



# **Econometrics Models**

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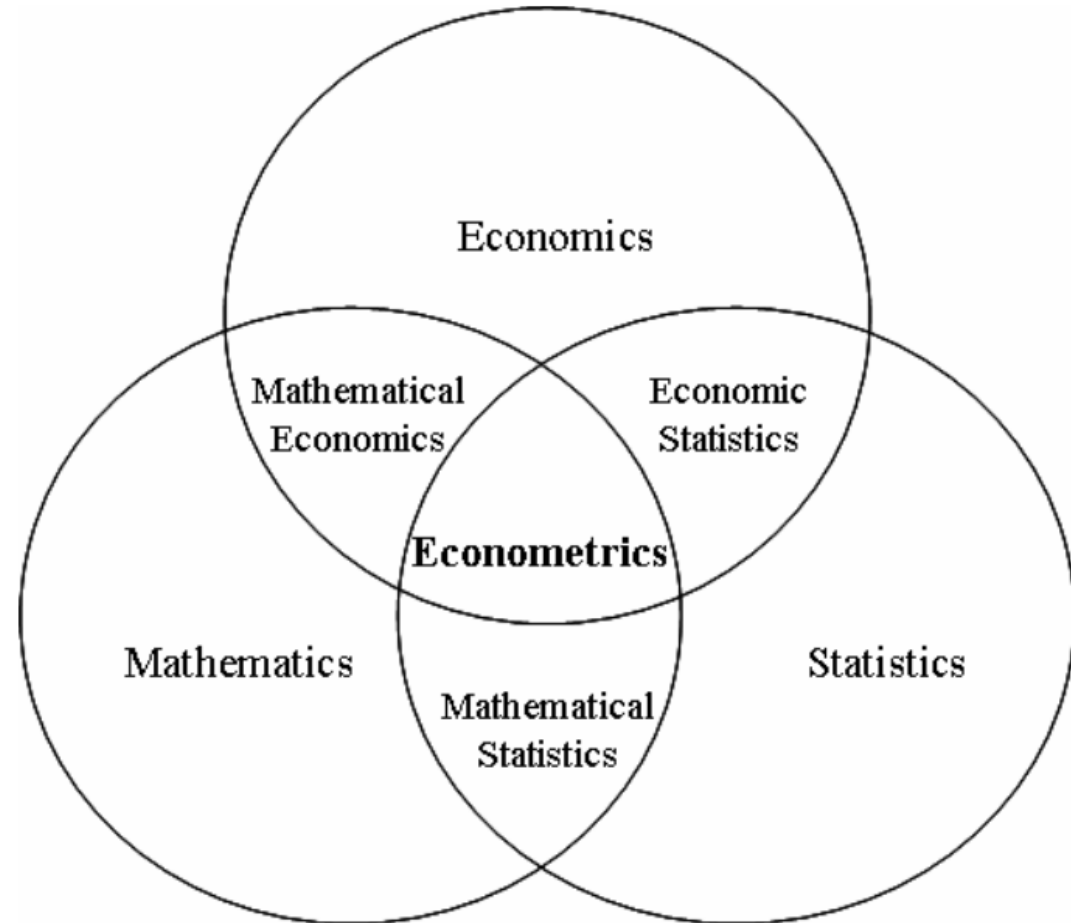
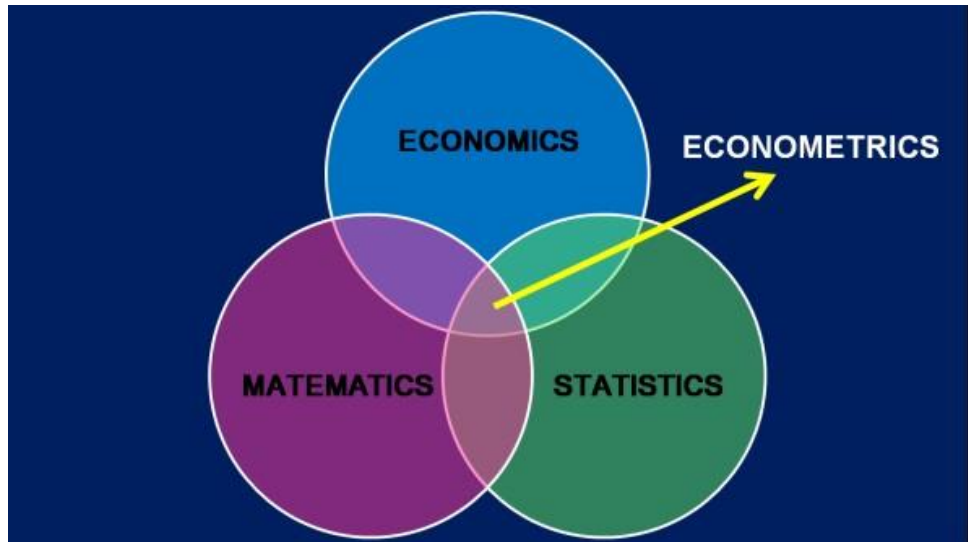
Lect. 1



