Essential of Econometrics Chapter1 Summary

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May 7, 2015

Abstract

Research in economics, finance, management, marketing, and related discipline is becoming increas- ingly quantitative. Beginning students in these fields are concouraged, if not required, to take a course or two in econometircs - a field of study that has become quite popular. The purpose of this chapter is to give the beginner an overview of what econometrics is all about.

Introduction

What is Econometrics?

Simply stated, econometrics means economic measurement. Although quantitative measurement of economic concepts such as the gross national product, unemployment, inflation, imports, exports, etc. is very important, the scope of econometrics is much broader, as can be seen from the following definitions:

What is Econometrics?

- 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
- 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 constructd by mathematical economics and to obtai numerical results.

Why study econometrics?

Economic theory makes statements or hypotheses that are mostly qualitative in nature. “provide such numerical estimates” The main concern of mathematical economics is to express economic theory in mathematical form or equations without regard to measurability or empirical verification of the theory. Econometrics, as noted earlier, is primarily intereted in teh empirical verification of economic theory(empirical testing).

The methodology of econometrics

Broadly speaking, econometric analysis proceeds along the folowing lines:

- Statement of theory or hypothesis
- Specification of the mathematical model
- Specification of the statistical or econometric model
- Collection of data
- Estimation of the parameters of the chosen econometric model
- Tests of the hypothesis derived from the model
- Forecasting or prediction

Statement of theory or hypothesis

The first thing the econometrician does is find out what economic theory has to say about the effect of a price change on the quantity demanded, an effect enshrined in the famous law of demand. In short, there is an inverse relationship between the price of a compodity and its quantity demanded. Note carefully that this law holds true provided all other things.

Specificaition of the mathematical model

The law does not tell whether the relationshi between quantity (Q) and price (P). The relationship between Q and P is linear or nonlinear. If the relationship between Q and P is linear, it can be expressed as:

$$Q = B_1 + B_2 P$$

Specificaition of the mathematical model

That equation is an example of a mathematical model of relationship between Q and P. In such a model the variable appearing on the left-hand side of the equality sign is called the dependent variable and teh variable on teh right-had side is called the independent, or explanatory variable. We are trying to find out how quantity demanded changes as its price changes. Functionally, quantity demanded is dependent on price

Specificaition of the mathematical model

The job of the econometrician is to choose a suitable mathematical function or mathematical model to represent economic relationships between variables. For the present, simply note that equation is just one of the possible models to depict the relationship between Q and P

Specificaition of the mathematical model

The purely mathematical model of the demand function assumes an exact, or deterministic, relationship between quantity and price. In reality, most often, the relationship are inexact or statistical in nature.It seems that the relationship is approximately linear.

Specificaition of the mathematical model

$$Q = B_1 + B_2 P + u$$

Where u is called the random error term, or simply the error term.We let u represent all those force that affect Q but are not explicitly introduced in the model as well as purely random forces. That equation is an example of a statistical or econometric model.

Specificaition of the mathematical model

More precisely, it is an example of what is known as a linear regression model. Our concern is to explain the behavior of one variable, say Q in relation to the behavior of another variable, say, P, allowing for the fact that the relationship between the two is not exact because of the presence of other factors included in the error term, u.

Specificaition of the mathematical model

Notice that the econometric model is derived from the mathematical model, which shows that mathematical economics and econometrics are mutually complementary disciplines. This is clearly reflected in the definition of econometrics given at the outset.

Collection of data

There are three types of data that are generally available for empirical analysis.

- Time serise
- Cross-sectional
- Pooled, that is, combination of time series and cross-sectional

Forecasting or prediction

Step & Example

1. Statement of theory & The law of demand
2. Mathematical model of theory | $Q = B_1 + B_2 P (e.g.)$
3. Econometric model of theory | $Q = B_1 + B_2 P + u$
4. Collection of data | Table 1-1
5. Parameter estimation | $\hat{Q} = 76.05 - 3.88P$
6. Testing of hypothesis | Is $B_2 < 0$? (i.e., is the slope negative?)
7. Forecasting & What is Q if $P = 4.50$

Forecasting or prediction

$$\hat{Y} = 0.84801 + 0.61033X$$

Where Y is the average market return and X is the average yearly accounting rate, both averages computed over the period 1959 to 1974. As these results indicate, if the accounting rate increases by, say, 1 percent, on the average the market rate increases by 0.6 of 1 percent. As a noneconomic example, suppose a criminologist is interested in studying the relationship between the population density and the robbery rate.

Forecasting or prediction

$$\hat{Y} = 182.97 + 0.2616X$$

where Y = robbery rate and X = population density of the city. These results seems to suggest that the higher the population density, the higher the crime rate, other things remaining the same. The criminologist has to determine the reasons for the positive association between the robbery rate and the population density.

References

Gujarati (2014). Essentials of econometrics , McGraw-Hill, NY