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Econometrics coined in 1926 by <sup>professor</sup> Frisch.

Econometrics :-

Introduction :-

Research is indispensable to gauge the nature and magnitude of the problem. The technique of the research may vary considerably from one subject to another. Testing of theory against fact has from come up to stay as the most important and essential part of all physical and social-sciences.

Economics also deals with such researches and use the statistical technique for analysis of economic problem which becomes inevitable. its study is widely spread and ~~encompass~~ embraces variety of economic problem it is formulated in mathematical terms.

Definition :-

origin of econometrics :-

Professor Ragner Frisch, a <sup>Norwegian</sup> economist and statistician, first of all, named <sup>the</sup> science as econometrics in 1926.

~~Econometrics~~, Before the 1<sup>st</sup> world war,



econometrics emerged as independent discipline studying economic phenomenon.

It gained recognition and attention after the world war. The methods were developed in western capitalistic countries. Hence it suits capitalistic states. Later on, with <sup>the</sup> development of socialistic society and controlled economy. The econometric tools were also developed to suit socialistic society.

In 1931, due to the necessity of econometric work, econometric society was formed founded.

Now a days, econometrics is playing a major role in solving the problems of all types of economics.

Definition:

Econometrics is science of <sup>measurement of</sup> economic measurement, which attempts to establish quantitative relationship between economic variable with the aid of theory of statistics.



According to professor Oskar Lange "econometrics is a science which deals with the determination of statistical methods of concrete quantitative laws occurring in economic life".

According to professor G. Tinbergen, "econometrics consists of application of mathematical economic theory and statistical procedure to economic data in order to establish numerical results, in the field of economics and to verify economic theorems".

According to professor Teh-wei-hue, "econometrics is a branch of economic that uses mathematical and statistical tools to analyse economic phenomena".

By professor J. L. Murphy, "econometrics is concerned with the analysis of measures of economic activity".

The econometrics can be represented in the form of following venn-diagram.



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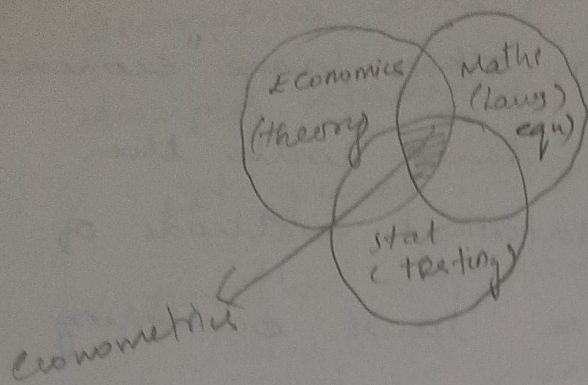
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In the above diagram, the shaded portions represent the econometrics, which is an integration of three subjects namely, economics, mathematics & statistics.

Objectives of econometrics :-

★ The main objective of econometrics is to give ~~emp~~ empirical content to economic theory. By empirical study, econometric explains the economic laws quantitatively.

★ The another objective is to analyse the forthcoming period (i.e. to forecast the economic phenomena.)

★ Econometrics has twin purposes First to serve the economic theories, second to verify the economic theories.



\* It has to estimate the parameters of the relationship among different economic variable. i.e. to test the hypothesis and estimate the parameter.

\* It also establishes the relationship in the field of economic study.

Characteristic of econometrics :-

\* Econometric theory is mainly concerned with quantitative relationships among economic variables. Such quantitative statements are usually expressed in the form of equations with specified numerical coefficients.

- 1) Relevance
- 2) simplicity
- 3) Theoretical plausibility
- 4) Explanatory ability
- 5) Accuracy of coefficients
- 6) Forecasting.

\* These equations must have some desirable characteristics.

They are

- 1.) Relevance
- 2.) simplicity
- 3.) Theoretical plausibility
- 4.) Explanatory ability
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1.) Relevance :-

The study is based on equations. Hence it should be relevant to the phenomena.

2.) simplicity :-

The equation should be simple to understand as each equation represents a special feature of the problem.