# Ch. 1. Introduction and Econometrics Modelling.

## What is Econometrics?

Econometrics is a mixture of economics, mathematics and statistics as illustrated in Figure below:



## Definition of Econometrics

- **Econometrics** is a set of techniques for measuring economic relationships. What is an economic relationship? It is a relationship among economic variables, where an economic variable is one that measures some aspect of the economy.
- Econometrics is the use of statistical and mathematical models to develop theories or test existing hypotheses in economics and to forecast future trends from historical data.
- economic theory, makes statements or hypotheses that are mostly qualitative in nature. Only econometrics gives empirical or numerical content to most economic theory. The main concern of mathematical economics is to express economic theory in mathematical form (equations) without regard to measurability or empirical verification of the theory. Econometrics, as noted previously, is mainly interested in the empirical verification of economic theory.

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## **Relationship of econometrics with other sciences**

- Economics is classified as a social science which deals with human wants and their satisfaction. It is related to other like politics, history, ethics and psychology, all of these disciplines study the behaviour of human beings individually.

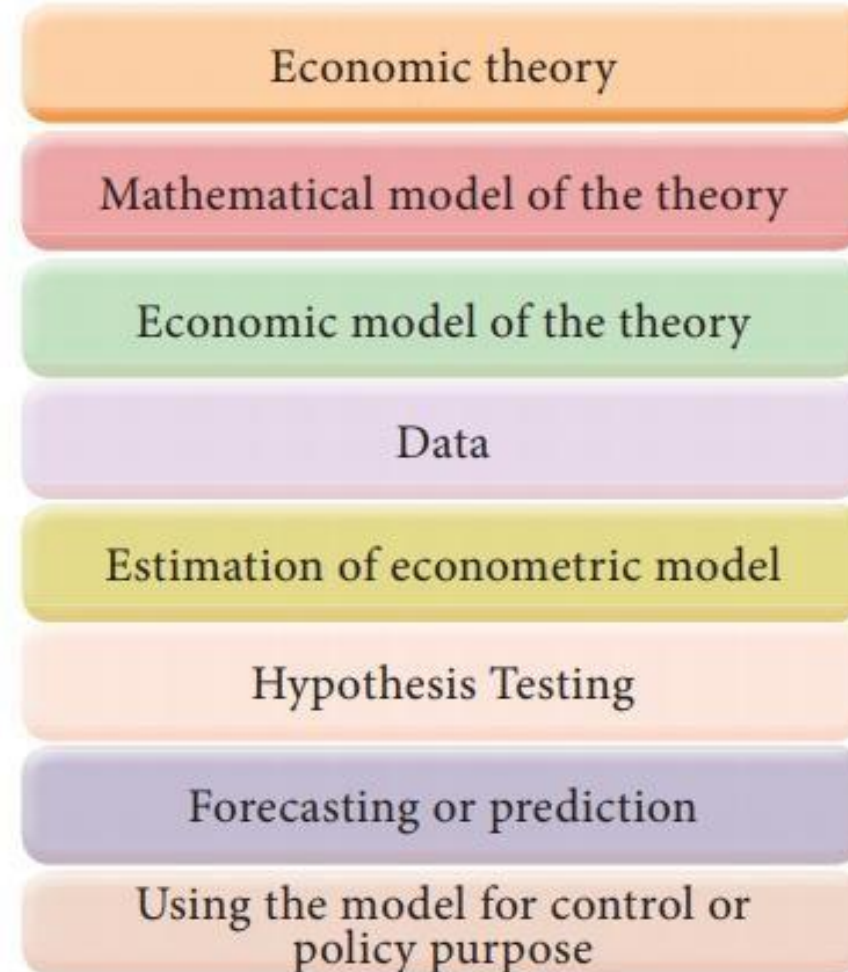
## **Methodology of Econometrics**

Traditional econometrics methodology proceeds along the following lines:

1. Statement of economic theory.
2. Specification of the mathematical model of the theory.
3. Specification of the econometric model of the theory.
4. Obtaining the data.
5. Estimation of the parameters of the econometric model.
6. Hypothesis testing.
7. Forecasting or prediction.
8. Using the model for control or policy purposes.



