high price and lose the contract to their competitors, but not necessarily. If a contractor has a high reputation in comparison with his rivals, there is always a chance that the contract is awarded to him. Therefore, they keep their bid high enough to cover the additional cost resulting from their overcapacity operation and the extra cost in case they go for sub-contracting a part or whole of their new contracts. 8.7.2 Determining the Competitive Bid Apart from the general pattern of competitive bidding on the basis of contractors' capacity, another and a more important issue is how to bid a price which can really win the contract under normal competitive conditions. The normal conditions may be described as (i) the competing firms are not new to this business, and are not facing the problem of entering the contract, (ii) the firm does not face the problem of retaining its labour and other services, and (iii) the firm is neither excessively under-worked nor over–worked. Under these conditions, the contracting firm is confronted with the problem of bidding a price which can win a profitable contract. In order to analyse the method of determining a competitive price, let us consider a simple case in which there are only two contractors, X and Y, bidding against each other for supplying jeeps to the government, and discuss competitive bidding from X's angle.

NOTES 256 Self-Instructional Material Pricing Strategies and Practices If Y's cost and profit margins were known, it would not be difficult for X to quote a contract winning price. But if Y's cost and profit margin are unknown, X may assume that Y's cost is not significantly different from his own cost of production, since quality, design, size and horse-power etc., are specified in the tender. But X may not be sure about Y's profit margin. The information regarding Y's profit margin may, however, be obtained from the past bids made by Y. Thus, X may find out a competitive bid-price for winning the contract for supplying jeeps to the government. The competitive bidding, is not as simple as described above. In fact, there is a large number of bidders and it may not be possible for X to obtain data on the production cost of all the competing bidders. And, it may not be realistic to assume the identical cost condition. Besides, profit margin of the competing bidders might vary from con- tract to contract. Now, a question arises: How will X determine the competitive bid. This question is answered below in the two bidders case. Although Y's cost is unknown to X, his past bid-prices are known to X or to any other competitor for the matter. The first step for X is, therefore, to examine the relationship between his own cost and Y's bid-price in respect of each contract or bid. For his analysis X will prepare a frequency distribution of relationship between his own cost and Y's bid-price and also obtain their probability distribution. Let us suppose that the frequency distribution of ratios between X's cost and Y's bid-price (i.e., Y's bid price ∏ X's cost) in respect of 100 past contracts is given as presented in Table 8.1. Table 8.1: Frequency Distribution of Bids and Probability Y's bid No. of bids Probability ÷ X's cost Distribution 0.80 5 0.05 1.00 10 0.10 1.20 20 0.20 1.40 50 0.50 1.60 15 0.15 Total 100 1.00 The information contained in Table 8.1 may be interpreted as follows. On 5 occasions, Y had bid a price equal to 80 per cent of X's cost; in 10 bids, Y had quoted a price equal to X's cost; on 20 occasions, Y had quoted a price 20 per cent higher than X's cost; in his 50 bids (out of 100) Y had bid a price 40 per cent above X's cost and in 15 bids Y's price was higher by 60 per cent. Assuming the same frequency distribution of relationship between Y's bid-price and X's cost to persist in future, X can calculate the probability of winning a contract at a given price and also his profit. The probability distribution is given in the last column of Table 8.1. For example, if X bids a price below 80 per cent of his cost, the probability of winning the contract is 0.95, i.e., 1–0.05, or 95 per cent. If X bids a price equal to his own cost, the probability of winning the contract is 0.90 (i.e., 1.00–0.10) or 90 per cent. Similarly, if X bids a price 40 per cent higher than his own cost, his chance or winning the contract is 1–0.50 = 0.50, i.e., 50 per cent. Considering the whole range of probability distribution, X may decide on the bid price. On the basis of probability distribution given in Table 8.1, it may be inferred that if X bids a price equal to, say, 139 per cent of his cost (i.e., 1 per cent less than 140 per cent), his chance of winning the jeep contract is more than 50 per cent. That is, the lower the percentage (than 140%), the greater the chance of winning the contract. So far so good. But, it is quite likely that X expects Y to bid at 140 per cent of X's cost and Y bids at 120 per cent of X's cost. This pattern of bidding may be expected in respect of all probabilities. Under this condition, X is bound to lose the contract to Y. But for the fear of losing the contract, X cannot always keep his bid equal to his cost

NOTES Self-Instructional Material 257 Pricing Strategies and Practices or less than that, and make no profit or make losses. Even otherwise, X cannot be advised to keep his bid unduly low with only marginal profit. For, in that case X will be ill-advised to unnecessarily forego his prospective profit. For example, if Y bids at 120 per cent of X's cost and X bids at 105 per cent of his cost, X is sure to win the contract. But he loses a less than 15 per cent of his expected profit because he would have won the contract even on a bid of 119.9 per cent of his cost. Thus, the decision on bid price taken merely on the basis of probability distribution may result in either loss of contract or loss of expected profit. Therefore, X would like to know his probable profit related to all combinations of Y's bid and his own, and to find out his pay-off in respect of all his bids. To calculated the pay off, let us suppose that X 's cost of supplying a certain number of jeeps to the government is Rs. 1,000,000. Given the supply price of Rs. 1,000,000, if X bids only 80 per cent of his cost, i.e., Rs. 800,000, his chance of winning the contract is about 95 per cent. Let us suppose that to make the win 100 per cent sure, X reduces his bid by Rs. 10,000, i.e., he bids only Rs. 790,000 instead of Rs. 800,000. (Remember that X keeps his bid lower by 10,000 than all expected bids of Y). On his bid-price of Rs. 790,000, X wins the contract and incurs a loss of Rs. 210,000, i.e., a negative profit which is X's 'Pay off.' The contractor X makes this negative profit against all probable bids of X, as shown in 'Pay-off Matrix' in Table 8.2. On the other hand, if X's bid equals 100 per cent of his cost less Rs. 10,000 and Y bids at 80 per cent of X's cost, X loses the bid and his pay-off is zero. The zeros in the matrix indicate that X loses the bid. To consider another example, if X bids 140 per cent of his cost less Rs. 10,000 and Y bids at 140 per cent of X's cost, X wins the contract and makes a profit of Rs. 390,000, i.e., his 'pay-off. The pay-offs in respect of all the combinations of X's and Y's bids are given in the last column of Table 8.2. Table 8.2: Pay-off Matrix X's Bids Y's bid as ratio of X's Cost 0.80 1.00 1.20 1.40 1.60 (Rs.) (0.05) (0.10) (0.20) (0.50) (0.50) 790,000 – 210,000 – 210,000 – 210,000 – 210,000 – 210,000 990,000 0 – 10,000 – 10,000 – 10,000 – 10,000 1,190,000 0 0 190,000 190,000 190,000 1.390,000 0 0 0 390,000 390,000 1,590,000 0 0 0 0 590,000 Note. Figures in parentheses show the respective probabilities of Y's bidding asa ratio of X's cost. It may be noted from the pay-off matrix that the probability of profits, as mentioned above, is different in each case. Therefore, profits do not appear as the actual percentage of cost. One important conclusion that emerges from Table 8.2 is that if probability is less than 1, and cannot from the basis of optimum bid price. In order to determine the optimum bid price, X will have to calculate the probability adjusted expected profit from each bid and select a bid with the highest return. The probability adjusted expected profit may be obtained by multiplying each element of bid-row of the matrix by the sum of Y's probabilities. The expected profit from the various bids of X may be calculated as shown in Table 8.3. Table 8.3: Bids and Profits X's bid (Rs.) Expected Profits (Rs.) Total Profit or Loss 790,000 – 210,000 (.05 + .1 + .2 + .5 + .15) = – 210,000 990,000 (0) (.50) + (– 10,000) (.1 + .2 + .5 + .15) = – 9,500 1,190,000 (0) (.05 + .1) + 190,000 (.2 + .5 + .15) = 161,500 1,390,000 (0) (.05 + .1 + .2) + 390,000 (.5 + .15) = 253,500 1,590,000 (0) (.05 + .1 + .2 + .5) + 590,000 (.15) = 88,500

NOTES 258 Self-Instructional Material Pricing Strategies and Practices It may be noted from the Table 8.3 that the probability adjusted (expected) profit is maximum when X's bid price is Rs. 1,390,000. If X bids Rs. 1,390,000 there is great possibility that X wins the contract for supplying jeeps to
the government. 8.8
PEAK LOAD PRICING There are certain non-storable goods, e.g., electricity, telephones etc., which are demanded in varying
amounts in day and night times.
Consumption of electricity reaches its peak in
day time.
It is called 'peak-load' time. It reaches its bottom in the night. This is called 'off-peak' time.
Electricity consumption peaks in daytime because all business establishments, offices and factories come into operation. It
decreases during nights because most business establishments are closed and household consumption falls to its basic minimum.
Also, in India, demand for electricity peaks during summers due to use of ACs and coolers, and it declines to its minimum level during winters. Similarly, consumption of telephone services is at its peak at day time and at its bottom at nights. Another example of 'peak' and 'off-peak' demand is of railway services. During festivals and summer holidays, 'Pooja' vacations, the demand for railway travel services rises to its peak.
A technical feature of such products is that they cannot be stored. Therefore, their production has to be increased in order to meet the 'peak-load' demand and reduced to 'off-peak' level when demand decreases. Had they been storable, the excess production in 'off-peak' period could be stored and supplied during the 'peak-load' period. But this cannot be done. Besides, given the installed capacity, their production can be increased but at an increasing marginal cost (MC).
8.8.1 Problems in Pricing Pricing of goods like electricity is problematic. The nature of the problem in a short run setting is depicted in Fig. 8.7.
The 'peak-load' and 'off-load' demand curves are shown by

D P and D L
curves, respectively. The short-run supply curve is given by the short-run marginal cost curve, SMC.
The problem is 'how to price electricity'. Fig. 8.7: Peak-Load Pricing of Electricity
As Fig. 8.7 shows, if electricity price is fixed in accordance with peak-load demand, OP 3 will be the price and if it is fixed according to off-load demand, price will be OP 1 . The problem is: what price should be fixed? If a 'peak-load' price (OP 3) is charged uniformly in all reasons, it will be unfair because consumers will be charged for what
Check Your Progress 5. What are the methods
of pricing a new product in relation to established products? 6.
What is meant by transfer pricing with external competitive market? 7. What is the method of pricing under competitive bidding? 8. Why does the problem of peak load pricing arise?
NOTES Self-Instructional Material 259 Pricing Strategies and Practices
they do not consume. Besides, it may affect business activities adversely. If electricity production is a public monopoly, the government will not allow a uniform 'peak-load' price. On the other hand, if a uniform 'off load' price (OP 1) is charged, production will fall to OQ 2 and there will be acute shortage of electricity during peak hours. It leads to 'breakdowns' and 'load-shedding' during peak-load periods, which disrupt production and make life miserable. This is a regular feature in Delhi, the capital city of India. This is because electricity rates in Delhi are said to be one of the lowest in the country. Alternatively, if an average of the two prices, say P 2 is charged, it will have the demerits of both 'peak-load' and 'off-load' prices. There will be an excess production to the extent of AB during the 'off-load' period, which will go waste as it cannot be stored. If production is restricted to OQ 1 , price P 2 will be unfair. And, during the "peak-load" period, there will be a shortage to the extent of BC, which can be produced only at an extra marginal cost of CD. 8.8.2 Double Pricing System
For the above reasons, generally,
a double pricing system is adopted. A higher price, called 'peak-load price' (OP 3) is charged during the 'peak-load' period and a lower price (OP 1) is charged during the 'off–peak' period. During the 'peak-load' period, production is increased to OQ 3 at which D P intersects SMC, and production is reduced to OQ 1 during the 'off-peak' period.
Advantages Peak-load pricing system has two advantages. (i) It results in an efficient distribution of electricity consumption. Housewives run their dishwashers and washing machines during the 'off-peak' period. (ii) It helps in preventing a loss to the electricity company and ensures regular supply of electricity in the long run. Disadvantages This system has two disadvantages too. (i) The businesses which are by nature day-business pay higher rates than those which can be shifted to 'off-peak' period. (ii) Billing system is the greatest problem. Each consumer will have to install two meters—one for 'peak-load' and another for 'off-load' period with an automatic switch-over system. This can be done. Alternatively, the problem can be resolved by adopting a progressive tariff rate for the use of electricity. But, in a country like India, all pervasive corruption will make it inefficient. Delhi Vidyut Board (DVB) is reportedly able to collect only about 50% of its cost of production. The rest goes to the unauthorized users of electricity. 8.9 SUMMARY z
Some economists have challenged the conventional theory of pricing. Besides, there are certain conditions under which theoretical pricing method cannot be applied. Therefore firms adopt different methods
of and rules of pricing. Some pricing practices are discussed here briefly. z
A common practice of pricing a product is 'cost-plus pricing' method. Under this method price of a product is determined on the basic of a formula, i.e., P = AVC + AVC (m), where m is profit margin as percentage of average variable cost (AVC).
z
In case a firm produces multiple brands of a product, it follows the traditional theoretical rule, i.e., the profit maximization rule for each product a different demand curve.
NOTES 260 Self-Instructional Material Pricing Strategies and Practices
z
Different methods are used in pricing a product over the period of its life cycle— introduction, growth, a penetration price policy is adopted at the introduction stage and skimming price policy later when there is no close substitute. z In case of pricing a new product in relation to established products, three kinds of pricing policies are used depending on market conditions (i)
pricing below the market price, (ii) pricing at market price,
and (iii) pricing above the
market price.
z
Similarly different methods are used in pricing a product used by the firm itself, called transfer pricing; pricing a product under competitive bidding, and pricing a product whose demand varies seasonally like electricity. 8.10
ANSWERS TO 'CHECK YOUR PROGRESS' 1. The formula for cost-plus pricing is given as Price (

P) = AVC + AVC (m), where m is profit margin of average variable cost (AVC). 2.
Cost plus pricing is not much different from margined rule pricing. By using the relationship between price (P) and MR, it can be shown that both the methods of close to one another. 3. Pricing different products of a multiple product firm is the same as the marginal rule of pricing. Equilibrium output of each product is determined where its MC = MR. One output is determined, the price of a determined automatically given its demand curve. 4. The life cycle of a product has five stages: (i) Introduction, (ii) Growth, (iii) Maturity, and (iv) Saturation, and (v) Decline. 5. Depending on the market conditions, three methods are generally used in pricing a new product in relation to established ones, viz., (i) pricing below the market price for capturing a market share, (ii) pricing at par with market price if purpose is to avoid competition and to show comparable quality, and (iii) pricing above the market price, especially in case of luxury goods sold in prestigious malls. 6. In case of competitive external market, market demand for the product of a subsidiary is considered to be a straight horizontal line and AR = MR. In that case price is determined at a point where MC curve of its subsidiary interacts the demand curve. 7. Given the objective of the bidding firm-whether or not to win-pricing is done on the basis of past experience and the probability rate of winning the bid. 8. Problem of peak load pricing arises because of variation in demand for a product (e.g., electricity) from season to season between low and peak demand. Here the problem is how to find the average seasonal price. 8.11 EXERCISES AND QUESTIONS 1. Discuss the controversy between marginal theorists and the empiricists on the relevance of 'marginal rule' in pricing the products by the manufacturing firms. 2. Describe mark-up pricing and show that mark-up pricing is based on 'marginal rule'. 3. Distinguish between skimming price and penetration price policy. Which of these policies is relevant in pricing a new product under different competitive conditions in the market? 4. What is transfer pricing? How is transfer price determined if (i) there is no external market for the transfer product, and (ii) there is an external market for it?
NOTES Self-Instructional Material 261 Pricing Strategies and Practices 5. What is competitive bidding? Describe the technique of competitive bidding of price under the condition of uncertainty. 6. What kind of pricing strategy is adopted over the life-cycle of a product. What do you think will be an appropriate price policy when the demand reaches its saturation and substitute products are likely to enter the market? 7. Discuss the technique of multiple product pricing. Illustrate your answer. Why can't a single average price be fixed for all products? 8. What is meant by 'peak-load pricing'? Why is sometimes peak-load pricing inevitable? What are its advantages and disadvantages? 8.12 FURTHER READING
Brigham, Eugene, F. and James L. Pappas, Managerial Economics, 3rd Edn., Dryden Press, Hinsdale, III, 1979, Ch. 11. Douglas, Evan J., Managerial Economics: Theory, Proactice and Problem, Prentice Hall Inc., N.J., 1979, Ch. 11. Koutsoyiannis, A., Modern Microeconomics, Macmillan Press Ltd., 1979, Ch. 11. Spencer Milton H., Managerial Economics, Richard D, Irwin, III, 1968. Ch. 11. Webb, Samuel, C., Managerial Economics, Houghton Miffln, Boston, 1976, Ch. 8. References 1. The 'fair' percentage of profit margin is usually determined on the basis of the firm's past experience and the practice of the rival firms. 2. A. Silbertson, "Price Behaviour of Firms", Economic Journal, September, 1970. 3. For Example, the different models of Maruti automobiles, viz., Maruti 800, Zen, Maruti 1000, Esteem, Maruti Van and Wagon-R, etc. 4. E.W. Clemens, 'Price Discrimination and Multiple Product Firm', Review of
Eco- nomic
Studies (1950–51). Reprinted in Industrial Organisation and Public policy (Am. Eco. Assn.) Richard D. Irwin, Illinois, 1959. 5. Managerial Economics., op. cit., p. 425. 6. Jack Hirshleifer, "On the Economics of Transfer Pricing" Journal of Business, July, 1956. 7. The MRc can also be obtained by asking the compressor division how much it will supply at different transfer prices. MR r – T p gives MR c , also known as "marginal net revenue".
MODULE - 3
NOTES 264 Self-Instructional Material Profit As Business Objective and Profit Planning
NOTES Self-Instructional Material 265 Profit As Business Objective and Profit Planning UNIT 9 PROFIT AS BUSINESS OBJECTIVE AND PROFIT PLANNING Structure 9.0 Introduction 9.1 Unit Objectives 9.2 Profit as Business Objective 9.2.1 Meaning of Profit 9.3 Theories of Profit: The Economists'Perception and Sources
of Profit 9.3.1 Walker's Theory
of Profit: Profit as Rent of Ability 9.4
Problems in Profit Measurement 9.4.1 Problem in Measuring Depreciation; 9.4.2 Treatment of Capital Gains and Losses; 9.4.3 Current vs. Historical Costs 9.5 Profit
Maximization as Business Objective 9.5.1 Profit Maximizing Conditions 9.6 Controversy over Profit Maximization Objective 9.6.1 Gap between Theory and Practice; 9.6.2 The Defence of Profit Maximization 9.7 Alternative Objectives Of Business Firms 9.7.1 Baumol's Hypothesis of Sales Revenue Maximization; 9.7.2 Marris's Hypothesis of Maximization of Firm's Growth Rate; 9.7.3 Williamson's Hypothesis of Maximization of Managerial Utility Function; 9.7.4 Cyert-March Hypothesis of Satisficing Behaviour; 9.7.5 Rothschild's Hypothesis of Long-run Survival and Market Share Goals; 9.7.6 Entry-prevention and Risk-avoidance 9.8 A Reasonable Profit Target 9.8.1 Reasons for Aiming at "Reasonable Profits" 9.9 Profit as Control Measure 9.10 Profit Planning: Break-Even Analysis 9.10.1

Break-even Analysis: Linear Cost and Revenue Function; 9.10.2 Break-even Analysis: Non-linear Cost and Revenue Functions; 9.10.3
Contribution Analysis; 9.10.4 Profit Volume Ratio; 9.10.5 Margin of Safety; 9.10.6 Profit-Volume Analysis Charts 9.11 Summary 9.12 answers to 'Check Your Progress' 9.13 Exercises and Questions 9.14 Further Reading 9.0 INTRODUCTION
The conventional theory of a
firm assumes profit maximization as the sole objective of business firms.
Baumol, a nobel laureate, has, however, argued, "
There is no reason to believe that all businessmen pursue the same objective" 1 .
Recent researches on this issue reveal that the objectives that
business firms pursue are more than one. Some important objectives, other than profit maximization, are: (a) maximization of sales revenue, (b) maximization of firm's growth rate, (c) maximization of manager's utility function, NOTES 266 Self-Instructional Material Profit As Business Objective and Profit Planning (
d) making satisfactory rate of profit, (e) long-run survival of the firm, and (f) entry- prevention and risk-avoidance.
All business firms have undoubtedly some organisational goals to pursue.
What is the most common objective of business firms? There is no definitive answer to this question. Perhaps the best way to find out the common objective of business firms
would be to ask the business executives. However, Baumol, a well–known authority on business economics, has remarked that firms and their executives are often not clear about their objectives. "
In fact, it is common experience when interviewing executives to find that they will agree to every plausible goal about which they are asked." 2
However,
profit maximization is regarded as the most common and theoretically most plausible objective of business firms.
This
aspect will be discussed in detail later in the chapter. We will first discuss profit and profit maximization as the objective of business firms in some details and then describe briefly the alternative objectives of business firms. 9.1 UNIT OBJECTIVES
z
To define profit, the main objective of business firms, and to discuss economists' views on sources of profit z To discuss the problems in measuring profit
z
To discuss profit maximization as the sole objective of business firms z To describe the alternative objectives of business firms—objectives other than profit maximization z To discuss profit planning by using break-even analysis 9.2 PROFIT AS BUSINESS OBJECTIVE 9.2.1 Meaning
of Profit
Profit means different things to different people. "
The word 'profit' has different meaning to businessmen, accountants, tax collectors, workers and economists
and it is often used in a loose polemical sense that buries its real significance..." 3 In a general sense, 'profit' is regarded as income accruing to
the
equity holders,
in the same sense as wages accrue to
the labour; rent accrues to the
owners of rentable assets; and interest accrues to the
money lenders. To a layman, profit means all income
that flow
to the investors. To an accountant, 'profit' means the excess of revenue over all paid-out costs including both manufacturing and overhead expenses.
It is more or less the same as 'net profit'. For all practical purposes, profit
or business income means profit in accountancy sense plus non-allowable expenses. 4
Economist's
concept of profit is of 'Pure Profit' called 'economic profit' or 'just profit'. Pure profit is a return over and above the opportunity cost, i.e., the income which a businessman might expect from the second best alternative use of his resources.
These two concepts of profit are discussed below in detail.
Accounting Profit vs. Economic Profit.

The two important concepts of profit that figure in business decisions are ‘economic profit’ and ‘accounting profit’. It will be useful to understand the difference between the two concepts of profit. As already mentioned, in accounting sense, profit is surplus of revenue over and above
all paid-out costs, including both manufacturing and overhead expenses.
Accounting profit may be calculated as follows. Accounting profit = TR – (W + R + I + M) where W = wages and salaries, R = rent, I = interest, and M = cost of materials.
NOTES Self-Instructional Material 267 Profit As Business Objective and Profit Planning
Obviously,
while calculating accounting profit, only explicit or book costs, i.e., the
cost
recorded in the books of accounts, are considered.
The concept of ‘economic profit’ differs from
that of ‘
accounting profit’. Economic profit takes into account also the implicit or imputed costs.
In the context of profit, implicit cost is essentially the
opportunity cost. Opportunity cost is defined as
the payment that would be ‘necessary to draw forth the factors of production from their most remunerative alternative employment’.
Alternatively, opportunity cost
is
the income foregone
which a businessman could expect from the second best alternative use of his resources.
For example, if an entrepreneur uses his capital in his own business, he foregoes interest which he might earn by purchasing debentures of other companies or by depositing his money with
joint stock companies
for a period. Furthermore, if an entrepreneur uses his labour in his own business, he foregoes his income (salary) which he might earn by working as a manager in another firm. Similarly, by using productive assests (land and building) in his own business, he sacrifices his market rent. These foregone incomes—interest, salary and rent—are called opportunity costs or transfer costs. Accounting profit does not take into account the opportunity cost. It should also be noted that
the
economic or pure profit makes provision also for (a) insurable risks, (b) depreciation, and (c) necessary minimum payment to shareholders to prevent them from withdrawing their capital.
Pure profit may thus be defined as ‘a residual left after all contractual costs have been met, including the transfer costs of management, insurable risks, depreciation and payments to shareholders sufficient to maintain investment at its current level’. Thus, Pure profit =
Total revenue – (explicit costs + implicit costs)
Pure profit
so defined may not be necessarily positive for a single firm in a single year— it may be
even negative,
since it may not be possible to decide beforehand the best way of using the resources. Besides, in economics, pure profit is considered to be a short- term phenomenon—it does not exist in the long run, especially under perfectly competitive conditions. 9.3
THEORIES OF PROFIT: THE ECONOMISTS’ PERCEPTION AND SOURCES
OF PROFIT What are the sources of profit? Economists are not unanimous on this issue. It is in fact this question that has been a source of an unsettled controversy and has led to the emergence of various theories of profit. In this section, we discuss briefly
the main theories
of profit. 9.3.1 Walker’s Theory of Profit: Profit as Rent of Ability One of the most widely known theories of profit was propounded by F.A. Walker. According to him,
profit is
the
rent of “exceptional abilities that an entrepreneur may possess” over others.
Just as rent is the difference between the yields of the least and
the most fertile lands,
profit is the difference between the earnings of the least
and the most efficient entrepreneurs.

In formulating his profit theory, Walker assumed a state of perfect competition in which all firms are presumed to possess equal managerial ability.
Each firm would receive only the wages of management which, in Walker's view, forms no part of pure profit. He regarded wages of management as ordinary wages. Thus, under perfectly competitive conditions, there would be no pure
profit and all firms would earn only managerial wages, which is popularly known as 'normal profit'. Clark's Dynamic Theory. According to J.B.
Clark, 5 profits arise in a dynamic economy, not in a static one. A static economy is one in which
there
is absolute freedom
NOTES 268 Self-Instructional Material Profit As Business Objective and Profit Planning of competition;
population and capital are stationary; production process remains un- changed over time; goods continue to remain homogeneous; factors enjoy freedom of mobility but do not move because their marginal product in every industry is the same; there is no uncertainty and hence no risk; and if there is any risk, it is insurable. In a static economy therefore all firms make only the 'normal profit', i.e., the wages of management. On the other hand, a dynamic economy is characterized by the following
generic changes: (i) increase in
population, (ii) increase in capital, (iii) improvement in production technique, (iv) changes in
the
forms of business organisations, and (v)
multiplication of consumer wants. The major functions of entrepreneurs or managers in a dynamic world are to take advantage of the generic changes and promote their business, expand their sales and reduce their
costs. The entrepreneurs who take
successfully the
advantage of changing conditions in a dynamic economy make pure profit.
Pure profits, however, exist only in the short run. In the long run, competition forces other firms to imitate the changes made by the leading firms. This leads to a rise in demand for factors of production and therefore rise in factor prices and rise in cost of production. On the other hand, rise in output causes a decline in product prices, given the demand. The ultimate result is that pure profit disappears.
In Clark's own words, 'Profit is an elusive sum which entrepreneurs grasp but cannot hold. It slips through their fingers and bestows itself on all members of the society'. This, however, should not mean that
profits arise in a dynamic economy only once and disappear for ever. In fact, in a dynamic economy, generic changes are continuous
and managers with foresight continue to take advantage of the change and make profit. Emergence, disappearance and re-emergence of profit is a continuous process.
Hawley's
Risk Theory of Profit.
The risk theory of profit was propounded by F.B. Hawley
in 1893.
Risk in business may arise for such reasons as obsolescence of a product, sudden fall in prices, non-availability of certain crucial materials, introduction of a better substitute by a competitor, and risks due to fire, war, etc.
Hawley regarded risk- taking as an inevitable accompaniment of dynamic production and those who take
risk have a sound claim to a separate
reward, known as "profit". According to Hawley, profit is simply the price paid by society for assuming business risks. In his opinion, businessmen would not assume risk without expecting adequate compensation in excess of actuarial value, i.e., the premium on calculable risk. They
would always look for a return in excess of the
wages of management for bearing risk.
The reason why Hawley maintained that profit
is
over and above the actuarial risk is that the assumption of risk is irksome; it give rise to trouble, anxiety and disutilities of various kinds.
Therefore, assuming risk gives the entrepreneur
a claim to a reward in excess of actuarial value of risk. Profit, according to Hawley, consists of two parts: one part represents compensation for actuarial or average loss incidental to the various classes of risks necessarily assumed by the entrepreneur; and the remaining part represents an inducement to suffer the consequences of being exposed to risk

in their entrepreneurial adventures. Hawley believed that profits arise from factor ownership only so long as ownership involves risk. According to him, an entrepreneur has to assume risk to qualify for profit. If an entrepreneur avoids risk by insuring against it,
he would cease to be an entrepreneur and would not receive any profit.
In his opinion, it is the uninsured risks out of which
profits arise, and until the uncertainty ends with the sale of entrepreneur's products, the amount of reward cannot be determined. Profit,
in his opinion
is a residue. Hawley's theory is thus a residual theory of profit.
Knight's Theory of Profit. Frank H. Knight 6 treated profit as a residual return to uncertainty bearing, not to risk bearing. Obviously, Knight made a distinction between risk and uncertainty. He divided
risk into calculable and non-calculable risks. Calculable
NOTES Self-Instructional Material 269 Profit As Business Objective and Profit Planning
risks are those whose probability of occurrence can be statistically estimated on the basis of available data.
For example, risk due to fire, theft, accidents, etc.
are calculable and
such risks are insurable. There remains, however, an area of
risk
in which probability of risk occurrences cannot be calculated. For instance,
there may be a certain element of cost which
may not be accurately calculable and the strategies of the competitors may not be precisely assessable. The risk element of such incalculable events are not insurable. The area of incalculable risk is
the area of
uncertainty'. It is in the area of uncertainty that decision-making becomes a crucial function of an entrepreneur. If his decisions are proved right by the subsequent events, the entrepreneur makes profit and vice versa.
Thus, according to Knight,
profit arises from the decisions taken and implemented under the conditions of uncertainty. In his view, the profits may arise as a result of decisions concerning the state of market, e.g., decisions which result in increasing the degree of monopoly, decisions with respect to holding stocks that give rise to windfall gains, and decision taken to introduce new techniques or innovations.
Schumpeter's
Innovation Theory of Profit. The innovation theory of profit was developed by Joseph A. Schumpeter 7 .
He was of the opinion that factors like emergence of interest and profits, recurrence of
trade cycles and such others are only incidental to a distinct process of economic development; and certain principles which could explain
the process of economic development
would also explain these economic variables. His theory of profit is thus embedded in his theory of economic development. To explain the phenomenon of economic development (and,
thereby, the profit) Schumpeter starts from the state of
a stationary equilibrium which is characterised by
the
equilibrium in all the spheres. Under the conditions of stationary equilibrium, the
total receipts from the business are exactly equal to the total outlay and there is no profit. Profit can be made only by introducing innovations in manufacturing
technique and methods of supplying the goods. Innovations may
include: (i) introduction of a new commodity or a new quality of goods; (ii)
the introduction of a new method of production; (iii)the opening of
a new market; (iv)finding new sources of raw material;
and (v) organizing the industry in
an innovative manner with the
new techniques. Over time, however, the supply of factors
remaining the same, factor prices tend to increase. As a result, cost of production increases. On the other hand, with other frms adopting innovations, supply of goods and services increases resulting in
a
fall in their prices. Thus, on the one hand, cost per unit of output goes up and, on the other, revenue per unit decreases.
Ultimately, a stage comes when

the difference between costs and receipts disappears.
Therefore, profits disappear.
In the process, however, the economy reaches a higher level of stationary equilibrium. It is, however,
quite likely that
profit exists
in spite of the process of profits being wiped out. Such profits are in the nature of quasi-rent arising due to some special characteristic of productive services. Furthermore, where profits arise due to such factors as patents, trusts, cartels, etc.,
it
would be in the nature of monopoly revenue rather than entrepreneurial profits.
Monopoly
Profit. Most profit theories have been propounded in the background of perfect competition. But perfect competition, as conceived in the theoretical models, is either non-existent or is a rare phenomenon. An extreme contrast of perfect competition is the existence of monopoly in the market.
Monopoly characterises
a market situation in which there is a single seller
of
a commodity
without a close substitute.
Check Your Progress 1. What is meant by profit from a businessmen's point of view? 2. Distinguish between account- ing profit and economic profit. 3. What is innovation theory of profit? 4. What is Knight's theory of profit or profit as reward for risk bearing?
NOTES 270 Self-Instructional Material Profit As Business Objective and Profit Planning
Monopoly may arise due to such factors as: (i) economies of scale, (ii) sole ownership of certain crucial raw materials, (iii)legal sanction and protection,
and (
iv)mergers and takeovers. A monopolist may earn 'pure profit' or what is generally called in this case, 'monopoly profit', and maintain it in the long run by using its monopoly powers. Monopoly powers include: (i) powers to control supply and price; (
ii)
powers to prevent the entry of competitors by price cutting;
and (iii)in some cases, monopoly power in
certain input markets. These powers help a monopoly firm to make pure profit (or monopoly profit). In such cases, monopoly is the source of pure profit. 9.4
PROBLEMS IN PROFIT MEASUREMENT As mentioned above, accounting profit equals revenue minus all explicit costs, and economic profit equals revenue minus explicit and implicit costs. Once profit is defined, it should not be difficult to measure the profit of a firm for a given period. But two questions complicate the task of measuring profit : (i) which of the two concepts of profit be used for measuring profit? and (ii) what costs should be
and what
should not be included in the implicit and explicit costs? The answer to the first question is that the use of a profit concept depends on the purpose of measuring profit. Accounting concept of profit is used when the purpose is to produce a profit figure for (i) the shareholders to inform them of progress of the firm, (ii) financiers and creditors who would be interested in the firm's progress. (iii) the managers to assess their own performance, and (iv) for computation of tax-liability. For measuring accounting profit for these purposes, necessary revenue and cost data are, in general, obtained from the firm's books of account. It must, however, be noted that accounting profit may present an exaggeration of actual profit (or less) if it is based on arbitrary allocation of revenues and costs to a given accounting period.

