Karnataka State Open University
Manasagangothri, Mysore- 570 006

ಕರ್ನಾಟಕ ರಾಜ್ಯ ಮುಕ್ತ ವಿಶ್ವವಿದ್ಯಾನಿಲಯ
ಮಾನಸಗಂಗೋತ್ರಿ, ಮೈಸೂರು ೫೭೦ ೦೦೬

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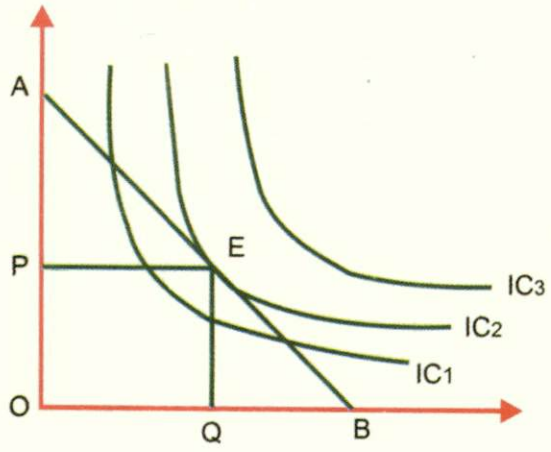
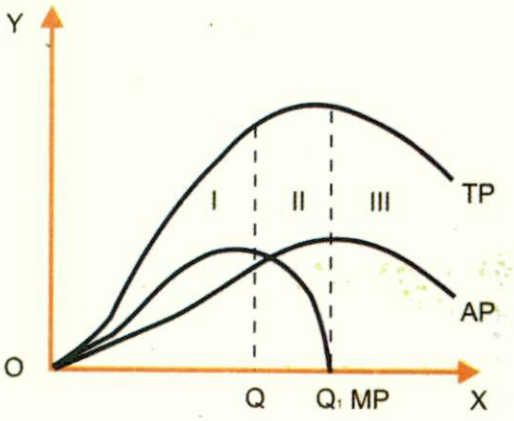
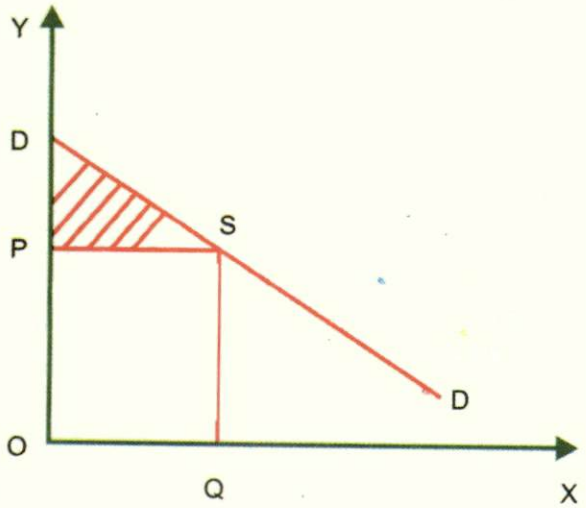
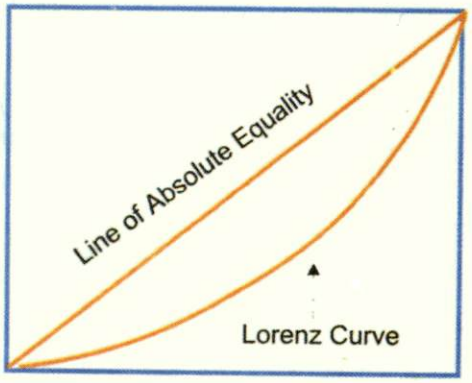
COURSE : 1

M.A. (PREVIOUS)
MICRO-ECONOMIC ANALYSIS









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M.A. Economics
(Previous)
Course - I
Micro Economic Analysis

Block

1

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M.A. ECONOMICS (PREVIOUS)

BLOCK I: MICRO ANALYSIS AND BASIC PROBLEMS

Block Introduction

Dear Student:

You are being introduced in this Block to four elementary topics in micro economic analysis. These are

Unit 1: Introduction to micro economic analysis and basic problems.

Unit 2: Methods of economic analysis.

Unit 3: Tools in economic analysis

Unit 4: Equilibrium

As these happen to be foundations for a proper study of economics, please read them with care.

UNIT 1:

Introduction to Micro Economic Analysis and Basic Problems

UNIT 1:

Introduction to Micro economic analysis and Basic Problems

1.0 Objectives:

At the end of this unit, you should be able to

* Distinguish between micro economics and Macro economics and the inter-relationship between the two and
* The fundamental problems that all economic systems face.

1.1 Introduction

The core of modern economics comprises two branches- micro economics and Macro economics. Adam Smith is usually considered as the founder of the field of micro economics, the branch of economics which today is concerned with the behaviour of individual entities such as markets, firms and households. In ***Wealth of Nations*** (1776), Smith considered how individual prices are set, studied the determination of prices of land, Labour and capital, and inquired into the strengths and weakenesses of the market mechanism. Most important, he identified the remarkable efficiency properties of markets and saw that economic benefit comes from the self-interested actions of individuals. These remain important issues today, and while the study of micro economics has surely advanced greatly since Smith's day, he is still cited.

The other major branch is Macro economics, which is concerned with the overall performance of the economy. Macro economics did not exist in its modern form until 1935, when John Maynard Keynes published his revolutionary *"General Theory of Employment, Interest and Money"*. At the time, England and the United States were still staruck in the Great Depression of the 1930s, with over one-quarter of the American labour force unemployed . In his new theory, Keynes developed an analysis of what causes business cycles, with alternating spells of high unemployment and high inflation. Today, Macro economics examines a wide variety of areas, such as how total investment and consumption are determined, how central banks manage money and interest rates,

what causes international crises, and why some nations grow rapidly while others stagnate. Although Macro economics has progressed far since his insights, the issues addressed by Keynes still define the study of Macro economics today.

In what follows, you will be introduced, at some length, to the relative merits and demerits of the two branches.

1.2. Micro economics and Macro economics :

1.2.1 Micro economics

Look at the following two definitions of the term micro economics:

"Analysis dealing with the behaviour of individual elements in an economy- such as the determination of price of a single product or the behavior of a single consumer or business firm (Samuelson and Nordhans);

"The study of individual units within the economy (such as households, firms and industries) and their interrelationships. The study of the allocation of resources and the distribution of income". (Wonnacott and Wonnacott).

"Micro' literally means millionth of a part. Thus, as can be seen from the above two definitions, micro economics deals with a small part of the national economy of a country. In micro economics we examine the trees, not the forest. It is an inquiry as to how a particular person maximizes profits, or how a particular family adjusts its expenditure to income, comes within the domain of micro economics. Since micro economics splits up the entire economy into smaller parts for the purpose of intensive study, it is sometimes referred to as the *slicing method*. Marginal analysis is an important tool in micro economics. Some important laws in economics are derived from the marginal analysis, the law of diminishing marginal utility, for example.

Micro economics is also referred to as the *Price theory* since prices act as the indicators of resource allocation.

To put in a nutshell , micro economics studies the following:

i) How resources are allocated to the production of particular goods and services;
ii) How the goods and services are distributed among the people and
iii) How efficiently they are distributed.

While studying the conditions in which the price of a particular good is determined, micro economics assumes the total quantity of resources as given and seeks to explain their allocation to the production of that commodity. Such an allocation is influenced by the prices of other goods and the prices of factors producing them. It is, therefore the relative prices of goods and services that determine the allocation of resources. Stated differently ,other things being equal, it is the allocation of resources that determines what to produce, how to produce and how much to produce.

Types of micro economics:

Generally, micro economics is divided into three types: i) Micro statics ii) Comparative micro statics and iii) Micro dynamics.

Microstatics is a method of analysis which deals with the relationship between different micro-variables at a given time under conditions of *equilibrium.* Ex: the price of a commodity in a market is determined by the equilibrium of demand and supply at a *given* time. It does not explain the *process* of this equilibrium.

In comparative micro statics, equilibrium positions are compared between micro variables at different points of time. The transition from one equilibrium to another is not explained. Here two 'still' pictures are compared.

Micro dynamics refers to that process whereby we reach from one position of equilibrium to that of another. That is, the process of transition from one equilibrium to another is explained.

Importance of micro economics:

It need not be said that micro economics has both theoretical and practical significance. Look at these specific aspects:

i) Efficient Utilisation of scarce resources:

You know, one of the major problems facing all economic systems is how best to utilise the available scarce resources. In other words, how to produce the highest level of output at the lowest possible cost? What conditions are to be fulfilled to achieve efficiency in both consumption and production? In a way , micro economics sets the ground rules for achieving economic efficiency.

ii) Understanding the making of an economy

Micro economics has a pivotal role in explaining the working of a free enterprise economy. As you know, in a free enterprise economy, the fundamental problems are answered by market forces. That is, there is no agency to plan and coordinate the working of the economic system. Then, how are the basic problems answered? micro economics provides the necessary theoretical tools and guidance.

iii).Helps in understanding the mechanism of international trade

The tools of micro economics are used to explain the gains from international trade, balance of payments and disequilibrium thereon and the determination of exchange rates. It is the relative elasticities of demand for each other's produce that determine gains from international trade. Disequilibrium in balance of payments occurs because of inequality between demand and supply of foreign currency. As you know, in the present day world economy where there is floating exchange rates, the exchange rate is determined by demand and supply factors.

iv) Implications of taxation:

Take a simple example like the usefulness of the law of diminishing marginal utility. It is the theoretical basis for explaining the rationale behind introduction of progression in taxation. Similarly, it is possible to measure the burden of a tax and its incidence.

v) Basis for welfare economics:

Welfare economics, as you know, is concerned with the normative analysis of

economic systems, that is, the study of what is "Wrong' or 'right' about the economy's functioning. The entire structure of welfare economics is built on price theory which is nothing but micro economics. Allocation of resources should be such that it promotes, the 'greatest happiness of the greatest number'.

vi) Provides tools for evaluating economic policies

Microeconomic theory provides tools for evaluating efficiency in consumption and production and highlight the factors which are responsible for the departure from economic efficiency. Price policy is also an important tool for economic policies.

vii) Conditional predictions possible:

Micro economics helps in making predicting economic events based on past experience. You are all aware of the phrase "Ceteris Paribus" or other things remaining constant. Given certain conditions, the economist, predicts that certain events are likely to occur.

viii) Construction and use of economic models:

An economic model is an abstraction of an economic reality . micro economics constructs and uses simple model for the understanding of the actual phenomena.