# Methodology of Econometrics



## Terminology

Y

Dependent variable

Explained variable

Predictand

Regressand

Response

Endogenous

Outcome

Target (controlled) variable

Output

X

Independent variable

explanatory variable

Predictor

Regressor

stimulus

Exogenous

Covariate

Control variable

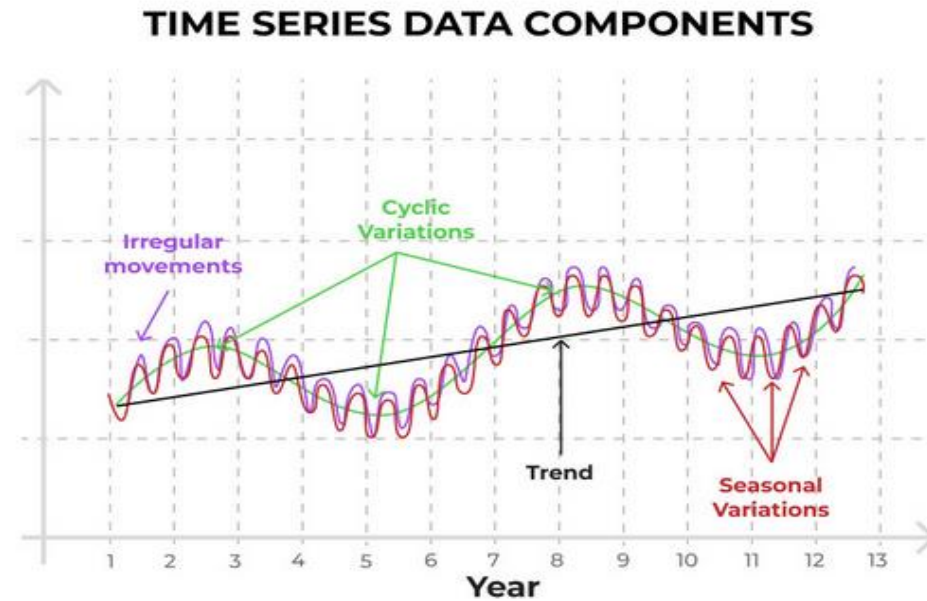
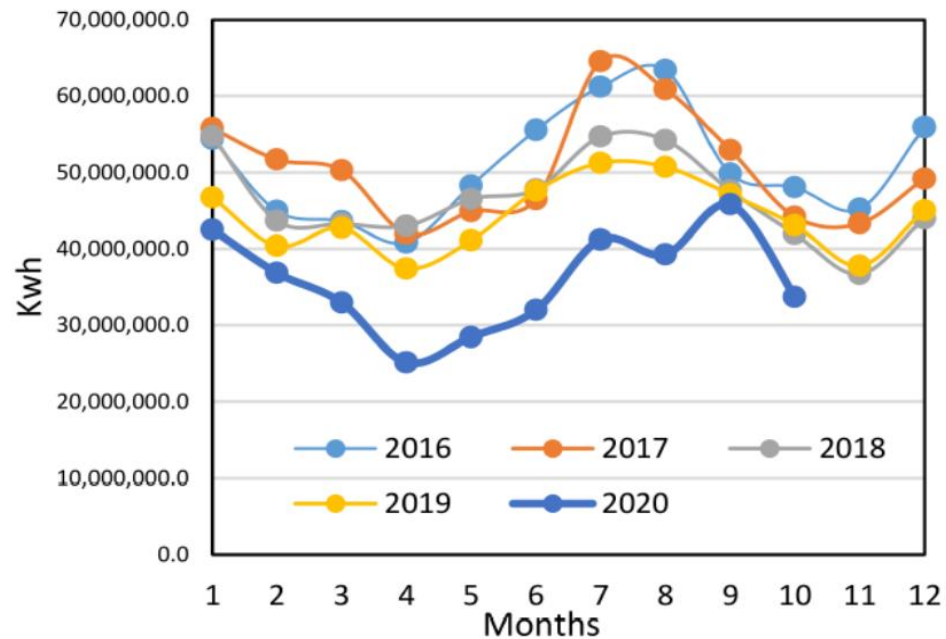
Input