On the other hand, if the objective is to measure 'true profit', the concept of economic profit should be used. However, 'true profitability of any investment or business cannot be determined until the ownership of that investment or business has been fully terminated. 8 But then life of a corporation is eternal. Therefore, true profit can be measured only in terms of "maximum amount that can be distributed in dividends (theoretically from now to the identifinite future) without impairing the companies' earning power. Hence, the concept aims at preservation of stockholders' real capital. To estimate income then a forecast of all future changes in demand, changes in production process, cash outlays to operate the business, cash revenues and price changes. [is needed]." 9 This concept of business income is, however, an 'unattainable ideal' and hence is of little practical use. Nevertheless, it serves as a guide to income measurement even from businessmen's point of view. If follows from the above discussion that, for all practical purposes, profits have to be measured on the basis of accounting concept. But, measuring even the accounting profit is not an easy task. The main problem is to decide as to what should be and what should not be included in the cost. One might feel that profit and loss accounts and balance sheet of the firms provide all the necessary data
to measure accounting profit.
There are, however, three specific items of cost and revenue which pose conceptual problems.
NOTES Self-Instructional Material 271 Profit As Business Objective and Profit Planning
These items are: (i) depreciation, (ii) capital gains and losses, and (iii) current vs. historical costs. Measurement problems arise for two reasons: (a)
economist's
view on these items differs from that of accountants, and (b) there is more than one accepted method of treating these items. We discuss below the problems related to these items in detail. 9.4.1 Problem in Measuring Depreciation
Economists view depreciation as capital consumption.
For them,
there are two distinct ways of charging for depreciation: (i) the depreciation of an equipment must equal its opportunity cost, or alternatively, (ii) the
replacement cost that will produce comparable earning. Opportunity cost of an equipment is 'the most profitable alternative use of it that is foregone by putting it to its present use'. The problem is then of measuring the opportunity cost. One method of estimating opportunity cost, suggested by Joel Dean, is to measure the fall in value during a year. Going by this method, one assumes selling of the equipment as an alternative use. This method, however cannot be applied when a capital equipment has no alternative use, like a hydro-power project. In such cases, replacement cost is the appropriate measure of depreciation. To accountants, depreciation is an allocation of capital expenditure over time. Such allocation of historical cost of capital over time, i.e., charging depreciation, is made under unrealistic assumptions of (a) stable prices, and (b) a given rate of obsolescence. What is more important in this regard is that
the
methods of charging depreciation over the lifetime of an equipment
are various.
The use of different methods of charging depreciation results in different levels of profit reported by the accountants. For example, suppose a firm purchases a machine for Rs. 10,000 having an estimated life of 10 years. The firm can apply any of the following four methods of charging depreciation: (1) straight method (2) reducing balance method (3)
annuity
method,
and (4) sum-of-the-year's digit approach. Under the straight-line method, an amount of
Rs.10,000 ∏ 10 = Rs. 1,000 would be charged as depreciation each year. Under the
reducing balance method, depreciation is charged at a constant (per cent) rate of annually written down values of the machine. Assuming a depreciation rate of 20 per cent, Rs. 2000 in the first year, Rs. 1600 in the second year,
Rs. 1280
in the third year, and so on, shall be charged as depreciation Under annuity method,
rate of depreciation is fixed as
d = (C + Cr)/n, where n is the number of active years of capital,
C = total and r is the interest rate.
Finally, under the sum-of-the year's digits approach (i.e., a variant of the reducing balance method) the years of equipment's life are aggregated to give an unvarying denominator. Depreciation is then charged at the rate of the ratio of the last year's digits to the total of the years. In our example, the aggregated years of capital's life equals 1 + 2 + 3 + ... + 10 = 55. Depreciation in the Ist year will be 10,000 ¥ 10/55 = Rs. 1818.18, in the 2nd year it will be 1,000 ¥ 9/55 = Rs. 1636.36 and in 3rd year it will be 10,000 ¥ 8/55 = Rs. 1454.54, and so on. Note that the four methods yield four different measures of depreciation
in subsequent years and, hence, the different levels of profit.

NOTES 272 Self-Instructional Material Profit As Business Objective and Profit Planning 9.4.2

Treatment of Capital Gains and Losses Capital gains and losses are regarded as 'windfalls'. Fluctuation in the stock market prices is one of the most common sources of 'windfalls'. In a progressive society, according to Dean, capital losses are, on balance, greater than capital gains. Many of the capital losses are of insurable nature, and when a businessman over-insures, the excess becomes eventually a capital gain.

Profit is also affected by the way capital gains and losses are treated in accounting. As Dean suggests, "A sound accounting policy to follow concerning windfalls is never to record them until they are turned into cash by a purchase or sale of assets, since it is never clear until then exactly how large they are ..." 10 But, in practice, some companies do not record capital gains until it is realized in money terms, but they do write off capital losses from the current profit. If 'sound accounting policy' is followed there will be one profit, and if the other method is followed, there will be another figure of profit. An economist is not concerned with what accounting practice or principle is followed in recording the past events. He is concerned mainly with what happens in future.

What an economist would suggest is that the management should be aware of the approximate magnitude of such 'windfalls' long before they become precise enough to be acceptable to accountants. This would be helpful in taking the right decision in respect of affected assets. 9.4.3 Current vs. Historical Costs Accountants prepare income statements typically in terms of historical costs, i.e., in terms of purchase price, rather than in terms of current price. The reasons given for this practice are : (i) historical costs produce more accurate measurement of income, (ii) historical costs are less debatable and more objective than the calculated present replacement value, and (iii) accountants' job is to record historical costs whether or not they may have relevance for future decision-making. The accountant's approach ignores certain important changes in earnings and losses of the firms, e.g., (i) the value of assets presented in the books of accounts is understated in times of inflation and overstated at the time of deflation, (ii) depreciation is understated during deflation. Historical cost recording does not reflect such changes in values of assets and profits. This problem assumes a critical importance in case of inventories and stock. The problem is how to evaluate the inventory and the goods in the pipeline.

There are three popular methods of inventory valuation: (i) first-in-first-out (FIFO), (ii) last-in-first-out (LIFO), and (iii) weighted average cost (WAC).

Under FIFO method, material is taken out of stock for further processing in the order in which they are acquired. The stocks, therefore, appear in firm's balance sheet at their actual cost price.

This method is suitable when price has a secular trend. However, this system exaggerates profits at the time of rising prices. The LIFO method assumes that stocks purchased most recently become the costs of the raw material in the current production. If inventory levels are stable the cost of raw materials used at any point in the calculation of profits is always close to market or replacement value. But, when inventory levels fluctuate, this method loses its advantages. The WAC method takes the weighted average of the costs of materials purchased at different prices and different point of time to evaluate the inventory. All these methods have their own weaknesses and do not reflect the 'true profit' of business. So the problem of evaluating inventories so as to yield a true profit figure remains there.

NOTES Self-Instructional Material 273 Profit As Business Objective and Profit Planning 9.5 PROFIT MAXIMIZATION AS BUSINESS OBJECTIVE

As mentioned earlier, profit maximization has been the most important assumption on which economists have built price and production theories. This hypothesis has, however, been strongly questioned and alternative hypothesis suggested. This issue will be discussed in the forthcoming sections.

Let us first look into the importance of the profit maximization hypothesis and theoretical conditions of profit maximization. The conventional economic theory assumes profit maximization as the only objective of business firms. Profit maximization as the objective of business firms has a long history in economic literature. It forms the basis of conventional price theory. Profit maximization is regarded as the most reasonable and analytically the most 'productive' business objective. The strength of this assumption lies in the fact that this assumption 'has never been unambiguously disproved'. Besides, profit maximization assumption has a greater predictive power. It helps in predicting the behaviour of business firms in the real world and also the behaviour of price and output under different market conditions. No alternative hypothesis explains and predicates the behaviour of firms better than the profit maximization assumption.

9.5.1 Profit Maximizing Conditions Total profit (P) is defined as

Π =
TR – TC ...(9.1) where TR = total revenue and TC = total cost. There are two conditions that must be fulfilled for TR – TC to be maximum. These conditions are called (i) necessary condition, and (ii) secondary or supplementary condition.
The
necessary or the first order condition requires that marginal revenue (MR) must be equal to marginal cost (MC). By definition,
marginal revenue is the revenue obtained from the production and sale
of one additional unit of output, marginal cost is the cost arising due to the production of one
additional unit
of output.
The
secondary or
the second order condition requires that the necessary condition must be satisfied under the
condition of decreasing MR and rising MC. The fulfilment of the two conditions makes it the sufficient condition.
This condition is illustrated by point P 2 in Fig. 9.1. Fig. 9.1: Marginal Conditions of Profit Maximisation
NOTES 274 Self-Instructional Material Profit As Business Objective and Profit Planning The profit maximizing conditions can be presented in technical terms
as follows: We know that a profit maximizing firm seeks to maximize
Π =
TR – TC Let us suppose that the total revenue and total cost functions are, respectively, given as TR = f(Q)
and TC =
f(Q) where Q = quantity produced and sold. By substituting total revenue and total cost functions in Eq. (9.1), the profit function may be written as Π = f(Q) TR – f(Q) TC ... (9.2) Equation (9.2) can now be manipulated to illustrate the first and second order conditions of profit maximization as follows.
First-order condition. The first-order condition of maximizing
a function is that its first derivative must be equal to zero. Thus, the
first-order condition of profit maximization is that the first derivative of the profit function Eq. (9.2) must be equal to zero.
Differentiating the total profit function and setting it equal to zero, we get 0 TR TC Q Q
Q ∂Π ∂ ∂ = – = ∂ ∂ ∂ ... (9.3) This condition holds only when
or
TR TC Q Q ∂ ∂ = ∂ ∂ In Eq. (9.3), the term ∂TR/∂Q
is
the slope of the total revenue curve, which is the same as marginal
revenue (MR). Similarly, the term ∂TC/∂Q is
the slope of the total
cost curve or what is the same as marginal cost (MC). Thus, the first-order condition for profit maximisation can be stated as MR = MC The first-order condition is generally known as necessary condition. A condition is
said to be necessary if its non-fulfilment results in non-occurrence of an event.
Second-order Condition. As already mentioned, in non-technical terms, the
second- order
condition of profit maximization requires that the first order condition is satisfied under rising MC and decreasing MR.
This condition is illustrated in Fig. 9.1. The MC and MR curves are the usual marginal cost and marginal revenue curves, respectively. MC and MR curves
intersect at two points, P 1 and P 2 Thus, the first order
condition is satisfied at both the points, but the second order condition of profit maximization is satisfied only at point P 2 . Technically, the second order condition. requires that its second derivative of the profit function is negative. When second derivative of profit function is
negative, it implies that the total profit curve has turned downward after having reached the peak, i.e., the highest point on profit scale.
The second derivative of the total profit function is given as 2 2 2 2 2 2
TR TC Q Q Q ∂ Π ∂ ∂ = – ∂ ∂ ∂ ... (9.4) The second-order condition requires that 2 2 2 2 0 TR TC Q
Q ∂ ∂ – > ∂ ∂
NOTES Self-Instructional Material 275 Profit As Business Objective and Profit Planning or 2 2 2 2 TR TC Q Q ∂ ∂ > ∂ ∂ ... (9.5) Since ∂ 2 TR/∂Q 2 is
the slope of MR and ∂ 2 TC/∂Q 2 is the slope of MC, the

second- order condition may also be written as Slope of MR > Slope of MC It implies that MC must have a steeper slope than MR or MC must intersect the MR from below. To conclude, profit is maximized where both the first and second order conditions are satisfied.

Example

We may now apply the profit maximization conditions to a hypothetical example and compute profit maximizing output. We know that TR = P.Q. Suppose

price (P) function is given as P = 100 – 2

Q ...(9.6) Then

TR= (100 – 2Q)Q or TR = 100Q – 2Q 2 ...(9.7) Let us also suppose that the total cost function as given as TC = 10 + 0.5 Q 2 ...(9.8) Let us now apply the first order condition of profit maximization and find profit maximizing output. We have noted that profit is maximum where MR = MC or TR Q ∂ ∂ = TC Q ∂ ∂ Given the total TR function in Eq. (9.7) and TC function in Eq. (9.8), MR = TR Q ∂ ∂ = 100 – 4Q ...(9.9) and MC = TC Q ∂ ∂ = Q ...(9.10) Thus, profit is maximum where MR = MC or 100 – 4Q = Q 5Q = 100 Q = 20

The output 20 satisfies the second order condition also. The second order condition requires that 2 2 2 2 0 TR TC Q Q ∂ ∂ – > ∂ ∂ In other words, the second-order condition requires that 0 MR MC Q Q ∂ ∂ – > ∂ ∂

NOTES 276 Self-Instructional Material Profit As Business Objective and Profit Planning Check Your Progress 5. What are the problems in measuring profit? 6. What methods are used to charge depreciation in measuring profit? 7. What are the conditions for profit maximization as business objective? 8.What is the nature of controversy on profit maximization being the objective of business firms?

or (100 4) ( ) 0 Q Q Q Q ∂ – ∂ – > ∂ ∂ – 4 – 1 > 0 Thus, the second-order condition is also satisfied at output 20. 9.6 CONTROVERSY OVER PROFIT MAXIMIZATION OBJECTIVE 9.6.1 Gap between Theory and

Practice As discussed above, traditional theory assumes profit maximization as the sole objective of a business firm. In practice, however, firms have been found to be pursuing objectives other than profit maximization. It is argued, in the first place, that the reason for the firms, especially the large corporations, pursuing goals other than profit maximization is the dichotomy between the ownership and management. The separation of management from the ownership gives managers an opportunity and also discretion to set goals for the firms they manage other than profit maximization. Large firms pursue such goals as sales maximization,

maximization of managerial utility function, maximisation of firm's growth rate, making a target profit, retaining market share,

building up the net worth of the firm, etc. Secondly, traditional theory assumes full and perfect knowledge about current market conditions and the future developments in the business environment of the

firm. The firm is thus supposed to be fully aware of its demand and cost functions in both short and long runs. Briefly speaking, a complete certainty about the market conditions is assumed. On the contrary, it is widely recognized that the firms do not possess the perfect knowledge of their costs, revenue, and their environment. They operate in the world of uncertainty. Most price and output decisions are based on probabilities. Finally, the marginality principle of equalizing MC and MR has been found to be absent in the decision-making process of the firms. Empirical studies of the pricing behaviour of the firms have shown that the marginal rule of pricing does not stand the test of empirical verification. Hall and Hitch 11 have found, in their study of pricing practices of UK 38 firms, that the firms do not pursue the objective of profit maximization and that they do not use the marginal principle of equalizing MR and MC in their price and output decisions. Most firms aim at long-run profit maximization. In the short-run, they set the price of their product on the basis of average cost principle, so as to cover AC = AVC + AFC and a normal margin of profit (usually 10 per cent). In a similar study, Gordon 12 has found that there is marked deviation in the real business conditions from the assumptions of the traditional theory and that pricing practices were notably different from the marginal theory of pricing. He has concluded that the real business world is much more complex than the one postulated by the theorists. Because of the extreme complexity of the real business world and ever-changing conditions, the past experience of the business firms is of little use in forecasting demand, price and costs. The firms are not aware of their MR and MC. The average-cost-principle of pricing is widely used by the firms. Findings of many other studies of the pricing practices lend support to the view that there is little link between pricing theory and pricing practices. 9.6.2 The Defence of Profit Maximization The arguments against

the profit-maximization assumption, however, should not mean

that pricing theory has no relevance to the actual pricing policy of the business firms. A section of economists has strongly defended the profit maximization objective and 'marginal principle' of pricing and output decisions. The empirical and theoretical

NOTES Self-Instructional Material 277 Profit As Business Objective and Profit Planning support put forward by them in defence of the marginal rule of pricing may be summed as follows. In two empirical studies of 110 'excellently managed companies', J.S. Earley 13 has concluded that the firms do apply the marginal rules in their pricing and output decisions. Fritz Maclup 14 has argued in abstract theoretical terms that empirical studies by Hall and Hitch, and Lester do not provide conclusive evidence against the marginal rule and these studies have their own weaknesses. He further argues that there has been a misunderstanding regarding the purpose of traditional theory of value. The traditional theory seeks to explain market mechanism, resource allocation through price mechanism and has a predictive value, rather than deal with specific pricing practices of certain firms. The relevance of marginal rules in actual pricing system of firms could not be established because of lack of communication between the businessmen and the researchers as they use different terminology like MR, MC and elasticities. Besides, businessmen even if they do understand economic concepts, would not admit that they are making abnormal profits on the basis of marginal rules of pricing. They would instead talk of a 'fair profit'. Also, Maclup is of the opinion that the practices of setting price equal to average variable cost plus a profit margin is not incompatible with the marginal rule of pricing and that the assumptions of traditional theory are plausible. While the controversy on profit maximization objective remains unresolved, the conventional theorists, the marginalists, continue to defined the profit maximization objective and its marginal rules. Arguments in Defence of Profit Maximization Hypothesis.

The conventional economic theorists defend the profit maximization hypothesis also on the following grounds. 1. Profit is indispensable for firm's survival. The survival of all the profit-oriented firms in the long run depends on their ability to make a reasonable profit depending on the business conditions and the level of competition. Nevertheless, what is a reasonable profit? May be a matter of opinion. But, making
a
profit is a necessary condition for the survival of the firm. Once the firms are able to make profit, they try to make it as large as possible, i.e., they tend to maximize it. 2.
Achieving other objectives depends on firm's ability to make profit. Many other objectives of business firms have been cited in economic literature, e.g., maximization of managerial utility function, maximization of long-run growth, maximization of sales revenue, satisfying all the concerned parties, increasing and retaining market share, etc. The achievement of such alternative objectives depends wholly or partly on the primary objective of making profit. 3.
Evidence against profit maximization objective not conclusive. Profit maximization is a time-honoured objective of business firms. Although this objective has been questioned by many researchers, the evidence against it is not conclusive or
unam- biguous. 4.
Profit maximization objective has a greater predicting power. Compared to other business objectives, profit maximization assumption has been found to be a much more powerful
premise in
predicting certain aspects of firms' behaviour. As Friedman has argued, the validity of the profit–maximization objective cannot be judged by a priori logic or by asking business executives, as some economists have done.
The
ultimate test of its validity is its ability to predict the business behaviour and the business trends. 5. Profit is a more reliable measure of firm's efficiency. Thought not perfect, profit is the most efficient and reliable measure of the efficiency of a firm. It is also the source of internal finance. Profit as a source of internal finance assumes a greater significance when financial market is highly volatile. The recent trend shows a
NOTES 278 Self-Instructional Material Profit As Business Objective and Profit Planning
growing dependence on the internal finance in the industrially advanced countries, In fact, in developed countries, internal sources of finance contribute more than three-fourths of total finance. Finally, whatever one may say about firms' motivations, if one judges their motivations by their acts, profit maximization appears to be a more valid business objective 15 . 9.7

ALTERNATIVE OBJECTIVES OF BUSINESS FIRMS While postulating the objectives of business firms, the conventional theory of firm does not distinguish between owners' and managers' interests. The recent theories of firm called 'managerial' and 'behavioural' theories of firm, however, assume owners and managers to be separate entities in large corporations with different goals and motivation. Berle and Means 16 were the first to point out the dichotomy between the ownership and the management and its role in managerial behaviour and in setting the goal(s) for the firm that they manage. Later on Galbraith 17 wrote extensively on this issue which is known as Berle-Means-Galbraith (B-M-G) hypothesis. The B-M-G hypothesis states (i) that owner controlled firms have higher profit rates than manager controlled firms; and (ii) that managers have no incentive for profit maximization. The managers of large corporations, instead of maximizing profits, set goals for themselves that can keep the owners quiet so that managers can take care of their own interest in the corporation. In this section, we will discuss very briefly some important alternative objectives of business firms, especially of large business corporations. 9.7.1 Baumol's Hypothesis of Sales Revenue Maximization Baumol 18 has postulated maximization of sales revenue as an alternative to profit- maximization objective. The reason behind this objective is the dichotomy between ownership and management in large business corporations. This dichotomy gives managers an opportunity to set their goals other than profit maximization goal which most owner-businessmen pursue. Given the opportunity, managers choose to maximize their own utility function. According to Baumol, the most plausible factor in managers' utility functions is maximization of the sales revenue. The factors which explain the pursuance of this goal by the managers are following. First, salary and other earnings of managers are more closely related to sales revenue than to profits. Second, banks and financial corporations look at sales revenue while financing the corporation. Third, trend in sale revenue is a readily available indicator of the performance of the firm. It helps also in handling the personnel problem. Fourth, increasing sales revenue enchances the prestige of managers while profits go to the owners. Fifth, managers find profit maximization a difficult objective to fulfill consistently over time and at the same level. Profits may fluctuate with changing conditions. Finally, growing sales strengthen competitive spirit of the firm in the market and vice versa. So far as empirical validity of sales revenue maximization objective is concerned, factual evidences are inconclusive. 19 Most empirical works are, in fact, based on inadequate data simply because requisite data is mostly not available. Even theoretically, if total cost

NOTES Self-Instructional Material 279 Profit As Business Objective and Profit Planning function intersects the total revenue function (TR) function before it reaches its climax, Baumol's theory collapses. Besides, it is also argued that, in the long run, sales maximization and profit maximization objective converge into one. For, in the long run, sales maximization tends to yield only normal levels of profit which turns out to be the maximum under competitive conditions. Thus, profit maximization is not incompatible with sales maximization. 9.7.2 Marris's Hypothesis of Maximization of Firm's Growth Rate According to Robin Marris, 20 managers maximize firm's balanced growth rate subject to managerial and financial constraints. He defines firm's balanced growth rate (G) as G = G D = G C where G D = growth rate of demand for firms product and G C = growth rate of capital supply to the firm. In simple words, a firm's growth rate is balanced when demand for its product and supply of capital to the firm increase at the same rate. The two growth rates are according to Marris, translated into two utility functions: (i) manager's utility function, and (ii) owner's utility function. The manager's utility function (U m) and owner's utility function (U o) may be specified as follows. U m = f (salary, power, job security, prestige, status), and U o = f (output, capital, market-share, profit, public esteem). Owners' utility function (U o) implies growth of demand for firms product and supply of capital. Therefore, maximization of U o means maximization of 'demand for firm's product' or growth of capital supply'. According to Marris, by maximizing these variables, managers maximise both their own utility function and that of the owners. The managers can do so because most of the variables (e.g., salaries, status, job security, power, etc.) appearing in their own utility function and those appearing in the utility function of the owners (e.g., profit, capital market, share, etc.) are positively and strongly correlated with a single variables, i.e., size of the firm. Maximization of these variables depends on the maximization of the growth rate of the firms. The managers, therefore, seek to maximize a steady growth rate. Marris's theory, though more rigorous and sophisticated than Baumol's sales revenue maximization, has its own weaknesses. It fails to deal satisfactorily with oligopolistic interdependence. Another serious shortcoming of his model is that it ignores price determination which is the main concern of profit maximization hypothesis. In the opinion of many economists, Marris's model too, does not seriously challenge the profit maximization hypothesis. 9.7.3 Williamson's Hypothesis of Maximization of Managerial Utility Function Like Baumol and Marris, Willamson 21 argues that managers have discretion to pursue objectives other than profit maximization. The managers seek to maximize their own utility function subject to a minimum level of profit. Managers' utility function(U) is expressed as U = f(S, M, I D) where S = additional expenditure on staff M = managerial emoluments, I D = discretionary investments

NOTES 280 Self-Instructional Material Profit As Business Objective and Profit Planning According to Williamson's hypothesis, managers maximize their utility function subject to a satisfactory profit. A minimum profit is necessary to satisfy the shareholders or else manager's job security is endangered. The utility functions which managers seek to maximize include both quantifiable variables like salary and slack earnings, and non- quantitive variable such as prestige power, status, job security, professional excellence, etc. The non-quantifiable variables are expressed, in order to make them operational, in terms of expense preference defined as 'satisfaction derived out of certain types of expenditures' (such as slack payments), and ready availability of funds for discretionary investment. Like other alternative hypotheses, Williamson's theory too suffers from certain weaknesses. His model fails to deal with the problem of oligopolistic interdependence. Williamson's theory is said to hold only where rivalry between firms is not strong. In case of strong rivalry, profit maximization is claimed to be a more appropriate hypothesis. Thus, Williamson's managerial utility function too does not offer a more satisfactory hypothesis than profit maximization. 9.7.4 Cyert-March Hypothesis of Satisficing Behaviour Cyert-March 22 hypothesis is an extension of Simon's hypothesis of firms' 'satisficing behaviour' or satisfying behaviour. Simon had argued that the real business world is full of uncertainly; accurate and adequate data are not readily available; where data are available managers have little time and ability to process them; and managers work under a number of constraints. Under such conditions it is not possible for the firms to act in terms of rationality postulated under profit maximization hypothesis. Nor do the firms seeks to maximize sales, growth or anything else. Instead they seek to achieve a 'sat- isfactory profit' a 'satisfactory growth', and so on. This behaviour of firms is termed as 'Satisfaction Behaviour'. Cyert and March added that, apart from dealing with an uncertain business world, managers have to satisfy a variety of groups of people—managerial staff, labour, shareholders, customers, financiers, input suppliers, accountants, lawyers, authorities, etc. All these groups have their interest in the firms—often conflicting. The manager's responsibility is to 'satisfy' them all. Thus, according to the Cyert-March, firm's behaviour is 'satisficing behaviour'. The 'satisficing behaviour' implies satisfying vari- ous interest groups by sacrificing firm's interest or objective. The underlying assumption of 'Satisficing Behaviour' is that a firm is a coalition of different groups connected with various activities of the firms, e.g., shareholders, managers, workers, input supplier, customers, bankers, tax authorities, and so on. All these groups have some kind of expections–high and low–from the firm, and the firm seeks to satisfy all of them in one way or another by sacrificing some of its interest. In order to reconcile between the conflicting interests and goals, managers form an aspiration level of the firm combining the following goals: (a) Production goal, (b) Sales and market share goals, (c) Inventory goal, and (d) Profit goal. These goals and 'aspiration level' are set on the basis of the managers' past experience and their assessment of the future market conditions. The 'aspiration levels' are modified and revised on the basis of achievements and changing business environment. The behavioural theory has, however, been criticised on the following grounds. First, though the behavioural theory deals realistically with the firm's activity, it does not explain the firm's behaviour under dynamic conditions in the long run. Secondly, it cannot be used to predict exactly the future course of firm's activities, Thirdly, this theory does not deal with the equilibrium of the industry. Fourthly, like other alternative hypotheses, this theory too fails to deal with interdependence of the firms and its impact on firms behaviour. NOTES Self-Instructional Material 281 Profit As Business Objective and Profit Planning 9.7.5 Rothschild's Hypothesis of Long-run Survival and Market Share Goals Another alternative objective of a firm–as an alternative to profit maximization–was suggested by Rothschild. 23 According to him, the primary goal of the firm is long-run survival. Some other economists have suggested that attainment and retention of a constant market share is an additional objective of the firms. The managers, therefore, seek to secure their market share and long-run survival. The firms may seek to maximise their profit in the long-run though it is not certain. 9.7.6 Entry-prevention and Risk-avoidance Yet another alternative objective of the firms suggested by some economists is to prevent entry of new firms into the industry. The motive behind entry-prevention may be (a) profit maximization in the long run, (b) securing a constant market share, and (c) avoidance of risk caused by the unpredictable behaviour of new firms. The evidence of whether firms maximize profits in the long-run is not conclusive. Some economists argue, however, that where management is divorced from the ownership, the possibility of profit maximization is reduced. The advocates of profit maximization, argue however, that only profit-maximizing firms can survive in the long-run. They can achieve all other subsidiary goals easily if they can maximize their profits. It is further argued that, no doubt, prevention of entry may be the major objective in the pricing policy of the firm, particularly in case of limit pricing. But then, the motive behind entry-prevention is to secure a constant share in the market. Securing constant market share is compatible with profit maximization. 9.8 A REASONABLE PROFIT TARGET As noted above,

objectives of business firms can be various. There is no unanimity among

the economists and researchers on the objective

of business firms. One thing is, however, certain that the survival of a firm depends on the profit it can make.

So whatever the goal of the firm–sales revenue maximization, maximization of firm's growth, maximization of managers' utility function, long-run survival, market share, or entry-prevention–it has to be a profitable organisation.

Maximization of profit in technical sense of the term may not be practicable, but profit has to be there in the objective function of the firms. The firms may differ on 'how much profit' but they set a profit target for themselves. Some firms set their objective of a 'standard profit', some of a 'target profit' and some of a 'reasonable profit'. A 'reasonable profit' is the most common objective.

Let us now look into the policy question related to setting standard or criteria for reasonable profits .The important policy questions are: (i) Why do modern corporations aim at a "reasonable profit" rather than attempting to maximise profit? (ii) What are the criteria for a reasonable profit? (iii)How should "reasonable profits" be determined? Let us now briefly examine the policy implications of these questions. 9.8.1 Reasons for Aiming at "Reasonable Profits" For a variety of reasons, modern large corporations aim at making a reasonable profit rather than maximizing the profit. Joel Dean 24 has listed the following reasons. Check Your Progress 9. What are the business objectives other than profit maximization? 10.How is the sales maximization objective different from profit maximization? 11. What is the managerial utility function? 12. What is a firm's satisficing behaviour?

NOTES 282 Self-Instructional Material Profit As Business Objective and Profit Planning 1. Preventing entry of competitors. Profit maximization under imperfect market conditions generally leads to a high 'pure profit' which is bound to attract competitors, particularly in case of a weak monopoly. 25 The firms, therefore, adopt a pricing and a profit policy that assure them a reasonable profit and, at the same time, keeps potential competitors away. 2. Projecting a favourable public image. It becomes often necessary for large corporations to project and maintain a good public image, for if public opinion turns against it and government officials start raising their eyebrows on profit figures, corporations may find it difficult to sail smoothly. So most firms set prices lower than that conforming to the maximum profit but high enough to ensure a "reasonable profit". 3. Restraining trade union demands. High profits make trade unions feel that they have a share in the high profit and therefore they raise demands for wage- hike. Wage-hike may lead to wage-price spiral and frustrate the firm's objective of maximizing profit. Therefore, profit restrain is sometimes used as a weapon against trade union activities. 4. Maintaining customer goodwill. Customer's goodwill plays a significant role in maintaining and promoting demand for the product of a firm. Customer's goodwill depends largely on the quality of the product and its 'fair price'. What consumers view as fair price may not be commensurate with profit maximisation. Firms aiming at better profit prospects in the long run, sacrifice their short-run profit maximization objective in favour of a "reasonable profit". 5. Other factors. Some other factors that put restraint on profit maximisation include (a) managerial utility function being preferable to profits maximization for executives, (b) congenial relation between executive levels within the firm, (c) maintaining internal control over management by restricting firm's size and profit, and forestalling the anti-trust suits. Standards of Reasonable Profits When firms voluntarily exercise restraint on profit maximization and choose to make only a 'reasonable profit', the questions that arise are: (i) what form of profit standards should be used, and (ii) how should reasonable profits be determined? (i) Forms of Profit Standards.

Profit standards may be determined in terms of (a) aggregate money terms, (b) percentage of sales, or (c) percentage return on investment.

These standards may be determined with respect to the whole product line or for each product separately. Of all the forms of profit standards, the total net profit of the enterprise is more comman than other standards. But when purpose is to discourage the potential competitors, then a target rate of return on investment is the appropriate profit standard, provided competitors' cost curves are similar. The profit standard in terms of 'ratio to sales is an eccentric standard' because this ratio varies widely from firm to firm, even if they all have the 'same return on capital invested'. This is particularly so when there are differences in (a) vertical integration of production process, (b) intensity of mechanization, (c) capital structure, and (d) turnover. (ii) Setting the Profit Standard. The following are the important criteria that are taken into account while setting the standards for a "reasonable profit". (a) Capital-attracting standard. An important criterion of profit standard is that it must be high enough to attract external (debt and equity) capital. For example, if the firm's stocks are being sold in the market at 5 times their current earnings, it is necessary that the firm earns a profit of 20 per cent of the book investment.