Limitations of micro economics

It is clear from the above that micro economics has great relevance both as a theoretical tool and as a practical guide. But it has certain limitations. A few such limiting factors are summarized below:

i) The major limitation is the assumption of full employment which, in a way, is to assume our 'problemsaway'. You know that full employment is only an exception and not a rule as is assumed in micro economics.

ii) Micro economics assumes laissezfaire which is not what is happening at present.
iii) Certain problems associated with the present day world economy like economic development, tax policy cannot be analysed in micro economics framework
iv) The collective functioning of the economy cannot be visualized.
v) Due to its abstractness, micro economics fails as a guide to policy making.

1.2.2. Macro economics

We noted that Macro economics is "the study of the overall aggregates of the economy (such as total employment, the unemployment rate, national product, and the rate of inflation)". It is a study of aggregates and therefore is the study of the economic system as a whole. This is what Kenneth E.Boulding says about the meaning of Macro economics", Macro economics deals not with individual quantities as such, but with aggregates of these quantities; not with individual incomes but with national incomes not with individual outputs but with the national outputs . It is a *method of lumping*. We noted in the introduction how, it was the 'General Theory' of Keynes that emphasised the importance of Macro economics. A good example of Macro economics is the now familiar *circular flow of income concept.*

The field of Macro economics comprises the following:
- Theory of income, output and employment ,including the theory of business cycles.
- Theories of prices with its constituents of the theories of inflation, deflation and reflation.
- The theory of economic growth.
- The macro theory of distribution dealing with the relative shares of wages and profits in total national income.

Types of Macro economics:

Similar to micro economics, Macro economics is also grouped under three types, namely, macrostatics, comparative macrostatics and macrodynamics.

Macro statics explains certain aggregative relations in a **stationary state.** It does not say anything about the process by which the national economy reaches *final* equilibrium.

Comparative macro statics involves a comparative study of different equilibrium attained by the economy. But the method does not detail the process of adjustment by which the economy moves from one equilibrium to another. It presents a, 'still' picture of the various equilibria reached by the economy.

Macro dynamics, which is more realistic, studies how the equilibrium in the economy is reached consequent upon changes in the macrovariables and aggregates. It indicate the *processes* of change.

Importance of Macro economics:

It may not be an exaggeration to say that the economic policies of governments are basically influenced by macro variables. Consequently, its significance has also greatly expanded. Look at some of the ways by which the present day economies are shaped by macro indicators:

i) Necessary for formulation and execution of government policies:

Modern governments being 'welfare' oriented, have to interfere in the developmental process to achieve certain socio-economic objectives. Formulation and implementation of these require the theoretical backing in terms of macroeconomic analysis.

ii) To understand the working of the economy:

Ultimately, it is the aggregative working of the economy that determines the level and nature of

economic progress of a country. These could be in terms of growth rates, inflationary pressures, capacity utilisation etc.

iii) **Understanding monetary issues:**

Macro economics has in its armoury , a number of monetary and fiscal policy tools. Their effects on the stability of prices and value of money are of great importance in promoting economic growth.

Iv) **In business cycles:**

Promoting growth with stability is an important macro economic goal. But in a modern capitalist society, economies are subject to fluctuations. Macro economic tools can be helpful in promoting growth with stability.

Limitations:

As a method of economic analysis, it is only an approach. Thus the method cannot be used under all circumstances and at all times. A few major limitations are highlighted here:

- Macro economics regards aggregates as homogenous in nature. But there are far too many differences which are ignored .
- Aggregates may not reflect the particular. For example, a rise in national income need not necessarily mean increased per capita incomes (due to increasing population) and equal distribution.
- Macroeconomic models have to invariably base their theories on micro level changes, all of which may not be represented properly in the aggregate
- Measuring macro variables have their own statistical and conceptual difficulties.

1.2.3. Interdependence between Micro economics and Macro economics

You may all be now familiar with the famous comparison of micro economics to a 'tree' and Macro economics to a 'forest' made by Kenneth E. Boulding. Both the 'tree' and the 'forest' are complementary to each other, and yet they are distinct! Stated simply, an aggregation of trees results in a forest. Similarly adding all micro units results in a macro unit. That's where the analogy ends. Tree has certain characteristics which the forest does not possess and vice versa. Similar is the case with regard to micro economics and Macro economics.

Let us take an example from the world of economics. Take the case of savings. Savings as you know is a virtue for you and me. What if the entire population reduces its consumption and increases savings? The result is an overall decline in aggregate spending and demand. This would mean lower prices, profits, investment, employment and output. So, as you can see, what is considered a "virtue' in micro economics turns out to be a 'vice' in Macro economics!

One thing is obvious: A combination of both these approaches would be an ideal answer. Read this saying of Samuelon: "There is really no opposition between micro and macro economics. Both are absolutely vital. You are less than half-educated if you understand the one while being ignorant of the other".

1.3. Fundamental Problems:

Every human society- whether it is an advanced industrial nation, a centrally planned economy, or an isolated tribal nation- must confront and resolve three fundamental economic problems. Every society must have a way of determining what commodities are produced, how these goods are produced and for whom they are produced.

Indeed, these three fundamental questions of economic organisation – what, how and for whom- are as crucial today as they were at the dawn of human civilization. Let us look more closely at them:

1.3.1 **What** commodities are produced and in what quantities? This is the problem of production. A society must determine how much of each of the many possible goods and services it will make and when they will be producedShould we produce bicycles or scooters today? Shall we go in for commercial crops or food crops? Or shall we have more of capital goods and less of consumer goods? The list can be expanded infinitely.

1.3.2. **How** are goods produced? A society must determine who will do the production with that resources, and what production techniques they use. In short, it is the problem of technology. Shall we generate electricity from oil from coal or from the sun? Will factories be run by people or by machines?

1.3.3 **For whom** are goods produced? This is the question of distribution. Who gets to eat the fruit of economic activity? Is the distribution of income and wealth fair and equitable? How is the national product divided among different households? Are many people poor and a few rich? Will society provide minimal consumption to the poor, or must people work if they are to eat?

1.3.4 **Others** include the need to evaluate the level of resource use and flexibility. Every economy must utilize its resources that it strikes a balance between the present and the future. Development should be true must be sustained. It is equally important that the economic system should be flexible enough to adapt itself to changing economic environs and political ideologies.

As desirable economic goals which every economy must strive, we may include the need for high level of employment, price stability, efficiency, an equitable distribution of income and economic growth.

1.4. Let us sum up:

* Study of Economics can be approached in two different ways, namely, micro economics and Macro economics.
* Micro economics is concerned with the behaviour of individual units such as markets, firms and households.
* Macro economics is concerned with aggregates such as how total investment and consumption are determined, and with such variables as level of unemployment, inflation etc.
* Micro economics is divided into three types, namely, micro statics, comparative microstatics and micro dynamics.
* Micro economics is significant in number of ways: helps in efficient utilization of scare resources, understanding the working of an economy, implications for taxation and is the basis for welfare economics.
* Micro economics fails when it comes to explaining the totality of an economic system and its greatest weakness is the assumption of full employment.
* Macro economics assumed great significance with the publication of *"General Theory of Employment, Interest and Money" by J.M.Keynes in 1936.*
* Similar to micro economics, Macro economics can also be classified into three types, namely, macro statics, comparative macro statics and macro dynamics.

* Macro economics has great relevance in contemporary economics since it helps in understanding the working of an economy, the significance of monetary and fiscal polices etc.

* Macro economics, similar to micro economics, only partially explains the working of an economic system.

* Both micro and Macro economics are interdependent.

* Samuelson highlights three basic or fundamental problems which may be called What to produce . How to produce and for whom to produce. We may add two other problems ,namely, level of resource use and flexibility.

* There are a number of desirable economic goals which every economy must strive to reach. These include achieving high levels of employment, price stability efficiency, equitable distribution of income and economic growth.

1.5 Keywords

Micro economics: The study of individual units within the economy(such as households, firms and industries) and their inter relationships. The study of the allocation of resources and the distribution of income.

Macro statics: Studies the relationship between different micro variables at a given time under conditions of equilibrium.

Comparative micro statics: Equilibrium positions are compared between micro variables at different points of time. It is a comparative study of different equilibria at different points of time.

Micro dynamics: It is a process whereby we reach from one postion of equilibrium to that of another. Process of equilibrium change is explained.

(Similarly, we can define macrostatics, macro comparative statics and macro dynamics).

Savings: That part of total income which is not consumed.

Sustainable development: Striking a balance between the present and the future.

1.6 For Further Study:

1. Samuleson, P.A and Nordhans : Economics
2. Wonnacott and Wonnacott: Economics

1.7 Review Questions

i) "Micro economics and Macro economics are complementary to each other". Critically examine this statement.

ii) Examine the fundamental problems faced by all economic systems. Explain with special reference to India.

iii) Examine the significance of micro economics and Macro economics in analysing economic problems.

Unit 2:

METHODS OF ECONOMIC ANALYSIS

Unit 2:
METHODS OF ECONOMIC ANALYSIS

2.0 Objectives

At the end of this unit, you should be able to

* Understand the meaning of the terms economic statics, comparative statics and economic dynamics.
* The main features of each of these methods of analysis; and
* The limitations of these methods.

2.1 Introduction

In Unit 1, you were introduced, in the course of our analysis of micr economics and marcro economics, that these two approaches have a further division generally calle economic statics, comparative statics and economic dynamics. You were given an idea as to what these concepts actually mean. Now, we are pursuing this a little further. We look at these three methods in some more detail.

2.2 Economic statics:

The term 'statics' as you know refer to a situation of stillness or rest or absence of movement. But economic statics does not imply absence of movement; rather it denotes a state in which there is a continuous, regular, certain and constant movement without change. It is a situation wherein economic activity goes on regularly and constantly on an even keel. Colin Clark maintains that a static state is characterised by the absence of five kinds of change: the size of population , the supply of capital, the methods of production, the form of business organisation and the wants of the people. Stated simply, economic statics refers to that type of analysis where we establish the functional relation between two variables whose values relate to some point of time or some period of time.

