ECONOMETRICS I

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Topic 1

Introduction to Econometrics

Learning objectives

- Define the scope of econometrics
- Explain the key goals of econometrics
- Distinguish between the divisions of econometrics
- Highlight different types of data for empirical analysis
- Describe the methodology of econometrics
- Describe the desirable properties of an econometric model
- Apply the criteria for evaluating parameters of an econometric model

1.1 Definition of econometrics

- Econometrics encompasses economic measurement.
- Applies itself to empirical measurement of relationships postulated by economic theory.
- Econometrics is a social science in which the tools of
  - Statistics
  - Economic theory and
  - Mathematics

  are applied to the analysis of economic phenomena.

1.1 Scope of econometrics

1. Econometrics provides empirical verification of economic theory.
   - Economic theory makes statements or hypotheses that are mostly qualitative in nature e.g. an inverse relationship between price (P) and quantity demanded (Qd) (law of demand). Theory does not provide numerical measure of strength of the relationship between P and Qd. Econometrics gives empirical content to most economic theory.

1.1 Scope of econometrics

2. Econometrics uses statistical data that may contain errors of measurement. Thus econometrics develops special methods of dealing with such errors.
3. Knowledge of econometrics is useful in estimating complex functions e.g. demand functions, consumption functions etc.
4. Econometrics has become an integral part of training in economics and business.

1.2 Goals of econometrics

1. Making policies: To obtain reliable estimates in economic relationships for policy decisions e.g. estimates for demand for basic commodities for efficient production decisions to be made.
2. Testing economic theory: to verify economic theory and hypothesis establishing information e.g. testing the law of demand, law of supply etc.
3. Forecasting: Use data to make inference about economic phenomena e.g. economic growth rate, population growth rate etc.

1.3 Division of econometrics

1. Theoretical econometrics: Theorists develop new techniques for estimation and hypothesis testing and analyze the consequences of applying particular methods when the assumptions that justify those methods are not met.
2. Applied econometricians: These are the users of the techniques developed, they analyze data. They estimate important quantities, analyze economic outcomes, markets or individual behavior, test theory and provide forecasts.

1.3 Division of econometrics

3. Microeconometrics: Characterized by its analysis of cross-section, panel data and focus on individuals, households, firms and micro-level decision makers.
4. Macroeconometrics: Involved in the analysis of time-series data of broad aggregates such as price levels, money supply, exchange rates, output etc.
5. Financial econometrics: Concerned with long time series data and occasionally big panel data sets that focus on individual behavior e.g. investment behaviour.

1.4 Types of data for empirical analysis

1. Time series data: Collected over a period of time e.g. GDP, money supply, exchange rates, stock prices, unemployment (UE) rate etc. Can be collected on a daily, weekly, quarterly or annual basis.
2. Cross-section data: Data for one or more variables collected at one point in time e.g. Kenya National Bureau of Statistics (KNBS) census, every ten years.

1.4 Types of data for empirical analysis

3. Pooled data: Has elements of time series and cross-section data e.g. GDP growth rate for ten countries for a period of twenty years.
   - Data on GDP growth rate for each country for the twenty year period will form time series data.
   - Data on GDP growth rate for ten countries for any single year will be cross-sectional data.
   - Panel/longitudinal data: a special type of pooled data in which the same cross-sectional unit is studied over time.

NB: Pre-requisites for econometric study include good quality and large quantity of data.

1.5 Methodology of econometrics

1. Creating a statement of theory or hypothesis.
2. Collecting data.
3. Specifying the mathematical model of theory.
4. Specifying the econometric model of theory.
5. Estimating the parameters of the model.
6. Model specification testing.
7. Testing the hypothesis of the model.
8. Using the model for prediction or forecasting.

1.6 Desirable properties of an econometric model

1. Theoretical plausibility: The model must adequately describe the economic phenomena to which it relates.
2. Explanatory ability: The model should have the ability to explain the observations of the actual world.
3. Accuracy of estimates of the model parameters: The parameters should approximate as best as possible the true parameters of the structural model i.e. they should be efficient, consistent and unbiased.

1.6 Desirable properties of an econometric model

4. Forecasting ability: The model should provide a satisfactory prediction of future values of dependent variables.
5. Simplicity: The model should represent the economic relationships with maximum simplicity.

These properties prove that econometrics is scientific because pre-requisites for scientific studies entail the ability for verifying results and producing accurate forecasts.

1.7 Criteria for evaluating parameters of an econometric model

1. **Economic apriori criteria**
   - Whether signs and magnitudes of parameters conform to economic theory.
   - Unexpected signs and implausible magnitudes lead to rejection of hypothesis.
2. **Statistical criteria – 1st order tests**
   - Tests for statistical reliability of estimates
   - Includes measure of variability e.g. standard errors
   - Includes correlation coefficients and coefficients of determination
   - Measures statistical reliability of estimates
   - It is secondary to economic theory thus the economic apriori criteria must first be satisfied
3. **Econometric criteria – 2nd order tests**
   - Checks whether OLS assumptions are satisfied.
   - Determines reliability of statistical criteria
   - Helps establish whether estimates satisfy BLUE properties
   - Includes tests for multicollinearity, heteroskedasticity and autocorrelation