NOTES Self-Instructional Material 283 Profit As Business Objective and Profit Planning There are however certain problems associated with this criterion: (i) capital structure of the firms (i.e., the proportions of bonds, equity and perference shares) affects the cost of capital and thereby the rate of profit, and (ii) whether profit standard has to be based on current or long-run average cost of capital as it varies widely from company to company and may at times prove treacherous. (b) 'Plough-back' standard. In case a company intends to rely on its own sources for financing its growth, then the most relevant standard is the aggregate profit that provides for an adequate "plough-back" for financing a desired growth of the company without resorting to the capital market. This standard of profit is used when maintaining liquidity and avoiding debt are main considerations in profit policy. Plough-back standard is, however, socially less acceptable than capital- attracting standard. From society's point of view, it is more desirable that all earnings are distributed to stockholders and they should decide the further investment pattern. This is based on a belief that market forces allocate funds more efficiently and an individual is the best judge of his resource use. On the other hand, retained earnings which are under the exclusive control of the management are likely to be wasted on low-earning projects within the company. But one cannot be sure as to which of the two allocating agencies– market or management–is generally superior. It depends on "the relative abilities of management and outside investors to estimate earnings prospects." (c) Normal earnings standard. Another important criterion for setting standard of reasonable profit is the 'normal' earnings of firms of an industry over a normal period. Company's own normal earnings over a period of time often serve as a valid criterion of reasonable profit, provided it succeeds in (i) attracting external capital, (ii) discouraging growth of competition, and (iii) keeping stockholders satisfied. When average of 'normal' earnings of a group of firms is used, then only comparable firms and normal periods are chosen. However, none of these standards of profits is perfect. A standard is, therefore, chosen after giving due consideration to the prevailing market conditions and public attitudes. In fact, different standards are used for different purposes because no single criterion satisfies all conditions and all the people concerned. 9.9

PROFIT AS CONTROL MEASURE An important managerial aspect of profit is its use in measuring and controlling performance of the executives of the large business undertakings. Researches have revealed that business executives of middle and high ranks often deviate from profit objective and try to maximize their own utility functions. 26 They think in terms of job security, personal ambitions for promotion, larger perks, etc., which often conflict with firms' profit-making objective. Keith Powlson 27 has pointed out three common deviationist tendencies: (i) more energy is spent in expanding sales volume and product lines than in raising profitability; (ii)subordinates spend too much time and money doing jobs to perfection regardless of its cost and usefulness;

and (iii)executives cater more to the needs of job security in the absence of any reward for imaginative ventures. In order to control these deviationist tendencies and orienting managerial functions towards the profit objective, the top management uses 'managerial decentralisation and

NOTES 284 Self-Instructional Material Profit As Business Objective and Profit Planning

control-by-profit techniques'. These techniques have distinct advantage for a big business corporation. Managerial decentralisation is achieved by changing over from functional division of business activities (e.g., production branch, sales division, purchase department, etc.) to a system of commodity wise division. Managerial responsibilities are then fixed in terms of profit. Managers enjoy autonomy in their operations under the general policy framework. They are allotted a certain amount to spend and a profit target to be achieved by the particular division. Profit is then the measure of executive performance, not the sales or quality. This kind of reorganisation of management helps in assessing profit-performance of various product lines in a multi- product organisation. It serves as a useful guide in reorganisation of the product lines. The use of this technique, however, raises many interesting technical issues that complicate

the application of this technique.

These issues centre around the method of measuring divisional profits and profit standards to be set. The two important problems that arise are: (i) should profit goals be set in terms of total net profit for the divisions or should they be confined to their share in the total net profit? and (ii) how should divisional profits be determined when there is a long ladder of vertical integration? In respect

of

question (i) the most appropriate profit standard of divisional performance is revenue minus current expenses. In respect of

allocating different costs, however, some arbitrariness is bound to be there. However, where a long vertical integration is involved, relative profitability of a division can be fixed in terms of a lower "transfer price" compared to the market price. But, control measures are not all that simple to apply. It is difficult to set a general formula. That has to be settled differently under varying conditions. 9.10 PROFIT

PLANNING:

BREAK-EVEN ANALYSIS In traditional theory of firm, the basic objective of the firm is to maximize profit. Maximum profit does not necessarily coincide with the minimum cost, as far as the traditional theory of firm is concerned. Besides, profit is maximum at a specific level of output which is difficult to know before hand. Even if it is known, it cannot be achieved at the outset of production. In real life, firms begin their activity even at a loss, in anticipation of profit in the future. However, the firms can plan their production better if they know the level of production where cost and revenue break even, i.e., the profitable and non-profitable range of production. Break-even analysis or what is also known as profit contribution
analysis is an important analytical technique used to study the relationship between the total costs, total revenue and total profits and losses over the whole range of stipulated output. Break-even analysis is
the calculation of the sales volume that is required to cover costs; the level of sales revenue below which production is unprofitable and above which production is profitable.
The break-even analysis is a technique of having a preview of profit prospects and a tool of profit planning. It integrates the cost and revenue estimates to ascertain the profits and losses associated with different levels of output. The relationship between cost and output and between price and output may be linear or non-linear in nature.
We shall discuss the break-even analysis under both linear and non-linear revenue conditions. 9.10.1 Break-Even Analysis: Linear Cost and Revenue
Function
To illustrate the break-even analysis under linear cost and revenue conditions, let us assume
a linear cost function and a
linear revenue function are given as follows. Cost function: TC = 100 + 10Q ...(9.11) Revenue function: TR = 15Q ...(9.12)
The cost function given Eq. (9.11) implies that the firm's total fixed cost is given at Rs. 100 and its variable cost varies at a constant rate of
Rs. 10 per unit in response to

increase in output. The revenue function given in Eq. (9.12) implies that the price for the firm's product is given in the market at Rs. 15 per unit of sale. What firm needs to carry out break-even analysis of its business operations is to make a chart of its total fixed cost (TFC), total variable (TVC), total cost (TC) and the total revenue (TR), and graph them to find the break-even point. The process of break-even analysis is illustrated graphically in Fig. 9.8. The line TFC shows the total fixed cost at Rs. 100 for a certain level of output, and the line TVC shows the variable cost rising with a slope (DQ/DTVC) = 1/10. The line TC has been obtained by plotting the TC function. It can be obtained also by a vertical summation of TFC and TVC at various levels of output. The line TR shows the total revenue (TR) obtained as Q . P. The
line TR intersects the line TC
at point B, where output is equal to 20 units. The point B shows that at Q = 20, firm's total cost equals its total revenue. That is, at Q = 20, TC breaks even with TR. Point B is, therefore, the break-even point and Q = 20 is the break- even level of output.
Below this level of output, TC
exceeds TR. The vertical difference between TC and TR, (i.e., TC–TR) is known as operating loss. Beyond Q = 20, TR < TC, and TR–TC is known as operating profit. It may thus be inferred that a firm producing a commodity under cost and revenue conditions mentioned above must pro- duce at least 20 units to make its total cost and total revenue break-even. Fig. 9.2: Break-even Analysis: Linear Functions
If TR and TC functions are known,
the break-even output can also be calculated algebraically. We know that at break-even point, TR = TC
Given the TR and TC functions, as above 15
Q = 100 + 10Q 5Q = 100 Q = 20 Thus, 20 is the break-even output. Given the TR and TC functions, production beyond 20 units will yield increasing profits, at least in the short-run. Algebra of Break-Even Analysis. The break-even analysis can also be presented algebraically.
As mentioned above, at break-even volume of sales,
TR = TC where TR = (P × Q) and TC = TFC + TVC. In break-even analysis, TVC is defined as TVC = AVC × Q. Thus, TC = TFC + AVC × Q

Now, break-even quantity (Q B) can be obtained as follows: TR = TC Q B ·P = TFC + AVC·Q B ... (9.13) where Q B = break-even volume. Rearranging Eq. (9.13), we get Q B ·P –
AVC·Q B = TFC Q B (P – AVC) = TFC Q B = TFC/P – AVC ... (9.14)
If TFC, AVC and P are known, Q B can be obtained straightaway from Eq. (9.14). Limitations. The break-even analysis, as presented above, is
based on the assumption that

cost and revenue functions are linear. Under the condition of linear cost and revenue functions, TC and TR are straight lines and intersect each other at only one point (as shown in Fig. 9.8.) dividing the whole range of output into two parts—profitable and non-profitable. It may give the impression that the whole output beyond the break-even level is profitable. In real life, however,
it may not be true
due to changing price and cost conditions. In reality, the cost and revenue functions may be non-linear. Non- linearity arises because AVC and price vary with variation in the output. As a result, the total cost (TC) may increase at increasing rates while the total revenue (TR) increases at decreasing rates. Therefore, at some stage of output, TC may exceed TR. Thus, there might be two break-even points (as shown in Fig. 9.3) instead of one. This limits the profitable range of output and determines the lower and upper limits of profitable output. The analyst should, therefore, pre-test and verify the validity of cost and revenue functions rather than assuming straightaway the linearity conditions. 9.10.2 Break-even Analysis: Non-linear Cost and Revenue Functions Let us now describe the break-even analysis under non-linear cost and revenue functions.
The break-even analysis is presented in Fig. 9.3. As shown in the figure, the
TFC line shows the fixed cost at OF and the vertical distance between TC and TFC measures the total variable cost (TVC). The curve TR shows the total sale proceeds or the total revenue (TR) at different levels of output and price. The vertical distance between the TR and TC measures the profit or loss for various levels of output.
Fig. 9.3: Break-even Analysis: Non-Linear Functions As shown in Fig. 9.3, TR and TC curves intersect each other at two points, B 1 and B 2 , where TR = TC. These are the lower and upper break-even points. For the whole range of output between OQ 1 (corresponding to the break-even point, B 1) and OQ 2 (corresponding to the break-even point B 2), TR < TC. It implies that a firm producing

more than OQ 1 and less than OQ 2 will make profits. In other words, the profitable range of output lies between OQ 1 and OQ 2 units of output. Producing less or more then these limits will result in losses. 9.10.3 Contribution Analysis Contribution analysis is the analysis of incremental revenue and incremental cost of a business decision or business activity. Break-even charts can also be used for measuring the contribution made by the business activity towards covering the fixed costs. For this purpose, variable costs are plotted below the fixed costs as shown in Fig. 9.4. Fixed costs are a constant addition to the variable costs. In that case, the total cost line will run parallel to the variable cost line. Fig. 9.4: Contribution
Analysis
The 'Contribution is the difference between total revenue and variable costs' arising out of a business decision. At the break-even level of output OQ in Fig. 9.5, contribution equals fixed costs. Below the output OQ, the total contribution is less than the fixed cost. This amounts to loss. Beyond output OQ, contribution exceeds fixed cost. The difference is a contribution towards profits resulting from a business decision.
Fig. 9.5: Profit Contribution Analysis
Sometimes, contribution over the time period under review is plotted in order to indicate the commitment that the management has made for fixed expenditure, and to find the level of output of which it will be recovered and profit will begin to emerge. This kind

of contribution analysis is graphically presented in Fig. 9.5. At output OQ, contribution equals fixed cost. Beyond output OQ, contribution includes net profit. 9.10.4 Profit Volume Ratio The profit volume (PV) ratio is another handy tool used to find the BEP for sales, specially for the multi-product firms. The formula for PV ratio is given below.
PV Ratio = S V S – × 100 where S = Selling price, and V = Variable
costs (average). For example, if selling price (S) = Rs. 5 and variable cost (V) =
Rs. 4
per unit, then, PV Ratio = 5 4 5 – × 100 = 20 per cent The break-even point (BEP)
in
sales value is calculated after dividing the fixed expenses by PV ratio as follows. BEP (Sale value) = Fixed Expenses Ratio PV For example, given the selling price at Rs. 5 per unit, average variable expenses at
Rs. 3 per unit and fixed expenses (F) of Rs. 4,000
per month, BEP (sale value) is calculated as follows. BEP (Sale value) = Fixed Expenses Ratio PV or ( )/ F S V S – We can calculate break-even sale volume by using the contribution per unit of sale by the following formula. BEP (Sale value) = Fixed Expenses Contribution per unit BEP = 4000 4000 (5 – 3) 2 = = 2,000 units The PV ratio is not only helpful in finding the break-even point but it can also be used for making a choice of the product. If there is no time constraint, the choice should always be for a product which assures
a higher PV ratio. Otherwise, PV ratio per time unit is taken as the basis of choice.

For example, suppose two products A and B involve the following variable cost and selling price. Products A B Selling price unit (Rs.) 2 2.5 Variable cost per unit (Rs.) 1 1.5 Machine hour per unit 2 1.0 PV ratio for A = Selling Price – Variable cost Selling price × 100 = 2 –1 2 × 100 = 50 per cent Therefore, for each machine hour, PV Ratio = 50/2 = 25 per cent
NOTES Self-Instructional Material 289 Profit As Business Objective and Profit Planning
PV ratio for B = 2.5 –1.5 2.5 × 100 = 40 per cent Therefore, for each machine hour, PV Ratio = 40 per cent. In this case, product B is preferable to product A. 9.10.5
Margin of Safety
The margin of safety represents the difference between the sales at break-even point and the total actual sales. Three measures of the margin of safety are given below: (i) Margin of safety = Profit Sales Ratio PV × (ii) Margin of safety = Profit Ratio PV (iii)Margin of safety = a b a S S S – × 100 where S a = actual sales and S b = Sales at BEP. The safety margin can be worked out by using formula (iii) as follows. Suppose TR and TC functions are given, respectively, as TR = 10Q TC = 50 + 5Q and S a = 20 Given the TR and TC functions, S b can be obtained as shown below. At break-even point, TR = TC. By substituting S b for Q in TR and TC functions, we get TR = 10S b and TC = 50 + 5S b Thus, at break-even point, 10S b = 50 + 5S b 10S b – 5S b = 50 5S b = 50 S b = 10 By substituting S a and S b in formula (iii), we get Margin of safety = 20 10 100 20 – × = 50 per cent Margin of safety can be increased by increasing selling price provided the sales are not seriously affected. This can happen only when demand for the product is inelastic. It can also be increased by increasing production and sales up to the capacity of the plant, if necessary, even by reducing selling price provided the demand is elastic. The other modes include reduction in fixed expenses, reduction in variable expenses or having a product mix with greater share of the one which assures greater contribution per unit or which has a higher PV ratio. 9.10.6 Profit-Volume Analysis Charts The general break-even and contribution break-even charts have been discussed above in Figs. 9.3 through 9.5. There can be a number of such charts or graphs showing existing and proposed situations with variation in sales price, fixed and variable cost and, consequently, variable contributions to fixed costs, profits, etc. One of such charts is the cash break-even chart.
NOTES 290 Self-Instructional Material Profit As Business Objective and Profit Planning Fig. 9.6:
Cash Break-Even Analysis A cash break-even chart can be prepared by taking cash inflow from sales and cash outlay on fixed and variable costs. The distribution of the total contribution may also be shown from the angle of incidence as shown in Fig. 9.6. Another variation of the break-even chart is called profit-volume analysis chart or graph. In this chart, the horizontal axis represents the sales volume and the vertical axis shows profit or loss. The profit line is graphed by computing the profit or loss consisting of the difference between sales revenue and the total cost at each volume. The point where the profit line intersects the horizontal axis is the break-even point. This has been shown in
Fig. 9.7. Fig. 9.7: Profit Volume Analysis
It may be noticed that break-even charts are good for displaying information. The same information is available from simple calculations.
Use of Break-Even Analysis (i) Sales volume can be determined to earn a given amount of return on capital. (ii) Profit can be forecast if estimates of revenue and cost are available. (iii) Effect of change in the volume of sales, sale price, cost of production, can be appraised. (iv) Choice of products or processes can be made from the alternatives available. Product-mix can also be determined. (
v)
Impact of increase or decrease in fixed and variable costs can be highlighted. (vi) Effect of high fixed costs and low variable costs to the total cost can be studied.
Check Your Progress 13. What is break-even analysis? What purpose does it serve? 14. Assuming linear cost and revenue functions, find break-even sales. 15. What is meant by contribu- tion analysis? How is con- tribution estimated? 16. What is profit-volume ratio? What are its uses in business analysis?
NOTES Self-Instructional Material 291 Profit As Business Objective and Profit Planning (vii) Valid interfirm comparisons of profitability can be made. (viii)
Cash break-even chart helps proper planning of cash requirements. (
ix)
Break-even analysis emphasizes the importance of capacity utilization for achieving economies. (
x)

Further help is provided by margin of safety and angle of incidence. Limitations We have discussed above that the break-even analysis based on linear assumptions. The linearity assumption can be removed by pre-testing the cost and revenue functions and by using, if necessary, the non-linearity conditions. Nevertheless, the break-even analysis as such has certain other limitations. First, the break-even analysis can be applied only to a single product system. Under the condition of multiple products and joint operations the break-even analysis can be applied only if product-wise cost can be ascertained which is, of course, extremely difficult. Second, break-even analysis cannot be applied usefully where cost and price data cannot be ascertained beforehand and where historical data are not relevant for estimating future costs and prices. Despite these limitations, the break-even analysis may serve a useful purpose in production planning if relevant data can be easily obtained.

Conclusion

Although profit maximization continues to remain the most popular hypothesis in economic analysis, there is no reason to believe that profit maximization is the only objective that firms pursue. Modern corporations, in fact, pursue multiple objectives. The economists have postulated a number of alternative objectives of business firms. The main factor behind the multiplicity of the objectives, particularly in case of large corporations, is the
separation of
management from the ownership. Moreover, profit maximization hypothesis is a time-honoured one. It is more easy to handle. The empirical evidence against this hypothesis is not conclusive and unambiguous. Nor are the alternative hypotheses strong enough to replace
the profit maximization
hypothesis. More importantly, profit maximization hypothesis has a greater explanatory and predictive power than any of the alternative hypotheses. Therefore,
profit maximization hypothesis
still forms the basis of firms' behaviour. In the subsequent chapters, we will use this hypothesis to explain the price and output decisions of the business firms. 9.11 SUMMARY

z Making profit, not necessarily profit maximization, is the most important objective of business firms. While economists use the concept of economic profit, business firms use accounting concept of profit, i.e., Profit = TR – TC. z Theory of firm or theory of price determination is based on the assumption that firms aim at profit maximization. Theoretically profit is maximized at the level of output where MR = MC
with rising MC. z Economists have pointed out many other alternative objectives of business firms, viz. (i) sales maximization, (ii) maximization of firm's growth rate, (iii) maximization of managerial utility function, (iv) satisfying all parties related with the firm, (v) entry prevention and risk avoidance, and (vi) making a reasonable profit. However, profit remains the main objective of business firms as it serves also as a control measure of business activities.

z

Related to cost analysis is break-even analysis. Break-even analysis requires calculation of sales volume which covers cost. Production and sales below the break-even level causes loss to the firm and production and sales beyond the break- even level yields profit. Graphically, break-even marks a point where TR and TC curves intersect.

NOTES 292 Self-Instructional Material Profit As Business Objective and Profit Planning • Contribution analysis shows the contribution of total sales revenue (TR) over and above the total variable cost (TVC). In fact, contribution is the difference between TR and TVC. • Profit volume ratio is the percentage of per unit contribution to sales. It is worked out as (S –V)/S; where S = sale price and V = per unit variable cost. 9.12 ANSWERS TO 'CHECK YOUR PROGRESS' 1. From businessmen's point of view, the term 'profit' is used in accounting sense. Profit is defined as measured as TR – TC. 2. Accounting profit is defined as the surplus of total revenue over all the explicit or paid out cost, i.e., profit = TR – TC, whereas 'economic profit' is defined as the surplus of total revenue over both explicit and implicit costs. Implicit costs include (i) insurable risk, (ii) depreciation, and (iii) necessary minimum payment to shareholders. 3. The innovation theory of profit, suggested by J. A. Schumpeter, states that profit (more than normal profit) is the result of innovation. Innovation may be in the forms of new product, new quality of product, new technique of production, new market, new source of raw materials, and innovative management. 4. Knight's theory of profit suggests that profit is the result of decisions taken and implemented under the condition of uncertainty-unpredictable risk. 5. Problems in measuring profit arise due to (i) problems in measuring depreciation, (ii) problem in treating capital gains and losses, and (iii) problem in treating current and historical cost. 6. The different methods used in accounting for depreciation are (i) straight line method, (ii) reducing balance method, (iii) annuity method, and (iv) sum of the year digit method. 7. There are two conditions for profit maximization: (i) necessary condition that MR = MC, and (ii) supplementary condition that necessary condition must be satisfied under rising MC. 8. In pricing theory, profit maximization is assumed to be the main objective of business firms. However, many economists suggest that business firms pursue many other objectives other than profit maximization, e.g., Sales maximization, firms growth maximization, a target or reasonable profit, etc. 9. Business

objectives other than profit maximization are (i) sales revenue maximization, (ii) maximization of firms growth rate, (iii) maximization of managerial utility function, (
iv) satisfying all those who are related with firms directly or indirectly, and (v) surviving in the long run and having large market share. 10. The equilibrium price and output under profit maximization and sales maximization are different. Generally, under profit maximization price is higher and output lower than those under sales maximization objective. 11. Managerial utility function includes such (i) increasing managerial perks and reputation, (ii) increasing expenditure on staff, and (iii) having discretion to make investments. 12. According to 'satisficing behaviour theory', firms seek to satisfy all those who are directly or indirectly related to the firm by sacrificing a part of their profit. Such parties include shareholders, employees, customers, input suppliers, accountant, financers and authorities. 13. Break-even analysis is an exercise to find out the sales revenue that equals total cost. It help in finding out the minimum sales required by the firm.
NOTES Self-Instructional Material 293 Profit As Business Objective and Profit Planning 14. For answer, see secton 6.6.1, Fig. 6.8. 15. Contribution analysis is carried out to find the difference between the sales revenue and total variable cost. 16. Profit volume ratio is the percentage profit per unit of sales estimated on the basis of variable cost. 9.13 EXERCISES AND QUESTIONS 1. Distinguish between the following concepts of profit: (a) Accounting profit and economic profit; (b) Normal profit and monopoly profit; (c) Pure profit and opportunity cost. 2. Explain the following statements: (i) Profit is the rent for exceptional ability of an entrepreneur (Walker). (ii) Profits arise only in a dynamic world (J.B. Clark). (iii)Profit is a reward for risk bearing (F.B. Hawley). (iv) Profit is a return to uncertainty bearing (F.H. Knight). (v) Profit is reward for innovations (J.A. Schumpeter). 3. What is the controversy on profit maximization hypothesis? How will you react to the controversy? 4. What problems do the depreciation and capital gains cause in measuring profit? What are the methods of resolving the problems? 5. Examine critically profit maximization as the objective of business firms. What are the alternative objectives of business firms? 6. Explain the first and second order conditions of profit maximization. 7. Why do firms in general aim at a reasonable profit rather than pursuing other goals? What are the standards of reasonable profits? 8. State whether the following statements are true of false: (a) Pure profit is the return in excess of the opportunity cost. (b) Profit maximization is the sole objective of all the firms. (c) Profit is maximum when MR – MC is maximum. (d) Pure profit is nil when opportunity cost equals actual earning. Ans. (a) True, (b) False, (c) False, (d) True 9. Profit maximization remains the most important objective of business firms in spite of multiplicity of alternative business objectives. Comment. 10. Profit maximization is theatrically the most sound but practically unattainable objective of business firms. Do your agree with this statement? Give reasons for your answer. 11. Assuming a price function as P = 90 – 2Q and a cost function as C = 10 + 0.5Q 2 find profit maximizing output and price. 12. Suppose cost (C) and revenue (R) functions are given as C = 100 + 5Q 2 R = 150Q – 2.5Q 2
NOTES 294 Self-Instructional Material Profit As Business Objective and Profit Planning 13. Find (a) profit maximizing output, (b) maximum profit, and (c) profitable range of output. 14. State precisely the major propositions of the Williamson's model of managerial discretion. How are his propositions different from profit maximization assumption? 15. Explain how profit is used as a control measure. What problems are associated with the use of profit figures as a control measure? 16. What are the considerations in aiming at a reasonable profit target? What standards are used in determining a reasonable
profit? 17. The profit and loss data of company for a particular year are given as follows:
Rs.
Net Sales 1,00,000 Cost of goods sold: Variable cost 40,000 Fixed cost 10,000 Gross profit 50,000 Selling costs Variable cost 10,000 Fixed cost 5,000 Net Profit 35,000 (a) Compute the break-even point. (b) Forecast the profit for the sale volume of Rs. 1,60,000 and Rs. 70,000. (c) What would be sales volume to earn a net profit of
Rs. 55,000? 18. (a) Discuss assumptions and limitations of break-even analysis. (b) A firm has purchased a plant to manufacture a new product. Cost data for the plant is given below: Estimated annual sales 24,000 units Estimated costs: Material Rs. 4.00 per unit Direct Labour Rs. 0.60 per unit Overhead Rs. 24,000 per year Administrative Expenses Rs. 28,000 per year Selling cost of sales Rs. 1,590 per year (i) Calculate the selling price if profit per unit is Rs. 1.02, and (ii) Find out the break-even point in terms of output. 19. Distinguish between the
following: (a) Marginal cost and incremental cost; (b) Business cost and full cost; (c) Actual cost and imputed cost; (d) Private cost and social cost
of private business. 20. From the following data find out: (i) PV ratio, and (ii) BEP. Selling price Rs. 50 Cost price Rs. 40 Fixed cost Rs. 5,000 [Ans. (i) 20; (ii) 250]
NOTES Self-Instructional Material 295 Profit As Business Objective and Profit Planning 9.14 FURTHER READING
Baumol, W.J., Economic Theory and Operations Analysis, Prentice-Hall of India,

Pvt. Ltd., 1985. Cyert, R.M. and J.G. March, A Behavioural Theory of the Firm, Prentice-Hall, New York, 1963. Dean, Joel, Managerial Economics, Asia Publishing House, Bombay 1960, Indian edition, Ch. 1. Koustoyiannis, A., Modern Microeconomics, 2nd ed., Macmillan, 1979, Chs. 15-18. Hawley, F.B., 'The Risk Theory of Profit' Qly. Jl. of Eco., July 1893. Knight, F.B., Risk Uncertainty and profit, Houghton Miffin Co., Boston, New York, 1957. Salvatore, D., Managerial Economics, McGraw-Hill, 1989, Ch. 1. Schumpeter, J.A., Theory of Economic Development, Harvard University Press, Cambridge, Mass., 1938. Walker, F.
A., 'The Source of Business Profits', Qly. Jl. of Eco., April 1887.
Williamson, O.E., 'Managerial Discretion and Business Behaviour', Am. Eco. Rev., 1963. References 1. Willian J. Baumol, Economic Theory and Operations Analysis, Prentice-Hall of India Pvt. Ltd., New Delhi, 1980,
Fourth edn., pp. 377-79. 2. ibid., p. 378. 3. Joel
Dean, Managerial Economics, Asia Publishing House, Bombay, 1960, p. 3. 4. For example, Indian Income Tax Act makes only partial allowance for expenses on 'entertainment and advertisement'. 5.
J.B. Clark, "Distribution as Determined by the
Law of Rent". Q.J.E. April, 1891. 6. Frank H. Knight, Risk, Uncertainty and Profit, Houghton Mifflin Company, Boston, New York, 1957. 7. In his Theory of Economic Development, Harvard University Press, Cambridge, Mass., 1934. 8. W.D. Reekie, and J.N. Crook, Managerial Economics, Phillip Allan, 1982, p. 381. 9. Joel Dean, op. cit., p. 14. 10. Joel Dean, op. cit., p. 19. 11. R.L. Hall and C.J. Hitch, 'Price Theory and Business Behaviour, Oxford Economics Papers (1939), reprinted in 'Studies in the Price Mechanism' (ed.) by T. Wilson and P.W.S. Andrews, (Oxford University Press, 1952). 12. R.A. Gordon, 'Short Period Price Determination in Theory and Practice', Am. Eco. Rev., 1948. 13. In his 'Recent Developments in Cost Accounting and the Marginal Analysis', Journal of Political Economy, 1955, and 'Marginal Policies of Excellently Managed Companies', Am. Eco. Rev., 1956. 14. Fritz Maclup, 'Marginal Analysis and Empirical Research', Am. Eco. Rev 1946, and 'Theories of the Firm: Marginalist, Managerialist, Behavioural', Am. Eco. Rev., (1967). 15. Milton Friedman, Essays in Positive Economics, Chicago University Press, Chicago, 1953, pp. 3-43. 16. A.A. Berle and G.C. Means, The Modern Corporation and Private Property, Commerce Clearing House, New York, 1932. 17. J.K. Galbraith, Amercian Capitalism; The Concept of Countervailing Power, 1952;
NOTES 296 Self-Instructional Material Profit As Business Objective and Profit Planning The Affluent Society, 1958; The new Industrial State, 1967, all by Houghton Mifflin, Boston. 18. W.J. Baumol, Business Behaviour, Value and Growth, Macmillan, New York, 1959 and revised edition from Harcourt, Brace & World Inc., 1967. 19. A. Koutsoyiannis, Modern Microeconomics, Macmillan, 1979, pp. 346-51. 20. Robin Marris, "A Model of the Managerial Enterprise", Q.J.E., 1963 and Theory of Managerial Capitalism, N.Y., Macmillan, 1963. 21. O.E. Williamson, "Managerial Discretion and Business Behaviour", Am. Eco. Rev., 1963 and The Economics of Discretionary Behaviour : Managerial Objectives the Theory of Firm, Markhamm, Chicago, 1967. 22. Richard M. Cyert and James G. March, A Behavioural Theory of the Firm, Prentice-Hall, 1963, Earlier the theme was developed by H.A. Simon, in his "A Behavioural Model of Rational Choice", Q.J.E., 1955, pp. 99-118. 23. K.W. Rothschild, "Price Theory and Oligopoly", E J, 1947 pp. 297-320. 24. Joel
Dean, op. cit., pp. 29-33. 25. A weak monopoly is one that has no strong barriers to protect its strategic material markets, patent rights, etc., and where production of a close substitute is technically a near possibility. 26. Managerial utility functions have already been discussed above
in the section '
Alternative Objectives of Business Firms'. 27. Quoted in Joel Dean, Managerial Economics, pp. 39-40.
NOTES Self-Instructional Material 297 National Income: Concept and Measurement UNIT 10 NATIONAL INCOME: CONCEPT AND MEASUREMENT Structure 10.0 Introduction 10.1 Unit Objectives 10.2 Definition of National Income 10.3 Measures of National Income 10.3.1
Gross National Product (GNP); 10.3.2 Gross Domestic Product (GDP); 10.3.3 Net National Product (NNP); 10.3.4 National Income:
Some Accounting Relationships 10.4 Methods of Measuring
National Income 10.4.1 Net Output or Value-Added Method; 10.4.2 Factor-Income Method; 10.4.3 Expenditure Method 10.5
Choice of Methods 10.6 Measurement of National Income in India 10.7 Summary 10.8
Answers to 'Check Your Progress' 10.9 Exercises and Questions 10.10 Further Reading 10.0 INTRODUCTION We have so far been concerned with microeconomic
aspects of
managerial economics. This chapter onwards, we will deal with macroeconomic aspects of managerial economics. The major aspects of macroeconomics that are

generally used in business analysis, especially in analyzing and understanding business environment of the country include (i) the level and trends in national income, (ii) factors determining national income, (iii) factors and forces leading to business cycles, (iv) the trend in general lend of price, especially inflation, (v) international economic aspects, and (vi) government policies, especially fiscal and monetary policies. In this chapter, we will discuss the meaning and methods of measuring national income and the methods of measuring national income in India. 10.1 UNIT OBJECTIVES z To define national income and its importance

z To discuss various methods of measuring national income z

To describe the methods used in India for measuring national income

z

To show the growth and trends in national income of India 10.2 DEFINITION OF NATIONAL INCOME

National income

is the final outcome of all economic activities of a nation valued in terms of money. National income is

the most important macroeconomic variable and

NOTES 298 Self-Instructional Material National Income: Concept and Measurement

determinant of the business level and environment of a country. The level of national income determines the level of aggregate demand for goods and services. Its distribution pattern determines the pattern of demand for goods and services, i.e., how much of which good is demanded. The trend in national income determines the trends in aggregate demand,

i.e., the demand for the goods and services,

and also the business prospects. Therefore, business decision makers need to keep in mind these aspects of

the

national income, especially those having long-run implications. National income or a relevant component of it is an indispensable variable considered in demand forecasting.

Conceptually, national income is the money value of the end result of all economic activities of the nation.

Economic activities generate a large number of goods and services, and make net addition to the national stock of capital. These together constitute the

national income of

a 'closed economy'—an economy which has no economic transactions with the rest of the world.

In an 'open economy', national income includes also the net results of its transactions with the rest of the world (i.e., exports less imports).