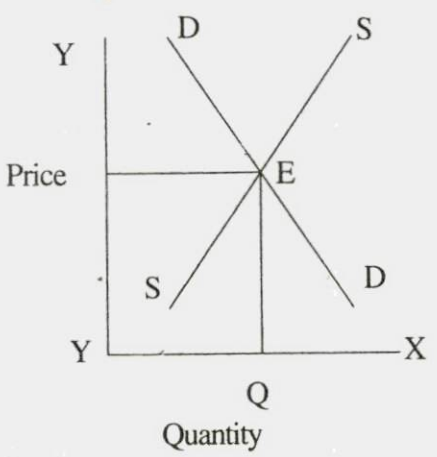
Economists explain static analysis in terms of micro and macro static equilibrium models. An economic model refers to relationship among different economic variables in which one variable appears in more than one relationship. In the micro static model supply and demand relationship determine price at a point of time which one also constant through time The given demand and supply functions are

$$D = 7(P) \ldots\ldots\ldots\ldots (1)$$

$$S = 7(P) \ldots\ldots\ldots\ldots (2)$$

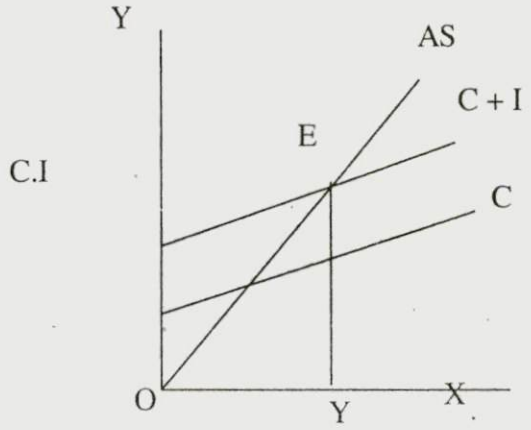
$$D = S$$

Here D represents the amount demanded of a particular commodity, S its supply and P the price. This relationship may be illustrated as follows:



Here the equilibrium is reached at point E where demand and supply have become equal to each other. In the absence of change in demand and supply conditions, this equilibrium position will apply not only to the present but also to the future.

Macrostatic analysis explains the static equilibrium position of the economy. It is a 'still' picture of the entire economy. A simple macrostatic equilibrium may be represented as Y=C+I where Y is the total income, C is the total consumption expenditure and I the total investment expenditure. It, shows a timeless identity equation without any adjusting mechanism. A macrostatic situation may be shown as follows.



Here the level of national income is determined as a result of interaction between aggregate supply and aggregate demand. This occurs at point E. This is a time less equilibrium.

2.2.1 Limitations

In a general sense, the problems in economic statics are these connected with equilibrium conditions which do not involve any variations in time element. The main limitations may be summarized as follows:

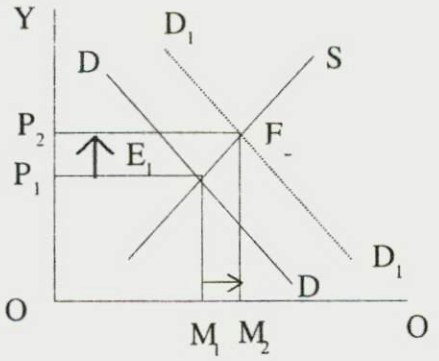
- Certain determining factors in this analysis are assumed to remain constant. However, these variables are subject to change with time.
- In a static analysis, given the variables like price of the good, quantity supplied and demanded, do not influence the determining conditions of incomes of the people their tastes and preferences, the prices of the related goods etc. It becomes a one-way movement- the data influence the variables of the system but not the other way about
- several economic models based on economic statics lose their touch of reality.

2.3. Comparative statics

Here we study the change from one equilibrium position to another as a result of changes in parameters. We compare equilibrium positions corresponding to different sets of data. It does not analyse the whole path as to how the system grows out from one equilibrium position to another when the data have changed; it merely explains and compares the initial equilibrium position with the final one reached after the system has adjusted to a change in data.

Let us make thin point clear with an example from microe conomic theory. We know that given certain assumptions the price of a good is determined as a result of interaction between demand and supply factors. Now, let us suppose that the level of income increases, but other factor assumptions hold good. Due to this, the demand function shifts upward. With the change in demand as a result of the

change in income, the supply position would adjust itself and a new, final equilibrium is established. To explain the determination of new equilibrium and how it differs from the initial one is within the domain of comparative statics. This may be shown with the following diagram.



Here, the initial equilibrium in reached at point E_1 due to the interaction of DD and SS curves. When the demand function changes to $D_1 D_1$ as a result of chages in consumers income, a new equilibrium point at E_2 is established. Here, in comparative statics, we are concerned with comparing it with E_1 and not with the process of moving from E_1 to E_2 comparative static analysis has been extensively used by Alfred Marshall in this time-period analysis of pricing under perfect competition.

2.3.1 Limitations:

The observations made with regard to economic statics hold good in regard to comparative statics in a broad sense. Here again, several complex and varied factors are held constant over time which is not realistic.

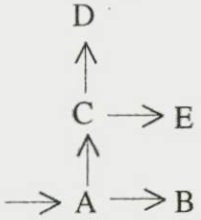
The comparative statics jumps over transitional developments. It is concerned with only the final position of equilibrium. In short, "comparative statics gives only a partial glimpse of the movement, for we have only the two 'still pictures' to compare, whereas true dynamics would give us a movie".

2.3 Economic Dynamics:

In statics, as we have seen, we deal with a static or stationary process. It is a simple technique because of the assumption of Ceteris Paribus. Comparative statics deal with a series of static models. The dynamic process however deals with an evolutionary prices in a dynamic manner. There is no assumption of Ceteris Paribus here. In a dynamic analysis ,we take into account all the changes, lags, sequences, cumulative magnitudes and even expectations. It visualizes the entire series of adjustments which take place between the break-up of the old equilibrium and the establishment of the new. It presents a continuing picture of the working of the economy. It is therefore a very realistic method of study; it is also comprehensive.

Economic dynamics refers to that analysis which considers the relationship between, those relevant variables whose values belong to different points of time. It is dynamic in the sense that an event at point of time 't' is influenced by point of time t-1.

A simple diagram may make the concept of economic dynamic clear:



Here, given the initial values of the economy, it would have moved along AB, but suddenly at A, due to certain disturbances in the economy, it would move along AC. Similar is the observation with regard to CE or CD.

The definition of economic dynamics has been a controversial one. One can see at least two types of dynamic analysis put forward by Ragnar Frisch which is called the time period analyis. The second type of dynamic analysis is associated with the name of R.F. Harrod and is called rates of change analysis. A brief explanation of each of these would be in order.

Time Period Analysis

An important feature of economic dynamics, as we noted above, is the significance of time element in the adjustment mechanism. Ragnar Frisch who is one of the pioneers in the technique of dynamic analysis in economics, defines economic dynamics as follows: "A system is dynamics if its behaviour over time is determined by functional equations in which variables at different points of time are involved in an essential way". It considers not only a set of magnitudes at a certain point of time but also considerS the magnitudes of certain variables in different points of time.

One can think of many possibilities drawn from both micro and macro economics. If we assume that the supply(s) a good in the market in the given time (t) depends upon the price that prevails in the previous period(t-1), the relationship between supply and price is said to be dynamic. This dynamic functional relation can be represented as

$$S_t = f(P_{t-1}) \text{ where}$$

S_t stands for the supply of a good offered in a given period t and P_{t-1} the price in the previous period. Similarly, if we assume that the quantity demanded (D) of a good in a period t is a function of the expected price in the succeeding period (t+1), the relation would be called a dynamic one and the analysis would be called a dynamic theory or economic dynamics.

Let us now take an example from macroeconomics. If we assume that the consumption(c) of period t depends upon the income(y) earned during the pervious period (t-1) then the functional relation in a dynamic set-up can be represented as $C_s=7(Y_{t-1})$. When macro economic theory (theory of income, employment and growth) is treated dynamically, the theory is known as macro dynamics.

It should be noted that the change of movement in a dynamic system is endogenous, that is , it goes on independently of the external; changes in it. In other words, the development of a dynamic process is self –generating. In short, in dynamic analysis the emphasis is on functional relationships as well as on different points of time.

Rates of Change analysis:

R.F. Harrod in his "Towards a Dyanmic Econmics" has given a different concept of economic dynamics.. According to him, economic dynamics deals with rates of change.. An analysis or a theory is dynamic if the rates of change of certain variables are considered to depend on the rates of change of other variables. He defines economic dynamics as the study of "the necessary relations between the rates of growth of the different elements in a growing economy". Harrod's concept of dynamics covers both the technique as well as the scope of economic dynamics. According to him, economic dynamics as technique has to consider rates of change of certain variables and how they are related to the rates of change of some other variables. Since only in a growing economy, magnitudes of variables undergo a change. It is the growing and changing economy with which dynamics deals with. It is to be noted that there is no time lag as was insisted by Frisch. In Harrod's dynamics, there is moving equilibrium in which the relevant variables are always in equilibrium relation to each other.

Modern economic theory uses both these variations of economic dynamics. Thus, in modern economics, dynamic analysis concerns itself with either establishing functional relationship between economic variables relating to different points of time, or considering rates of change of variables in a growing economy and how they are related to each other.

Expectation in economic dynamics

When the relationships between the economic variables belonging to different points of time is considered, or when rates of change of certain variables in a growing economy are under discussion, the issue of "future' enters the theoretical analysis. The economic units, both at micro & macro levels, decide their present course of action on the basis of their expected values of economic variables in the future. When their expectations are realised, they continue behaving in the same way and the dynamic system is in equilibrium. In other words when the expectations of the economic units are fulfilled, they repeat the present pattern of behaviour and there exists what has been called "dynamic equilibrium', unless some external shock or disturbing force unsettles the dynamic system.