3.) Theoretical plausibility :-

It is difficult to know the whole economic theory. It is necessary that the equations should be consistent and should consider the relevant part of the study.

4.) Explanatory ability :-

The equations relating to the problem should be consistent with the available relevant data.

Sometimes the given set of data may not be relevant for the given equation. Hence it is expected that the equation should be clear and



should explain the wider range of data.

5) Accuracy of coefficients:

The coefficients of a equation affect the economic theories. Hence it should be accurate.

6) Forecasting ability:

The relative equation should be able to forecast the future as econometric study is not concerned with present alone. Its main objective is to analyse the future also.

scope of econometrics :-

\* Applications of econometrics is expanding constantly it includes simple as well as sophisticated mathematical and statistical techniques.

\* Econometrics is the application of specific methods in the general field of economic science.

\* It plays a service role to

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economic analysis by establishing new relationships and theories. It also serves the policy makers.

\* Econometrics is widely used in policy formation by governments, businessmen and other economic thinkers.

suppose the government want to devalue its currency for ~~estimating~~ to correct the balance of payment position. For that, the government is immediately concerned with price elasticities of imports and exports. These elasticities are to be estimated with the help of demand function. Thus econometric tools are applied.

suppose a producer wants to maximize <sup>its</sup> ~~his~~ profit he will choose the level of production which gives minimum cost and maximum output with the help of econometric methods.

The effects of taxation on consumers or effects of government expenditure on consumers, standard of living also comes



under econometric analysis.

The plan economy can be solved with the help of econometrics, <sup>that is</sup> allocation of resources optimally.

Demand functions, price elasticities, help a producer to choose his field of investment.

Econometrics is also helpful to establish new relationships and prove old theorems.

~~Eco~~ Econometric tools helps to analyse the type of market regarding economic phenomena.

Limitations of econometrics :-

\* Econometric method is applicable only to quantifiable phenomena. It throws

Very little light on qualitative problems.

\* Errors may arise due to wrong assumptions about the relationships among the variables.

\* The main difficulties of econometrics are statistical as statistical method are based on certain assumptions which are not true with economic data.



- ★ Mathematical model are inadequate.
- ★ Econometric method study the phenomena in a abstract manner they do not help in moral judgement.
- ★ Econometric methods are time consuming, tedious and complex.
- ★ Econometric study has to pass through different stages which requires skill.
- ★ Economic method needs continuous checks. Hence it cannot be applied one for all.

Relationship between economic theory mathematical and statistical.

Economic theory:-

Economic theory make statements or hypothesis that are quantitative in nature.

Mathematical :-

Mathematical economic is to express economic theory in mathematical form. It assumes that economic relationship



it exact like economic theory.

Economic statistic :-

It is mainly concerned in collecting, processing and presenting economic data in the form of diagrams and tables. it is mainly disoerspective aspect of economics it does not provide numerical estimate.