# Types of Economic data (Data and Variables)

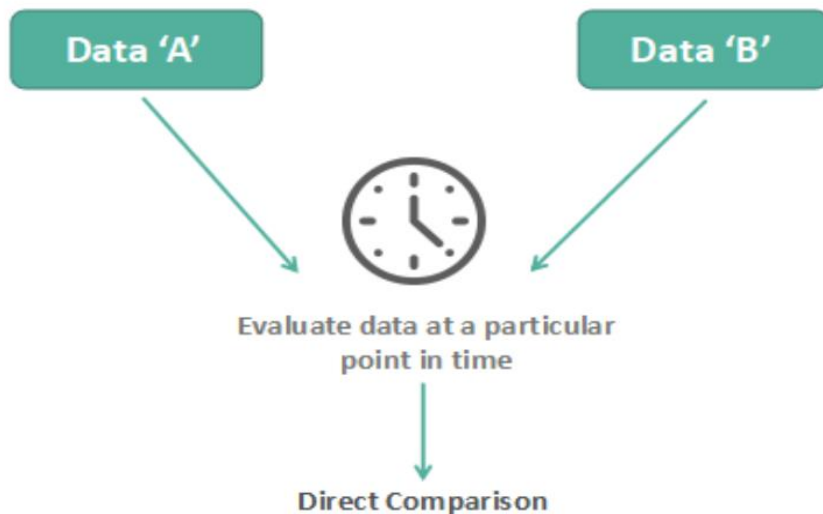
Various types of data is used in the estimation of the model:

1. Time Series Data / Time series data gives information about the numerical values of variables from period to period and are collected over time. A time series is a set of observations on the values that a variable takes at different times. Such as data of daily, weekly, monthly, quarterly, annually, quinquennially or decennially

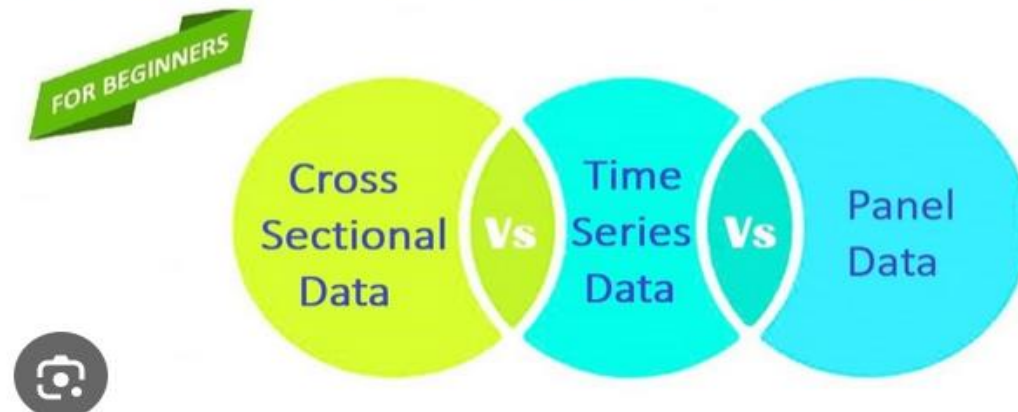


2. Cross-Sectional Data / consists of a sample of individuals taken at a given moment of time. It refers to observations of many different individuals (subjects, objects) at a given time, each observation belonging to a different individual. The key difference between time series and cross sectional data is that the time series data focuses on the same variable over a period of time while the cross sectional data focuses on several variables at the same point of time.