2.4.1 Siginificance

You would have already formed an opinion about each of the above methods. By far, the most realistic approach to analyzing economic issues is through economic dynamics. The following additional arguments may be put forward:

i) Dynamic analysis studies the behaviour of the economic system in disequilibrium and traces the parts of the forces that bring a new equilibrium position.

ii) Several classical economic theories can be presented (Ex: Ricardian theory of distribution , Malthusian theory of population) can be presented in a dynamic setting.

iii) Problems of economic growth are best analysed using a dynamic approach.

iv) Business cycles, as you would agree, involve the element of time. Dynamic analysis is most suited for such issues.

2.4.2 Limitations:

A few weaknesses of this approach may be summarized as follows;

- The analysis itself involves several intricate steps and methods.
- The economic data on which dynamic models are constructed, seem to lack the empirical vigour.
- Economic model building on dynamic considerations has its own problems.

2.5 Let us sum up:

- Economic statics denotes a state in which there is a continuous,regular, certain and constant movement without change.
- Colin Clark maintains that static state is marked by absence of five kinds of change; the size of population, the supply of capital, the methods of production, the form of business organisation and the wants of the people.
- Static anaysis may be micro and macro static equilibrium models.
- The very assumptions of this analysis acts as limitations.
- Under comparative static analysis, the initial equilibrium and final equilibrium positions are compared.

- In this analysis also, several complex factors are ignored.
- Economic dynamics refers to that analysis which considers relationship between those relevant variables whose values belong to *different points of time.*
- Economic dynamics has been generally looked at from two perspectives: the *time period analysis* and *rate of change analysis.*
- Under time period analysis, the influence of time is considered whereas under rates of change analysis, the rates of change in one variable are considered to depend on the rates of change of other variables.
- The time period analysis is attributed to Ragnar Frisch, while R.F.Harrod is associated with the rate of change analysis.
- Modern economic theory uses both.
- Expectations have an important role in economic dynamics.

2.6 Key Words

Please refer to Unit 1

2.7 Suggested reading:

1) M.L. Seth: Principles of Economics
2) M.L.Jhingan: Advanced Economic Theory
3) H.L. Ahuja: Advanced Economic Theory

2.8 Review Questions:

1) Compare and contrast economic statics, comparative statics and economic dynamics.
2) Examine the main elements of economic dynamics. How relevant is it in explaining economic phenomena ?

UNIT 3:

TOOLS IN ECONOMIC ANALYSIS

UNIT 3:

TOOLS IN ECONOMIC ANALYSIS

3.0 Objectives:

At the end of this Unit, you should be familiar with some important theoretical tools employed in economics. This would enable you to understand and appreciate the implications of economic phenomena.

3.1 Introduction

We know that an economic theory consists of definitions and hypotheses about the way in which the world behaves. The economic theorist has the task of discovering what is implied by these hypotheses. He seeks to make statements such as "*If* costs vary in a certain way with output and *if* business men sek to make as much profits as they can, *then* a tax on the businessmen's sales will have certain specified effects both on the level of output and on the price at which the product is sold". The hypotheses of economic theory may be described in words, formulated symbolically, or if there are no more than three variables involved illustrated graphically. Once formulated in a precise way, implication of the hypotheses may also be derived by verbal argument, mathematical analysis or geometry.

To a great extent, these methods are inter-changeable . Any piece of logic reasoning that can be done verbally or geometrically can also be done mathematically. Some things that are done mathematically, however, cannot be done rigorously in verbal or in geometrical analysis. The choice of method is dictated by considerations of convenience, economy and the technique that the economist is familiar with.

3.2. Tools in economic analysis

In order to accomplish the desired result, economist needs two separate sets of tools. The first set is composed of all the apparatus of logical deduction used to discover the implications of his assumptions, and thereby to deduce from his theories predictions about observable events. The second set of tools is composed of the techniques of statistical analysis that the economist requires when he comes to test his theories against empirical observations.

The attempt in this Unit is to initiate you to the more important of such analytical tools which are frequently employed in economic theory.

3.2.1 Functional Relationship:

Modern economic theory uses both these variations of economic dynamics. Thus, in modern economics, dynamic analysis concerns itself with either establishing functional relationship between economic variables relating to different points of time, or considering rates of change of variables in a growing economy and how they are related to each other.

The idea that one thing depends on another is one of the basic notions behind all sciences. For example the amount of a commodity that people will buy is observed to depend on, among other things, the price of the commodity. When mathematicians wish to say that one thing depends on another, they say that one thing is a *function* of the other.

There are two steps in giving compact symbolic expressions to the relation noted above. First, we give each concept a symbol, and second, we designate a symbol to express the idea of one factor's

dependence on another. The hypothesis that quantity demanded depends on the price of the product is written as

$Q_d = f(p)$, where q_d is the quantity demanded of some commodity, and P is the price of the commodity.

The expression Y=f(x) says that Y is a function of x. It means that Y depends on and varies with X. The quantities X and Y in this functional relationship are called *variables.* Variations in one of the quantities are associated with variations in other quantities. The expression Y=f(x) merely states that Y is related to X; it says nothing about the form that this relation takes.

Now consider a second example. Let C equal the total spending of a household on consumption of goods in one year, and Y equals household's income. Now state the hypothesis

C= f(Y).....(1) and more specifically
C=0.8Y.....(2)

Equation 1 says that we hypothesize that household's consumption depends on income, Equation 2 says, more specifically, that expenditure on consumption will be 4/5ths as large as the households income . Equation 2 expresses the hypothesis about the relation between two observable magnitudes. There is no reason why equation 2 must be true. It needs to be tested. What we have is a concise statement of a particular hypothesis.

In the equation Y=7(x) if Y increases as X increases (Ex: Y=10+2X), we say that Y is an ***increasing function*** of X or that Y and X ***varydirectly*** with each other. If Y decreases as X increases (Ex: Y=10-2X), we say that Y is a ***decreasing function*** of X or that Y and X ***vary inversely with*** each other.

Economic theory is based on relations between various magnitudes (Ex: price-quantity; consumption-national income). All such expressions can be expressed mathematically. It is this fact that gives mathematical analysis importance in economics since once our hypotheses are written down in terms of algebraic expressions, we can use mathematical manipulation to discover what implications they have about behaviour.

The Error Term: The examples of functional relations considered above were all *deterministic* ones in the sense that they were expressed as if they held exactly: given the value of X, we knew the value of Y exactly. The relations considered in economicsare rarely of this deterministic sort. When an economist says that the world *behaves* so that Y=7(X), he does not expect that knowing X will tell him *exactly* what Y will be but only that it will tell him what will be Y *with some margin of error.* This error in predicting Y from knowledge of X arises for two quite distinct reasons. First, there may be other variables that also affect Y . Second, we can never measure, our variables exactly , so that, even if X is the only cause of Y our measurements will give various Ys corresponding to the same X.

If all the factors that affect the measured value of Y other than X are summarized into an error term, L, we write Y=7(XL). This says that the observed value of Y is related to the observed value of X as well as a lot of other things, all of which will be lumped together and called L(Greek letter alpha).In economic theory, this error term is almost always suppressed, and we proceed as if our functional relations are deterministic. *However it is very important to remember that the deterministic formulation is a simplification, and that the error term is really present in all our assumed and observed functional relations.*

Sometimes, we may have to deal with more than one functional relation. It could be , for example, that in one case Y=3X, whereas in the other Y=0.5X. This may be indicated in any one of several ways, for example.

Y=7(X) and Y=g(X) where 7 and g indicate that we are dealing with two different relations between X and Y. The choice of letters used to indicate a functional dependence is, of course, arbitrary, but sometimes letters can be selected to indicate the particular dependence in question.

3.2.2 Necessary conditions and sufficient conditions

In general, a necessary condition is something that must be present but by itself may not guarantee the result. A sufficient condition is something that, if present, does guarantee the result but that need not be there for the result to occur. A condition (or set of conditions) that is necessary and sufficient must be there *and*, if there is enough to guarantee the result.

3.2.3 Dependent and independent variables

Suppose we say that Y is always 3 times as large as X. Two other ways of saying the something are to say that X is one-third as large as Y and that Y minus 3X must be zero. We can write

Y=3X

X=1/3Y and

Y-3X=0

There are three ways of writing the same functional relation. To express the same three forms in general terms, we can write

Y=g(X).....(1)

X=h(Y).....(2) and

F(X,Y)=0.....(3)

Equations(1) and (2)are called the explicit forms of function. In (1) Y is written as an explicit function of X. Equation (3) is called the implicit form of the function. All the terms are gathered into the left-hand side and the whole expression is thus equal to zero. In which of the three forms we choose to write the function clearly is only a matter of convenience.

The term on the left-hand side of (1) and (2) is called the VARIABLE and the terms on the right-hand side are called the INDEPENDENT VARIABLES . As a matter of convention, we write the causes as independent variables and the effects as dependent ones.

3.2.4 Exogenous and endogenous variables

In economic theories, it is convenient to distinguish between Exogenous and Endogenous variables. Endogenous variables are ones that are explained <u>within</u> a theory. Exogenous variables, on the other hand, are ones that influence the variables but are themselves determined by factors outside the theory. Assume that we have a theory of what determines the price of vegetables from day to day in Mysore. The price of vegetables in this case is an our endogenous variable-something determined within the framework of the theory. The state of the weather, is an exogenous variable. It will influence vegetable prices but will not be influenced by these prices. The state of the weather is not explained in our theory; it is something that happens from without, so to speak, but is nonetheless influences our

endogenous variable, because it affects the demand for vegetables. Exogenous variables are sometimes referred to as "autonomous variables".

3.2.5 Stocks & flows

Some of the most serious confusions in economics have arisen from a failure to distinguish between stocks and flows. Imagine bathtub half full of water with the tap turned on and the plug removed; you have in mind a model similar to many simple economic theories. The level of water in the bath tub is a stock- an amount that is just there. We could express it as so many gallons of water. The amount of water entering through the tap and the amount leaving through the drain are both flows. We could express them as so many gallons per minute or per hour. A flow necessarily has a time dimension; a stock does not have a time dimension.

The amount of paddy produced is a flow; there is so much flow per year or per month. The amount of paddy sold is also a flow-so much per month or year . The amount of wheat stored (Produced but unsold) is a stock.

