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What Is Econometrics?

Econometrics means the measure of things in economics such as economies, economic systems, markets, and so forth. Likewise, there is biometrics, sociometrics, anthropometrics, psychometrics and similar sciences devoted to the theory and practice of measure in a particular field of study. Here is how others describe econometrics.

Gujarati (1988), Introduction, Section 1, What Is Econometrics?, page 1, says:

Literally interpreted, *econometrics* means "economic measurement." Although measurement is an important part of econometrics, the scope of econometrics is much broader, as can be seen from the following quotations.

Econometrics, the result of a certain outlook on the role of economics, consists of the application of mathematical statistics to economic data to lend empirical support to the models constructed by mathematical economics and to obtain numerical results. ~~ Gerhard Tintner, *Methodology of Mathematical Economics and Econometrics*, University of Chicago Press, Chicago, 1968, page 74.

Econometrics may be defined as the quantitative analysis of actual economic phenomena based on the concurrent development of theory and observation, related by appropriate methods of inference. ~~ P. A. Samuelson, T. C. Koopmans, and J. R. N. Stone, "Report of the Evaluative Committee for *Econometrica*," *Econometrica*, vol. 22, no. 2, April 1954, pages 141-146.

Econometrics may be defined as the social science in which the tools of economic theory, mathematics, and statistical inference are applied to the analysis of economic phenomena. ~~ Arthur S. Goldberger, *Econometric Theory*, John Wiley & Sons, Inc., New York, 1964, page 1.

Econometrics is concerned with the empirical determination of economic laws. ~~ H. Theil, *Principles of Econometrics*, John Wiley & Sons, Inc., New York, 1971, page 1.

The art of the econometrician consists in finding the set of assumptions that are both sufficiently specific and sufficiently realistic to allow him to take the best possible advantage of the data available to him. ~~ E. Malinvaud, Statistical Methods of Econometrics, Rand McNally & Co., Chicago, 1966, page 514.

Gujarati (1988), Introduction, Section 3, Methodology of Econometrics, says: Broadly speaking, econometric analysis proceeds along the following

lines.

- 1. Statement of theory or hypothesis.
- 2. Specification of the econometric model to test the theory.
- 3. Estimation of the parameters of the chosen model.
- 4. Verification or statistical inference.
- 5. Forecasting or prediction.
- 6. Use of the model for control or policy purposes.

Maddala (1992), Chapter 1. What Is Econometrics?, Section 1.1. What Is

Econometrics?, pages 1-2, says:

Literally speaking, the word "econometrics" means "measurement in economics." This is too broad a definition to be of any use because most of economics is concerned with measurement. … What we mean by *econometrics* is:

The application of statistical and mathematical methods to the analysis of economic data, with a purpose of giving empirical content to economic theories and verifying them or refuting them. In this respect econometrics is distinguished from mathematical

economics, which consists of the application of mathematics only, and the

theories derived need not necessarily have an empirical content.

Before any statistical analysis with economic data can be done, one needs a clear

mathematical formulation of the relevant economic theory.

Economic theory is rarely informative about functional forms. We have to use

statistical methods to choose the functional form, as well.

Maddala (1992), Chapter 1, sections:

1.1 What Is Econometrics?

1.2 Economic and Econometric Models

- 1.3 The Aims and Methodology of Econometrics (Figure 1.1)
- 1.4 What Constitutes a Test of an Economic Theory?

Summary and an Outline of the Book

The emphasis has now shifted to specification testing, diagnostic checking model comparison, and an adequate formulation of the expectational variables given the pervasive role of expectations in almost all economic theories.

Hill, Griffiths and Judge (2001), Chapter 1 Introduction to Econometrics, Section 1.2

What Is Econometrics?, pages 2-3, says:

Each of the above equations is a general economic model that describes how we visualize the way in which economic variables are interrelated. Economic models of this type *guide our economic analysis*.

For most economic decision or choice problems, it is not enough to know that certain economic variables are interrelated, or even the direction of the relationship. In addition, we must understand the magnitudes involved. That is, we must be able to say *how much* a change in one variable affects another.

Econometrics is about how we can use theory and data from economics, business, and the social sciences, along with tools from statistics, to answer "how much" type questions.

Hill, Griffiths and Judge (2001), Chapter 1 Introduction to Econometrics, Section 1.5 Statistical Inference, pages 9-10, says:

The phrase **statistical inference** will appear often in this book. By this we mean we want to "infer" or learn something about the real world by analyzing a sample of data. The ways in which statistical inference are carried out include:

- Estimating economic parameters, such as elasticities, using econometric methods.
- Predicting economic outcomes.
- Testing economic hypothesies.

Hill, Griffiths and Judge (2001), Chapter 1 Introduction to Econometrics, Section 1.6

A Research Format, pages 10-11, says:

- 1. It all starts with a problem or question.
- 2. Economic theory gives us a way of thinking about the problem.
- 3. The working economic model leads to an econometric model.
- 4. Sample data are obtained, and based on our initial assumptions, and our understanding of how the data were collected, a desirable method of econometric analysis is chosen.
- 5. Estimates of the unknown parameters are obtained with the help of a statistical software package, predictions are made and hypothesis tests are performed.
- 6. Model diagnostics are performed to check the validity of assumptions we've made. For example, were all of the right-hand-side explanatory variables relevant? Was the correct functional form used?
- 7. The economic consequences and the implications of the empirical results are analyzed and evaluated. What economic resource allocations and distribution results are implied, are what are their policy-choice implications?

SUMMARY

As indicated by the above quotations, econometrics is concerned with more than measurement. More importantly, econometrics is a method of causal inference applied to economics. This method of causal inference is statistical inference combined with the

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logic of casual order. The combination of logic (classical binary), causality (in contrast to teleology) and experimentation (empiricism) makes econometrics a scientific method of inquiry. Inferential statistics, unlike descriptive statistics, requires a hypothesis for testing. The null hypothesis is based on the model equation and assumptions.

Econometric models are stochastic or probabilistic. They may be cross-sectional for many stocks in one time period, time-series for one group of stocks in many time periods, or panel which combines cross-section and time-series for many stocks in many time periods. The workhorse of econometrics is the Classical Linear Regression Model, which uses the Normal probability distribution (the well-known Bell curve) and is based on classical linear regression theory and the Gauss-Markov Theorem.

REFERENCES

Gujarati, Damodar N., 1988, *Basic Econometrics*, second edition. New York: McGraw-Hill.

Hill, R. Carter, William E. Griffiths and George G. Judge, 2001, *Undergraduate Econometrics*, second edition. New York: John Wiley & Sons.

Maddala, G. S., 1992, *Introduction to Econometrics*, second edition. New York: Macmillan Publishing Company.