### Cross-Sectional Data Analysis

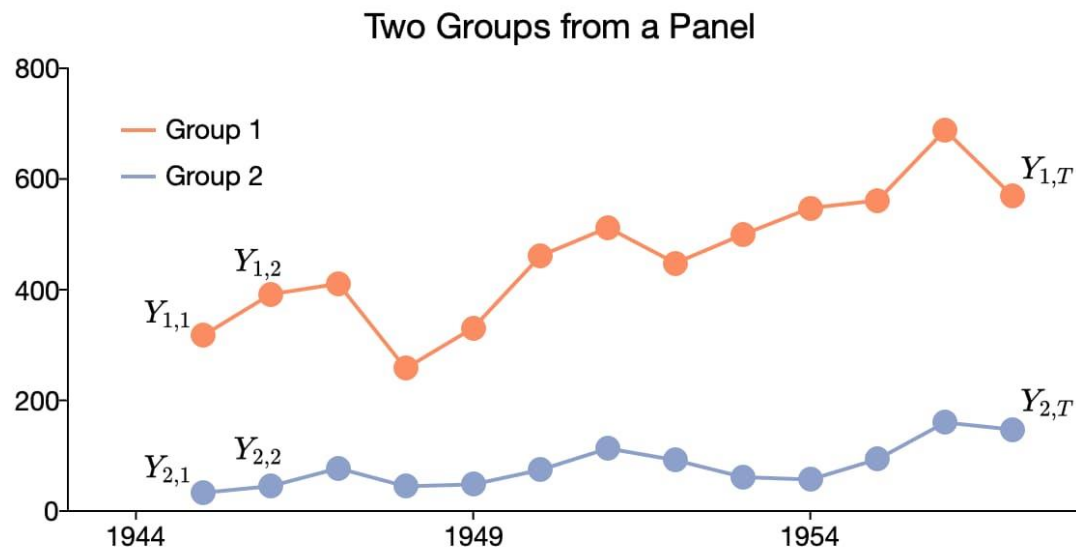


## Types of Data: Cross Sectional, Time Series & Panel Data





3. Panel Data or Pooled Data / The panel data are the data from a repeated survey of a single (cross-section) sample in different periods of time. Panel data refers to samples of the same cross-sectional units observed at multiple points in time. It is a collection of quantities obtained across multiple individuals, that are assembled over even intervals in time and ordered chronologically. A panel-data observation has two dimensions:  $Y_{it}$  where  $i$  runs from 1 to  $N$  and denotes the cross-sectional unit and  $t$  runs from 1 to  $T$  and denotes the time of the observation.



Time	$Y_1$	$Y_2$	$Y_N$
1	$Y_{11}$	$Y_{21}$	$Y_{N1}$
2	$Y_{12}$	$Y_{22}$	$Y_{N2}$
3	$Y_{13}$	$Y_{23}$	$Y_{N3}$
4	$Y_{14}$	$Y_{24}$	$Y_{N4}$
⋮	⋮	⋮	⋮
$T-1$	$Y_{1T-1}$	$Y_{2T-1}$	$Y_{NT-1}$
$T$	$Y_{1T}$	$Y_{2T}$	$Y_{NT}$



4. Dummy Variable Data / When the variables are qualitative in nature, then the data is recorded in the form of the indicator function. The values of the variables do not reflect the magnitude of the data. They reflect only the presence/absence of a characteristic. For example, variables like religion, sex, taste, etc. are qualitative variables. The variable `sex` takes two values – male or female, the variable `taste` takes values-like or dislike etc. Such values are denoted by the dummy variable. For example, these values can be represented as ‘1’ represents male and ‘0’ represents female. Similarly, ‘1’ represents the liking of taste, and ‘0’ represents the disliking of taste.

Gender
Female
Male
Male
Female



Gender
1
0
0
1

Responses
YES
NO
YES
YES
NO



YES_Dummy
1
0
1
1
0



## The Econometric model

- A model is a simplified representation of a real-world process. It should be representative in the sense that it should contain the salient features of the phenomena under study. In general, one of the objectives in modeling is to have a simple model to explain a complex phenomenon. Such an objective may sometimes lead to oversimplified model and sometimes the assumptions made are unrealistic. In practice, generally, all the variables which the experimenter thinks are relevant to explain the phenomenon are included in the model. Rest of the variables are dumped in a basket called “disturbances” where the disturbances are random variables. This is the main difference between economic modeling and econometric modeling. This is also the main difference between mathematical modeling and statistical modeling. The mathematical modeling is exact in nature, whereas the statistical modeling contains a stochastic term also.
  
- An econometric model consists of
  1. a set of equations describing the behavior. These equations are derived from the economic model and have two parts – observed variables and disturbances.
  
  2. a statement about the errors in the observed values of variables.
  
  3. a specification of the probability distribution of disturbances