3.2.6. Identities and Equations

The difference between identities and equations is important and subtle. An identity is a relation that is true for all values of the variables; no value can be found that would contradict it. An example of an identity is

$(X+Y)^2 = x^2+2xy+y^2$ which expression is true for all numerical values of X and Y. It should be noted that identities are usually written with a three-bar sign and that the expression $y \equiv x$ is read as y is identical with x. Identities are statements compatible with any state of the universe.

Equations are relations that are true only for some variables but that can be contradicted by other values. Thus the expression y=10+2x is an equation. It is written with a two-bar or equals sign and is read Y is equal to ten plus two x. This expression is true for x = 2 and y =14, but not for x = 2 & y = 2. Equations can be used to state testable hypotheses, since they make statements that are true for some states of the universe but false for other states. Identities cannot be used to state testable hypotheses, since they make statements that are true for all states of the universe.

Identities cannot tell anything about the world. They cannot be the 'basis' of any theory. Consider, for example, the statement Y = C + S. Where y is a man's income. C is the expenditure on goods and services and s the amount of savings. If we define s as that part of income not consumed, then we get.

S = Y-C or Y = C + S which is an identity. We have not learnt anything from this, for, if we substitute y-c into y=c+s, we get

Y= C + S- C which would be Y = Y which is true for <u>any</u> values of Y, C and S

3.2.7 some conventions in functions/notation

Assume we are talking about some sequence of number, say, 1,2,3,3,4,5..... If we wished to talk about one particular term in this series without indicating which one, we could talk about ith term, which might be the 5^{th} or 50^{th}. ith If we now want to indicate terms adjacent to the ith term , we talk about the (i-1) and the (i+1)th terms.

Now consider some functional relation, say, one between the quantity produced by a factor and the number of workers employed. In general, we can write Q = Q(w),where Q is the amount of

production and w the number workers. If we wished to refer to the value of output where ten workers were employed, we could write $Q_{10} = Q(W_{10})$- If we wished to refer to output when some particular, but unspecified, number was employed , we write $Q_i=Q(W_i)$. Finally, if we wished to refer to output when the number of workers is increased by one about the previous level, we can write $Q_{i+1}=Q(W_{i+1})$.

Another convention is used to save space when there are many independent variables in a function. Let us say that Y depends on six variables X_1 to X_6. We could write this as

$Y=Y(X_1 X_2X_3X_4X_5X_6)$ but this is rather cumbersome-Instead, t can be written as

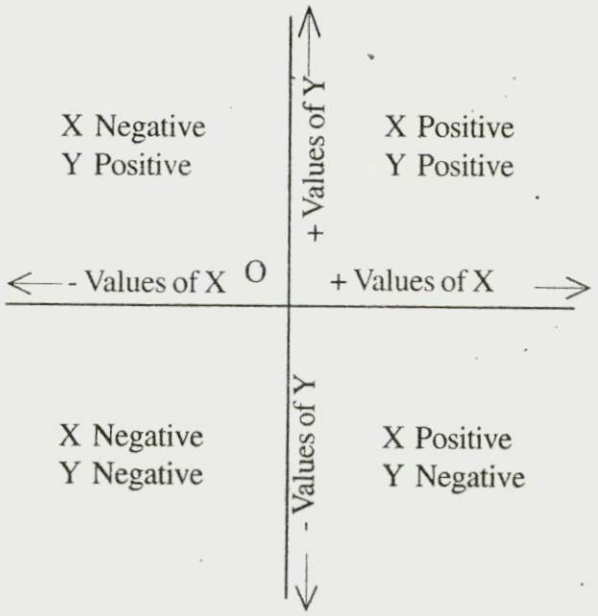
$Y=Y(X_1.....X_6)$ where the dots indicate that the intervening terms are understood to be present.

Now, assume that Y is a function of some number of variables but we do not wish to say exactly how many. We can say that Y is a function on of 'n' variables X_1 to X_n. Now Q the omission of intermediate variables is necessary, for, until we know what number 'n' stands for, we cannot say how many variables there are. In this case we write

$Y=Y(X_1.....X_n)$

3.2.8 Graphing function

A co-ordinate graph divides space into four quadrants as shown below.



The upper right hand quadrant , which is the one in which both X and Y are positive, is usually called the positive quadrant . Very often in economics we are concerned only with the positive values of our variables, and in such cases we confine our graph to the positive quadrant. Whenever we want one or both of our variables to be allowed to take negative values, we must include some or all of the other quadrants.

3.2.9. Straight Lines: Slopes and Tangents:

Consider the following functional relations.

$Y=0.5X_1$

$Y=X_1$

$Y=2X$

When plotted on a graph, all of them will be straight lines. Further, if we let X=o, in each of the above relations, Y also becomes zero. In the first equation, Y goes up by half unit, every time X goes up by one unit. In the second equation, Y goes up one unit every time X goes up one unit. Finally, in the third equation, Y goes up two units every time X goes up one Unit.

We now introduce the symbol Δ to indicate a change in a variable. Thus ΔX means the value of the change in X and ΔY means the value of the change in Y. In the first equation, if X=10 then Y=5 and if X goes up to 16, Y goes up to 8. thus, in this exercise $\Delta X=6$ and ?Y=3,

Next consider the ratio $\Delta Y/\Delta X$. In the above example it is equal t 0.5. In general, it will be noted that, for any change we make in X in the equation, $\Delta Y/\Delta X$ is always 0.5. In the second, it is unity and in the third the ratio is always 2. In general, if we write Y=bX then the ratio $\Delta Y/\Delta X$ is always equal to b.

We now define the slope of a straight line to be the ratio of the distance moved up the Y axis to the distance moved along the X axis. We start at the point (X_1, Y_1) and then move to the point (x_2, y_2) The change in X is X_2-X_1 or ΔX as indicated. The change in Y is Y_2-Y_1 or ΔY. Thus the ratio $\Delta Y/\Delta X$ is the slope of a straight line. This slope tells us the ratio of a change in Y to a change in X.

In trigonometry the tangent of an angle is defined as $\Delta Y/\Delta X$. Thus the slope of the line is equal to the tangent of the angle between the line and any line parallel to the X axis. In general, the larger the ratio $\Delta Y/\Delta X$, the steeper the graph of the relation.

Now consider the following equations.

$Y=2X$

$Y=10+2X$

$Y= -5+2X$

When these functions are graphed we get these a parallel lines, that is, they have the some slope. In all three $\Delta Y/\Delta X$ is equal to 2. Clearly the adoration of a (positive or negative) constant does not affect the slope of the line. This slope is influenced only by the number attached to X. In general we may write the equation of a straight line as

$Y=a+bX$

Now, by inserting two values of X_D say X_1 and X_2, and finding the corresponding Y_s, we get

$Y_1=a+bX_1$ and $Y_2=a+bX_2$, and by substraction, $Y_2-Y_1=b(X_2-X_1)$ or

$\Delta Y= b\Delta X$

$$\frac{\Delta Y}{\Delta X} = b$$

The constant a disappears when we subtract and so does not influence the slope of the line. What the constant does is to shift the line upward or downward parallel to itself.

3.2.10 Nonlinear functions:

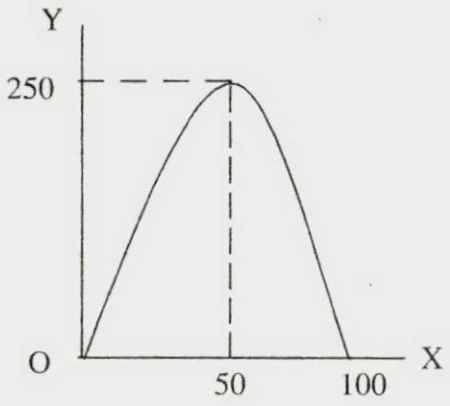
We have learnt that a linear relation is described graphically by a straight line, and algebraically by the equation Y=a+bX.

It is a characteristic of a linear function that the effect of a given change in X is the same whatever the values of X and Y from which we start. The graphical expression of this is that the slope of a straight line is constant.

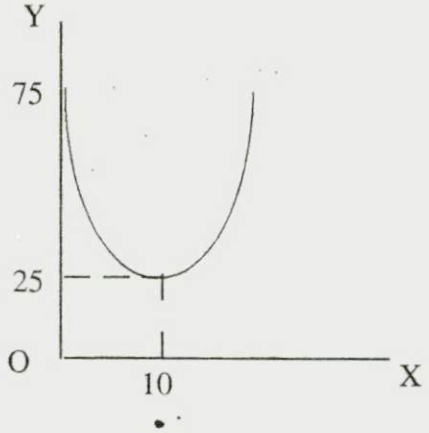
Many of the relations encountered in economics are nonlinear. In these cases the relation will be expressed graphically by a curved line and algebraically by some expression more complex than the one for a straight line. Two common examples are as follows.

$$Y=a+bX+cX^2 \quad \text{and} \quad Y=\frac{a}{x^b}$$

The first example is a parabola that can take up various positions and shapes depending on the signs and magnitudes of a, b and c. Two examples are given below.



Parabola with a maximum value of Y



Parabola with a minimum value of Y

There are of course, many other examples of nonlinear relations between variables. In general, whatever the relation between X and Y , as long as it can be expressed on a graph, it can also be expressed by means of an algebraic equation.

3.2.11 Maximum and Minimum Values

Consider the function $Y=10X-0.1X^2$. When plotted on a graph, it will be observed that Y at first increases as X increases, but after a while Y begins to fall as X goes on rising. We say that Y rises to a maximum, which is reached in this case when X=50. Until X=50, Y is rising as X rises, but after X=50,Y is falling as X rises. Thus Y reaches a maximum value of 250 when X=50.

A great deal of economic theory is based on the idea of finding a maximum (or minimum) value. Since Y is a function of X_1 we speak of *maximising the value of a function,* & by this we mean that we wish to find the value of X(50in this case) for which the value of Y is at a maximum(250 in this case).

Now consider the function

$Y=Y5-10X+0.5X^2$. In this case, the value of Y falls at first while X increases, reaches a *minimum* and then rises as X goes on increasing. In this case, Y reaches a minimum value of 25 when X=10. Here we speak of minimising *the value of the function,* by which we mean finding the value of X for which the value of Y is at a minimum (please refer to the note on "non linear function' for the two graphs)

3.2.12 Functions with more than two variables:

In the examples used so far, we have been considering the relation between only two magnitudes. In most cases, we are concerned with the relation between more than two things. The demand for a good might be defined, for example, on the price of that good, on the number of competing product, consumer income etc.