Mathematical statistics :-

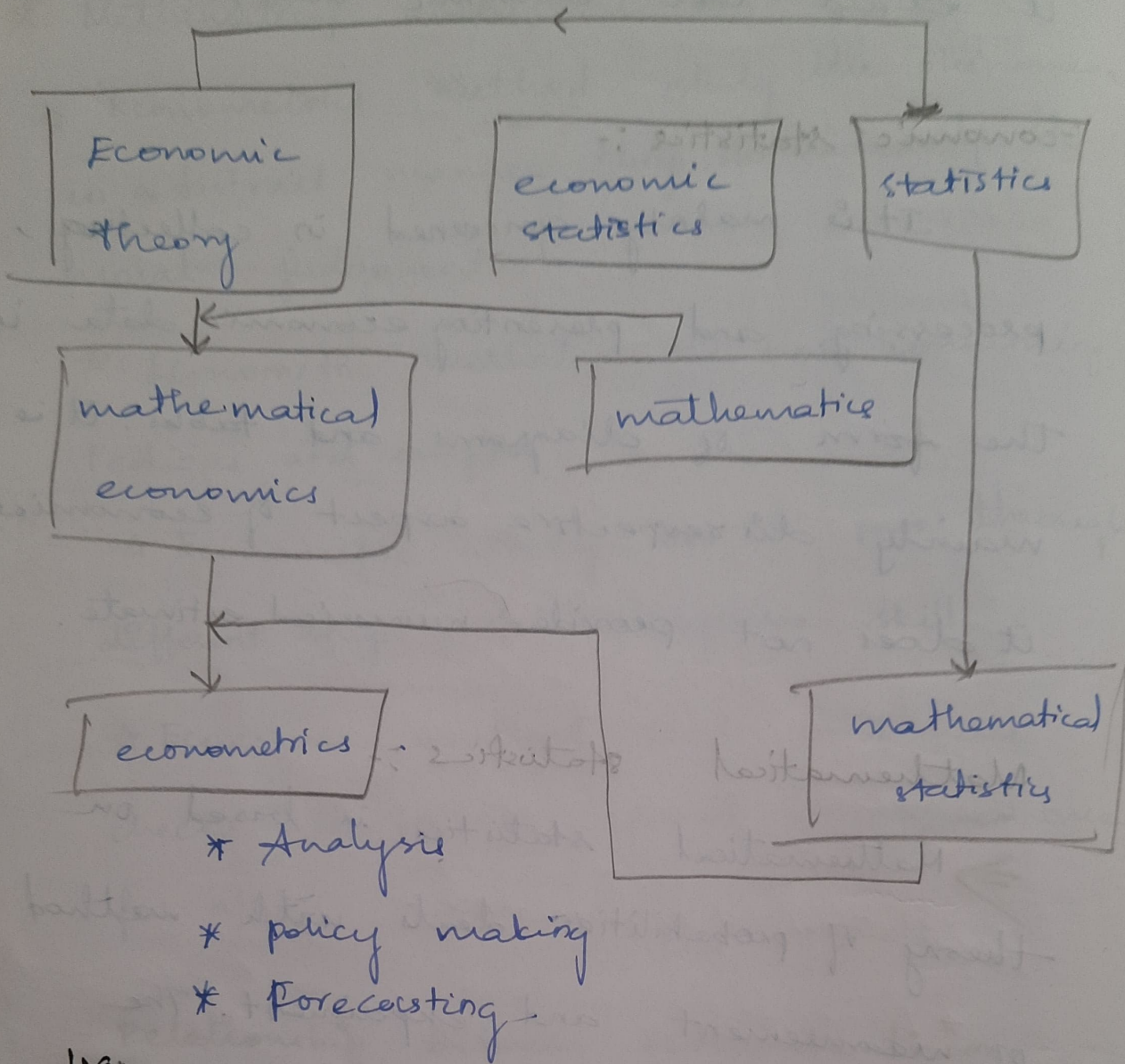
⇒ Mathematical statistics is based on theory of probabilities deals with method of measurement and experiment. The ideas of mathematical statistics are applied in the problem of economic life these applied

⇒ statistical methods are called econometric methods.

⇒ Thus econometrics blends the elements of economic theory, mathematics and statistical inference to provide



# unified picture of economics.



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Economic and econometric model :-

\* Economic theory is mainly concerned with relationships among economic variables. The economic theory can be regarded as collection of relations among variables. It is very important to understand the theory and to have concrete and still later to have a concrete well-defined mathematical model.



\* Model is a simplification of reality. An economic model is a logical representation of a theoretical knowledge about economic analysis.

\* usually a model takes the form of system of equations with certain assumptions among interdependent variables. Thus a model establishes the main variables involved and connected by means of mathematical statements which points out the basic features of the problem and denotes a set of hypothesis.

\* An econometric model denotes a set of hypothesis that permits statistical inference from the particular data under review.

\* Econometric model must specify the stochastic <sup>chance</sup> elements that are supposed to enter into the observation.

\* For econometric model, the understanding of what is relevant to the particular observation is more important than wide knowledge of economic theory.

\* Econometric model includes partial analysis which ~~is obj~~ can be obtained on



available data.

\* Econometric models are designed to forecast about economic phenomena and finally helps in policy formation. Hence the models are called policy models.