Economic activities should be distinguished from the non-economic activities from a national point of view. Broadly speaking, economic activities include all human activities which create goods and services that can be valued at market price. Economic activities include production by farmers (whether for household consumption or for market), production by firms in the industrial sector, production of goods and services by the government enterprises, and services produced by business intermediaries (wholesalers and retailers), banks and other financial organizations, universities, colleges and hospitals, etc. On the other hand, non-economic activities are those which produce goods and services that do not have any economic value. Non-economic activities include spiritual, psychological, social and political services. The non-economic category of activities also includes hobbies, service to self, services of housewives, services of members of family to other members and exchange of mutual services between neighbours.

We have defined national income from the angle of product flows. The same can be defined in terms of money flows. While economic activities generate flow of goods and services, on the one hand, they generate money flows, on the other, in the form of factor payments—wages, interest, rent, profits, and earnings of self-employed. Thus, national income may also be obtained by adding the factor earnings and adjusting the sum for indirect taxes and subsidies. The national income thus obtained is known as national income at factor cost. It is related to money income flows. The concept of national income is linked to the society as a whole. It differs fundamentally from the concept of private income. Conceptually, national income refers to the money value of the entire final goods and services resulting from all economic activities of the country. This is not true of private income. Also from the calculation point of view, there are certain receipts of money or of services and goods that are not ordinarily included in private incomes but are included in the national incomes, and vice versa. National income includes, for example, employer's contribution to the social security and welfare funds for the benefit of employees, profits of public enterprises, and services of owner occupied houses. But it excludes the interest on war-loans, social security benefits and pensions. There items are, however, included in the private incomes. The national income is, therefore, not merely an aggregation of the private incomes. One can however obtain an estimate of national income by summing up the private incomes after making necessary adjustments for the items excluded from the national income.

NOTES Self-Instructional Material 299 National Income: Concept and Measurement 10.3

MEASURES OF NATIONAL INCOME 10.3.1

Gross National Product (GNP) Of the various measures of national income used in national income analysis, GNP is the most important and widely used measure of national income. It is the most comprehensive measure of the nation's productive activities. The GNP
is defined as the value of all final goods and services produced
during a specific period, usually one year, plus incomes earned abroad by the nationals minus incomes earned locally by the foreigners. The GNP so defined is identical to the concept of gross national income (GNI). Thus, GNP = GNI. The difference between the two is only of procedural nature. While GNP is estimated on the basis of product-flows,
the
GNI is estimated on the basis of money income flows, (i.e., wages, profits, rent, interest, etc.). 10.3.2 Gross Domestic Product (GDP)
The
Gross Domestic Product (GDP) is defined
as the market value of all final goods and services produced
in
the domestic
economy during a period of one year, plus income earned locally by the foreigners minus incomes earned abroad by the nationals. The concept of GDP is similar to that of GNP with a significant procedural difference. In case of GNP
the
incomes earned by the nationals in foreign countries are added and incomes earned locally by the foreigners are deducted from the market value of domestically produced goods and services. In case of GDP, the process is reverse – incomes earned locally by foreigners are added and incomes earned abroad by the nationals are deducted from the total value of domestically produced goods and services. 10.3.3 Net National Product (NNP) NNP is defined as GNP less depreciation, i.e., NNP = GNP – Depreciation Depreciation is that part of total productive assets which is used to replace the capital worn out in the process of creating GNP. Briefly speaking, in the process of producing goods and services (including capital goods), a part of total stock of capital is used up. 'Depreciation' is the term used to denote the worn out or used up capital. An estimated value of depreciation is deducted from the GNP to arrive at NNP. The NNP, as defined above, gives the measure of net output available for consumption
and investment
by the society (including consumers, producers and the government). NNP is the real measure of the national income. NNP = NNI (net national income). In other words, NNP is the same as the national income at factor cost. It should be noted that NNP is measured at market prices including direct taxes. Indirect taxes are, however, not a point of actual cost of production. Therefore, to obtain real national income, indirect taxes are deducted from the NNP. Thus, NNP–indirect taxes = National Income. 10.3.4 National Income: Some Accounting Relationships (a) Accounting Indentities at Market Price GNP ≡ GNI (Gross National Income) GDP ≡ GNP less Net Income from Abroad NNP ≡ GNP less Depreciation NDP (Net Domestic Product) ≡ NNP less net income from abroad (b) Some Accounting Indentities at Factor Cost GNP at factor cost ≡ GNP at market price less net indirect taxes
Check Your Progress 1.How is national income defined? 2. What are the measures of national income? 3. What is the difference between GNP and GDP? 4. What is meant by NNP?
NOTES 300 Self-Instructional Material National Income: Concept and Measurement
NNP at factor cost ≡ NNP at market price less net indirect taxes NDP at factor cost ≡ NNP at market price less net income from abroad NDP at factor cost ≡ NDP at market price less net indirect taxes NDP at factor cost ≡ GDP at market price less Depreciation 10.4
METHODS OF MEASURING NATIONAL INCOME 1
For measuring national income, the economy
through which people participate in economic activities, earn their livelihood, produce goods and services and share the national products
is viewed from three different angles. (1) The national economy is considered as an aggregate of producing units combining different sectors such as agriculture, mining, manufacturing, trade and commerce, etc. (2)
The
whole
national economy is viewed as a combination of individuals and households owning different kinds of factors of production
which they use themselves or sell factor-services to make their livelihood. (3)
The national economy may also be viewed as a collection of consuming, saving and investing units (
individuals, households and government). Following these notions of a national economy, national income may be measured by three different corresponding methods: (1) Net product method—when the entire

national
economy is considered as an aggregate of producing units; (2)
Factor-income method—
when national economy is considered as combination of factor-owners and users; (3) Expenditure method—when national economy is viewed as a collection of spending units. The procedures which are followed in measuring the national income in a closed economy—an economy which has no economic transactions with the rest of the world—are briefly described here.
The measurement of national income in an open economy and adjustment with regard to income from abroad will be discussed subsequently. 10.4.1
Net Output or Value-Added Method The net output method is also called the value added method. In its standard form, this method consists of three stages: "(i) estimating the gross value of domestic output in the various branches of production; (ii) determining the cost of material and services used and also the depreciation of physical assets; and (iii) deducting these costs and depreciation from gross value to obtain the net value of domestic output...". The net value of domestic product thus obtained is often called the value added or income product which is equal to the sum of wages, salaries, supplementary labour incomes, interest, profits, and net rent paid or accrued. Let us now describe the stages (i) and (ii) in some detail. Measuring Gross Value. For measuring the gross value of domestic product, output is classified under various categories on the basis of the nature of activities from which they originate. The output classification varies from country to country depending on (i) the nature of domestic activities; (ii) their significance in aggregate economic activities, and (iii) availability of requisite data. For example, in the US, about seventy-one divisions and subdivisions are used to classify the national output; in Canada and the Netherlands, classification ranges from a dozen to a score; and in Russia, only half a dozen divisions are used. According to the CSO publication, fifteen sub-categories are currently used in India.
NOTES Self-Instructional Material 301 National Income: Concept and Measurement
After the output is classified under the various categories, the value of gross output is computed in two alternative ways: (i) by multiplying the output of each category of sector by their respective market price and adding them together, or (ii) by collective data about the gross sales and changes in inventories from the account of the manufacturing enterprises and computing the value of GDP on the basis thereof. If there are gaps in data, some estimates are made thereof and gaps are filled.
Estimating Cost of Production. The next step in
estimating
the net national product is to estimate the cost of production including depreciation. Estimating cost of production is, however, a relatively more complicated and difficult task because of non- availability of adequate and requisite data. Much more difficult is the task of estimating depreciation since it involves both conceptual and statistical problems. For this reason, many countries adopt factor-income method for estimating their national income. However, countries adopting net-product method find some ways and means to calculate the deductible cost. The costs are estimated either in absolute terms (where input data are adequately available) or as an overall ratio of input to the total output. The general practice in estimating depreciation is to follow the usual business practice of depreciation accounting. Traditionally, depreciation is calculated at some percentage of capital, permis- sible under the tax-laws. In some estimates of national income, the estimators
have deviated from the traditional practice and have instead estimated
depreciation as some ratio of the current output of final goods. Following a suitable method, deductible costs including depreciation are estimated for each sector. The cost estimates are then deducted from the sectoral gross output to obtain the net sectoral products. The net sectoral products are then added together. The total thus obtained is taken to be the measure of net national products or national income by net product method. 10.4.2
Factor-Income Method This method is also known as income method and factor-share method. Under this method, the national income is calculated by adding up all the "incomes accruing to the basic factors of production used in producing the national product". Factors of production are conventionally classified as land, labour, capital and organization. Accordingly, the national income equals the sum of the corresponding factor earning. Thus, National income = Rent + Wages + Interest + Profit
However, in a modern economy, it is conceptually very difficult to make a distinction between earnings from land and capital, on the one hand, and between the earnings from ordinary labour and entrepreneurial functions, on the other. For the purpose of estimating national income, therefore,
factors of production are broadly grouped as labour and capital.
Accordingly, national income is supposed to originate from two primary factors, viz., labour and capital. In some activities, however, labour and capital are jointly supplied and it is difficult to separate the labour and capital contents from the total earnings of the supplier.

Such incomes are termed as mixed incomes. Thus, the total factor-incomes are grouped under three categories: (i) labour incomes; (ii) capital incomes; and (iii) mixed incomes. Labour Incomes. Labour incomes included in the national income have three components: (a) wages and salaries paid to the residents of the country including bonus and commission, and social security payments; (b) supplementary labour incomes including employer's contribution to social security and employee's welfare funds,
and direct pension payments to retired employees 2 ; (
c) supplementary labour incomes in kind, e.g., free health and education, food and clothing, and accommodation, etc. Com- pensations in kind
in the form of
domestic servants and such other free-of-cost services provided to the employees are included in labour income. War bonuses,
pensions, service grants are not included in labour income as they are regarded as 'transfer payments'.
NOTES 302 Self-Instructional Material National Income: Concept and Measurement
Certain other categories of income, e.g., incomes from incidental jobs, gratuities, tips etc., are ignored for lack of data. Capital Incomes. According to Studenski,
capital incomes include the following capital earnings: (a) dividends excluding inter-corporate dividends; (b) undistributed before-tax profits of corporations; (c) interest on bonds, mortgages, and saving deposits (excluding interests on war bonds, and on consumer-credit); (d) interest earned by insurance companies and credited to the insurance policy reserves; (e) net interest paid out by commercial banks; (f) net rents from land, buildings, etc., including imputed net rents on owner- occupied dwellings; (g) royalties;
and (
h) profits of government enterprises. The data for the first two items are obtained mostly from the firms' accounts submitted for taxation purposes. But the definition of profit for national accounting purposes differs from that employed by taxation authorities. Some adjustments in
the
income tax data become, therefore, necessary. The data adjustments generally pertain to (i) excessive allowance of depreciation made by the firms; (ii) elimination of capital gains and losses since these do not reflect the changes in current income; and (iii) elimination of under or over-valuation of inventories on book-value.
Mixed Income. Mixed incomes include earnings from (a) farming enterprises, (b) sole proprietorship (not included under profit or capital income); and (c) other professions, e.g., legal and medical practices, consultancy services, trading and transporting etc. This category also includes the incomes of those who earn their living through various sources as wages, rent on own property, interest on own capital, etc. All the three kinds of incomes, viz., labour incomes, capital incomes and mixed incomes added together give the measure of national income by factor-income method. 10.4.3 Expenditure Method The
expenditure method, also known as final product method, measures national income at the final expenditure stages. In estimating the total national expenditure, any of the two following methods are
followed: first,
all the money expenditures at market price are computed and added up together, and second, the value of all the products finally disposed
of
are computed and added up, to arrive at the total national expenditure. The items of expenditure which are taken into account under the first method are (a) private consumption expenditure; (b) direct tax payments; (c) payments to the non-profit- making institutions and charitable organizations like schools, hospitals, orphanages, etc.; and (d) private savings. Under the second method, the following items are considered: (a) private consumer goods and services; (b) private investment goods; (c) public goods and services; and (d) net investment abroad. The second method is more extensively used because the data required in this method can be collected with greater ease and accuracy.
Treatment of Net Income from Abroad. We have so far discussed methods of measuring national income of a 'closed economy'. But most economies are open in the sense that they carry out foreign trade in goods and services and financial transactions with the rest of the world. In the process, some nations get net income through foreign trade while some lose their income to foreigners. The net earnings or
loss in
foreign trade affects the national income. In measuring the national income, therefore, the net
NOTES Self-Instructional Material 303 National Income: Concept and Measurement result of external transactions are adjusted to the total. Net incomes from abroad are added to, and net losses
to the foreigners

are deducted from the total national income arrived at through any of the above three methods. Briefly, speaking, all exports of merchandise and of services like shipping, insurance, banking, tourism, and gifts are added to the national income. And, all the imports of the corresponding items are deducted from the value of national output to arrive at the approximate measure of national income. To this is added the net income from foreign investment. These adjustments for international transactions are based on the international balance of payments of the nations. 10.5 CHOICE OF METHODS As discussed above, there are three standard methods of measuring the national income, viz., net product (or value added) method, factor-income or factor cost method and expenditure method. All the three methods would give the same measure of national income, provided requisite data for each method is adequately available. Therefore, any of the three methods may be adopted to measure the national income. But all the three methods are not suitable for all the economies simply for non-availability of necessary data and for all purposes. Hence, the question of choice of method arises.

The two main considerations on the basis of which a particular method is chosen are: (i) the purpose of national income analysis, and (ii) availability of necessary data. If the objective is to analyse the net output or value added, the net output method is more suitable. In case the objective is to analyse the factor-income distribution, the suitable method for measuring national income is the income method. If the objective at hand is to find out the expenditure pattern of the national income, the expenditure or final products method should be applied. However, availability of adequate and appropriate data is a relatively more important consideration is selecting a method of estimating national income. Nevertheless, the most common method is the net product method because: (i) this method requires classification of the economic activities and output thereof which is much easier than to classify income or expenditure; and (ii) the most common practice is to collect and organize the national income data by the division of economic activities. Briefly speaking, the easy availability of data on economic activities is the main reason for the popularity of the output method. It should be however borne in mind that no single method can give an accurate measure of national income since the statistical system of no country provides the total data requirements for a particular method. The usual practice is, therefore, to combine two or more methods to measure the national income. The combination of methods again depends on the nature of data required and sectoral break-up of the available data. 10.6 MEASUREMENT OF NATIONAL INCOME IN INDIA In India, a systematic measurement of national income was first attempted in 1949. Earlier, many attempts were made by some individuals and institutions. The earliest estimate of India's national income was made by Dadabhai Naoroji in 1867–68. Since then many attempts were made, mostly by the economists and the government authorities, to estimate India's national income 3 . These estimates differ in coverage, concepts and methodology and are not comparable. Besides, earlier estimates were mostly for one year, only some estimates covered a period of 3 to 4 years. It was therefore not possible to construct a consistent series of national income and assess the performance of the economy over a period of time. Check Your Progress 5. What are the methods of mea- suring national income? 6. What is value-added method? 7. What is factor-income method of measuring national income? 8. How is income from abroad adjusted in national income?

In 1949, A National Income Committee (NIC) was appointed with P.C. Mahalanobis as its Chairman, and D.R. Gadgil and V.K.R.V. Rao as members. The NIC not only highlighted the limitations of the statistical system of that time but also suggested ways and means to improve data collection systems. On the recommendation of the Committee, the Directorate of National Sample Survey was set up to collect additional data required for estimating national income. Besides, the NIC estimated the country's national income for the period from 1948–49 to 1950–52. In its estimates, the NIC also provided the methodology for estimating national income, which was followed till 1967. In 1967, the task of estimating national income was given to the Central Statistical Organization (CSO). Till 1967, the CSO had followed the methodology laid down by the NIC. Thereafter, the CSO adopted a relatively improved methodology and procedure which had become possible due to increased availability of data. The improvements pertain mainly to the industrial classification of the activities. The CSO publishes its estimates in its publication, Estimates of National Income. Methodology used in India Currently, net output and factor

income methods are used by the CSO to estimate the national income of the country. The output method is used for agriculture and manufacturing sectors, i.e., the commodity producing sectors. For these sectors, the value added method is adopted. Income method is used for the service sectors including trade, commerce, transport and government services. In its conventional series of national income statistics from 1950-51 to 1966-67, the CSO had categorized the income in 13 sectors. But, in the revised series, it had adopted the following 15 break-ups of the national economy for estimating the national income; (i) Agriculture; (ii) Forestry and logging; (iii) Fishing; (iv) Mining and quarrying; (v) Large-scale manufacturing; (vi) Small-scale manufacturing; (vii) Construction; (viii) Electricity, gas and water supply; (ix) Transport and communication; (xii) Real estate and dwellings; (xiii) Public Administration and Defence; (xiv) Other services; and (xv) External transactions. The national income is estimated at both constant and current prices. 10.7 SUMMARY z

National income

is the market

value of all final goods and services produced in a

country

over a

period of

time, generally one year. z In general, there are three important measures of national income, viz., (i) GNP, (ii) GDP, and (iii) NNP. z In measuring GNP, income earned abroad by the nationals is added and income earned by foreigners in the country is subtracted from national income estimates; on the contrary, a reverse process is used in estimating GDP. z NNP is defined as GNP–Depreciation. Depreciation equals the loss of national capital in the process of production.

z

There are three methods of measuring

national income: (i) Value-added method, (ii) factor-income method, and (

iii) expenditure method.

z

The choice of method depends on the availability of data required for estimating national income. Often two or all the three methods are combined to estimate national income.

z

In India, an organisation called CSO estimates the national income. It uses net output and factor income method for estimating national income.

NOTES Self-Instructional Material 305 National Income: Concept and Measurement 10.8 ANSWERS TO 'CHECK YOUR PROGRESS' 1.

National income

is defined as the market value of all final goods and services produced

during a period of

time, usually one year. 2. In general, three measures of national income are used in economic and business anaylsis: (i) GNP, (ii) GDP, and (iii) NNP. 3. The difference between GNP and GDP lies in the treatment of income earned abroad by nationals and income earned by foreigner in the domestic economy. In measuring GNP, income abroad by nationals is added and income earned by foreigners in the country is deducted from the value estimated. In case of GDP, a reverse process is used. 4. NNP means GNP less depreciation, i.e., the value of national capital lost in the process national production. 5.

There are three methods of measuring

national income: (i) net product or value added method, (ii) factor income method, and (

iii) expenditure method. 6. Under value-added method,

first gross value of national product is estimated. Then costs of material and services also depreciation are estimated. These costs are deducted from the gross value to arrive at national income. 7. In general, factor income method follows the principle that national income = wages + rent + interest + profit. For estimating national income, however, factor incomes are classified as (i) labour income, (ii) capital income, and (iii) mixed income. 8. The adjustment of income earned abroad depends on GNP and GDP estimation. In case of GNP, income earned abroad by the citizens of a country is added to the gross value. But in case of GDP, this is deducted from the gross value. 10.9 EXERCISES AND QUESTIONS 1. What is the relevance of national income statistics in business decisions? What kinds of business decisions are influenced by the change in national income? 2. Describe the various methods of measuring national income. How is a method chosen for measuring national income? 3. Distinguish between net-product method and factor-income method. Which of these methods is followed in India? 4. Does the method of measuring national income of a 'closed economy' differ from one followed in an 'open economy'? How is foreign income treated in national income estimates? 5. What is value-added?

Explain the value-added method of estimating national income. 10.10 FURTHER READING Backerman, W., An Introduction to National Income Analysis, English Language Book Society
and Weldernfeld and Nicolson, London, 1968, Ch. 2. Dwivedi, D. N., Macroeconomics: Theroy and Policy, Tata McGraw Hill, New Delhi, 2005, 2nd Edition, Ch. 3. Edey, Harold, C., Altan T. Peacock and Ronald A. Cooper, National Income and Social Accounting, University Library, London, 1967, Ch. 6. Ruggles, R. and N. Ruggles, National Income Accounts and Income Analysis, McGraw- Hill Book Company, Inc., New York, 1956, Chs. 1, 2 and 12.
NOTES 306 Self-Instructional Material National Income: Concept and Measurement Studensky, Paul, The Income of Nations: (Part II) Theory and Methodology, Khosla and Co., Delhi, 1977, Chs. 11, 17–2. References 1.
This section is based mostly on Paul Studenski, The Income of Nations (Part Two), Theory and Methodology, New York University Press, New York, 1958. 2. Conventionally, pension to the retired employees is considered to be a 'transfer payment' and is excluded from the labour income and national income accounting. In the US, however, this item is included in national income (See Studenski, op. cit., pp. 11 and 118–20). 3. Some often quoted estimates were made by F.J.
Atkinson, (1875
and 1895); Major Baring (1881); W. Digby, (1898–99); Curzon (1901); E.A. Home, (1911); C.N. Vakil and S.K. Muranjan (1891–94 and1911–14); Shirras Findlay (1911 and 1921); K.T. Shah and K.J. Khambata (1900–14 annual and 1921–22); V.K.R.V. Rao (1925– 29 and 1931–32); Commerce, Journal (1938–39, 1942–43 and 1947–48). (Year in the parantheses are the reference years).
NOTES Self-Instructional Material 307 Inflation UNIT 11 INFLATION Structure 11.0 Introduction 11.1 Unit Objectives 11.2 Definition of Inflation 11.2.1 What is Inflation? 11.2.2 Desirable Limits of Inflation 11.2.3 Every Price Rise Is Not Inflation 11.3 Measures of Inflation 11.3.1 Measuring Inflation through Wholesale PINs 11.3.2 Measuring Inflation by GNP Deflator 11.4 Kinds of Inflation 11.5 Effects of Inflation 11.5.1 Effect of Inflation on Production and Growth 11.5.2 Effect of Inflation on Employment 11.5.3 Effect of Inflation on Income Distribution 11.5.4 Effect of Inflation on Distribution of Wealth 11.6 The Monetarist View on Inflation 11.7 The Modern Approach to Inflation 11.7.1 Demand-Pull Inflation 11.7.2 Cost-Push Inflation 11.7.3 Interaction Between Demand-Pull and Cost-Push Factors 11.8 Inflation in Less Developed Countries: The Structuralist View 11.8.1 Structuralists' Approach to Inflation 11.9 Policy Measures to Control Inflation 11.9.1 Monetary Measures 11.9.2 Fiscal Measures 11.9.3 Price and Wage Control 11.9.4 Indexation 11.10 Summary 11.11 Answers to 'Check Your Progress' 11.12 Exercises and Questions 11.13 Further Reading 11.0 INTRODUCTION Business cycles of high magnitudes are now things of past. The government control measures keep trade cycles under control. What has gone nearly uncontrolled over time is the problem of almost continuous increase in the general price level, especially during the post-World War II period. This is called the problem of inflation. The problem of inflation became accentuated since the early 1970s. It emerged as the most intractable economic problem for both theoreticians and policy-makers all over the world. A continuous
rise in the general price level over a long period of time
has been the most common feature of both the developed and the developing economies. Persistent inflation is perhaps the second most serious macroeconomic problem confronting the world economy today—second only to hunger and poverty in the 'third world'. Some authors consider inflation as the 'dominant economic problem' in modern times. Inflation causes often serious problems for businessmen, especially in controlling cost of production and pricing the product under competitive conditions. It is therefore important to have a clear understanding of various aspects of inflation. 1
NOTES 308 Self-Instructional Material Inflation 11.1 UNIT OBJECTIVES z To discuss the meaning and method of measuring inflation rate z To elaborate kinds of inflation
z
To discuss the effects of inflation on different sections of society and on different aspects of the economy
z
To explain various theories of inflation z To discuss inflation in less developed economies
z To discuss monetary and fiscal policies to control inflation z
To discuss the method of indexation for a clear view of inflationary forces 11.2 DEFINITION OF INFLATION 11.2.1 What is Inflation? Inflation means generally a considerable and persistent rise in the general level of prices. However, a precise meaning of 'inflation' has been
a matter of economists' opinion. There is no universally acceptable definition of inflation. The definition of inflation has been changing over time depending on the perception of the economists. For example,
Pigou 2 defined inflation in the following words: "
Inflation exists when money income is expanding more than in proportion to increase in earning activity." To Coulborn, inflation is a situation of "too much money chasing too few goods". Modern economist have tried to define inflation more meaningfully. According

to Ackley, “Inflation is a persistent and appreciable rise in the general level or average of prices.” 3
Harry G. Johnson defines inflation as “a sustained rise in prices.” 4 According to Samuelson, “Inflation denotes a rise in the general level of prices.” 5 Bronfenbrenner and Holzman 6 have suggested a number of alternative definitions of inflation which are mostly modified versions of earlier definitions. Their alternative definitions make things more fuzzy rather than adding clarity to inflation. However, economists seem to agree that inflation
is a situation in which there is
a ‘persistent’ and ‘appreciable’ increase in the general level of prices. The
terms like ‘persistent, ‘appreciable’ “sustained”, “considerable”, “continuing” and “prolonged” are not precisely defined. In practice, however, the term ‘persistent’ implies that the price rise exhibits a secular trend or continues to rise over a period of one to two years, and does not respond to anti-inflationary policies. The term ‘appreciable’ is more ambiguous because it does not specify as to what rate of increase in the price level is to be considered as ‘appreciable’ or ‘considerable’. 11.2.2
Desirable Limits of Inflation A moderate rate of inflation is considered to be desirable for the economy. The limit of desirable inflation
varies
from country to country and from time to time.
The
moderate rate of inflation can be determined on the basis of the rise in price that contributes in following ways. (i) Keeping economic outlook optimistic and helping production and employment; and (ii) Promoting mobilization of resources 7 (savings and investment) by what is called inflationary method of financing. The desirable limit of inflation depends on the need and the absorption capacity of a country. This limit is determined for an economy on certain symptoms: (i) inflation
NOTES Self-Instructional Material 309
Inflation makes economy overheated; (ii) real macro variables like savings, investment and growth of output declines in spite of inflation, and (iii) BOP position turns adverse, and (iv) employment get adversely affected. These symptoms and the absorption capacity, so defined,
varies from country to country and from time to time
depending on their growth potentials. Therefore, the desirable limit or the moderate limit of inflation has to be determined for each country. There is no definite rule in this regard. However, based on the past experience, it is sometimes suggested that 1–2% inflation in developed countries and 4–6% inflation in less developed countries is the appropriate and desirable limit of moderate inflation. 8 Some consider a lower rate to be desirable. “Some people who regard inflation as an economic evil believe that a price level rising at around 1.5%... assists in achieving and maintaining full employment and a satisfactory rate of growth. 9
What is the Desirable Rate of Inflation? There is no precise or unique answer to this question. However, a
price rise in excess of 2–3% per annum in the developed and 4–5% per annum in developing economies
is considered to be undesirable inflation. These rates of desirable inflation have no theoretical basis. However, these rates have great policy implications. So long as (i) the general level of price rises at an annual average rate of 2–3% in developed countries and 4–5% in less developed countries, and (ii) macro-variables are not adversely affected by the price rise, policy measures to control inflation are not required because controlling inflation under these conditions may distort the price system and disturb employment and growth process. 11.2.3
Every Price Rise Is Not Inflation One may think that any price rise in excess of 2–3% in the developed and 4–5% in the developing economies can be called inflation. However, a price rise even in excess of these rates on account of the following factors is not inflationary. (i) When prices tend to rise due to change in the composition of GDP, it is not inflationary. During the period of economic growth, the proportion of low- price goods, e.g., agriculture product, decreases and that of high-price goods, e.g., cars, TV sets, computers, superior housing, increases causing a high rise in price index number. This rise in price is not inflation. (ii) Price rise due to qualitative change in products is not inflation. For example, in case of colour TV sets, qualitative improvements have been made in the form of multi-channel and remote control facilities. In case of cars, to consider another example, the brand of car may have qualitative improvement in the form of AC facility, automatic gear system and power brake, etc. Such qualitative changes involve increase in cost of production and therefore cause a rise in the price. (iii) Short-run rise in price due to sudden increase in demand and/or decrease in supply is not inflation. Sometimes prices rise because of sudden increase in market demand and/or sudden decrease in supply for such reasons as crop failure, strikes and lockouts, pre-budget speculations, disruption of foreign supply due to war, etc. The price rise under such conditions are not supposed to be a persistent increase in the price level. (iv) Price rise after depression or recession is not inflationary. Prices tend to rise during the phase of recovery after a short-run depression or recession to reach their normal level. Such a price rise is not inflation, even if it is ‘persistent’ and ‘appreciable’.

MEASURES
OF INFLATION There are two common methods of measuring inflation: (i) by computing change in Price Index Numbers (PIN), and (ii) by comparing the change in GNP Deflator. 11.3.1
Measuring Inflation through Wholesale PINs The following
formula is used for measuring the rate of inflation through the changes in the PINs. Rate of inflation = $-1 - 1\ 100$
$t\ t\ t\ PIN\ PIN\ PIN - \times$
where PIN t is the wholesale price index number for the year selected for measuring inflation and PIN t–1 is the PIN in the preceding year.
For example, consider some recent price index number in India. The WPI (1993–94 = 100) for 'all commodities' increased from 150.9 in fiscal year 1999–2000 to 159.2 in 2000–01. The rate of inflation between 1999–2000 and 2000–01 can be obtained by using the above formula as follows. Rate of inflation = $159.2\ 150.9\ 100\ 150.9 - \times = 5.5\%$ 11.3.2
Measuring
Inflation by
GNP Deflator The GNP deflator is
the ratio of nominal GNP in a year to the real GNP of that year.
It is also
defined as follows. GNP Deflator = Nominal Real GNP
GNP where Nominal GNP is GNP at current prices and Real GNP is GNP at constant prices.
That percentage change in GNP deflator between any two continuous years gives the rate of inflation. For example, suppose we want to know inflation rate between 1999– 2000 and 2000–0l by using GNP deflator method. India's nominal GNP (i.e., GNP at current prices) in 1999–2000 was
Rs 1740.2 (
P) thousand crores and her real GNP (i.e., GNP at constant prices of 1993–94 = 100) in this year was
Rs 1136.9
thousand crores. Now, India's GNP deflator for 1999–2000 can be obtained as follows. GNP deflator (1999–2000) = 1740.2 1136.9 = 1.53 In terms of percentage, India's GNP deflator in 1999–2000 equals 1.53 × 100 = 153. Similarly, GNP deflator for 2000–01 (Q) is worked out at 1.60 and at percentage rate of 160. The percentage change in GNP deflator between any two years gives a measure of inflation. For example, the rate of inflation in India between 1999–2000 and 2000–01 can be obtained as follows. Rate of inflation = 160–153 153 × 100 = 4.6% It is important to note here that GNP takes into account all the goods and services and all the prices in the economy. Therefore, GNP deflator method takes into account all

the final prices. In contrast, WPI takes into account prices only at the wholesale level. Therefore, economists consider GNP deflator as a better measure of inflation than WPI. 10
Inflation in India The annual average rate of inflation decadewise based on wholesale price index number is given in Table 11.1. As the table shows, during the 1950s, the rate of price rise was very low—only 1.5 per cent per annum. Although price rise picked up during the 1960s, inflation, in the real sense of the term, started during the 4th Plan. During 1970s, the rate of inflation was 9.9 per cent per annum and during the period from 1980–81 to 1993–94, it was 8.1 per cent.
Table 11.1: Annual Average Rate of Inflation in India (WPI: 1980–81 = 100) Period (decennial) Rate of Inflation (%) 1950-51 to 1960-61 1.5 1960-61 to 1970-71 6.1 1970-71 to 1980-81 9.9 1980-81 to 1993-94 8.1 1950-51 to 1993-94 6.5 Annual Inflation Rate (WPI Base 1993–94 = 100)* 1990-91 12.1 1991-92 13.9 1996-97 4.8 1997-98 4.8 1998-99 5.9 1990-2000 3.3 2000-01 7.2 2001-02 3.6 2002-03 3.4 2003-04 5.5 2004-05 6.5 2005-06 5.0 Source: Center for Monitoring Indian Economy (CMIE), Basic Statistics Relating to the Indian Economy, August 1994, Table 22.2. * Economic Survey: 2000–01 & 2001–02 (Ministry of Finance, Government of India). India had virtually no inflation during the 1950s. It had a moderate rate of inflation (6.1% p.a.) during the 1960s. In the following decade, however, the rate of inflation (9.9% p.a.) had almost reached a double-digit rate, the galloping inflation. During the 1980s, the rate of inflation declined marginally to 8.1 per cent per annum. The annual average rate of inflation during the period from 1990–91 to 1995–96 was about 8 per cent (as published in Economic Survey, MOF, GOI, 1996–97, p. 9). What is noteworthy, India has had intermittent bouts of galloping inflation—about 14.0% in 1966–67; 20.1% in 1973–74, 25.2% in 1974–75; 17.1% in 1979–80, and 19.2% in 1980–81. As can be seen in Table 11.1, the rate of inflation since 2001-02 had varied between 5% and 6% which is fairly low compared to that in the past years.
Check Your Progress 1. Define the term 'inflation'. 2. Why is moderate inflation desirable? 3. How is the desirable limit of inflation determined? 4. How is the inflation rate measured?