When we wish to denote the dependence of Y on several variables, say, V_1 W and X_1 we write $Y=Y(V_1W_1X)$,. Which is read as Y is a function of V_1 W and X

3.2.13. Partial Derivatives

Students who do not know mathematics are often disturbed by the frequent use in economics of arguments that depend on the qualification "other things being equal' (for which we often use the Latin Phrase Ceteris Paribus). They are used successfully in all branches of science and there is an elaborate set of mathematical techniques available to handle them.

When mathematicians wish to know the approximate ratio $\Delta Y/\Delta X$ (that is, how Y is changing as X changes)when other factors that influence Y are held constant,they calculate what is called the *partial derivative of Y with respect to X.* This is written symbolically as$\Delta Y/\Delta X$. We cannot enter here into a discussion of how this expression is calculated. We only wish to note that finding dy/dx is a well recognised & very common mathematical method, and the answer tells us approximately how Y is affected by small variations in X when *all other relevant factors are held constant.*

3.3. Let us sum up

* Economists need two setS of tools: the first set is composed of all the apparatus of logical deduction used to discover the implication of theories . The second set of tools is the set of mathematical & statistical techniques.
* A functional relation is said to exist when one thing depends on another.
* Such a functional relation may be increasing function or decreasing function
* Necessary condition is something that must be present but by itself may not guarantee the result. A sufficient condition is something that, if present, does guarantee the result but that need not be there for the result to occur.
* Causes are independent variables and effects are dependent ones.
* Endogenous variables are those within a system and exogenous variables are those outside a system.
* Stocks do not consider time element, while flows do.
* Identities are those which are true under all circumstances but equations hold good only under specified circumstance.
* the ratio $\Delta Y/\Delta X$ is the slope of a straight line.
* Non linear functions are those which when plotted on a graph resembles a curve rather than a straight line.
* In economics, more than one variable is used
* Partial derivatives are useful when the assumption Ceteris Paribus is introduced .

3.4: Key words:

Functional relation: the notion that one thing depends on another.

Necessary condition: something that must be present but by itself may not guarantee the result.

Sufficient condition: A sufficient condition is something that, if present, does guarantee the result but that need not be there for the result to occur.

Dependent variable and independent variable: whenever there is causal link between variables but are themselves determined by factors outside the theory.

Exogenous and endogenous variables: Exogenous variables are ones that influence the variables but are themselves determined by factors outside the theory.

Endogenous variables: Endogenous variables are ones that are explained within a theory.

Stocks & flows: Stocks do not take into account the element of time while flows do.

Identities & equations: An identity is a relation that is true for all values of the variable. Equations are relations that are true only for some values of the variables but that can be contradicted by other values.

3.5. Suggested Reading

1. Richard G.Lipsey: An Introduction to Positive Economics
2. R.G.D Allen: Mathematical Analysis for Economics

3.6. Review Questions

1. Examine the significance of mathematical & statistical tools in economics. Illustrate your answer with a few mathematical & statistical tools.
2. Explain the importance of functional relations in Economics.
3. Distinguish between
   (i) Stocks and flows
   (ii) Linear and non-linear functions and
   (iii) Endogenous & exogenous variables

UNIT 4:

EQUILIBRIUM

UNIT 4:
EQUILIBRIUM

4.0 Objectives

At the end of this unit, you should be able to know

* The meaning of the term equilibrium as used in economics.
* Its different forms and
* The general features of partial equilibrium analysis and general equilibrium anaylsis.

4.1 Introduction

One of the most frequently used terms in economics is that of "equilibrium'. It is only fair and proper that we make a detailed analysis of this much used expression. According to Samuleson and Nordhans. " An equilibrium is a situation where the different forces at work are in balance'. For example, if you see a ball rolling down a hill, the ball is not in equilibrium because the forces at work are pushing the ball down (this is therefore a disequilibrium). When the ball comes to rest in a hole at the bottom of the hill, the forces operating on the ball are in balance and the ball is in equilibrium.

The concept of equilibrium in economics can be traced back to Quesnay's Tableau Economique. Adam Smith developed a kind of partial equilibrium analysis which was developed later on by Marshall. His 'natural price' is to indicate the equilibrium price in the long rum. Cournot And Marshall developed the partial equilibrium analysis in a systematic way.

Another branch of economic equilibrium, namely, general equilibrium analysis, is attributed to Leon Walras. Important contributions have been made to general equilibrium analysis by economists like Ragner Frisch, Jan Tinbergen, Hicks, Samuelson, Myrdal, Patinkin etc.

4.2 Types of equilibria

We noted that when forces acting in opposite directions are exactly equal, the object on which they are acting is said to be in a state of equilibrium. We may distinguish the following types of equilibria.

i) Static equilibrium
i) Dynamic equilibrium
ii) Stable and Unstable equilibria
iii) Neutral equilibrium

Static equilibrium

A static equilibrium is one where, once this position is reached ,there is no tendency to move away from it. It is that state where every individual firm, industry or factor wants to attain and once reached, would not like to leave. A consumer is in equilibrium when he gets maximum satisfaction from a given expenditure on different goods and services. Any move to reallocate his expenditure among his purchases will decrease rather than increase his total satisfaction. A firm is in equilibrium when its profits are maximum and it has no incentive to expand or contract its output. Any deviation from this reduces his profit. Simlarly, an industry is in equilibrium when it has no incentive to change its output. It is also a state where all firms in the industry are earning only normal profits. A productive resource is in equilibrium when it is employed in its highest paid employment so that its income is maximized. Prof. Boulding summarises a static equilibrium as follows: "A mechanical analogy may be found in a ball rolling

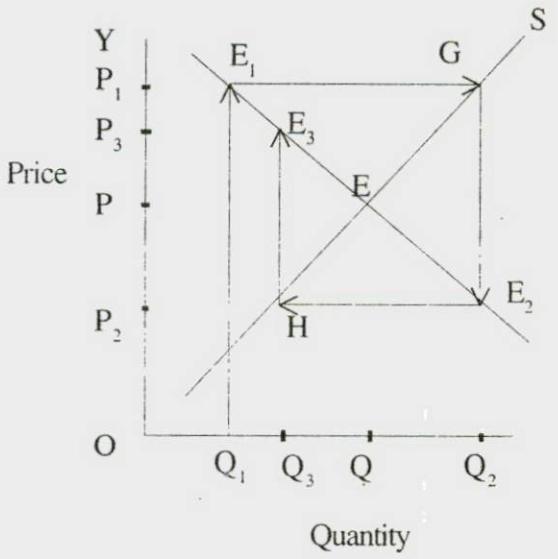
at a constant speed, or better still, of a forest in equilibrium where tree sprout grows or dies but where the composition of the forest as a whole remains unchanged". Thus, it is a state of equilibrium with given constant prices. Quantities, income, tastes, technology, population etc.

Dynamic equilibrium

A dynamic equilibrium relates to a progressive economy, which is the opposite of a static equilibrium. The incentive to change is to be found in all the organisms of the economy. The organisms do undergo changes, but the point to be noted is that the various organisms change at the same rate (Whether in the direction of increase or decrease). "A economic system might be said to be in dynamic equilibrium if its total stock, including both things and people, changed at a constant rate (percent per annum), and if the rates of production and consumption of all items of the stock increased at the same rate". Two points become crucial here the various organisms ***must*** change and they must change at ***Uniform*** rate. But organisms do change and thus this concept becomes unrealistic.

The Cobweb Cycle:

The Cobweb example provides a good example of a dynamic problem. That is, a problem in which time must explicitly be taken into account. The "Cobweb' name comes from the appearance of the diagram. A typical Cobweb cycle is shown below.



Suppose that the equilibrium has traditionally been at E where long run supply S and demand D interest. If there is no shock to this system, price will continue at P with production at Q. But now suppose that in the initial period some disturbance reduces the total quantity of paddy coming into the market to Q_1. Also assume no more paddy can be grown during the rest of the year, so that the immediate supply is inelastic at Quantity Q_1. In other words, immediate supply can be visualized as the tall arrow running vertically up from Q_1 and intersecting demand at equilibrium at point E_1. As a result, price is at a high level P_1.

In this initial year, the farmers have to decode on how much paddy to produce for the next year (assuming that yield/hectare is known). Facing the very favourable price P_1, they respond moving to point G on their supply curve, thus producing the quantity Q_2. But when this large quantity comes on the market in the second year, the completely inelastic immediate supply (shown by the arrow pointing down toward Q_2 now results in a new equilibrium E_2, with low price P_2.

Of course, in this second year, farmers must decide what to produce for the third year. Facing low price P_2, they respond by selecting point H on their supply curve. But when this small quantity Q_3 is finally produced and comes on the market in the third year, it results in an equilibrium at E_3, with the price at the relatively high level P_3.Price, production and consumption continue to move backward and forward until the system again settles down to a long run equilibrium at E.

The above is a "convergence' cycle. Can you think of an opposite situation, namely, the 'explosion' cycle?

4.2.3 Stable Unstable and Neutral equilibrium

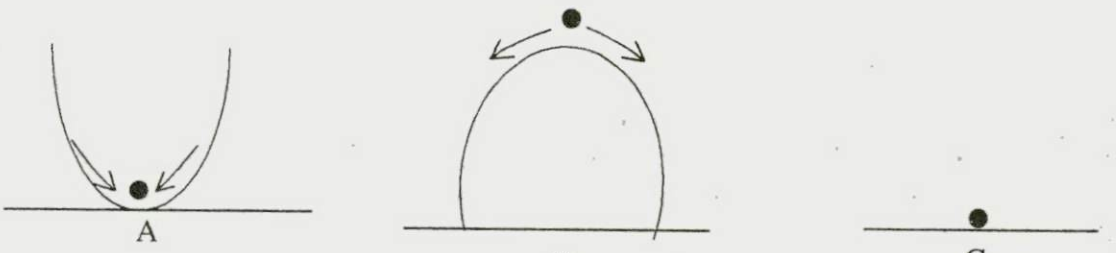
There is stable equilibrium, when the object concerned, after having been disturbed, tends to resume its original position. "A stable equilibrium value is an equilibrium value that, if changed by a small amount, calls into action forces that will tend to reproduce the old value". According to Pigou, a ship with a heavy keel is in stable equilibrium. Another famous comparison is that given by Schumpeter. A ball that rests in a bowl is in stable equilibrium because if disturbed, it will eventually come to rest in its initial position after moving back and forth.