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In econometric modelling process, number of concepts and terms are used. Few of them are fundamental in nature.

The requirements for a satisfactory use of econometric model are under four heading.

First 1) Variables

2) Equations

3) Data

4) Graphs

\* Variable:

A variable can be \* quantitative

\* qualitative

If the observations are expressed numerically



(14)

It is quantitative variable. such entities are price, demand, supply, income, consumption, production, profit, wages etc.

Economic concepts which are qualitative characteristic are qualitative variables. They do not have direct cardinal measurement. For example, literary, rural, urban etc.

To develop a complete model, it is necessary to describe the variables used in the model. They are

- 1) Endogenous Variable
- 2) Exogenous Variable
- 3) lagged variable.
- 4) ~~pre~~ pre-determined variable.

\* Endogenous variable :-

The ~~variables~~ variables whose values are required to be explained or predicted are called endogenous variables.

Example, National income, interest rate, quantity demanded etc.



(48)

Exogenous variables :-

The variable whose values are not to be determined within the system but they are assumed to be known in advance are called exogenous variables.

Example, money supply, tax rate, time etc.

Lagged variables :-

These are the lagged values of endogenous variable. For example,

demand may not depend not only on current period price  $(P_t)$  but also on

price of the previous period  $(P_{t-1})$ .

Here  $P_{t-1}$  is a lagged variable.

pre-determined variables :-

These variables include both endogenous and exogenous variable. Consider the supply function

$$Q_s = \beta_0 + \beta_1 P + \beta_2 F + \beta_3 W + u.$$



Here  $P$  = price level.

$F$  = fertilizer

$W$  = weather conditions

~~$U$  =~~

In the above equation  $F$  and  $W$  are ~~exogenous~~ <sup>exo</sup> endogenous variables.  $P$  is endogenous variables.

equation :-

Equation is a statement of equality between two mathematical arguments. It contains one or more variables the coefficients and exponents associated with the variables.

Economic equations contain the following four types namely,

- Behavioural equation
- Definitional equation
- Technological equation
- Institutional equation.

• Behavioural equation:-

Behavioural equations describes the action of individual or groups or firms in the



economy.

Example demand function, consumption function, investment function etc.

Definitional equation :-

Equations which assumes that the relationship between the variables is true by its definition is called definitional equation.

Example,

$$Y_t = C_t + I_t + G_t + X_t$$

Here  $Y_t$  = Gross national product

$C_t$  = personal consumption expenditure

$I_t$  = Gross private domestic investment.

$G_t$  = Government expenditure

$X_t$  = Net export.

Technological equations :-

These are the relationships among the descriptions of the production process in the economy.



Example, production function of any sector.

### Institutional equation

The institutional equation in bank reserves, tax laws takes the form of institutional equations.

Example, Demand deposit,

$$D = \beta_0 R.$$

Here  $D =$  Demand deposit  
 $R =$  total reserves.

### 37) Data :-

Another requirement of the model is to have a good data. They are generally of the following types:-

- ★ Time series
- ★ cross-section data
- ★ pooled data
- ★ panel data
- ★ Engineering data

#### ★ Time series data :-

This data gives information about numerical value of variable over a period



of time.

\* Cross-section data :-

These data give information on one or more variables collected at the given point of time. Data on household expenditure at one point

\* of time.

\* pooled data :-

It is a combination of time series and cross-section data.

\* panel data :-

These types of data are collected from repeated surveys of a single sample at different point of time.

\* Engineering data :-

The data provides the information about technical requirements in the production process.

Example, Information regarding input output relation in a firm.



Graph :-  
Graphical technique :-

A verbal statement between economic variables can be reduced to a mathematical expression which in turn can be impressed as diagrams or graphs.

Graphs are the visual-aids enabling to trace functional relationship example, supply curve, demand curve, consumption function etc.

are familiar from the study of economic theory.

$$Y = a + b \cdot X$$

The above function is linear and the graph is a straight line. The relationship between X and Y takes the form:

- 1) Deterministic
- 2) Stochastic