Inflation 11.4 KINDS
OF INFLATION Inflation is generally classified on the basis of its rate and causes. The types of inflation on basis of its cause will be discussed under the causes of inflation. Here, we take a look at the kinds of inflation based on the rate of inflation. Inflation on the basis of rate is classified as (i) moderate inflation, (ii) galloping inflation, and (iii) hyper inflation. (i) Moderate Inflation: 'A single digit' rate of annual inflation is called 'moderate inflation' or 'creeping inflation'. During the period of moderate inflation, prices increase but at a moderate rate. The 'moderate rate' may vary from country to country. However, important feature of moderate inflation is that it is 'predictable' and people hold money as a store of value. By this definition, India has had a moderate of inflation during the post-independence period, except in few years. (ii) Galloping Inflation: A very high rate of inflation is called "galloping inflation'. How high should be the rate of inflation to be called galloping inflation is not defined precisely. According to Baumol and Blinder, 11 "Galloping inflation refers to an inflation that proceeds at an exceptionally high rate." They do not specify what rate of inflation is 'exceptionally high'. Samuelson and Nordhaus 12 define 'galloping inflation' more precisely. According to them, "Inflation in the double or triple-digit range of 20, 100 or 200 percent a year is labeled "galloping inflation". This definition is not less imprecise because the double-triple-digit inflation varies from 10% to 999%. A country with 900 percent inflation will have devastating effects whereas a country with 20–30 per cent inflation can manage without pressing the alarm bell. The post-War I inflation in Germany is an example of galloping inflation. The wholesale prices in Germany increased 140 per cent in 1921 and a colossal 4100 per cent in 1922. Some recent examples of galloping inflation, i.e., the annual average rate of inflation 13 during 1980–91 are as follows: Argentina – 418.9%; Brazil – 327.6%; Mexico – 66.5 %; Peru – 287.3% and former Yugoslavia – 123.0%. These cases are often quoted as the example of hyper inflation also. (iii)Hyper Inflation: Hyper inflation takes place when prices shoot up at more than three-digit rate per annum. During the period of hyper inflation, paper currency becomes worthless. Germany had hyper inflation in 1922 and 1923 when wholesale price index shot up by '100 million per cent between December 1922 and November 1923.' 14 November 1923 was the worst period of hyper inflation in Germany—"from January 1922 to November 1923, the price index rose from 1 to 10,000,000,000." 15
Hungarian inflation of 1945–46 is another example of hyper inflation, the worst case of hyper inflation ever recorded. In Hungary, "rate of inflation averaged about 20,000 per cent per month for a year and in the last month prices skyrocketed 42 quadrillion 16 per cent." 17 In recent times, Argentina, Brazil, and Peru had hyper inflation in 1989 and 1991, as shown below. Country 1989 1990 Argentina 3079.8% 2314.0% Brazil 1287.0% 2937.8% Peru 3398.6%; 7481.7% Source: CMIE, World Economy & India's Place In It, October 1993, Table 19.6. (iv)Suppressed Inflation: Another category of inflation often come across in the contemporary writings on the subject is suppressed inflation. In contrast
NOTES Self-Instructional Material 313 Inflation
to open inflation (i.e., price rise without any control and regulation), when price rise is prevented from rising at its potential rate, there exists suppressed inflation. Price control through various direct or indirect price control measure has become a common feature of economic policy of most developed and developing economies. Price controls take the form of statutory fixation of the price or fixation of a price ceiling; rationing the consumption of scarce goods, controlled distribution of goods through public distribution system; subsidization of commodities with high inflation potentials. In spite of these control measures, prices do rise and inflation does take place but at a rate lower than the potential rate in the open system. This kind of inflation is called suppressed inflation. 11.5

EFFECTS OF INFLATION The economic effects of inflation is all pervasive. It affects all those who depend on the market for their supplies. Its effects may be lower or high depending on the rate of inflation. A high rate of inflation is called 'economic evil' because it affects economy in many adverse ways. It affects different sections of the society in different ways and to different extent. The effects of inflation may be favourable or unfavourable. Besides, galloping and hyper-inflation have social and political implications too. In this section, however, we will discuss only economic effects of inflation on the economy as a whole and on the different sections of the people. We will discuss here the effects of inflation on (i) production and economic growth, (ii) employment of labour, (iii) distribution of income, and (iv) distribution of wealth. 11.5.1 Effect of Inflation on Production and Growth Theoretically, the rate of economic growth depends primarily on the rate of capital formation and the rate of capital formation depends on the rate of saving and investment. Therefore, whether inflation affects economic growth depends on how it affects savings and investment. Many economists hold the view that inflation is conducive to economic growth and that there is positive relationship between inflation and economic growth. For example, Harry G. Johnson says, "...some degree of inflation— but a moderate degree only—is the logical concomitant of efficient economic mobilization." 18 Apart from helping growth through redistribution of income, he argues, a moderate rate of inflation breaks the characteristic "rigidities and immobilities" of the underdeveloped economies and can "draw labour and resources out of traditional or subsistence sectors into the developing sectors of the economy" and can help efficient re-allocation of resources. 19 Johnson puts forward two arguments in support of his view. First, during the period of inflation, output prices rise first and input prices follow. This is called time-lag 20 between the rise in output prices and rise in input prices, especially the wage rate. In fact, output prices increase first and wages increase after a time-lag. This time-lag between the rise in output prices and the wage rate is called wage-lag. If wage-lag persists over time, it enhances the profit margin which provides incentive for investment and investible funds to the firms. This results in increase in investment, production capacity and a higher level of output. 21 Second, inflation redistributes incomes in favour of higher income-groups which have higher propensity to save. Inflation-induced redistribution of incomes increases total savings because upper-income classes have a higher propensity to save. As

NOTES 314 Self-Instructional Material Inflation a result, the level of savings increases which lowers the rate of interest. Lower interest rate induces new investment. Increase in investment enhances production capacity of the economy leading to increase in the total output which means economic growth. Empirically, there does not seem to be a clear evidence of positive relationship between inflation and economic growth, at least in the long run. "Looking back to the record of the eighteenth and the nineteenth centuries, some economists find a positive relationship between inflation and economic growth in various countries." 22 Samuelson and Nordhaus recount the US experience: "Until the 1970s, high inflation usually went hand in hand with high employment and output. Rising inflation occurred when investment was brisk and jobs were plentiful...But a more careful examination of the historical record has revealed an interesting fact: The positive association between output and inflation appears to be only a temporary relationship. Over the longer run, there seems to be no sustained relation between a country's inflation rate and its level or growth of output or employment. 23 Different kinds of relations between inflation and growth have been observed during the post-War II period: (i) low rate of inflation and high rate of growth (West Germany); (ii) high rate of inflation and high rate of growth (Japan); (iii) high rate of inflation and low rate of growth (United Kingdom); 24 and (iv) low rate of inflation and low rate of growth (India). 25 To conclude, economists generally agree that a moderate rate of inflation is conducive to economic growth. In the words of Samuelson and Nordhaus, "While economists may disagree on the exact target for inflation, most agree that a predictable and stable or gently rising price level provides the best climate for healthy economic growth. 26 In the long run, economic growth of a country is affected by many other factors and therefore the relation between inflation and growth loses its distinctiveness. Furthermore, a very high rate of inflation of galloping and hyper type cause erosion in real savings and investment and thereby in real savings and investment. Besides, when price rise is uncertain or unanticipated, people find it very difficult to determine their course of response to the price changes. This upsets the price system which causes inefficient allocation of resources and a lower output. Dornbusch and Fisher quote evidence from Jorret and Selody 27 that the output growth in Canada declined by 0.3 per cent for each 1 per cent increase in the inflation rate. 28 In their opinion, "... there is no doubt that high inflation is bad for growth." 29 11.5.2 Effect of Inflation on Employment The rate of employment depends generally on the rate of economic growth. The factors that accelerate the pace of economic growth determine also the course of employment. If inflation rate is such that it affects growth variables—savings, investment and profits— favourably then it affects employment favourably too. However, growth rate and employment come in conflict at a high rate of inflation. A high rate of inflation increases employment but it affects growth adversely. Besides, inflation as a means to growth and employment involves severe economic and social costs. Evidence shows that a high rate of inflation causes distortions in relative prices, malallocation of resources, and social and political unrest. Policy-makers are therefore often faced with a situation of dilemma: whether are or not to control inflation. If inflation is allowed to go on a high rate, it will affect growth adversely, and if it is controlled, it will affect employment adversely: there may be a high rate of unemployment The policy-makers are therefore required to find a trade-off between inflation and unemployment. Since inflation

NOTES Self-Instructional Material 315 Inflation and unemployment have persisted side by side in many countries, this issue has received a great deal of attention in recent times. We give a brief review of the developments in this area. The Phillips Curve The relationship between inflation and employment was first studied systematically way back in 1958 by A.W. Phillips, a New Zealander, who taught economics in England in the 1950s. 30 He studied the relationship between unemplo-yment and the change in money wage rates in the British economy for the period from 1861 to 1957. He found an inverse relationship between the rate of change in the money wage rate and the rate of unemployment. He presented this relationship by a curve called Phillips curve as shown in Fig. 11.1. The Phillips curve in the figure shows the inverse relationship between the rate of change in money wage rate and the rate of unemployment. The general conclusion drawn from this empirical finding is that rise in money wage rate reduces the rate of unemployment and fall in money wages increases the rate of unemployment. From policy point of view, the Phillips curve implies that there is a trade-off between the rate of unemployment and the rate of change in money wage rates, i.e., unemployment can be reduced by lowering the money wage rate. Fig. 11.1: The Phillips Curve: Inflation and Unemployment Although Phillips had traced the relation between the rate of change in money wages and the rate of unemployment, it was later extended to examine the

relationship between the rate of inflation and the rate of unemployment.

Dernburg 31 studied this phenomenon for the period 1951–61, Dornbusch and Fisher 32 for 1961–69, Ackley 33 for 1955–69, and Glahe 34 for 1961–70. They all find Phillips curve to be consistent with the US data in the short-run, i.e., in the US,

there existed an inverse relationship between the rate of inflation and rate of unemployment

at least in the short run. The Phillips curve implies that there is a positive or direct relationship between the rate of inflation and the rate of employment. The inverse relationship between the wage rates and the unemployment rates can be explained by both demand-pull and wage-push factors. The demand-pull factor works through demand-pull inflation. Increase in product prices increases the demand for labour and when demand for labour increases and unemployed labour is drawn into employment. Therefore, with the increase in the money wage rates, the rate of unemployment decreases. The wage-push factor works through autonomous demand by the labour unions for wages in excess of increase in labour productivity. The extent
NOTES 316 Self-Instructional Material Inflation to which labour unions can push wages up depends, among other things, on the rate of unemployment. The lower the rate of unemployment, the greater the union's power to push the wages up. The period of low unemployment is generally the sign of 'buoyant' product market and high profits. Therefore, employers are willing to pay higher wages. There is, therefore, fast upward movement in wages and decrease in employment. Phillips curve created a flutter and generated a long debate on the relationship between inflation and unemployment and its policy implications. In the course of the debate, several economists commented on and contributed to the relationship between the rate of employment (or unemployment) and inflation, and made several modifications to the Phillips curve hypothesis. 35 11.5.3 Effect of Inflation on Income Distribution Whether inflation affects income distribution depends on how it affects price received and price paid. Prices received are the same as incomes defined crudely. Incomes are received, for example, in the form of wages and salaries, rents and royalties, dividend, interest, profits and self-employment earnings. Incomes are also received in the form of old age pensions, unemployment allowances, etc. On the other hand, prices paid represent expenditures. Also, prices paid by one person are the prices received by another person and all prices do not change simultaneously and proportionately. Inflation changes income-distribution pattern only when it creates a divergence between the total price received and the total prices paid by different sections of the society. Effects of Inflation on Some Sections of Society We have noted above that the overall impact of inflation is unpredictable. However, inflation has certain definite and predictable effect on the incomes of some sections of society. These are briefly discussed below. (i) Wage Earners: It is a common belief that wage earners are hurt by inflation more than other sections of the society. For, in general, wage rise lags behind the rise in consumer prices. Some authors consider this belief as a myth. 36 In fact, whether wage earners lose or gain by inflation is again a matter of labour market conditions. In developed countries, labour is, by and large, organized and labour market is competitive. According to Baumol and Blinder 37 'the average wage typically rises more or less in step with prices'. This contradicts the 'popular myth' that wage earners are, in general, losers during the period of inflation. Baumol and Blinder have used US data to show that real wage "is not systematically eroded by inflation". They add, "The fact is that in the long run wages tend to outstrip prices as new capital equipment and innovation increase output per worker". The Baumol-Blinder conclusion holds for at least the organized sector in India. In the organized sector, labour is unionized. The organized labour uses its union power to get compensatory increase in their wages. The labour in the organized sector is, therefore, often adequately compensated for the loss of purchasing power due to inflation. According to the official data, the public sector employees—a part of the organized sector—are more than doubly compensated. The per capita annual emoluments have increases by 1326.17 per cent between 1971–72 and 1994–95 whereas the consumer price index (1960 = 100) has gone up by only 630.21 per cent during this period. 38 The annual emoluments in the private organized sector has increased at a faster rate. It may thus be concluded that the wage earners in the organized sector have gained during the period of inflation. Check Your Progress 5. What is GNP deflator? 6. What are the different kinds of inflation? 7. What is 'suppressed infla- tion'? 8. What is Phillips curve?
NOTES Self-Instructional Material 317 Inflation The above conclusion can however be hardly accepted as a universal phenomenon. For, labour market conditions and price variations
vary
from country to country and from time to time.
The

labour market in the less developed countries, mostly faced with large scale open and disguised unemployment, is generally divided between organized and unorganized labour markets. In India, for example, the employment share of unorganized sector is much larger, nearly 5 times bigger... than that of the organized sector. 39 The wage in the unorganized labour market have not increased in proportion to the rate of inflation. Therefore, the labour in the unorganized sector has been a net loser during the period of inflation because their wages lag far behind the pricerise. (ii) Producers: Whether producers gain or lose due to inflation depends, theoretically, on the rate of increase in prices they receive (the sale price) and the prices they pay (input prices or the cost of production) including wages and salaries, interest, rent and other input prices like cost of raw material, transportation and communication, and electricity. In general, product prices rise first and faster than the cost of production. The product prices rise first due to demand-pull factor, rise in money supply, supply bottlenecks, or a sudden rise in certain input prices (e.g., oil price). The input prices remaining the same, profit margin increases. This creates additional demand for inputs pushing the input prices up though at different rates and with different time lags. However, it must be brone in mind that wages and salaries do not increase automatically and simultaneously during the period of inflation. There is always a time-lag between the rise in commodity price and wages. The producers gain during the period of inflation due to wage-lag. (iii)Fixed Income Class: The fixed income class which consists of house-owners getting fixed rent on their property; some category of wage-earners getting fixed wages, and artisans make a limited fixed income during the period of industria-lization. The people of the fixed-income category are the net losers during the period of inflation. The reason is, their income does not increase— it remains constant—but the prices of goods and services they consume increase. As a result, the purchasing power of their income is eroded in proportion to the rate of inflation. (iv) Borrowers and Lenders: In general, borrowers gain and lenders lose during the period of inflation. During the period of inflation, borrowers gain because when they pay off their debts, they pay a lower real value. Lenders lose for the same reason. For example, suppose a person borrows Rs 5 million at 12 per cent simple rate of interest for a period of five years to buy a house. Suppose also that escalation in property prices is such that property prices double every 5 years. After 5 years, the borrower would pay a total sum of Rs 8 million whereas the price of house rises to Rs 10 million. The borrower thus gains by Rs 2 million. The lender loses by the same amount in the sense that had he bought the house himself, the worth of his money would have risen to Rs 10 million. (v) The Government: The government is a net gainer during the period of inflation. It gains because inflation increases tax yields from personal income tax because (i) inflation redistributes income in favour of higher income groups taxable at higher rates of income tax, and (ii) inflation increases the nominal income at the rate of inflation, real income remaining the same. As a consequence, an income which was non-taxable prior to inflation becomes taxable after inflation. Inflation enhances also the tax base and, therefore, tax revenue increases. In case of corporate income tax, tax-yield increases during the period of inflation on account of (i) increase in corporate profits, and (ii) increase in depreciation

NOTES 318 Self-Instructional Material Inflation allowance due increase in the nominal value of firm's assets. Inflation enhances also the revenue from indirect taxes because tax yield increases in case commodities are taxed at ad valorem rates. Finally, the government gains as a net borrower. 11.5.4 Effect of Inflation on Distribution of Wealth Here, the term 'wealth' means net worth defined as assets minus liabilities or debts. For our purpose here, net worth means the net worth of variable price assets comprising physical and financial assets. The effect of inflation on the distribution of wealth depends on how inflation affects the net worth of the different classes of the wealth holders. In general, the value of variable price assists increases at the rate higher than the cost of maintenance. Therefore, sections of the society holding large price-variable assets gain. This increases their returns on wealth and ability to accumulate more assets. Therefore, wealthy people gain more wealth. The result is redistribution of wealth in favour of rich section of the society, even if low asset holder maintain their assets. However, if low asset holders sell their property under the pressure of inflation, wealth distribution get more accentuated in favour of rich. However, the voluminous literature 40 available on the subject and various empirical studies do not produce conclusive evidence on the effect of inflation on the distribution of income and wealth. To quote Samuelson and Nordhaus. 41 "The summary wisdom of these studies indicates that the overall impact is highly unpredictable". 11.6 THE MONETARIST VIEW ON INFLATION Monetarists comprise a class of economists who attach a greater significance to money as economic factor than to any real factor. As mentioned above, modern monetarists, especially Milton Friedman, revived and modified the classical monetary theory of inflation. The modern monetarists 42 hold that the general level of price rises only due to increase in money supply but not proportionately. According to Milton Friedman, "Inflation is always and everywhere a monetary phenomenon... and can be produced only by a more rapid increase in the quantity of money than in output." 43 More importantly, while classical economists, especially Irvine Fisher, considered increase in the stock of money as the sole cause of inflation and price rise being proportional to increase in money supply, modern monetarists do not agree with proportionality of increase in price level. Recall here Fisher's quantity theory equation, MV = PT and P = MV/T

Clearly, the volume of transactions (T) remaining constant, P increases in proportion to increase in MV, the total supply of money. This proposition is not acceptable to modern monetarists. In Friedman's own words, "In its most rigid and unqualified form the quantity theory asserts strict proportionality between the quantity of what is regarded as money and the level of prices. Hardly any one has held the theory in that form." 44 That is, modern monetarists do not agree that there is proportional relationship between the supply of money and the price level. 11.7 THE MODERN APPROACH TO INFLATION The modern approach to inflation follows the theory of price determination. That is, the general price is determined by aggregate demand for
and
aggregate supply of goods and services and the
variation in the aggregate price level is caused by the shift in the
Check Your Progress 9. How does inflation affect economic growth? 10. How does inflation affect employment? 11. How are wage earners affected by inflation? 12. How does 'inflation' affect wealth distribution?
NOTES Self-Instructional Material 319 Inflation
aggregate demand and aggregate supply curves. The modern theory of inflation is, in
fact, a synthesis of classical and Keynesian theories of inflation. The modern analysis of inflation shows that inflation is caused by one or both of demand-
side
and supply- side factors. The factors which operate on the demand-side are called demand-pull factors, and those operating on the supply-side are called cost-push factors. Accordingly, there are two kinds of inflation: (i) demand-pull inflation, and (ii) cost push inflation. The two kinds of inflation are discussed here briefly. 11.7.1
Demand-Pull Inflation The demand-pull inflation occurs when the aggregate demand increases much more rapidly than the aggregate supply. Demand-pull inflation occurs when given the aggregate supply, aggregate demand increases. Increase in aggregate demand may be caused by (a) monetary factors, i.e., increase in money supply, and/or (b) real factors, i.e., increase in demand for real output. Let us now see how monetary and real factors cause inflation. (a)
Increase in Money Supply and Demand-Pull Inflation One important reason for demand-pull inflation is increase in money supply in excess of increase in potential output. Whether increase in money supply in excess of output is the only cause of inflation is a controversial issue. But the fact is that monetary expansion in excess of increase in the level of output is one of the most important factors causing demand-pull inflation.
Let us look at the process of demand-pull inflation caused by monetary expansion. When monetary and real sectors are in equilibrium at the same level of output and prices, the economy is also in general equilibrium. When the economy is in the general equilibrium, the general price level corresponding to the general equilibrium is called equilibrium price level. Now let money supply increase, other things remaining the same. The increase in money supply increases the real stock of money at each level of prices. This causes a decline in the interest rate. Therefore, people's desire to hold money increases. The decrease in the interest rate causes also an increase in investment and, thereby increase in the level of income. Increase in income causes a rise in consumption expenditure. The rise in investment and consumer expenditures increases aggregate demand, aggregate supply remaining the same. This rise in aggregate demand is exactly proportional to the rise in the money stock. The rise in aggregate demand, given the aggregate supply, causes increase in the general price level, which may be inflationary. The German inflation of 1922–23 is often cited as an example of demand-pull inflation caused by the increase in money supply. During 1922–23, the German government had fallen under heavy post-war debts and reparations payment obligations. The government, left with no option, printed and circulated billions and billions of paper currency, the general price level rose a billion fold. In recent times, the excess supply of money caused demand-pull inflation in Russia in 1990s 'when the Russian government financed its budget deficit by printing roubles'. Due to rapid increase in money supply, the general level of prices had risen in Russia during the early 1990s at an average rate of '25 per cent per month [or 100 × (1.25 12 – 1) = 1355 per cent per year].' 45
(b) Demand-Pull Inflation Due to Real Factors
Demand-pull inflation can be caused by any or many of the following real factors: (i) Increase in the government expenditure without change in tax revenue; (ii) Cut in tax rates without change in the government expenditure; (iii) Upward shift in the investment function;
NOTES 320 Self-Instructional Material Inflation (
iv) Downward shift in the saving function; (v) Upward shift in export function; and (vi) Downward shift in the import function.
The first four factors straightaway increase the level of disposable income.
Aggregate demand being

the function of income, increase in aggregate income increases aggregate demand causing demand-pull inflation. For example, suppose that the government increases its spending financed through borrowings abroad. The rise in the government spending generates additional demand and, therefore, aggregate demand increases. Since there is, by assumption, full employment, additional resources can be acquired only by bidding a higher price. This pushes the prices up without increase in the output. Therefore, the transaction demand for money increases. In order to meet the additional transaction demand for money, people sell their financial assets—bonds and securities. Consequently, bond and security prices go down and the rate of interest goes up. In the product market, prices increase to such an extent that the additional government spending is absorbed by the price rise. 11.7.2 Cost-Push Inflation There are instances of inflation which could not be fully explained by the demand-side factors. The 1958-recession in the western countries is a famous instance. During the period of recession, the aggregate demand had declined. Yet there was no decrease in the general price level. It tended instead to rise. In recent times, it is a common experience that prices generally do not decrease during the period of recession. Furthermore, even when there is stagnation in the economy and there is no inflationary pressure, the general price level generally continues to increase, i.e., a situation of stagflation. The search for this kind of phenomenon, particularly for the 1958-puzzle, had lead to the emergence of supply-side theories of inflation, popularly known as cost- push theory and supply-shock theory of inflation. Cost-push inflation is generally caused by monopolistic groups of the society, like labour unions and firms in monopolistic and oligopolistic market setting. Strong labour unions often succeed in forcing money wages to go up causing prices to go up. This kind of rise in price level is called wage-push inflation. Also, firms enjoying monopoly power have also been found using their monopoly power to raise prices which in turn leads to rise in the general price level. The monopolistic and oligopoly firms push their profit margin up causing a rise in the general price level. This kind of inflation is called profit-push inflation. Another kind of cost-push inflation is said to be caused by supply shocks, i.e., decrease in the aggregate supply. This is called supply shock inflation. Minimum-wage legislation and administered prices are other supply side factors which not only keep price level up but also create conditions for increase in the prices. In this section, we will discuss briefly these kinds of cost-push inflation. (i) Wage-Push Inflation: Wage-push inflation is attributed to the exercise of monopoly power by the labour unions to get their money wages enhanced more than the competitive labour market conditions would permit. Organized and powerful labour unions exercise their monopoly power and force their employers
to increase their money wages above the competitive level without matching increase in labour productivity. Increase in money wages causes an equal increase in the cost of production. The increase in cost of production causes the aggregate supply curve shift backward. Given the aggregate supply curve, a backward shift in the aggregate supply causes an upward movement in the price level. However, every rise in the money wages is not always inflationary. The rise in money wages due to the following factors is not said to be inflationary. (i) increase in wage rate due to increase in productivity.
NOTES Self-Instructional Material 321 Inflation (
ii) rise in wage rates due to inflation otherwise, (
iii) wage rise where unionized wage bill is very small, and (iv) wage rise due to shortage of labour supply. (ii) Profit-Push Inflation: In contrast to wage-push inflation, profit-push inflation is caused by the use of monopoly power by the monopolistic and oligopolistic firms to enhance their profit margin which results into rise in price and inflation. Today, monopolistic competition and oligopolies characterise the real market situation all over the world. The monopolies, monopolistically competitive firms and oligopolies
account for the almost all manufacturing industries.
Therefore, a profit-push type of inflation is certainly a theoretical possibility.
The profit- push type of inflation is more common where labour unions demand higher wages. Firms increase prices of their products more than increase in the wage rate and create, thereby, an inflationary pressure.
It may be added here that wage-push and profit-push inflation go hand in hand, whichever may be the leading cause. Labour unions may be the first to force wage rate to go up but firms raise the price level often more than proportionately. Or else, monopolistic firms may be the first to push the product price up forcing labour unions to demand a higher wage rate. It has then its repercussions on the money wages. Higher prices and profits induce demand for higher wages. The powerful labour unions force their wages up. Following the wage hike, firms raise the product prices. When this process gets going, it takes the form of 'profit-wage spiral'. (iii)Supply-Shock Inflation: Supply shock is generally caused by unexpected decline in the supply of major consumer goods or key industrial inputs. For example, food prices shoot up due to crop failure, and
prices of some key industrial inputs like, coal, steel, cement, oil, basic chemicals, etc., go up because of labour strike, natural calamities, etc. Also, rise in the price may be caused by supply bottlenecks in the domestic economy or international events (generally wars) causing bottlenecks in the movement of internationally traded goods and causing thereby shortage of supply and rise in imported industrial inputs.

The sudden rise in the OPEC oil prices of 1970s due to Arab-Israel war is the famous example of the supply shock inflation all over the world. The OPEC had more than quadrupled the oil prices between 1972 and 1974. The oil price (Arabian Lights/Dubai) had increased from $ 1.90 per barrel in 1972 to $ 10.41 per barrel in 1974. 46 Due mainly to rise in the oil prices, the rate of inflation in India was 20.1% in 1973–74, 25.2% in 1974–75; 19.1% in 1979–80, and 18.2% in 1980–81 compared to the annual average of 6.1. per cent inflation during the preceding and about 8 per cent inflation during the succeeding decades. The other factors which had contributed to the high price- rise were failure of crops in 1972–73 and

aftermath of 1971 war and influx of Bangladesh refugees. For these reasons, prices had risen by 32 per cent in September 1974. This kind of inflation falls in the category of supply-shock inflation. 47 11.7.3

Interaction Between Demand-Pull and Cost-Push Factors

One may conclude from the preceding discussion that, inflation is caused either by demand-pull or by cost-push factors. In fact, as mentioned above, demand-pull and cost-push factors work as cause-and-effect to cause a sustained increase in prices. Many economists hold the view that any one of these factors alone cannot cause

NOTES 322 Self-Instructional Material Inflation

inflation. To quote Machlup, “There is a group of economists contending that there cannot be a thing as cost-push inflation because, without an increase in purchasing power and demand, cost increases will lead to unemployment and depression, not to inflation.” 48 There is another group of economists who contend that ‘demand-pull is no cause of inflation, it takes a cost push to produce it.’ 49 The sum of these arguments is that neither cost-push nor demand-pull alone can cause and sustain inflation. In reality, cost-push and demand-pull interact to sustain the inflation over a period of time, whichever may be the cause of initial inflation. And, the dichotomy between the demand- pull and cost-push inflation is only a convenient way of classifying inflation. Besides, in the process of their interaction, cost-push and demand-pull factors gets so intermixed that it is difficult to identify whether it is demand-pull or cost-push type of inflation. Some economists even contend that “the distinction between demand-pull and cost-push inflation is unworkable, irrelevant or even meaningless.” 50 It may be argued that demand-pull and cost-push inflation may be distinguished on the basis of

as to

which of the two factors caused rise in the price for the first time. But the question arises: first since what time? If prices and wages have risen in turn, especially in a cause-and-effect manner, in successive years, ‘the choice of a base period is quite arbitrary and a conclusion assigning the leading role to one factor or the other would be equally arbitrary’. Nevertheless, demand-pull factor is regarded as the leading factor. 11.8

INFLATION IN LESS DEVELOPED COUNTRIES: THE STRUCTURALIST VIEW Theories of inflation discussed above are all based on the characteristics and experience of the western developed countries. A question that may be asked here is: Can inflation problem faced by the less developed countries (LDCs) be explained by inflation theories developed with reference to the western industrialized nations? It is often argued that inflation theories based on the economic characteristics of the developed countries can hardly be applied to explain the nature of inflation in the developing countries and are, therefore, of little consequence as far as formulations of anti-inflationary policy is concerned. The reason is that the characteristics and the institutional set up of the developed countries do not exist in the LDCs. Besides, in the framework of the orthodox theories, inflation takes place only when the economy is in the state of full employment with ‘natural rate of unemployment’, if any. The rise in the general price level prior to the state of full employment in the economy is not considered to be inflationary because that price level was lower than what was necessary to bring about full employment in the economy. In contrast, in the less developed economies, inflation and large scale unemployment go hand in hand. This has been the experience of most developing economies trying to achieve a high growth rate through the public sector investments. As regards the institutional factors, the less developed economies are characterized by highly fragmented markets, market imperfections, immobility of factors, wage rigidities, disguised unemployment and underemployment, ‘low equilibrium trap’ and sectoral imbalances with surplus in some sector and scarcity in others. Furthermore, inflation in the LDCs has generally been an inevitable consequence of their growth efforts. For these reason, inflation theories built on the experience and in the background of the developed countries have little relevance to LDCs. However, it is equally incorrect to say that inflation theories built in the background of developed countries cannot be applied to explain inflation in LDCs. The economic literature offers two plausible explanations or, in other words, two approaches to the phenomenon of inflation in the developing countries, 51 viz., (i) monetarist approach, and (ii) structuralist approach. Monetarist approach to inflation has already been discussed above. In this Check Your Progress 13.What is the monetarist view of inflation? 14.Define demand-pull inflation. 15.What are the sources of cost- push inflation? 16.How do demand-pull and cost-push factors interact?