On the other hand, unstable equilibrium is that equilibrium, which once disturbed will not come back to the original position. In this case, there is a tendency for the object to assume newer and newer positions once there is departure from the original position.

Equilibrium is neutral when the disturbing forces neither bring it back to the original position nor do they drive it further away from it. Thus, in the case of neutral equilibrium , the object assumes once-for-all, a new position after the original position is disturbed.

The distinction among the above three concepts is described by Schumpeter as follows: "*A stable equilibrium* value is an equilibrium value that, if changed by a small amount, calls into action forces that will tend to reproduce the old value; a *neutral equilibrium* value is an equilibrium value, that does not know any such forces; an unstable equilibrium value is an equilibrium value, change in which calls forth forces which tend to move the system farther and farther away from the equilibrium value". Stable equilibrium is the word most widely used in economic analysis.

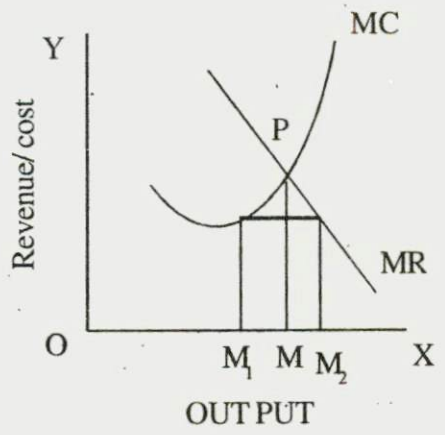
The above three types may be made clear with the following figure.



Stable equilibrium Un stable equilibrium Neutral equilibrium

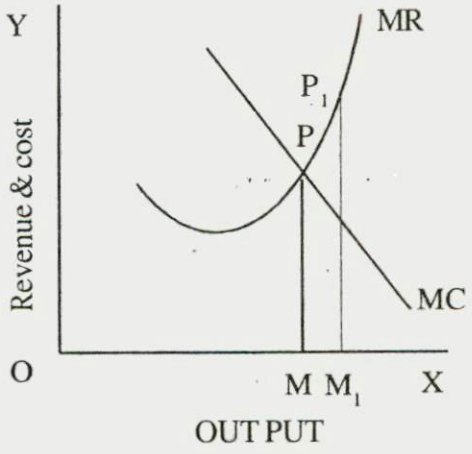
These three types of equilibrium can also be illustrated by making use of the marginal revenue and marginal cost curves.

The following diagram represents a stable equilibrium.



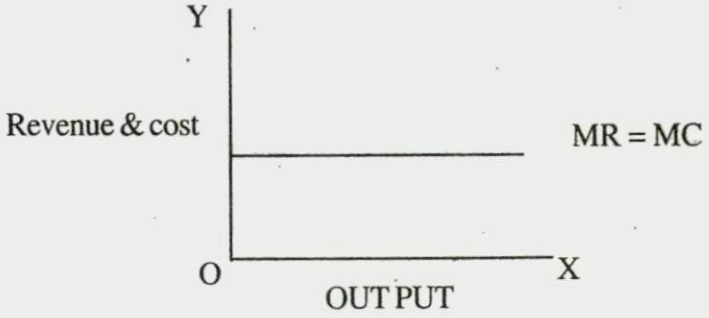
Equilibrium is reached at point P where MR=MC. When in equilibrium at P_1 the producer produces an output OM and maximises this profit . In case the producer increases this output to OM_2 or decreases it to OM_1 the size of his profits is reduced. This akutomatically brings in forces that tend to establish equilibrium again at P.

The following diagram illustrates an unstable equilibrium.



Initially, the producer is in equilibrium at point P where MR=MC and he is producing amount OM of output and maximizing his profits. If he now increases output to OM_1 , he would be in equilibrium at point P_1, where he will obtain higher profits, because, at this output , marginal revenue is greater than marginal cost thus there is no tendency to return to the original position at P

The neutral equilibrium may be represented as follows

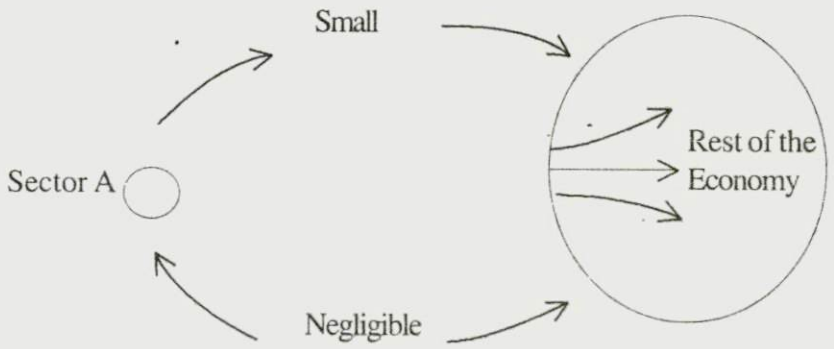


In this case MR=MC at all levels of output so that the producer has no tendency to return to the old position and every time a new equilibrium point is obtained which is as good as the initial one.

4.3 Partial equilibrium analysis

Partial equilibrium analysis may be defined as "the analysis of the effects of changes in supply and demand conditions within a single market". Thus this analysis essentially involves a process of simplification . Whereby it excludes certain variables and relationship from the totality, and studies only a few selected variables at a time . In other words, this method considers changes in one or two variables keeping all others constant.

The equilibrium of a single consumer, or producer, single firm or single industry are examples of partial equilibrium analysis. Marshall's theory of value is a case of partial equilibrium analysis. Let us illustrate this with a diagram.



This let us assume, is a market for potatoes. We call this sector A. If there is some change in sector A, this will cause changes in the rest of the economy and these changes will in turn reflect back on sector A, causing further change in that sector. Let us assume, for example, that the initial change in sector A is a fall in the supply of potatoes. This will cause an increase in the price and a fall in the quantity bought. The rise in the price of potatoes will cause other demands to change; in general, we would expect to find an increase in the demand for goods that are close substitutes for potatoes and a decrease in the demand for goods that are complementary. As a result, the prices of all these other goods will change. These are the induced changes in the rest of the economy. The original demand curve for potatoes, that we used to derive our prediction, was based on the assumption that all other prices were given. Now, however, prices of substitutes for potatoes have risen and this will cause a ***shift*** in our original demand curve for potatoes. This is the reflection back of the induced changes in the rest of the economy on the original sector. ***It is a basic assumption of partial equilibrium analysis that such effects are small enough to be ignored.***

All partial equilibrium analysis are based on the assumption of **Ceteris Paribus.** Strictly interpreted, the assumption is that all other things in the economy are unaffected by any changes in the sector under consideration (sector A). This assumption is always violated to some extent, for anything that happens in one sector must cause change in some other sectors. What matters is that changes induced throughout the rest of the economy are sufficiently small and diffuse so that the effect they in turn have on sector A can safely be ignored. There is no simple rule telling us when partial analysis can safely be employed. The final test is in whether or not the predictions of partial theory are refuted by the facts. As a first approximation, it is probably safe to say that the smaller is the sector under consideration, the more likely is it that its behaviour can successfully be predicted by partial analysis.

The partial equilibrium analysis, is in fact, the threshold to the general equilibrium analysis which involves the inter-dependence of various variables. In a way, partial equilibrium analysis is the basis on which the general equilibrium analysis is built. It helps in knowing the causes of a change in the product or the factor prices. Partial analysis also enables us to predict the consequences of such changes.

The major drawback of this analysis is that it studies the market or an entity in isolation of the rest of the economy.

4.4 General Equilibrium Analysis

In order to determine the relationships between various markets within the economy, the concept of general equilibrium analysis is employed. It may be defined as the analysis of the effects of changes in other markets. General equilibrium analysis may attempt to look at the economy as a whole , or it may concentrate on selected markets with clear interrelationships".

General equilibrium analysis drops the simplifying all-other-things-equal assumption and investigates the effects of changes in one market on other markets. It is a relatively new field of economic study. The concept was first suggested by a19th century economist, Leon Walras, but little empirical work was under-taken in the field until the 1930s.

If we carry general equilibrium analysis to its logical extreme, we may conclude that every single economic event in the world influences every other subsequent economic event. It may be true that all economic events are related, but the degree of influence many of them exert on the others is so slight that it is negligible. As a matter of practical significance, therefore, economists are not interested in constructing a general equilibrium model that will account for every last variable circumstance, but in one that will account for most influential variables, so that it can be used to understand and to predict consequences.

By definition, the term "equilibrium" implies an eventual state of rest. Some economists suggest that the constant adaptations made in various independent markets as a result of changes in other markets are working toward some such state of balance. But the concept of some ideal and static outcome is misleading when applied to a complex and dynamic economy like our own. Our economy includes several thousand different markets; our national income has increased every year; social and economic programmes since independence have brought about changes in the distribution of income and this list can be elangated. It is impossible to imagine that such an economy could ever be in a state of rest. But the concept of general equilibrium can help us follow, perhaps even anticipate ,the changes that occur.

General equilibrium analysis is actually the connecting link between the microeconomic analysis of individual markets and prices and the macroeconomic analysis of aggregates and averages. The relationships between individual markets help illuminate the mechanism by which changes in aggregate variables, such as consumer spending , business investment, and saving, take place.

A MODEL OF GENERAL EQUILIBRIUM

Following the methodology adopted by D.S.Watson, a model of general equilibrium is presented below. This is one of the simplest versions and is usually called the Walras – Cassel model, named after Leon Walras and Gustav Cassel.

The economy described by the model has 1,2,.....,n commodities and 1,2,.....,m resources or productive services. The quantities of resources are r_1,. r_2, ..., r_m.

The prices of the commodities are $P_1, P_2, \ldots\ldots\ldots P_n$. The prices of the productive services are $v_1, v_2 \ldots\ldots\ldots\ldots, v_m$.

In this economy, the commodities are produced directly with the productive services. Intermediate goods do not appear, just as they do not in the national income and product accounts. In these accounts, the final products in the GNP are produced with the two groups of productive services, labour and capital. To produce a unit of the jth commodity, the physical quantity, a_i of the ith resource is needed. A loaf of bread needs so many minutes of the labour time of a baker. Thus a_{ij} is called a production coefficient or an input coefficient. In the model, all the production coefficients are fixed. There are millions of them.

All prices are measured in terms of the price of one commodity. Let $P_1=1$ thus prices are the ratios at which commodities 2,3,.....,n exchange for commodity 1, which Walras called the *numeraire*. The economy is really a kind of barter economy, with the *numraire* serving as a unit of reckoning.

The Demand Equations:

The model has two sets of demand equations one is that of the households for commodities. The other is that of firms for resources.

The market-demand equations for each commodity are the totals of the demands of each household for each commodity. Each household's demand for a commodity is a function of its utility, its price, the prices of all other commodities, and the households income which, in turns, depends on the amounts of productive services it sells and their prices.

The market –demand equations are

$X_1=f_1(P_1, P_2, \ldots\ldots\ldots\ldots, P_n; V_1, V_2, \ldots\ldots\ldots V_m)$

$X_2=f_2(P_1, P_2, \ldots\ldots\ldots\ldots, P_n; V_1, V_2, \ldots\ldots\ldots V_m)$ ————————(1)

.....

$X_n=f_n(P_1, P_2, \ldots\ldots\ldots\ldots P_n; V_1, V_2 \ldots\ldots\ldots\ldots V_m)$

Notice that resource prices appear in these equations. The resource prices allow for changes in demand when there are shifts in the incomes of the households.

Because the production coefficients are fixed, the demand of firms of unit of resources is the sum of the quantities required for each commodity. The firms producing commodity 1, where quantity is X_1, demand a_{11} units of resource 1, a_{21} units of resource 2, etc. The demand for resource 1 is the sum of the amounts of it used in all commodities, or $a_{11}X_1$ plus $a_{12}X_2$ etc. Then the total supply of each resource be put equal to its demand because the model has no unemployment. Here are the equations.

$a_{11}x_1+a_{12}x_2+\ldots\ldots\ldots\ldots+a_{1n}x_n=r_1$

$a_{21}x_1+a_{22}x_2+\ldots\ldots\ldots\ldots+a_{2n}+x_n=r_2$

.....

$a_{m1}x_1+a_{m2}x_{2+}\ldots\ldots\ldots\ldots.+a_{mn}xn=r_m$

The Supply Equations

All markets are purely and perfectly competitive in the model, which also has the adjustments of the long rum. Therefore, the price of each commodity equals its cost per unit. Cost per unit is the sum of the payments for the quantities of the productive resources used per unit of a commodity. Production of a unit of commodity 1 requires resource a_{11} units of resource 1 at price $v_1 a_{21}$ units of resource 2 at price v_2 etc. The equations are

$$a_{11}v_1+a_{21}v_2+.....+a_{m1}v_m=P_1$$

$$a_{12}v_1+v_{22}v_2+.....+a_{n2}v_m=P_2$$

$$a_{1n}v_1+a_2v_2+.....+a_{mn}v_n=PA$$

The last step is to tie the supply of resources to the prices. The supply of any one resource depends on its price, the prices of the other resources, and the prices of the commodities. The supply of hours of bakers' services depends , on the wage rates in other occupations, and on the prices of bread, cake, etc. The final set of equations is

$$r_1=g_1(P_1,P_2,.....,Pn;V_1,V2.....,V_m)$$

$$r_2=g_2(P_1,P_2,.....,P_n;V_1,V_2,.....,V_m)$$

.....

$$r_m=g_m(P_1,P_2,.....,P_n,V_1,V_2,.....,V_m)$$

These are 2n+2m equations for the wn+2m unknowns $x_1 r_1 p$ and V. But equations (1) and (4) really contain m+n-1 independent equations. By setting $p_1=1$, however, the number of unknown is also reduced by one. Thus the system of equations is determinate. (For an alternative analysis of general equilibrium analysis please refer to Lewis C-Solmon. Microeconomics or Richard G.Lipsey. An introduction to positive Economics.

4.5 Let us sum up

* The concept of "equilibrium' is basic to both micro economics and macro economics
* Equilibrium is a situation where different forces at work are in balance.
* Equilibrium may be of different types; Static and dynamic; stable, unstable and neutral.
* Equilibrium analysis may be carried on using both partial equilibrium analysis and general equilibrium analysis.
* A stable equilibrium is one which tends to reproduce the old value.
* An unstable equilibrium tends to move the system further away from the equilibrium value.
* Neutral equilibrium is one in which no external force operates.
* Partial equilibrium analysis studies effect of changes in supply and demand conditions within a single market.
* General equilibrium analysis looks at the economy as a whole.

4.6 Keywords

Equilibrium : A situation where there is no tendency to change.

Static equilibrium : An equilibrium from which there is no tendency to move away.

Dynamic equilibrium : It is an equilibrium in which prices, quantities, income, tastes, technology are constantly changing.

Stable equilibrium : It is a situation where the object concerned, after having been disturbed, tends to resume its original position.

Unstable equilibrium : Equilibrium once disturbed will not come back to the original position.

Neutral equilibrium : Disturbing forces neither bring it back to the original position nor do they drive it further away from it.

Partial equilibrium : Analysis of the effects of changes in supply and demand conditions within a Single market.

General equilibrium : Analysis of the effects of changes in other markets. General equilibrium Analysis attempts to look at the economy as a whole.

4.6 For Further reading

1) Lewis C.Solmon. Microeconomics
2) D.S.Watson: Prince theory and Its uses
3) Wonnacott and Wonnacott: Economics
4) R.G.Lipsey: An Introduction to Positive Economics
5) Samuelson : Economics

4.7 Review Questions

1) Examine the significance of equilibrium analysis in economics
2) Distinguish between Partial equilibrium and general equilibrium. How are they related to each other?
3) Construct a simple general equilibrium model.

NOTES

ಆದೇಶ ಸಂಖ್ಯೆ : ಕರಾಮುವಿ/ಸಿಪಾವಿ/4/517/2006–07 ದಿನಾಂಕ : 26/8/2006
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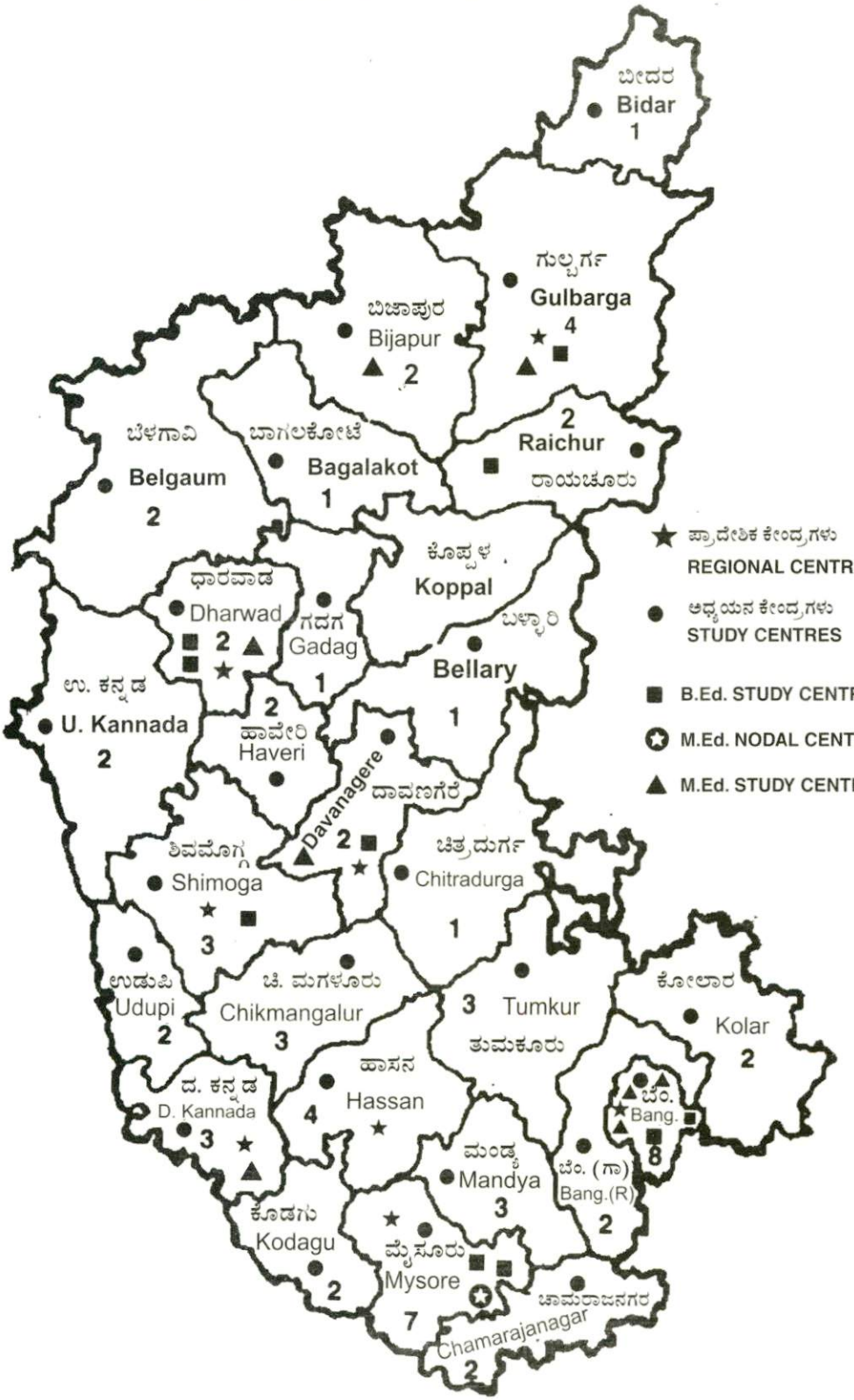

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