NOTES Self-Instructional Material 323 Inflation section, we briefly discuss the structuralist approach to inflation in the developing countries. 11.8.1 Structuralists' Approach to Inflation As mentioned above, inflation theories developed in the background of the developed countries do not offer a reasonable explanation to inflation in the LDCs. Nor do the measures that emerge from these theories can be effectively applied to control inflation in the developing economies. Economists like Myrdal and Streeten argue strongly against straightaway application of the so called modern theories of inflation to LDCs. Their effort to find an appropriate explanation to inflation in LDCs has led to the emergence of a new school of economists called 'structuralists' and a new class of inflation theories known as structuralist theories of inflation. Some significant contributors of this school of thought are Myrdal, 52 Streeten, 53 and several Latin American economists. 54 The structuralist view on inflation is briefly explained in this section. According to the structuralist view, inflation in LDCs is an unavoidable result of their ambitious development programmes and is caused mainly by the structural imbalances in such economies. The structural imbalances in LDCs are: (i) food scarcity, i.e., the imbalance between demand for and supply of food (ii) input imbalance: shortage of capital and surplus labour, shortage of fuel and oil, (iii) foreign exchange bottleneck: imbalance between exports and imports and balance of payment deficits, (iv) infrastructural bottlenecks in respect of electricity, transport and communication, and telecommunication, and (v) social and political constraints. In LDCs, inflation is caused by an admixture of factors including 'the latent factors' built up in the early years of planning, increase in money supply, international factors, 'dislocation of infrastructural facilities such as power, transport and port facilities', continued deficit financing, 'accretion of foreign exchange reserves', droughts and floods causing poor performance of the agricultural sector, heavy indirect taxation, administered prices, etc. This, however, should not mean that demand-pull and cost- push factors do not apply at all to LDCs. 11.9 POLICY MEASURES TO
CONTROL INFLATION
Economists agree that inflation beyond a moderate rate is bad and can often prove disastrous and, therefore, it must be kept under control. The various measures suggested for controlling inflation can be classified under (i) monetary measures, (ii) fiscal measures, (iii) price and wage control, and (iv) indexation. 11.9.1 Monetary Measures Monetary measures which are widely used to control inflation include (i) bank rate policy, (ii) variable reserve ratio, and (iii) open market operation. (i) Bank Rate Policy: Bank rate
or, more appropriately called, 'Central Bank rediscount rate', is the rate at which central bank buys or rediscounts the eligible bills of exchange and other approved commercial papers presented by the commercial banks for building reserves. 55 The central bank performs this
NOTES 324 Self-Instructional Material Inflation
function as the 'lender of the last resort.' In general, bank rate policy is used even during the period of inflation as the main instrument of monetary control. The use of bank rate policy forms the basis of 'dear money' or 'tight money' policy and the 'cheap money policy' depending on the need of the country. When the central bank raises the bank rate, it is said to have adopted a 'dear money
policy'. The bank rate as a measure of inflation control works in two ways. One, during the period of
inflation, the central bank raises the bank rate. This increases the
cost of borrowing which reduces commercial banks' borrowing from the central bank.
This reduces banks' ability to create credit through the process of credit multiplier. As a result, flow of money from the commercial banks to the public gets reduced. Therefore, inflation is controlled to the extent it is caused by the bank credit. Two, bank rate sets the trend for the general market rate of interest, particularly in the short-term money market. If bank rate is increased with a view to controlling money supply and, thereby, inflation, commercial banks increase their lending rates and other market rates follow
the suite.
In general, the cost of borrowing goes up. This slows down the monetary flows to the society. This method, however, does not work effectively, if (i) commercial banks have excess liquidity, (ii) they have alternative sources of creating reserves, (iii) they are free not to raise their lending rates following the increase in the bank rate, and (iv) future expectations regarding the market prospects is optimistic.
In India, the RBI is constrained to make full use of the bank rate policy as an instrument of monetary control for the fear of (i) that it might raise the interest rate in the gilt-edged market and thereby increase government's cost of borrowing, and (ii) that it might result in capital loss to the bond-holders, the financial institutions. "The role of the bank rate as an instrument of monetary policy has been very limited in India, because of a number of factors like the administered structure of interest rates, sector specific refinance facilities for commercial banks and underdeveloped bill market" (Economic Survey, 1994–95, Government of India, p. 43). (

ii) Variable Reserve Ratio: Commercial banks are required to maintain a certain proportion of their total demand and time deposits in the form of cash reserves, called cash reserve ratio (CRR). The cash reserve ratio (CRR) is generally determined and imposed by the central bank which it uses as a weapon to control money supply. To control inflation, the central bank rises the CRR. When central bank raises the CRR, it reduces the lending capacity of the commercial banks. As a result, flow of money from the commercial banks to the public decreases. In the process, it halts the rise in prices to the extent it is caused by the banks credits to the public. This method of
monetary control or
controlling inflation has the same limitations as the bank rate policy. (iii)Open Market Operations: Open market operations refers to sale and purchase of the government securities and bonds by the central bank. To control inflation, central bank sells the government securities to the public through the authorized commercial banks. The sale of government bonds through the banks
reduces credit creation capacity of the commercial banks because it reduces their total deposits.
Therefore, money supply with public is reduced a multiple of sale proceeds of the treasury bills through a
process of reverse money multiplier.
As a result, inflation is controlled to the extent money supply with public decreases.
Open market operation is regarded an efficient instrument of monetary control in the developed countries like the USA and the UK. This method is more
NOTES Self-Instructional Material 325 Inflation
effective than other methods of monetary control. In the developing countries like India, however, open market operation has not proved very successful mainly because treasury bill market is not developed and well organized. In India, treasury bill market is not well developed. It is largely a captive-market confined to the financial institutions such as scheduled commercial banks, life insurance and general insurance companies, and the government financial corporations. These institutions are required by law to invest a certain proportion of their total liabilities in the government bonds and securities. The treasury bill market in India is therefore said to be a ‘captive market’. 11.9.2 Fiscal Measures Fiscal measures to control inflation include taxation, government expenditure and public borrowings. Keynesian economists, also called ‘fiscalists’, argue that demand-pull inflation is caused by excess of aggregate demand over aggregate supply. The excess demand is the result of increase in expenditure by the households, firms and the government, particularly by excessive spending by government. Excess demand, be it household or government expenditure
it
can be effectively controlled by fiscal measures. Therefore, fiscal policy
or the budgetary
measures are a more powerful and effective weapon to control demand-pull inflation. In case government expenditure is the cause of excess demand, it can be controlled straightaway by cutting down public expenditure. A cut in public expenditure reduces government demand for goods and services and also the private consumption expenditure arising out of government expenditure multiplier. Therefore, the excess demand decreases more than a given cut in public expenditure. And, in case excess demand is caused by rise in private expenditure,
taxing incomes is
a more appropriate measure to control inflation. Taxation of incomes reduces the disposable income of the people and thereby consumer demand. In case of a very high rate of persistent inflation, the government may adopt both the measures simultaneously. It should cut down its own spending, on the one hand, and increase the rate of income taxation, on the other. This kind of policy is known as a policy of surplus budgeting, i.e., the government should spendless than its tax revenue.

Is Fiscal or Monetary Policy More Effective in Controlling Demand-pull Inflation? Whether fiscal or monetary policy is more effective in controlling demand-pull inflation or any kind of inflation has been a matter of controversy and prolonged debate between the fiscalists and monetarists. Fiscalists argue that fiscal policy is more effective in controlling inflation whereas monetarists argue that monetary policy is a more effective weapon than the fiscal measures to control inflation. Economists called 'rationalists' and 'supply-siders' hold a different view from those of the monetarists and fiscalists on the measures to control inflation. Empirical evidence on the relative effectiveness of monetary and fiscal policies are not conclusive either. Some economists, viz., Andersen and Jordan, find in their researches monetary policy more effective than the fiscal policy in controlling inflation and promoting employment. Some other economists, viz., Leeuw and Kalchbrenner, find that fiscal policy is more effective than the monetary policy. Findings of Gary Fomm and R. Klien support the view that fiscal policy is more effective. Most researches on this issue find that fiscal policy is more effective, but they do not prove conclusively that monetary policy is not effective. However, it may be suggested that if inflation is caused by the monetary factors, say, due to excess money supply, then monetary policy would be more effective. And, if inflation is caused by real factors, e.g., due to rise in the household demand and public expenditure, then fiscal policy would be more effective. In fact, an appropriate combination of fiscal and monetary policy is more effective in controlling inflation than any of these policies.

Check Your Progress 17. What is the structuralist view on inflation? 18. What are the monetary mea- sures to control inflation? 19. What are the fiscal measures to control inflation? 20. Why is a combination of both monetary and fiscal mea- sures considered to be a more effective policy?

NOTES 326 Self-Instructional Material Inflation 11.9.3

Price and Wage Control Where monetary and fiscal measures prove ineffective in controlling inflation, direct control measures are adopted to control inflation. Direct measures consist mainly of price and wage controls. The price and wage controls go together because price-push and cost-push inflation go hand in hand whatever may be the cause of initial inflation. Under price control method, a maximum retail price of goods and services is fixed. Price control may be general, applicable to all goods and services or it may be partial confined to only scarce and essential goods and services. The primary objective of price control is to prevent the price rise of scarce goods and to ration the use of the commodity. Whether price control works effectively and efficiently is a controversial matter. It is a general experience that price controls lead to black-marketing of goods and unfair distribution of scarce goods and services, especially where administrative machinery is corrupt and inefficient. Wage control is used where inflation is of cost-push or of wage push nature. Under this method, rise in wage rate is prevented directly by imposing a ceiling on the wage incomes in both private and public sectors. Often 'wage-freeze' is applied to control inflation. In case trade unions are powerful and oppose 'wage-freeze' effectively, government uses a weaker method called 'jawboning'. A more sensible and effective method of containing wage-push inflation is known as 'wage guideposts'— a plan of action against inflation prepared by common consent and mutual agreement between the representatives of the government, trade unions and the businessmen, for a disciplined and controlled upward movement in the wages and prices. Under this scheme, wage and price rise are monitored by a board of the representatives. However, this method does not work for long, especially when prices continue to rise. Friedman comments, "Guideposts and pleas for voluntary compliance are a halfway [measure] whose only merit is that they can more readily be abandoned than legally imposed controls. They are not an alternative to other effective measures to stem inflation, but at most a smoke- screen to conceal lack of action.' 56 11.9.4

Indexation It should be clear from the foregoing discussion that inflation is an intractable problem. Controlling inflation involves the risk of aggravating unemployment problem. However, as discussed above, a high rate of inflation affects different sections of the society in different ways. Economists argue that if controlling inflation is not advisable, its adverse effects on different sections of society can be minimized by a method called indexation. They suggest that

indexation of prices, wages and contractual obligations with a view to compensating those who lose their real incomes due to inflation. According to Samuelson and Nordhaus, "Indexing is a mechanism by which wages, prices and contracts are partially or wholly compensated for changes in the general price level." 57 Thus, indexation is not a method of controlling inflation. It is a method of adjusting monetary incomes so as to minimize the undue gains and losses in real incomes of the different sections of the society due to inflation. Its main objective is to manage social discontent. Its objective is

to make inflation easier to live with. Indexation of wages is most important and a common practice in many countries where wage contracts are long-term contracts and inflation continues to persist. In such cases, compensating workers for the loss of their real income due to inflation becomes unavoidable. Two systems are adopted in general: one is to tie wages to cost-of-living index (CPI), and

second is

to make a periodic scheduling of wage rise after CPI goes up by a certain percentage point. For instance, in the USA, wages are linked to cost-of-living index and cost-of-living adjustment (COLA) with inflation is made automatic. Here, wages increase automatically following the increase in the cost-of-living index. In India, wage compensation takes the form of 'dearness
NOTES Self-Instructional Material 327 Inflation
allowance', i.e., compensation for loss of purchasing power of the nominal wages due to inflation. Dearness allowance to the public sector employees in India is linked to consumer price index (CPI) and dearness allowance is granted after every 8 percentage point increase in the CPI. Although economists strongly recommend indexing of wages, debts, taxes, and all other long-term contractual payments, the governments doubt the feasibility and practicability of indexation method for three reasons. 58 One, adjustment in indexation is impracticable in case of frequent supply shocks of great amplitude. Second, economy being a complex system with interlinked and interrelated prices, a reasonable indexing of all prices to the satisfaction of all concerned is an extremely difficult task. Third, the government find indexation politically undesirable because it does not control inflation, it rather creates a base for its perpetuation. 11.10
SUMMARY z
Inflation is defined as the persistent and considerable increase in the general price level over a period time without change in composition of national output. z Inflation
rate is calculated as follows Inflation rate = 1 1 100 t t t PIN PIN PIN − − − × , where PIN = Price Index Number
z
Inflation can also be measured by what is called 'National Income Deflector'. National income deflator = Nominal GNP/ Real GNP. z
Inflation is classified as (i) moderate inflation—single digit inflation, (ii) galloping inflation—double and triple digit inflation, and (iii) hyper inflation—more than triple digit inflation.
z
A moderate rate of inflations helps economic growth and employment. But a very high rate of inflation affects growth rate adversely; cause unequal distribution of income; reduces real wage income; redistribution wealth in favour of rich people; benefits produces; and harms the consumers.
z
Theories of inflation bring out the factors and causes, which create conditions for inflation.
z
The economists have over time offered different theories to show the cause or causes of inflation. Theories of inflation are generally classified as classical or monetarist and modern theories.
z
Monetarist view on inflation is that 'inflation' is always, and everywhere is caused by excess supply of money.
z
Modern theories of inflation are again classified as (i) demand-pull inflation, (ii) cost-push inflation, and (iii) demand-pull-and-cost-push inflation.
z
According to demand-pull theory, inflation is caused by excess of demand over supply. Cost-push theory states that inflation is caused by rise in wages and other costs. According to demand-pull-and-cost-push theory, inflation may begin due to demand-pull or cost-push factors but finally the two kinds of factors interact to accelerate the inflation rate.
z
It becomes often necessary to control inflation. There are generally two kinds of measures to control inflation: (i) monetary measures, and (ii) fiscal measures.
z
Monetary measures
include (i) bank rate, (ii) cash reserve ratio, and (iii) open market operation.
NOTES 328 Self-Instructional Material Inflation
z
Fiscal measures include (i) high direct tax rates, and (ii) reducing government spending. In general, however, a combination of both methods is used to control inflation. 11.11 ANSWERS TO 'CHECK YOUR PROGRESS' 1.
Inflation is persistent and consideration rise in the general price level over a long period of time. 2. A moderate inflation is desirable as it helps economic growth and employment by increasing profit, giving incentive for ability to invest. 3. The desirable limit of inflation is determined by the rate that benefits the economy. In general, 2-3% inflation for developed countries and 4-5% developing countries is considered to be desirable. 4. Inflation rate is measured by two methods: (i) by working out the percentage change in price based on price index number of any two years

as Inflation rate = 1 1 100 t t t PIN PIN PIN – – – × and (ii) by national income deflator as Inflation rate = Nominal income Real income 5. GNP deflator is the ratio of nominal income to real income. Nominal income is the GNP at current prices and real income is GNP estimated at base year prices. (Note: see also answer to Q. 4) 6. There are three kinds of inflation based on inflation rate: (i)
moderate inflation—one digit inflation, (ii) galloping inflation—2-3 digit inflation, and (iii) hyper inflation—higher than 3-digit inflation. 7.
Suppressed inflation refers to a situation in which there is strong potential for high ratio of inflation but prices are controlled by direct and indirect price control measures. 8. Phillips curve is curve devised by economist A.W. Phillips to show the relationship between the inflation rate and unemployment rate. 9. A moderate rate of inflation helps economic growth favourably. It provides incentive for investment by giving a higher rate of profit and it gives ability to save and invest. But a very high rate of inflation increases cost heavily, reduces profit and ability to invest. Therefore, it affects growth adversely. 10. If inflation is such that it helps economic growth, it promotes employment and if inflation affects growth adversely, it reduces employment. 11. Inflation affects wage earners adversely because during the period of inflation prices of consumer goods rise faster than the wage rate. This reduces their real income. 12. Inflation redistributes wealth in favour of wealthier people. Inflation causes deficits for poor sections and forces the sale of property which rich people can buy. So the wealth moves from poor to rich. 13. Monetarist view is one of the oldest and one of the modern views of inflation. According to modern monetarist view, 'inflation is always and everywhere a monetary phenomenon'–that is inflation is always caused by excess supply of money. 14. According to demand-pull theory, inflation takes place when aggregate demand increases much faster than aggregate supply.
NOTES Self-Instructional Material 329 Inflation 15. The main factors in cost-push inflation are wage-push (demand for high wages), profit-push (firms increasing their profit margin and therefore prices), and supply- shock (supply of goods and services decreasing suddenly). 16. Inflation may start due to either demand-pull factor or cost-push factor. But demand- pull and cost-push factor begin to interact or complement one another leading to high rise in prices. 17. Structuralist view on inflation applies to less developed countries. According to this view, inflation in less developed countries takes place due to structural imbalance— demand and supply gaps—in different sectors of the economy. 18. Monetary measures
to control inflation include (i) raising bank rate, (ii) raising cash reserve ratio, and (iii) open market operation. 19. Fiscal measures to control inflation include (
i) raising tax rates, (ii) decreasing public expenditure, and (iii) adopting surplus budget policy. 20. Monetary or fiscal policy alone is not found to be effective in controlling inflation. Therefore, both the policies are implemented simultaneously in combination of one another. This approach is found to be more effective under normal conditions. 11.12 EXERCISES AND
QUESTIONS 1. How is inflation defined? Can any rise in prices be considered as inflation? What is the acceptable or desirable limit of inflation? 2. What are the methods of measuring inflation? Why is national income deflator considered as a more reliable method of measuring inflation? 3.
Explain
the various kinds of inflation? How do they differ from one another? 4.
Explain and
distinguish between moderate, galloping and hyper inflation. How do these kinds of inflation affect economic growth of a country? 5. 'A moderate degree of inflation is the logical concomitant of efficient mobilization'. Explain and examine the validity of the statement. 6. What are the effects of
inflation on wage-earners, fixed income people, debtors and creditors, producers and the government? Give the reasons for the effects of inflation. 7. In what way does inflation contribute to economic growth? What kind of inflation affects economic growth adversely? 8. What does Phillips curve reveal? Discuss the reasoning behind the negative slope of the Phillips curve. 9. What are the factors responsible for the Phillips curve reasoning? What are its policy implications? 10. Given the Phillips curve relations, what kind of policy dilemma is faced by the policy makers? How will you react to the option of making a choice between a high rate of unemployment and a high rate of inflation? Give reasons for your choice. 11. Explain the relationship between inflation and employment. Is achieving a high rate of employment by means of inflation always desirable? 12. What is monetarists' explanation of inflation? Is inflation always and everywhere a monetary phenomenon? 13. "
Inflation is always and everywhere a monetary phenomenon ... and can be produced only by a more rapid increase in the quantity of money than in output".
Who said it? Do you agree with this statement? Give reasons for your answer.

NOTES 330 Self-Instructional Material Inflation 14. Explain how demand factors cause demand-pull inflation. What are the major weaknesses of the demand-pull theory of inflation? 15. What are the factors behind cost-push inflation? Is there any link between cost- push and demand-pull inflation? 16. Distinguish between demand-pull and cost-push inflation. Can the two types of inflation go hand-in-hand ? Explain in this regard the 'wage price spiral'. 17. " The distinction between demand-pull and cost-push inflation is unworkable, irrelevant or even meaningless". Who gave this statement? Do you agree with this statement ? Why? 18. Theories of inflation based on conditions in and experience of developed countries cannot be and should not be applied straightaway to explain inflation in less developed countries. Do you agree with this statement? If not, why? 19. What is 'structuralist view' on inflation? Explain the structural bottlenecks that are supposed to cause inflation in the developing countries. 20. Combating inflation has been one of the most intractable economic problem faced by the developed and underdeveloped countries. Comment. 21. What are the traditional monetary measures to control inflation? Explain how these measures work to control inflation. 22. Explain the working of the monetary weapons of inflation control. Which of these weapons is more effective under what conditions? 23. What are the fiscal measures of controlling inflation? Are the fiscal or monetary measures more effective in controlling inflation? 11.13 FURTHER READING Baumol, W.J. and S. Fischer, Economics: Principles and Policy, Harcourt, Brace, Innovich, London 1988. Bronfenbrenner, M. and F.D. Holzman, "A Survey of Inflation Theory", Am. Eco. Rev., Sept. 1963. Dornbusch, R. and A.S. Blinder, Macroeconomics (McGraw-Hill, N.Y., 1994) Dwivedi, D.N., Macroeconomics: Theory and Policy. Tata McGraw-Hill, New Delhi, 2005. Froyen, Richard T., Macroeconomics: Theories and Policies, Macmillan, NY, 1990. Johnson, Harry G., "A Survey Theory of Inflation", Ind. Eco. Rev., Vol. 6, No. 4, November 1963 and in his Essays in Monetary Economics George Allen and Unwen, London, 1966. Alchian, A. A. and R.A. Kessel, "The meaning and Validity of the Inflation—Induced Lag of Wages Behind Prices", Am. Eco. Rev., March 1960. Friedman, Milton, "The Role of Monetary Policy", Am. Eco. Rev., March 1968. References 1. This unit is based largely on Chapters 21, 22 and 23 of this author's book, Macroeconomics (Tata McGraw-Hill Publishing Company, New Delhi). Readers interested in detailed study of inflation are advised to read the relevant chapter of this book.
NOTES Self-Instructional Material 331 Inflation 2. A.C. Pigou, "Types of War Inflation", E.J., December 1947, p. 409 and in his The Veil of Money, 34. 3. Ackley Gardner, Macroeconomic Theory, op. cit., 421. 4. Harry G. Johnson, "A Survey of Theory of Inflation", Ind. Eco. Rev., Vol. VI, No. 4, August 1963, reprinted in his Essays in Monetary Economics (George Allen & Unwin Ltd., London, 1966), p. 104. 5. P.A. Samuelson, and W.A. Nordhaus, Economics, 15th International Edn., 1955, p. 574. 6. Martin Bronfenbrenner and Franklin D. Holzman, "A Survey of Inflation Theory", in Surveys of Monetary Theory, Vol. I, 1965. 7. This aspect of inflation will be discussed in a subsequent section of this chapter. 8. Harry G. Johnson, "Is Inflation the Inevitable Price of Rapid Development or Retarding Factor in Economic Growth?", Malayan Economic Review, Vol. 11, No. 1, April 1966. Partly reproduced in Leading Issues in Economic Development, (ed.) by Gerald M. Meier (Oxford University Press, Delhi), Sixth Edition quoted from p. 179. 9. Edward Shapiro, Macroeconomic Analysis (Galgotia Publishers, 1994, New Delhi), p. 468. 10. See also Dornbusch, R. and Fischer, S., Macroeconomics (McGraw-Hill, NY, 1994), p. 36; Baumol, W.J. and Blinder, A. S., Economics: Principles and Policy (Harcourt Brace Jovanovich, London, 1988), p. 114; Froyen, Richard T., Macroeconomics: Theories and Policies (Macmillan, 1990), p. 35. .11. W.J. Baumal, and A.S. Blinder, Economics: Principles and Policy, op. cit., p. 109. 12. Economics, 15th Edn., p. 579. 13. CMIE., World Economy and India's Place in It, October 1993, Table 11.6. 14. W.J. Baumol, and A.S. Blinder, Economics: Principles and Policy, op. cit., p. 109. 15. P.A. Samuelson, and W.D. Nordhaus, op. cit., p. 579. 16. In USA and France, 1 quadrillion = 1,000,000,000,000,000 and in UK and Germany, 1 quadrillion = 1,000,000,000,000,000,000,000,000 (i.e. 24 zeros after 1), or 1 quadrillion = 1,000,000,000 zillion or 1 quadrillion = 1,000,000 septillion. 17. W.J. Baumol, and A.S. Blinder, op. cit., p. 109. 18. Harry G. Johnson, "In Inflation the Inevitable Price of Rapid Development or a Retarding Factor in Economic Growth?", Malaysian Economic Review, Vol. II, No. 1, April 1966, reproduced in Gerald M. Meier (ed.). Leading Issues in Economic Development (Oxford University Press, Delhi, 1995), pp. 179–82. 19. Harry G. Johnson, op. cit., p. 179. 20. For the evidence of wag-lag, see A.A. Alchian, and R.a. Kessel, "The Meaning and the Validity if Inflation Induced Lag of Wages Behind Prices", Am. Eco. Rev., March 1960, pp. 43–66; T.F. Cargil, "An Empirical Investigation of Wage-lag Hypothesis", Am. Eco. Rev., December 1969, pp. 806–16. 21. For the effect of wage-lag on economic growth, see D. Felix, Profit Inflation and Industrial Growth", Qly. Jl. of Eco., August 1956, pp. 441–63, and E.J. Hamilton, "Prices as Factor in Business Growth", Jl. of Eco-Hist., December 1952.

NOTES 332 Self-Instructional Material Inflation 22. Edward Shapiro, Macroeconomic Analysis, 5th Edn. (Galgotia Publication (P) Ltd., New Delhi), p. 489. 23. P.A. Samuelson and W.D. Nordhaus, Economics, 15th Edn., pp. 582–83. 24. Edward Shapiro, op. cit., p. 489. 25. The annual rate of inflation in India during 1950–51 to 1993–94 was 6.5 per cent which is a close to the desirable limits of inflation (5–6% p.a.) for developing economies. This is therefore a low rate of inflation accompanied by a low rate of economic growth (3.5%) during this period. 26. In Economics, op. cit., p. 583. 27. Evidence reviewed in Jack Selody, "The Goal of Price Stability", Bank of Canada, Technical Report No. 534, May 1960. 28. Ruddier Dornbusch and Stanley Fischer, Macroeconomics, Sixth Edn., op. cit., p. 521. 29. Ibid. 30. A.W. Phillips, "The Relation between Unemployment and the Rate of Change of Money Wage Rates in the United Kingdom, 1862–1957", Economica, Vol. XXV, November 1958, reprinted in M.G. Mueller (ed.), Readings in Macroeconomics, 2nd Indian Edn. (Surjeet Publications, Delhi, 1988), (All quotations from the reprint). 31. Thomas F. Dernburg, Macroeconomics: Concepts, Theories and Policies (McGraw- Hill), 7th edn., pp. 295–96. 32. Rudigar Dornbusch and Stanley Fisher, Macroeconomics, 6th edn., pp. 216–17; 33. Gardner Ackley, Macroeconomics: Theory and Policy, op. cit., pp. 441–43. 34. Fred. R. Glahe, Macroeconomics: Theory and Practice, op. cit., 1973, p. 233. 35. For a detailed study of later developments, see this author's Macroeconomics: Theory and Policy (Tata McGraw-Hill Book Publishing Company, New Delhi, 2005). 36. See, for example, W.J. Baumol and Alan S. Blinder, Economics: Principles and Policy, op cit., p. 100. 37. W.J. Baumol and A.S. Blinder, Economics: Principles and Policy, p. 101. 38. See Economic Survey, 1996–97, Government of India, Ministry of Finance, p. S-54. 39. According to Planning Commission estimates (published in Economic Survey, 1996– 97, p. S-54), the total employees in India stood at 320.5 million persons in 1994– 95, of which nearly 183 million (based on 1981 ratio) were self-employed. It means, only 137.5 million fall in the category of employees. Of this, only 27.4 million, i.e., about one-fifth, were employed in the organized sector including private industrial and public sectors. Thus, unorganized labour market is nearly 5 times the total workforce in the organised sector. 40. Some widely quoted works are G. L. Bah and A. Anode, "The Redistribution Effect of Inflation", Rev. of Eco. & Stat., February 1957, pp. 1–13; S. E. Harris, The Incidence of Inflation: Or who Gets Hurt?", Study Paper No. 7, in Study of Employment and Price Levels, Joint Economic Committee, US Congress 1959; A Brimmer, "Inflation and Income Distribution in the United States", Rev. of Eco. & Stat., February 1971, pp. 37–48, E.C. Budds and D. F. Seiders, "The Impact

NOTES Self-Instructional Material 333 Inflation of Inflation on the Distribution of Income and Wealth", Am. Eco. Rev., May 1971, pp. 128–33; W. D. Nordhaus, "The Effect of Inflation on the Distribution of Economic Welfare", Jl. of Credit, Money and Banking, February 1973, Part 2, pp. 465–96; G. L. Bah and J. B. Stephenson, "Inflation and the Distribution of Wealth", Rev. of Eco. & Stat., February 1974, pp. 1–13; A. M. Masslove and J. L. Rawley, "Inflation and Redistribution", Canadian JL. of Eco., August 1975, pp. 399–409. J. Foster, "The Redistributive Effects of Inflation: Questions and Answers", Scottish Jl. of Pol. Eco., February 1976, pp. 73–98, H. Niida, "The Distributional Effects of the Inflationary Process in Japan", Rev. of Income and Wealth, June 1978, pp. 195–219; J. J. Minarik, The Size Distribution of Income During Inflation", Rev. of Income and Wealth, December 1979, pp. 377–92. 41. Economics, op. cit., p. 581. 42. "Leading monetarists include the late Karl Brunner of the University of Rochester, Allan Meltzer of Cannegie-Mellon University, William Poole of Brown University, Anna Schwartz the National Bureau of Economic Research and Hunter College, and Robert Barro of Harvard University". Quoted from Rudiger Dornbusch and Stanley Fischer, Macroeconomics, 6th edition (McGraw-Hill, Inc., New York, 1994), p. 209. 43. Milton Friedman, The Counter-Revolution in Monetary Theory, Occasional Paper No. 33, Institute of Economic Affairs, London, 1970, p. 24. 44."Milton Friedman, Money: The Quantity Theory" in The International Encyclopedia of Social Sciences, Vol. 10 (London, Corwell Collier and Macmillan, Inc.), 1968, pp. 432–47. Quoted in Rudiger Dornbusch and Stanley Fisher, op. cit., p. 209. 45.Samuelson, P.A. and W.D. Nordhau, Economics, op. cit., p. 584–85. 46.Center for Monitoring Indian Economy, Economic Intelligence Service, World Economy and India's Place In It, October 1993, Table 11.11. 47.For more example of supply-shock inflation, see Thomas F. Dernburg, Macroeconomics: Concepts, Theories and Policies (McGraw-Hill, New York, 1985), 7th Edn., Section "12.2. Food and Energy Shocks", pp. 278–82. 48.F. Machlup, "Another View of Cost-Push and Demand-Pull Inflation", In Rev. of Eco., and Stat., Vol. 42, 1960, reproduced in R. Ball and Peter Doyle (eds), Inflation: Selected Readings, Penguin Books, 1969 (All page references from Ball and Doyle). 49.F. Machlup, op. cit. p. 153. 50.Fritz Machlup, op. cit. 51.P.C.I. Ayre, "Money, Inflation and Growth" in Subrat Ghatak (ed.), Monetary Economics in Developing Countries (Macmillan, 1981), p. 68. 52.G. Myrdal, Asian Drama: An Inquiry into the Poverty of Nations (Hormondsworth, Penguin, 1968). 53.P. Streeten, The Frontiers of Development Studies (Macmillan, London, 1972). 54.For details, see C.H. Kirkpatrick, and F.I. Nixon, "The Origins of Inflation in Less Developed Countries: A Selected Review," in M. Parkin and G. Zis, (eds.), Inflation in Open Economies (Manchester University Press, 1976). 55.Since bill market in India is underdeveloped, the Reserve Bank of India (RBI) advances money to the commercial banks in two forms: (i) in the form of advances mostly against the government securities, and (ii) rediscounting facility for eligible

NOTES 334 Self-Instructional Material Inflation usance bill and other approved securities. As mentioned above, RBI makes this kind of lending under its traditional function as 'lender of the last resort' to help the commercial banks in the period of liquidity crisis. 56.Milton Friedman, "What Price Guidepost?", in Arthur M. Okun (ed.), op. cit., p. 211. 57.P.A. Samuelson, Economics, 15th Edn., p. 596. 58.Rudigar Dornbusch and Stanley Fischer, op. cit., p. 525.
NOTES Self-Instructional Material 335 Fiscal and Monetary Policies UNIT 12 FISCAL AND MONETARY POLICIES Structure 12.0 Introduction 12.1 Unit Objectives 12.2 Fiscal Policy: Definition and Objectives 12.3
India's Taxation Policy—1950-1990 12.3.1 Formulation of Tax Policy 12.3.2 Basic Functions of Tax Policy 12.4 Tax Policy Reforms (1991) 12.4.1 Anomalies in India's Tax Policy 12.4.2
Tax Reforms in 1991 12.5 Income Taxation and the
Private Business 12.5.1 Effects of Income Taxation on Work Efforts 12.5.2 Effect of Taxation On
Saving 12.6 Corporate Income Taxation, Business Saving and Investment 12.7
Meaning and Scope
of Monetary Policy 12.7.1 Meaning of
Monetary Policy 12.7.2 Scope of Monetary Policy 12.8 Instruments of Monetary Policy 12.8.1
Quantitative Measures of Monetary
Control 12.8.2 Qualitative or Selective Credit Controls 12.9
The Limitations of Monetary Policy 12.7 Summary 12.8
Answers to 'Check Your Progress' 12.9 Exercises and Questions 12.10 Further Reading 12.0
INTRODUCTION In this unit
we discuss fiscal policy in some detail with reference to India. This unit also defines fiscal policy, India's tax policy and its effects on the economy. Our concentration is on private income and corporate income taxation, the two main aspects of direct taxation. These taxes play a significant role in affecting the economy as a whole and also the corporate business. This unit also deals with monetary policy, one of the two most widely used tools of economic control and regulation.
The major aspects of monetary policy discussed in this unit include: (i) meaning and scope of monetary policy, (ii) monetary policy instruments and target variables, (iii) role of monetary policy in achieving macroeconomic goals, and (iv) effectiveness and limitations of monetary policy. 12.1 UNIT OBJECTIVES
z To introduce and define fiscal policy z
To discuss India's taxation policy and policy reforms z To examine the effect of income taxation on private business z To discuss corporate income tax and its effect on business saving and investment
NOTES 336 Self-Instructional Material Fiscal and Monetary Policies z To define monetary policy and its scope z To describe instruments of monetary policy and their working
z
To point out the limitations of monetary policy 12.2 FISCAL POLICY: DEFINITION AND OBJECTIVES
Fiscal policy is defined as the government's programme of taxation, expenditure and other financial operations to achieve certain national goals. The objectives of fiscal policy, like those of other economic policies of the government, are derived from the 'aspirations and goals' of the society. Since the economic, political and social conditions of the nations vary, the aspirations of the people and, therefore, the objectives of their fiscal policy may be different. However, the most common objectives of fiscal policy of different countries are: (i) economic growth (ii) promotion of employment (iii)economic stability (iv)economic justice or equity The emphasis and the order of priority of these objectives may vary
from country to country and from time to time. For
instance, while stability and equality get higher priority in the developed nations, growth, employment and equality get higher priority in the less developed countries. Whatever the objectives and the order of their priorities, the two basic instruments that are used to achieve the social goals are taxation and public expenditure.
In this unit, we will concentrate on
India's taxation policy and its possible impact on the private business of the country. 12.3
INDIA'S TAXATION POLICY—1950-1990 India's taxation policy 1 was formulated primarily to meet the financial needs of the country in the post-independence period. The most challenging task that India faced was how to

mobilize adequate financial resources to finance the development programmes chalked out in Five-Year Plans. The financial resources of the country had to be increased four times so that the rate of capital formation could be stepped up from "5 per cent of the national income to, say about 20 per cent" 2 . The problem was that none of the known sources of development finance—taxation, domestic borrowing, external borrowing, or foreign aid had the potentials of yielding adequate development finance. Taxable potential of the country was very low because of extremely low level of per capita income. For the same reason, the scope of domestic borrowing was much lower. Since India's repaying capacity was incredibly low, she could hardly find lenders abroad. What India could manage in a considerable measure was 'external assistance' which accounted for 22.4 per cent of the Second Plan and 28.2 per cent of the Third Plan outlays, though it declined drastically in the subsequent plans. This too, however, proved to be too small to achieve the target rate of capital formation. Therefore, India had to rely on her domestic sources howsoever meager they were. It was under these circum- stances that the Government of India formulated its taxation policy. 12.3.1 Formulation of Tax Policy The tax policy that existed during 1950-1990 was the result of recommendations of dozens of tax enquiry committees and review panels and deliberations on the

recommendations in the Parliament. The tax policy was formulated, reformulated and reformed several times with view to making it fair, equitable and efficient. The efforts to formulate such a tax policy began in the early 1950s with the appointment of a number of enquiry and reform committees one after another, listed below. 1. Taxation Enquiry Committee (TEC) in 1953-54 to suggest suitable tax measures for mobilizing additional tax revenue. 2. Nicholas Kaldor Committee, under the chairmanship of Prof. Nicholas Kaldor, a renowned tax expert of Britain, was set up in 1956 to suggest new tax measures to augment government revenue. 3. Direct Taxes Administration Committee (Tyagi Committee) was appointed in 1958 to suggest measures for (i) a scheme of integration of direct taxes, (ii)
to prevent tax evasion, and (iii) to simplify
the procedure of tax compliance. 4. The Committee on Rationalization and Simplification of the Tax Structure (Bhoothalingam Committee) was set up in 1967 to suggest measures to reform the tax system and to prevent tax evasion. 5. Direct Taxes Enquiry Committee (Wanchoo Committee) was appointed in 1971 to suggest tax reform measures to prevent tax evasion. 6. Indirect Taxation Enquiry Committee (Jha Committee) was appointed in 1976 to find and examine the sources of anomalies in the indirect tax system and to explore the possibility of implementing Value Added Tax (VAT) system in place of excise duties. 7. Direct Tax Laws Committee (Choksi Committee) was set up in 1978 to suggest measures to simplify and rationalize tax laws and to improve their implementation. 12.3.2 Basic Functions of Tax
Policy
A tax policy is supposed to perform multiple functions, depending on the needs of the country. India's taxation policy has been changing from time to time in the process of tax reforms. However, tax policy was designed to perform two basic functions, viz., (i) Revenue function (
ii) Regulatory
functions 1. Revenue Function: Revenue collection has been the primary objective of India's tax policy. In pursuance of its revenue objective, the central government and also the state governments, used their taxing powers extensively and intensively. As regards the extensive use of taxes, the governments cast their tax net as far and wide as possible. The centre imposed five new taxes—estate duty 3 , wealth tax, gift tax, expenditure tax 4 and capital gains tax during the 1950s. Progressive and high tax rates were imposed in case of both direct and indirect taxes. Both direct and indirect tax rates were, in general, revised upwards intermittently. Central excise duty was extended to all imaginable non–agricultural products. Extension of excise duties in India was 'unprecedented 5 . Prohibitively high import duty was imposed on almost all items of imports. The state governments on their part, imposed several new taxes viz., agricultural income tax or large holding tax, surcharge on cash crops, profession tax, tax on urban property, sales tax on motor spirit, motor vehicle tax, tax on passengers and goods, entertainment and betting tax, state excise on alcohol and narcotics, though many of these taxes did not prove revenue productive. As regards the intensive use of taxes, tax rates were hiked almost every alternate year, more so the rates of excise duty. The upward revision of excise duty in India was 'unparalleled' 6 . As a result, excise duty rates increased manifold

between 1960-61 and 1971-72. For example, excise duty on synthetic and artificial silk increased
to 2232%, on vegetable product (vanaspati) to 1428% on matches 737%, cigar and cigarette to 545%, on kerosene 350%, on cotton cloth (A) to 280%
and on tea to 174%. Another important feature of India's taxation policy prior to 1975-76 was to make income tax rate highly progressive with increased rates on all the income slabs, though exemption limit was raised too. Consequently, income tax rates for higher income groups had risen so much that it amounted to almost confiscation of income. For example, in 1973-74, marginal rate of personal income tax on an income of

Rs. 500,000
was 89% and on incomes over Rs. 10,00,000 the tax rate was 95.7% and with surcharge added, the marginal tax rate for the latter category rose to 97.75%. The corporate income tax rate was raised from 35% in 1957 to 45% in 1966 and to 55% in 1978-79. With surtcharge tax added, the corporate tax rate in 1978-79 rose to 51%. 2. Regulatory Function: Regulatory functions of taxation include: (i) reducing disparities in income and wealth distribution; (ii) restraining consumer demand with a view to containing inflation; (iii) promoting savings and investment; and (iv) shifting investment from non-essential, non-priority to priority sectors. In pursuance of these goals, progressive tax rates were imposed; excise duties were enhanced more on the so-called luxury goods; incentives were provided for savings; and tax holidays were granted for new investments
specially in backward areas.
It is noteworthy that revenue and regulatory functions of taxes work together and it is extremely difficult to separate the effects of the two functions. 12.4 TAX POLICY REFORMS (1991) The tax policy that existed in India between 1950 and 1990 had a number of defects and anomalies which defeated many objectives of tax policy. Ironically, the anomalies in India's tax system continued to grow, tax evasion increased at an increasing rate, tax- evaders continued to thrive and inequity in taxation continued to widen in spite of volumes of suggestions made by the expert committees for reforming the tax system and their suggestions implemented partially or wholly. One does not know for sure why tax reforms attempted over a period of 35 years between 1955-56 and 1990-91 failed to yield the intended results. One does not know whether it was due to lack of wisdom on the part of the committees or their suggestions lacked foresight or that the sugges- tions were not implemented in letter and spirit or follow up was too poor to make implementation effective or the administrative machinery was too inefficient and corrupt to implement the reform measures effectively or all of these factors worked in unison. However, India's tax system remained beset with many dangerous anomalies.
Thanks
to the foreign exchange crisis of 1990 and the IMF, a Tax Reform Committee (Chelliah Committee) was appointed in 1991 to examine the direct and indirect tax structure and to suggest measures to (i) improve the elasticity of tax revenue, (ii) make the tax system fairer and more broad based, (iii) rationalize the direct tax system by removing its anomalies, (iv) improve equity and sustain economic incentives (
iv) identify new areas for taxation, (v)
improve compliance of direct taxes and strengthen enforcement, (vi) simplify and rationalize customs so to improve international competitiveness of Indian exports, (vii) simplify and rationalize the structure of excise
Check Your Progress 1. Define fiscal policy. 2. What are
the major objectives of fiscal policy? 3. What are the basic functions of
tax policy? 4. How can taxation be used as a regulatory measure?
NOTES Self-Instructional Material 339 Fiscal and Monetary Policies
duties for better tax compliance and to widen the scope for MODVAT (a modified value added tax) scheme. 12.4.1 Anomalies in India's Tax Policy The Tax Reform Committee (TRC) pointed out the defects and anomalies in India's tax system. In its opinion, India's tax system has grown over time to become inefficient, inequitable, regressive, unjust, cumbersome, and difficult to administer. Some of the major defects and anomalies of India's tax system till 1991, as pointed out by the TEC are briefly described here. 1. Very high tax rates: Central tax rates in India were much higher compared to the average tax rates in comparable countries. This had harmed the economy, the society, the taxpayers and the administration. High rates of income tax, company tax and excise duties are solely responsible for the rampant tax evasion in the country. According to the TRC, "High tax rates... without indexation and lack of effective enforcement are the main factors contributing to large scale tax evasion. Lack of effective enforcement means very little fear of being detected and punished". 2. Tax system of cascading nature: All indirect taxes are of cascading nature. Tax cascading means taxes piling on taxes and tax on tax so that actual tax burden borne by the society is much higher than one calculated on the basis of the tax rates. In the absense of tax cascading, the actual tax burden on the society would be equal to the calculated tax burden. Apart from excess tax burden than stipulated, tax cascading distorts the price structure and, thereby, the resource allocation. 3. Administratively complex tax system: The tax system over time has become so complex that it is extremely difficult to understand and administer. Complexity arises due to multiplicity of tax laws, provisions and sub-provisions, sections and subsections with respect to definition of tax base, exemptions and concessions. Even the tax law experts find it difficult to interpret the laws to their own satisfaction, let alone the tax payers, The complexity of the tax system and tax laws gives tax administrators ample opportunity to interpret the law in their own way with a view to harass the tax payers with the aim of extracting a share in the concessions and making money. Thus, practice is ubiquitous in all the tax departments. One is flabbergasted to come across the news, 'CBI raids the houses of tax officials'. 4.

Anomalies in individual taxes: Apart from pointing out the defects in the tax system as a whole, the TRC pointed out the anomalies in the individual taxes. In this regard, we will confine our discussion to three major taxes, viz., personal income tax, import duties, and excise duties. The TRC did not find much against the corporate income tax except that its effective rate was very high at 51.75 per cent. Personal income tax has 'serious anomalies and inequities'. It is anomalous because it provides 'tax shelters' to the members of parliament, central government ministers, a section of government officials, and top executives of private firms by leaving their perks tax-free. There is no rationale for not taxing perks which account for a considerable proportion of their real income. It is iniquitous because it discriminates between different categories of tax payers. For example, the salary income of the government servants has a lower tax burden than other categories of salary earners because the former category is provided housing at nominal rent. Personal income tax is regressive because, according to TRC, at 1990-91 prices, the tax payers with incomes between Rs.50,000 and
Rs.100,000
had the highest income tax burden and those with incomes above Rs.500,000 had the lowest tax burden.
NOTES 340 Self-Instructional Material Fiscal and Monetary Policies
Import duties had, according to the TRC, the following anomalies: (i) the average rate of import duty (125%) was much higher
by
international standards, (ii) tariffs were widely dispersed and complex, and administratively cumbersome, (iii) import tariffs had a multiple rate system—basic, auxiliary
and
additional, (iv) tariffs had a complicated system of concessions granted by notification which made the system not only admin- istratively inefficient but also created room for arbitrary use of discretionary powers by the customs officials. Excise duty, the largest contributor to the central revenue, had the following defects: (i) it had unimaginably multiple rate system for a commodity classified under different categories, (ii) it is of cascading nature as it makes the same commodity taxable at different stages of its production, (iii) excise duty fell also on capital goods like machinery, tools, accessories, office equipment, etc., and (iv) the excise concession for small and tiny sectors encouraged manipulation of firm's size for the purpose of tax evasion. 12.4.2 Tax Reforms in 1991
Although the basic tax structure of the country remains intact, the Government of India made sweeping changes in the taxation policy on the recommendations of the TRC. The core tax reforms and those
of
far reaching consequences are described here tax-wise. 1. Personal income tax: The rate structure of the personal income tax has been reduced from about 6 slab-rates in the 1980s to 3 slab-rates: 10%, 20% and 30%. The most significant reform is cutting down the tax rate on the top income bracket from about 67% in the late 1980s to 30%. This has solved many problems but has made the tax system regressive. 2. Company income tax:
The company tax rate has been reduced to 40% for domestic and 45% for foreign companies. The number of concessions granted to the companies under Sections 35CCA, and 34AC have been withdrawn. 3. Excise Duties
as
MODVAT: Excise duty rates have been modified across the aboard. The number of classification of commodity under tax has
laws has been substantially reduced. The procedure of excise calculation has been simplified. This makes tax compliance an easier task. The process
is on way to replace the excise duties with
MODVAT. 4. Import Duties: Import duties which appeared to be "a bewildering picture of combinations of 'basic' and 'auxiliary' duties" have been simplified. The duty rates have been slashed across the board so that the weighted- average effective rate comes down from about 85% to 45%. 12.5 INCOME TAXATION AND THE PRIVATE BUSINESS A multiple tax system has widespread ramifications on the economy and different kinds of taxes have different kinds of effects on the private business. Taxes affect the economy in many ways by affecting macro variables like consumption, saving, investment, price structure, price levels and work effort. In India, there is a wide range of direct and indirect taxes. Direct taxes include personal and corporate income taxes on current earnings, wealth tax, and gift tax on transfer of property. Indirect taxes include excise duty, sales tax, custom duties and a number of other taxes imposed by the states. Not only is there multiplicity of taxation, but also double taxation of incomes and commodities. The total revenue of the country accounts for about 22 per cent of the national income. Such a widespread and heavy taxation cannot be supposed to be neutral to private business activities. In fact, it is alleged by the business community,
NOTES Self-Instructional Material 341 Fiscal and Monetary Policies
even after the tax reforms of 1991 and 1992, that the existing Indian tax structure is seriously undermining the incentive to save and invest for both individuals and

corpo- rations. The
taxation reforms made in India since 1991 are expected to have far reaching impact on the private business. In this section, we will confine our discussion to how income tax affects the private business. The effect of the corporate income tax on private business will be discussed in the next section. The impact of income taxation on the growth of private business in general, and on private investment in particular, may be examined through its effects on (i) people's work-efforts; (ii) saving of the households in general and of private firms in particular, and (iii) incentive and ability to invest. It is important to note at the outset that there is little evidence available in case of India to support or refute the proposition regarding the adverse effects of taxation on saving and investment. 7 The empirical evidence available for other countries is not strictly
conclusive, and even if it is, the same may not be applicable to the Indian economy. We will, therefore, confine our discussion to only theoretical propositions regarding the effects of various taxes on private investment. 12.5.1 Effects of Income Taxation on Work Efforts The effect of taxation on private enterprise depends, among other things, on how income tax affects people's desire to work. The additional work effort depends, in fact, on peoples' choice between leisure and work. 8 Leisure gives a kind of satisfaction (or pleasure) while work yields income which yields another kind of satisfaction. Taxation reduces disposable income and, therefore, it alters peoples' choice between leisure and work. When a tax is imposed or tax rate is increased, wage income decreases. As a result, the reward for an additional unit of labour and the price of an additional unit
of leisure, i.e., opportunity cost of leisure, are both lowered. Under this condition, 'the worker will tend to substitute leisure for work.' Thus, taxation reduces the supply of labour. But, at the same time, increase in tax rate reduces the total income from given hours of labour. It makes the worker poorer while poor workers normally wish to enjoy fewer units if leisure.
The workers would, therefore, like to work more to raise their income. Thus, taxation has both negative and positive effects on labour supply. The net effect of taxation on work effort (or labour supply) depends on the relative strength of the two effects 9 . A number of surveys and econometric studies carried out in the United States and England on this aspect of taxation have not yielded any definite measure of the net effect of taxation on work effort 10 . According to Musgrave and Musgrave, "There is no a priori basis on which to judge the direction in which the net effect will go, although it is reasonable to assume... that effort will decline." 11 They have, however, contradicted themselves (in the next paragraph) by saying. "... it should not be readily assumed that an income tax must reduce effort." Sanders has found that "the typical (business) executive [does not] put forth his best efforts, taxes or no, to fulfill the requirements of his job and to progress on the promotional ladder of his company." 12 George F. Break 13 interviewed 306 lawyers and accountants in England—an ideal group to study as they belonged to the category of tax-payers who can easily adjust their working hour with changes in their incomes. According to his findings, '40 men reported definite adverse effect on incentive' for additional work, 32 men reported to have worked harder due to taxation as some of them wanted to accumulate wealth and some wanted to maintain their standard of living. The remaining 234 men reported minor or no effect on their work effort. It may be inferred from these empirical evidences that taxation of income has, if at all, only marginal effect on work effort. Although under the conditions mentioned above any
NOTES 342 Self-Instructional Material Fiscal and Monetary Policies
generalization would be risky, much of tax effect on work efforts depends on (i) the level of income; (ii) tax-rates—proportional, progressive or regressive; (iii) the productivity or marginal efforts; and (iv) non-monetary benefit, such as free accommodation, education of children, health care, travel benefits, etc. In general, if a person has low income and is willing
to raise standard of living to the level of his society, he will have to increase his work efforts to earn an additional income to make up the loss in income due to tax. But a very rich person may not like to work more. If tax- rates are progressive, the additional work effort will be less and less paying. If earning per unit time becomes regressive, taxation may have a negative effect on work effort. The effect will be reverse in case of proportional and regressive tax rates. If hard work, experience and marginal productivity are positively correlated, the tax will have only marginal negative effect, as it happens in the case of lawyers, doctors, managers, consultants, accountants, etc. Also, if non-monetary benefits (not to be included in taxable income) increase with additional work effort, tax would not have a negative effect on the supply of labour. Finally, whether taxation affects work-effort depends to a great extent on a person's desire, effort and ability to shift and to evade tax. It may thus be concluded that general taxation of income does not materially affect the supply of labour. Incidentally, as regards the effect of indirect taxes, economists generally compare with the effect of income tax, both of the equal amounts.

Since there is no definite measure of income tax effect on work effort, nothing definite can be said about the effect of indirect taxes too. The general opinion regarding the effect of indirect taxes on work effort is that indirect taxes may affect the labour supply since they raise the price and thereby reduce the real wage rate. But, if money incomes are rising and workers are under money illusion, feel happy with larger money income irrespective of its purchasing power, indirect taxes may not affect the work efforts. 14 It is believed that the negative effect of indirect taxes on work effort is less than that of income tax because workers can avoid indirect taxes by consuming less of a taxed commodity, which is not possible under income tax. 12.5.2 Effect of Taxation on Savings The effect of taxation on private enterprise also depends on the effects of taxation on private savings. The three most important sources of funds for private enterprises are: (i) household savings, (ii) banks and financial institutions, and (iii) internal savings of the firms. Household savings are the source of equity and debt capital. The growth of the private sector depends, given other factors, on the supply of funds from both external and internal savings. Let us now examine the expected effects of taxation on household and corporate savings. Household savings will be examined in respect of personal income-tax, and corporate savings in respect of corporate income tax and the tax-treatment of depreciation and retained earnings. Effect of Income Taxation on Personal Savings. As a matter of law, saving is a function of disposable income: the higher the income, the higher the average propensity to save. This law states that when income increases, the marginal propensity to consume decreases and marginal propensity to save increases. This implies that the households in higher income brackets save more and supply a major proportion of savings to the capital market. Households in the lower income brackets also save, but the major proportion of their savings flows into house construction, bank deposits, insurance policies
and
not directly into the capital market. Thus, major part of equity and debt capital is supplied by the households in higher income classes. Therefore, the supply of external capital to the private firms depends on how taxation affects savings by the upper-income households.
Taxation reduces the disposable income and the capacity to save. Since marginal propensity to save is higher in the higher income classes, a highly progressive income tax reduces the overall rate of saving. “Taxation effect on saving
NOTES Self-Instructional Material 343 Fiscal and Monetary Policies
may result not only because the tax payer’s income is reduced, but also because an income tax reduces the net rate of return on savings.” 15 For this reason, households may prefer to increase their present consumption rather than to save and invest their income for future larger consumption. If the rate at which the households substitute future consumption for present consumption decreases, the rate of saving also decreases, given the rate of interest. Through a study of 750 active investors, mostly belonging to high income-brackets, Butters 16 et al. have found
that income taxation had substantially reduced the capacity of the investors to accumulate new investible funds and it had changed the investment pattern. The reason was that ‘security minded’ investors rechannelled their investment towards tax-exempt government bonds and insurance policies, and the ‘application minded’ investors invest into more risky ventures, e.g., speculative common stocks. In case of India, a study of the ‘attitudes and reaction of individual investors and of the trends in the stock market’ indicates that the willigness of the public to invest in equity shares has not been perceptively affected. 17 The incentive to invest, particularly in the higher income groups, was found to be sustained “to some extent by the concessional treatment of capital gains,” though their capacity to invest out of current saving was materially curtailed. The study also indicates that ‘the combined impact of income and wealth taxes tends to severely curtail the capacity to save of active entrepreneur-investors in the larger ranges of income and wealth.’ The Effect of Indirect Taxation on Saving: A Digression. According to Musgrave and Musgrave, 18 the effect of indirect taxes on saving is comparatively less retarding at least for two reasons. First, the incidence of indirect taxes, unlike the direct taxes, tends to be regressively distributed. The regressiveness of indirect taxes is based on a decreasing marginal propensity to consume as income rises. Second, ‘consumption tax’ (or com- modity tax) does not reduce the rate of return on savings and, therefore, avoids the substitution effect of the income tax, which is adverse to saving.” In case of India, however, this argument is not tenable because as the studies made by the Ministry of Finance (MOF) for 1958-59 and 1963-64, and by the National Institute of Public Finance and Policy (NIPFP) for 1973-74 have revealed, incidence of indirect taxes in India is fairly progressive. The findings of these studies are summed up in Table 12.1. Table 12.1: Incidence of Indirect Taxes: Tax as Percentage of Consumer Expenditure Ministry of Finance National Institute of Public Finance and Policy Monthly household Monthly per capital 1973-74 expenditure group 1953-54 1963-64 Expenditure group (Rs) (Rs) 0-50 2.4 6.5 0-15 2.96 51-100 2.7 7.0 15-28 3.63 101-150 3.1 8.0 28-43 4.89 151-300 3.3 10.1 43-55 6.85 301 and above 5.5 17.6 55-75 7.92 75-100 11.40 100 and above 21.96
Sources: (i) Incidence of Indirect Taxation—1963-64, (Ministry of Finance, Government of India, New Delhi, 1969). (ii) Chelliah, R.J. and Lal, R.N., Indirect Taxation in India—1973-74, National Institute of Public Finance and Policy, 1978, p. 17.
The progressiveness of indirect taxes may be relatively less than that of income taxes. It is however difficult to show that indirect taxes are less deterrent to saving than income tax since both kinds of taxes are simultaneously payable by the richer section of the society.

Check Your Progress 5. What are the anomalies in India's taxation policy? 6. What major tax reforms were made in 1991? 7. How does income taxation affect work effort? 8. How does income taxation affect savings and investment?
NOTES 344 Self-Instructional Material Fiscal and Monetary Policies 12.6
CORPORATE INCOME TAXATION, BUSINESS SAVING AND INVESTMENT Corporate income taxation is the most important factor that affects directly the growth of private sector business. This tax affects the firm's own savings and investment by (i) decreasing the incentive to save and invest by reducing the rate of return; (ii) reducing the internal investible funds, and (iii) increasing the risk in the investment 19 . Apparently, the corporate income tax is expected to be a deterrent to the firm's capacity to save and invest. But the overall effect of this tax on corporate savings and investment depends on a number of other tax factors 20 mentioned below. (i) Statutory allowances and disallowances in computing the assessable income, e.g., expenditure of non-capital nature, advertisement expenditure, entertain- ment expenditure (ii) Statutory tax concessions, e.g., development rebate, depreciation allowance, allowance on contributions towards employee's welfare, tax holidays (iii) Corporate income tax rates (proportionate or progressive) and variation in tax- rate on other considerations (iv) Tax treatment of losses: carry-forward facilities and offsetting of loss against the profit of subsidiaries or closely held companies (v) The system of depreciation allowance—straight line method or exponential rates (vi) Tax free reserves, e.g., contingency reserves for bad debts, anticipated losses, unforeseen expenditure on account of damage (vii)Tax-treatment of corporate retentions (viii)Personal income tax rates. Company profits are generally subject to double taxation—first under corporate income tax and then under personal income tax. It may, therefore, affect people's desire to invest their savings in equity (ix) Taxation of personal capital gains mainly in case of corporate common stocks (x) Tax treatment of inter-corporate dividends—whether subject to double taxation (xi) Taxation of corporate capital gains To these may be added another important factor affecting the private investment, i.e., the ability of firms to shift the tax-burden. Let us now briefly discuss the important aspects of corporate income taxation in India in relation to private investment. Company Tax and Incentive to Invest. Corporate income tax reduces the expected rate of return on investment in proportion to tax paid. In India, the corporate income was being taxed before 1991-92 at rates varying between 45 per cent
to 65
per cent, depending on (i) whether public investment was 'substantially' involved in the company, and (ii) whether profit exceeded certain limits. Most large scale companies were subject to taxation at the rate of 55 per cent, the effective rate being 51.75 per cent. Such a high rate of company income taxation reduced the after-tax profits rate by about 55 per cent, i.e., post-tax profit is reduced to less than half of the pre-tax profits. Such a heavy reduction in firm's earning cannot remain without reducing the incentive and also the ability and desire to invest. The disincentive to invest is created by the wedge which the corporate income tax drives between before-tax and after-tax rates of return on investment 21 . For example, a private firm expecting a 20 per cent return on its additional investment will be left with a 9 per cent return after paying tax at the rate of 55 per cent. Under such heavy taxation, only the well established firms can afford to carry on their business. The new potential investors may find it least attractive to invest their resources in productive activities. They would rather prefer to invest abroad where tax rates are lower and return on investment is higher or spend their potential saving on
NOTES Self-Instructional Material 345 Fiscal and Monetary Policies items
of luxury consumption. Some investors may find it more profitable to lend their money in the 'black' sector of the economy.

Company Tax and Ability to Invest. Most industrial corporations rely mainly on their internal resources for their expansion for such reasons as high cost of borrowed capital, intervention in management by new equity holders. The major sources of internal finance are depreciation reserves and retained profits. The magnitude of these sources of internal funds depends on depreciation allowance permissible under corporate income taxation and tax-treatment of retained earning. Depreciation allowance provided in corporate income taxation affects considerably the tax liability of the firm and post-tax profitability of the corporate investment. It also materially affects the availability of funds for replacement of worn-out capital stock. If depreciation allowed by the tax authorities is very low, "the government is taxing more than the actual income; or to put it in another way, the government takes its share of profit earlier than they are really earned." 22 The firms are, therefore, left with fewer funds to replace the depreciated capital. On the other hand, the accelerated depreciation method allows postponement of some tax-liability to a future date and, therefore, the company benefits by the value of compound interest on the deferred tax-liability. "Postponement of tax-liability influences investment in two ways: first, it increases the ability of firms to expand by increasing the liquid assets at their disposal and second, it reduces the risk of capital investment." 23 In India, not much evidence is available to show the effect of tax-treatment of depreciation and retained earnings (taxable) on corporate saving and investment. Regarding the retained earning, the remarks by the NCAER 24 are worth mentioning, "the fluctuations in retained profit (during fifties) were caused mainly by fluctuations in gross profit because tax provisions as a proportion of profit did not vary widely." It also mentions, "It is difficult to say definitely what would have been the effect of greater variation in tax rates. Most probably its impact on retained profits would have been no less than that of fluctuations in gross profits". It may be finally mentioned that the Indian government had provided a number of incentives to private entrepreneurs. Given the incentives for investment, it may be said that corporate income taxation in India would have not affected the corporate saving and investment much because the effective tax burden on individuals as well as on corporations is considerably reduced. Some important incentives provided before 1990 for savings and investment are enumerated below. (a) Tax holidays for new undertakings including industries, shops and hotels established after 31 March 1976, for a period of 5 years, on the income upto 7.5 per cent of the capital employed. (b) Special-tax holidays for new industrial undertakings set up in backward areas after 31 March 1973, to the extent of 20 per cent of the total profit. (c) Liberal depreciation allowance on building, furniture, plant and machinery. Rates for plant and machinery varied from 5 per cent to 100 per cent on the basis of 7 categories thereof, depending on the useful life. (d) Investment allowance in the form of depreciation at the rate of 25 per cent of cost of new physical capital installed after 31 March 1976. Investment allowance is comparable to development rebate. (e) Allowance of all revenue expenditure incurred on scientific research related to business, during three years immediately preceding the commencement of business. (f) Development allowance for tea industry in new areas at 50 per cent of the actual cost of planting done after 31 March 1965 and at 30 per cent of actual cost of replantation between 1 April 1965 and 31 March 1970.

Check Your Progress 9. How does a company income tax affect the growth of private business? 10. How does a company income tax affect incentive to invest? 11. How does a company income tax affect the ability to invest? 12. What incentives are given by the government to promote corporate investment?

NOTES 346 Self-Instructional Material Fiscal and Monetary Policies (

g) Concessional treatment of intercorporate dividends—60 to 100 per cent of intercorporate dividend received by a domestic company were exempted from tax. (h) Other incentives and concessions included: (i) Five year wealth tax holidays for initial equity (ii) Wealth tax exemption for share holdings (iii) Export market development allowance (iv) Exemption of dividend and interest upto a certain limit (v) Tax concession for book publishing (vi) Carry forward and set-off of accumulated losses (vii) Amortization of prospecting and development expenditure for certain minerals With such a wide range of incentives, Indian company income taxation might be supposed to have been least deterrent to saving and investment. However, the available data show that saving and investment by the corporate sector have not increased in a great measure. Many of the incentives have now been withdrawn during the fiscal reforms since 1990. The effects of the tax reforms of 1990 remain to be investigated. Effect of Indirect Taxes on Inputs and Output. While direct taxation of corporate affects directly the incentive, willingness and ability to invest, indirect taxes imposed on the inputs used by the firms and on their product affect indirectly the firm's investment choices by changing the prices and, thereby, the supply and demand conditions. If all inputs and products are uniformly taxed, the firm's choices are uniformly affected. If taxation is not uniform, the effect on different firms would be different, and this is more important particularly in respect of investment and production decisions. If certain industrial inputs are taxed more heavily than others, the cost of production in industries using heavily taxed inputs will increase, leading to an increase in their prices. In case goods produced by such industries are price-elastic, demand will decrease. The fall in demand for the product affects their production adversely. Exactly a similar reduction in demand is experienced by the industries whose final products are taxed. Reduction or shift in demand also depends on the income-elasticity of taxed commodities. Shift in demand for products causes a shift in the investment preferences. Thus, even indirect taxes affect the private business.

Conclusion Taxation is an important instrument for mobilizing saving potential for capital formation in the public sector. In a mixed economy like India, however, capital formation in the public sector alone would not be sufficient to accelerate the growth of the economy as a whole. The taxation policy should, therefore, be so designed that it restrains consumption, increases savings, and encourages investment in productive activities. It is, however, difficult to maintain such a critical balance in the fiscal policy. Although tax effect on work effort is not certain, it is generally accepted that taxation does affect the wilingness and capacity to save and invest. The negative effect, however, depends on the rate and nature of taxation. Progressive tax rates are more deterrent to saving and investment than the proportional tax rates. And, direct taxation has a greater adverse effect than indirect taxation. An attempt should, however, be made to minimize the adverse effect of taxation with a view to promoting economic activities which is the basic requirement of developing economies like India. As already discussed, the government has made sweeping tax reforms in respect of both direct and indirect taxes. However, the reform process has yet to go a long way to eliminate adverse effect of taxation on business activities.

NOTES Self-Instructional Material 347 Fiscal and Monetary Policies 12.7 MEANING AND SCOPE OF MONETARY POLICY 12.7.1 Meaning of

Monetary Policy Economists have defined monetary policy in different words. For example,

Harry Johnson defines

monetary policy

as a "policy employing central bank's control of the supply of money as an instrument of achieving the objectives of general economic policy" 25 . Shaw defines monetary policy as "

any conscious action undertaken by the monetary authorities to change the quantity, availability or cost... of money" 26 .

Monetary policy is essentially a programme of action undertaken by the monetary authorities

generally

the central bank, to control and regulate the supply of money with the public and the flow of credit with a view to achieving predetermined macroeconomic goals.

The objectives of monetary policy are the same as the objective of macroeconomic policy. viz., growth, employment, stability of price and foreign exchange and balance-of- payment equilibrium already discussed

in a previous unit. 12.7.2 Scope

of Monetary Policy The scope of monetary policy spans the area of economic transactions and the macroeconomic variables that monetary authorities can influence and alter through the monetary policy.

The scope of monetary policy depends, by and large, on two factors. (i) The level of monetized economy (ii) The level of development of the capital market In a fully monetized economy, the scope of monetary policy encompasses the entire economic activities. For, in such an economy, all economic transactions are carried out with money as a medium of exchange. In that case, monetary policy works by changing the general price level. It is, therefore capable of affecting all economic activities— production, consumption, savings, investment and foreign trade. The monetary policy can influence all major macroeconomic variables—GDP, savings and investment, employment, the general price level and the foreign exchange. The other contributory factor is the level of capital market development. While the change in the supply of money affects the level of economic activities through the price level, the other instruments of monetary control (bank rate and cash reserve ratio) work through the capital market. Where the capital market is fairly developed, monetary policy affects the level of economic activities through the changes in the capital market. It works faster and more effectively. Incidentally, a developed capital

market is one which has the following features: (i) a large number of

financially strong commercial banks, financial institutions, credit organizations and short-term bill market, (ii) a major part of financial transactions are routed through the capital markets, (iii) the working of the various capital sub-markets is inter-linked and inter-dependent, and (iv) the commodity sector is highly sensitive to the changes in the capital market. It is important to note that the changes in the bank rate and cash reserve ratio work through the commercial banks. Therefore, for the monetary policy to have a widespread impact on the economy, it is necessary that the capital sub-markets have strong financial links with the commercial banks. 12.8 INSTRUMENTS OF MONETARY POLICY The instruments of monetary policy refer to the economic variables that the central bank can change at its discretion with a view to controlling and regulating the money supply and the availability of credit. The instruments are also called 'weapons of monetary control'. Samuelson and Nordhaus call them "The Nuts and Bolts of Monetary Policy".

NOTES 348 Self-Instructional Material Fiscal and

Monetary Policies The measures of monetary policy are generally classified under two categories: (i) quantitative measures, and (ii) qualitative or selective credit controls. 12.8.1 Quantitative Measures of Monetary Control

The quantitative measures or the traditional measures of monetary control are following: (i) Open Market Operations (ii) Discount Rate or Bank rate (iii)Cash Reserve Ratio (CRR)

Let us now briefly discuss the meaning and working of these measures. Open Market Operations (OMO): The 'open market operation' comprises sale and purchases of government securities and treasury bills 27 by the central bank of the country. When the central bank decides to increase the supply of money with the public, it purchases the government securities, i.e., bills and bonds, and when it decides to reduce money in circulation, it sells the government bonds and securities. The open market operation is the most powerful and widely used tool of monetary control. Let us look into the working of open market operations. The central bank carries out its open market operations through the commercial banks—it does not deal directly with the public. The buyers of the government bonds include commercial banks, financial corporations, big business corporations and
indi- viduals
with high savings. These customers of government bonds hold their accounts with the banks.
Therefore, when the central bank carries out its open market operations, it affects bank deposits and reserves and thereby, their capacity to create credit. For instance, suppose the central bank decides to reduce money supply with the public and the availability of credit with the objective of preventing inflation. To this end, the central bank will offer the government bonds and treasury bills for sale through the commercial banks. The task becomes easier when the government 28 owns the commercial bank as is the case in India. The sale of government bonds and securities affects both the supply of and demand for credit. As regards the supply of credit, it is affected adversely in the following ways: (i) The people buy the government bonds and securities generally through cheques drawn on the commercial banks in favour of the central bank. In this process of sale of bonds, the money is transferred form the buyers' account to the central bank account. This reduces the total deposits with the commercial banks and also
their cash reserves. As a result, credit creation capacity of commercial banks decreases. Consequently, the flow of credit from the commercial bank to the society decreases. (ii) When the commercial banks decide to buy the government bonds and securities themselves, their cash reserves go down. This further reduces their credit creation capacity. The ultimate result is a fall in the flow of credit to the public. As regards the demand for credit, when the central bank sells government bonds, their prices go down and, therefore, the rate of interest goes up. This causes an upward push in the interest rate structure. The rise in the rate of interest reduces the demand for credit. Thus, not only the supply of credit but also the demand for credit is affected by the open market operations. On the contrary, when the central bank decides to increase money supply, it starts buying back government bonds and securities. Then the money flows out from the central bank account to the people's accounts with the commercial
NOTES Self-Instructional Material 349 Fiscal and Monetary Policies
banks. As a result, deposits with the commercial banks and their cash reserves increase. This enhances their capacity to create credit. Other things given, the flow of money from the banks to the public increases. Effectiveness of Open Market Operations. The effectiveness of open market operation as a weapon of monetary control depends on the following factors. (i) When commercial banks possess excess liquidity, the open market operation does not work effectively. (ii) In a very buoyant market situation, the effective control of demand for credit through the open market operation is doubtful. And, during the period of depression, open market operations are not effective for lack of demand for credit. (iii) In underdeveloped countries in which the banking system is not
well developed
and security and capital markets are not interdependent, open market operations have a limited effectiveness. (iv) The popularity of government bonds and securities with the public also matters a lot. The government debt instruments are generally not popular due to low rate of return. The central bank then has to use coercive measures and force the commercial banks to buy the government bonds, as is the case in India. Discount Rate or Bank Rate Policy: Discount rate or Bank rate is the rate at which the central bank rediscounts the bills of exchange presented by the commercial banks. The RBI Act, 1935 defines 'bank rate' as the "standard
rate at which (the bank) is prepared to buy or rediscount bills of exchange or other
commercial papers eligible for purchase under this Act". It rediscounts only approved bills and the 'first class bills of exchange'. Why do commercial banks get their bills of exchange rediscounted? What happens, in fact, when commercial banks are faced with a shortage of cash reserves, they approach the central bank to get their bills of exchange rediscounted. It is a common method of borrowing by the commercial banks from the central bank. The central bank rediscounts the bills presented by the commercial bank because it is a part of its functions—it is the lender of the last resort. For rediscounting the bills of exchange, the central bank charges a rate. This rate is traditionally called bank rate. A more appropriate name in usage now is the discount rate. However, for all practical purposes, bank rate is the rate which the central bank charges on the loans and advances to the commercial banks. The central bank can change this rate—increase or decrease—depending on whether it wants to expand or contract the flow of credit from the commercial bank. When it
wants to increase the credit creation capacity of the commercial banks, it reduces the

discount rate and vice versa. This action by the central bank is called the bank rate policy or more appropriately, the discount rate policy. The bank rate policy was first adopted by the Bank of England in 1839. It was the only and the most widely used weapon of credit control until the open market operation, first used in 1922, emerged as a more powerful instrument of monetary control. It still works as the main indicator of the central bank's monetary policy. The working of the discount rate policy is simple. When the central bank changes its own discount rate, commercial banks change their discount rate
too.
That is, when the central bank raises its discount rate, commercial banks raise their discount rates too. Generally, the central bank rate is 1 percentage point higher than the discount rate charged by the commercial banks. In order to look Check Your Progress 13. What is monetary policy? 14. What is the scope of a mon- etary policy? 15. What are the various quanti- tative measures of monetary control? 16. What is meant by an open- market operation?
NOTES 350 Self-Instructional Material Fiscal and Monetary Policies
at how a change in discount rate affects the availability of credit, let us suppose that the central bank wants, as a matter of policy, to control the flow of bank credit. To achieve this objective, it will raise the discount rate. This action of the central bank reduces the flow of credit in three ways. One, a rise in the discount rate (virtually the interest rate) reduces the net worth of the government bonds (the treasury bills and promissory notes) against which commercial banks borrow funds from the central bank. This reduces the commercial banks' capacity to borrow from the central bank. As a result, commercial banks find it difficult to maintain a high cash reserve. This reduces the credit creation capacity of the commercial banks. So the flow of credit to the market is reduced. Two, when the central bank raises its discount rate, commercial banks raise their discount rate.
A rise in the
discount rate raises the cost of credit which discourages the business sector to get their bills of exchange discounted. Be- sides, a rise in the bank rate pushes the interest rate structure up. The rise in the interest rate reduces the demand for funds too. Such a policy is, therefore, called a 'dear money policy'. A reverse process is
set in motion when the
central bank adopts a cheap money policy. Three, bankers' lending rate is quickly adjusted to deposit rates. Therefore, a rise in the bank rate causes a rise in the deposit rate. This turns borrowers into depositors. Therefore, savings flow to the banks in the form of deposits. This is called the deposit mobilization effect. Limitations of Discount Rate Policy. The discount rate policy has lost its effectiveness as a weapon of monetary control over time for the following reasons. 1. The variation in the discount rate works effectively only when commercial banks approach the central bank for borrowing. In modern times, the commercial banks have built their financial resources. They are not dependent on the central bank for financial support. Therefore, their discount rate is not affected when central bank raises the bank rate. 2. With the growth of credit institutions and financial intermediaries, the capital market has widened extensively. The share of banking credit has declined. Therefore, variations made by the central bank in the discount rate, especially when it raises the rate, have only a limited impact on the credit market. 3. Looking from the credit demand angle, variations in the discount rate become effective only where demand for credit is interest-elastic. The structure of the credit market in the less developed countries is such that the interest rates are sticky. Hence change in the discount rate has not been found to be very effective.
The Cash Reserve Ratio or Statutory Reserve Ratio: The cash reserve ratio (CRR) is the percentage of total deposits which commercial banks are required to maintain in the form of cash reserve with the central bank 29 . The objective of the cash reserve ratio is to prevent shortage of cash in meeting the demand for cash by the depositors. The cash reserve ratio depends, normally, on the banks' experience regarding the cash demand by the depositors. But, "If there were no government rules, banks would probably keep only a very small fraction of their deposits in the form of reserves" 30 . Since cash reserve is non- interest bearing, commercial banks often keep their cash reserves below the safe limits. This situation might lead to financial crisis in the banking sector. So, in order to prevent this eventuality, the central bank imposes a CRR on the
NOTES Self-Instructional Material 351 Fiscal and Monetary Policies
banks. This has become a handy tool for the central bank to control money supply. The central bank enjoys the legal powers to change the cash reserve ratio of the banks at its own discretion. The cash reserve ratio is a legal requirement. Therefore,
cash reserve ratio
is also called statutory reserve ratio (SRR). By changing the CRR, the central bank can change the money supply overnight. When economic conditions demand a contractionary monetary policy, the central bank raises the CRR, and when economic conditions demand monetary expansion, the central bank cuts down the CRR. The effect of change in the CRR on the supply of money and credit can now be briefly explained. Suppose commercial banks possess a total deposit of

Rs.100
million and CRR is 20 per cent. It means (a) that the banks can loan Rs. 80 million, and (b) that the credit or deposit multiplier 31 equals 5. It also means that the banks can create, through the process of credit multiplier, a total credit of Rs. 500 million or an additional credit of Rs. 80 million × 5 = Rs. 400
million. Now let the central bank decides to reduce the money supply with the public and it raises the CRR to 25 per cent. Then the credit multiplier will go down to 4. With this provision, the banks can loan only Rs. 75 million (= Rs.100 million – Rs. 25 million). Thus, the total credit created by the banks goes down to
Rs 100 × 4 = Rs. 400 million and additional credit goes down to Rs. 75 × 4 = Rs. 300 million. A fall of Rs. 100 million in the bank credit is supposed to have considerable impact on the money market. The effect will be reversed when the central bank cuts back the CRR to 20 per cent.
The Statutory Liquidity Requirement (SLR). In India, the RBI has imposed another kind of reserve, in addition to CRR, called Statutory Liquidity Requirement (SLR). The SLR is that proportion of the total deposits which commercial banks are required to maintain with them in the form of liquid assets (cash reserve, gold and government bonds) in addition to cash reserve ratio. This measure was undertaken to prevent the commercial banks
to liquidate
their liquid assets (government security holdings) when CRR is raised. What commercial banks used to do, before SLR was imposed, was to convert their liquid assets into cash to replenish the fall in their loanable funds due to a rise in the CRR. The RBI has been almost regularly raising the SLR since the early 1970s. It has raised the SLR from 25% to 30 % in November 1972, to 32% in 1973, to 33% in 1974, to 34% in 1978 and then to 38.5%. Since April 3, 1992, however, the RBI reduced the SLR on the additional demand and time deposits. It cut down the SLR on additional deposits to 30% on April 3.1992. At present the scheduled commercial banks are required to maintain SLR at 25% whereas the effective rate worked out to 28% of the total Net Demand and Time Liabilities (NDTL) in March 1996.
Limitations of CRR as an Instrument of Monetary Control. This method alone is effective where other measures fail. It proves more handy where open market operation and bank rate policy prove less effective. However, its effectiveness in terms of impact on the capital market depends on the share of the banking credit in the credit market. It is relatively more effective in the advanced countries with advanced banking system accounting for a major share in the capital market. 12.8.2
Qualitative or
Selective Credit Controls The quantitative methods of monetary control affect, (when they are effective), the entire credit market in the same direction.
They lead either to expansion or to contraction of the total credit.
In other words, their impact on all the sectors of the economy is
NOTES 352 Self-Instructional Material Fiscal and Monetary Policies
uniform. This may not be always desirable or intended by the policy-makers. The monetary authorities are often faced with the problems of (a) rationing the credit, (b) diverting the flow of credit from the non-priority sectors to the priority sectors, and (c) curbing speculating tendency based on the availability of bank credit. These objectives of credit control are not well served by the quantitative measures of credit control. The monetary authorities then resort to qualitative or selective credit controls which include the following
kinds of
measures. (i) Credit rationing: When there is shortage of institutional credit available for the business sector, the large and financially strong sectors or industries tend to capture the lion's share in the total institutional credit. The result is that the priority sectors and weaker industries are starved of necessary funds,
while the
bank credit goes to the non-priority sector. In order to curb this tendency, the central bank resorts to credit rationing measures. Generally, two measures are adopted: (a) imposition of upper limits on the credit available to large industries and firms,
and (b) charging a higher or progressive interest rate on bank loans beyond a certain limit. This is done with a view to making banking credit available to relatively weaker sectors. (ii) Change in lending margins: The banks advance money more often than not against a mortgage of property–land, building, jewellery, shares, stock of goods, etc. The banks provide loans only upto a certain percentage of the value of the mortgaged property. The gap between the value of the mortgaged property and amount advanced is called 'lending margin'. For example, if the value of stock is
Rs. 10

million and the amount advanced is only Rs. 6 million, the lending margin is 40 per cent. The cerntral bank is empowered to increase or decrease the lending margin with a view to decreasing and increasing the bank credit. This method was used for the first time by the RBI in 1949 with the objective to control speculative activity in the stock market. Since 1956, the RBI has made an extensive use of this method with a view to preventing speculation in scarce agricultural products, namely, foodgrains, cotton, oil seeds, vegetable oils, sugar, khandsari and gur, and cotton textiles and yarns.
The speculative rise in the price of scarce agricultural products had taken place because high price of such goods could secure higher loans. Higher loans provided more funds to buy and stock the scarce agricultural commodity to be mortgaged for further borrowing. This created a kind of artificial scarcity which fuelled the price further up. The RBI by increasing the lending margin could curb this kind of speculative borrowing. This method is no more a widely used method in India. (
iii)Moral suasion: The moral suasion is a method of persuading and convincing the commercial banks to advance credit in accordance with the directive of the central bank in the economic interest of the country. This method is adopted in addition to quantitative and other qualitative methods, particularly when effectiveness of these methods is doubtful. Besides, quantitative and qualitative methods are, in fact, ineffective in the underdeveloped countries with underde- veloped money and credit markets. Under
this method, the central bank writes letters to and holds meetings with banks on money and credit matters. (
iv)Direct controls: Where all other methods prove ineffective, the monetary authorities resort to direct control measures with clear directive to the banks carry out their lending activity in a specified manner. There are however rare instances of direct control
measure. Check Your Progress 17. What is meant by bank rate? 18. How does bank rate policy work to control money supply? 19. What is CRR? Is CRR raised or reduced to reduce money supply with public? 20. What are the factors that limit the effectiveness of monetary policy?
NOTES Self-Instructional Material 353 Fiscal and Monetary Policies 12.9
THE LIMITATIONS OF MONETARY POLICY The effectiveness of monetary policy, or any policy for that matter, depends on a number of factors: 1. The time lag 32 : The first and the most important limitation in the effective working of monetary policy is the
time lag, i.e., time taken in chalking out the policy action, its implementation and working time.
The time lag is divided in
two parts: (i) 'inside lag' or preparatory lag, and (ii) 'outside lag' or response lag. The 'inside lag' refers to the time lost in (a) identifying the nature of the problem, (b) identifying the sources of the problem, (c) assessing the magnitude of the problem, (d) choice of appropriate policy action, and (e) implementation of policy actions. The 'outside lag' or the response lag refers to the time taken by the households and the firms to react in response to the policy action taken by the monetary authorities. If preparatory and operational lags are long, not only the nature and the magnitude of the problem may change rendering the policy ineffective, but it may also worsen the situation. It has been the experience of many countries including developed ones that 'time lag' has been unduly long making monetary policy less effective than expected. The time lag of monetary policy, particularly its response lag, has been found to be generally longer than the time lag of fiscal policy. However, the issue of time lag of monetary policy is controversial. Friedman and Schwartz find an average time lag of 18 months between peaks (troughs) of money supply and peaks (troughs) of business cycle. Their findings have however been questioned by the findings of other economists 33 . However, 'the evidence from several sources suggests that the lag associated with monetary policy is long and possibly variable' 34 and 'the consensus seems to be that the lag is about 12 to 16 months long' 35 . 2.
Problem in forecasting: The formulation of an appropriate monetary policy requires
a reliable assessment of
the magnitude of the problem—recession or inflation—
as it helps in determining the appropriate policy measures. What is
more important is to forecast the effects of monetary actions. Despite advance- ment in forecasting techniques, reliable forecasting of macroeconomic variables remains an enigma.
In this regard, it is interesting
to quote Stephen McNees 36 . "How can forecasters go wrong? They may not predict disturbances (the Gulf War, for example); they may misread the current state of the economy and hence base their forecasts on a wrong picture of the present situation; and they may misjudge the timings and the vigour of the government's monetary and fiscal responses to booms or recessions. The fact is that forecasting has not reached perfection, particularly at major turning points in the economy...." With this status of forecasting, prediction of the outcome of a policy action
and hence

formulation of an appropriate monetary policy has remained an extremely difficult task. An inappropriate policy based on guesswork is bound to be unsatisfactorily effective. The empirical evidence proves the point. 3. Non-banking Financial Intermediaries: The structural change in the financial market has also reduced the scope of effectiveness of monetary policy. The proliferation of non-banking financial intermediaries including industrial finance corporations, industrial development banks, mutual saving funds, insurance companies, chits and funds etc., has reduced the share of the commercial banks in the total credit. Although financial intermediaries cannot create credit through the process of credit multiplier, their huge share in the financial operations reduces the effectiveness of monetary policy.
NOTES 354 Self-Instructional Material Fiscal and Monetary Policies 4.
Underdevelopment of money and capital markets: In addition, the effectiveness of monetary policy in less developed countries is reduced consid- erably because of the underdeveloped character of their money and capital markets. Their money and capital markets are fragmented while effective working of monetary policy requires that money market and the sub-markets of the capital market work interdependently. For this reason, the effects of change in money supply and particularly in the interest rate remain confined to the banking sector. 12.10 SUMMARY
z
Fiscal policy refers to
the government programme of taxation and expenditure designed to achieve certain
predetermined goals. z India's taxation policy was formulated
in the 1950s. It has since then been reformed and reformulated several times. z The basic functions of tax policy are twofold: (i) to generate revenue, and (ii) to regulate the economy, e.g., Reducing income disparities, promoting saving and investment, controlling production and consumption of some goods and service. z India's taxation policies had certain big anomalies prior to 1991, the year in which taxation policy was reformed. Main anomalies were (i) unduly high tax rates, (ii) tax system of cascading nature, difficult to administer, and tax on tax. z Income taxation affects adversely (i) incentive to save and investment, and (ii) ability to save and invest. Tax reforms made in 1991 have reduced these adverse effects considerably. This applies to both personal income and company income tax. z
Monetary policy refers to action taken by the central bank to regulate the money supply in the country. z Monetary policy instruments such quantitative measures as (i) bank rate, (
ii) cash reserve ratio, and open market operations. z Bank rate is the discount of which a central bank charges from the commercial banks to discount their first class bills. z Cash reserve ratio (CRR) is the percentage rate of deposits with commercial banks to be deposited with central bank. z Under open market operation, central bank buys or sell the government bonds to increase or to decrease the money supply. z In addition, central banks also use selective controls, called selective credit control, i.e., to divert the banking funds from less desirable sectors to more desirable sectors, depending on the needs of the country. 12.11 ANSWERS TO 'CHECK YOUR PROGRESS' 1.
Fiscal policy is defined as the government's programme of taxation and expenditure designed to achieve certain macroecnomic goals. 2. The major objectives of fiscal policy
are (i) reducing income disparities, (ii) promoting saving and investment, (iii) preventing business cycles and stabilizing the economy, (iv) promoting employment and economic growth. 3. Tax policy has two basic functions to perform: (i) raising revenue, and (ii) regulating economic activities. 4. Regulatory functions of taxation are performed by (i) reducing or raising tax rate of existing taxes, (ii) imposing new taxes, and (iii) applying different taxes at different tax rates.
NOTES Self-Instructional Material 355 Fiscal and Monetary Policies 5. Some major anomalies of India's taxation system are: (i) very high tax rates, (ii) high cascading effects, (iii) administrative complexity, and (iv) inequitable tax system. 6. Main tax reforms made in India in 1991 were (i) the highest personal income tax rate was reduced from about 65% to 30%, (ii) corporate income tax rate was reduced from 50% to 35%, (iii) excise duty was converted into Modified Value Added Tax (MODVAT), and (iv) import duties were heavily reduced. 7. High income tax rate reduces the after-tax income from work effort. This increases preference for leisure and lower hours of work. That is, high income tax rate affects work effort adversely. 8. High income tax rates reduce return on investment incomes. Therefore, people prefer to enjoy their income —consume it—rather than save and investment. 9. High corporate tax affects private business by reducing both incentive to invest and ability to invest. 10. Company income tax reduces profit after tax. The higher the tax rate, the lower the post-tax profit. This creates disincentive for investment. 11. Company's own profit is the main source of finance for investment. A high corporate tax rate reduces post-tax profit heavily. That is high corporate tax reduces ability to invest. 12. In order to neutralise the adverse effect to corporate taxation, the government gives certain incentives like tax holidays, investment allowance, development allowance, high depreciation allowance, etc. 13.
Monetary policy is a programme of action adopted by the monetary authority, the central bank, to control and regulate money supply with public. 14. The scope of

monetary policy refers to the macroeconomic variables that can be changed by changing the monetary weapons. The scope includes demand for making, supply of money with the public, saving and investment, and credit creation by the banks. 15. Quantitative measures refer to monetary weapons that are used to control quantity of money demand by public and supply of money with public. 16.
Open market operation is the sale and purchase of government bonds to and from the public
in the open market. 17. Bank rate is the rate at which central bank charges from the commercial bank for discounting government bills and for granting loans. 18. Increase in bank rate reduces borrowing of banks from the
central bank. This reduces credit creation capacity of the commercial banks.
This reduces money supply. Decrease in bank rate increases money supply with public. 19.
Cash Reserve Ratio (CRR) is the percentage of total deposits which banks are legally required to maintain in the form of cash
reserves. CRR is raised to reduce the money supply with public. CRR
reduces credit creation capacity of the banks and the flow of bank credit to the
public. 20. The factors that limit the effectiveness of monetary policy include (i) time lag between planning and implementation of action, (ii) problem of forecasting future needs, (iii) availability of credit from non-banking financial institutions, and (iv) underdevelopment of money market. 12.12 EXERCISES AND QUESTIONS 1. What are the main objectives of fiscal policy? Briefly
describe the role of fiscal policy in the economic growth of an underdeveloped economy.
NOTES 356 Self-Instructional Material Fiscal and Monetary Policies 2. How
does taxation affect private business activities? Is taxation always a deterrent to
the
growth of private business? 3. Describe the effects of taxation on (a) work-efforts of the people, (b) desire and capacity to save and invest. 4.
How
does corporate income taxation affect the incentive and capacity of the large corporations
to
save and invest? 5. Indirect taxes are deterrent to private saving and investment than the direct taxes. Elucidate. 6. How do the indirect taxes affect
the private business? Explain with examples in Indian context. 7. What is meant by monetary policy? How does it differ from fiscal policy? 8.
Describe the instruments of monetary policy. How do they work and what are their limitations? 9.
Distinguish between quantitative and qualitative measures of monetary control. Under what conditions are qualitative controls preferred to quantitative controls? 10.
What is open market operation? How does it work to affect the money supply? Why is this measure considered to be more effective than other measures of monetary control? 11. Explain the transmission mechanism of monetary policy. How does a change in money supply change the levels of income and prices? 12.
What
are the factors that determine the effectiveness of monetary policy?
How does empirical evidence corroborate with theoretical propositions? 13.
What is meant by 'time lag'? How does it affect the effectiveness of monetary policy? 12.13 FURTHER READING
Chelliah, R.J., Fiscal Policy in Underdeveloped Countries, George Allen and Unwin Ltd., London, 1969. Due, John F. And A.F. Friedlander, Government Finance: Economics of Public Sector, Richard D. Irwin, Inc., 1977, Ch. 9. Dwivedi, D.N., Readings in Indian Public Finance, Wiley Eastern Limited, New Delhi, 2nd Edn., 1994, Chs. 1, 2, 10 and 11. Ekstein Otto, Public Finance, Prentice Hall, Inc., New Jersey, 1967, Chs. 1 and 6. Hevemen, R.H., The Economics of Public Sector, John Wiley and Sons Inc., New York, 1970, Chs. 3, 5, and 7. Heller, W.W., Fiscal Policies for Underdeveloped Countries, in Readings on Taxation in Developing Countries (ed.) by Richard M. Bird and Oliver Oldman, The Johns Hopkins Press, Baltimore, 1967. Kaldor, Nocholas, 'The Role of Taxation in Economic Development', in Fiscal Policy for Economic Growth in Latin America, The Johns Hopkins Press, Baltimore, 1965. Musgrave, R.A., Theory of Public Finance, McGraw-Hill Book Co., Asian Student Edition, 1959. Musgrave, R.A., and P. Musgrave, Public Finance In Theory and Practice, McGraw- Hill Kogakusha Ltd., Tokyo, 1989, International Student Edition, Ch. 22. Prest, A.R., Public Finance in Theory and Practice, Weidenfeld and Nicolson, London, 1975, Chs. 4, 16. Edgmand, Michael R., Microeconomics : Theory and Policy, 2nd Edn., 1983, Prentice Hall of India, New Delhi. Ch. 18.

NOTES Self-Instructional Material 357 Fiscal and Monetary Policies Friedman, M., "The Role of Monetary Policy", Am. Eco. Rev., March 1968. Friedman, M., "Monetary Policy : Theory and Practice", Journal of Money, Credit and Banking, February 1982. Hamburger, Michael J., "The Lag in the Effect of Monetary Policy : A Survey of Recent Literature", Monthly Review of the Federal Reserve Bank of New York, December 1971. Modigliani, Franco., "The Monetarist Controversy or, Should We Forsake Stabilization Policy?", Am. Eco. Rev., March 1977. Tobin, James, "Monetary Policy : Rules, Targets and Shocks", Journal of Money, Credit and Banking, November 1983. References 1. In India, there are three levels of taxation–centre, states and local bodies. We will confine our discussion here to centre's taxation policy. For a detailed analysis of India's taxation policy, see D.N. Dwivedi (ed.), Readings in Indian Public Finance, Second Edition, Wiley Eastern Limited, New Delhi, 1994, Ch. 1 and 2. 2. First Five-Year Plan (1951-1956), p. 17. 3. Estate duty was abolished in 1991 because revenue from this tax was insignificant. 4. Expenditure tax was abolished in 1963 due to administrative problems in its administration and insignificant revenue yield. 5. John F. Due, Indirect Taxation in Developing Economies, Johns Hopkins Press, 1970, p. 16. 6. W.R. Mahler, Jr., Excise and Sales Taxation in India, Orient Longmans, 1970, p. 105. 7. The only comprehensive and reliable study, Taxation and Private Investment, was made for 1950s by the National Council of Applied Economic Research, New Delhi. 8. For a simple analysis of tax-effect on choice between work and leisure, see, A.R. Prest, Public Finance in Theory and Practice, Weidenfeld and Nicolson, London, 1975, pp. 74-8. 9. George F. Break, 'The Incidence and Economic Effects of Taxation, in The Economics of Public Finance, The Brookings Institution, Washington, D.C., 1974, p. 180. See also R.A. Musgrave, and P. Musgrave, Public Finance: Theory and Practice, 2nd Ed., McGraw-Hill Kogakusha Ltd. Tokyo, 1976, p. 407. 10. George F. Break, op. cit., p. 185. 11. Op. cit., p. 484. 12. Quoted from Otto Ekstein, op. cit. p. 81. 13. "Income Taxes and Incentive to Work : An Empirical Study, "Amercian Economic Review, Vol. XLVII, No. 5, September 1955, Quoted in Otto Ekstein, op. cit. 14. Musgrave and Musgrave, op. cit., p. 485. 15. Musgrave and Musgrave, op. cit., p. 491. 16. Quoted from Otto Ekstein, op. cit. 17. National Council of Applied Economic Research, Taxation and Private Investment. pp. 77-78. 18. Op. cit., p. 491. 19. Otto Ekstein, op. cit., p. 84.
NOTES 358 Self-Instructional Material Fiscal and Monetary Policies 20. Ved Gandhi, Some Aspects of Indian Tax Structure, Vora & Co. Publishers Private Ltd., Bombay, 1970, p. 93. 21. R.H. Haveman, The Economics of Public Sector, John Wiley and Sons Inc., New York, 1970, p. 133. 22. Otto Ekstein, op. cit., p. 8. 23. A.R. Prest, Public Finance in Underdeveloped Countries, Vikas Publishing House Pvt. Ltd., Delhi, 1972, pp. 51-52. 24. op. cit. 25. Harry G. Johnson, "Monetary Theory and Policy", Am. Eco. Rev., Vol. LII, No. 3, June 1962, p. 335. Reprinted in his Essays in Monetary Economics (ed.). George Allen and Unwin, London, 1969, p. 17. 26. G.K. Shaw, An Introduction to the Theory of Macroeconomic Policy, op. cit, p. 65. 27. In India, Treasury Bills are short-term promissory notes issued by the Government of India through the Reserve Bank of India (RBI). There are two kinds of Treasury Bills—91-Day and 182-Day Bills.
The 91-Day Treasury Bills are issued by the RBI on behalf of the Government
at a fixed discount rate of 4.6 per cent. The RBI provides rediscounting facility within 14 days of issue at an 'additional rediscounting fees'. 28. The 182-days Treasury Bills, introduced in 1986, are sold by way of auction to residents of India (excluding State Governments and Provident Funds), for a minimum value of Rs. 100,000. The auction bid is invited every fortnight and the 'discount rate' is decided on the basis of the auction rate. As regards the auction procedure, the auction bids invited are scrutinized by a Committee headed by the Deputy Governor of the RBI. The Committee decides on the cut-off price or the minimum official price. Bids quoting a price equal to or higher than the cut-off price are accepted and other bids are rejected. 29. In India, the scheduled commercial banks were required until 1956 to maintain 5% of the demand liabilities and 2% of the time liabilities in the form of cash reserves. The RBI Amendment Act, 1956 empowered the RBI to vary minimum cash-deposit ratio between 5% and 20% for demand deposits and between 2% and 5% for time deposits. In 1962, however, this distinction between the demand and time deposits was removed and a flat rate of 3% was fixed for all deposits with the provision that this could be raised to 15%. 30. P.a. Samuelson, and W.D. Nordhaus, Economics, 1995, op. cit, p. 511. 31. The formula for deposit multiplier (Dm) is given below. D m = 1 CRR = 1 20 100 = 1 0.20 = 5 The total credit creation (TCC) can be worked out as follows: TCC = 1 CRR (Deposit) = 1 20 100 (100 million) = 500 million. 32. For a comprehensive analysis of time lag in monetary policy, see Michael J. Hamberger, "The Lag in the Effect of Monetary Policy: A Survey of Recent Literature", Federal Reserve Bank of New York Monthly Review, December 1971. 33. For details, see Michael R. Edgmand, Macroeconomics: Theory and Policy, Prentice Hall of India, 2nd edn., 1985, Chapter 18. 34. Michael R. Edgmand, op. cit., p. 373.
NOTES Self-Instructional Material 359 Fiscal and Monetary Policies 35. Fred R. Glahe, Macroeconomics: Theory and Policy, Harcourt Brace Jovanovich, Inc., New York, 1973, p. 287. 36. Stephen McNees, "How Large Are Economic Forecast Errors?" New England Economic Review, July-August 1992, part reproduced in Rudigar Dornbusch and Stanley Fischer, Macroeconomies, 6th Edn., 1994, McGraw Hill, Inc., p. 456.

Hit and source - focused comparison, Side by Side

Submitted text As student entered the text in the submitted document.

Matching text As the text appears in the source.

1/1	SUBMITTED TEXT	18 WORDS	86%	MATCHING TEXT	18 WORDS

is essential for planning and scheduling production, purchase of raw materials, acquisition of finance and advertising. It is

SA COM 231 Business Economics - I.pdf (D165092265)