

UNIT-I

Econometrics:

Econometrics is a combination of economic theory, mathematical economics and statistics, but it is a completely distinct from each one of these three branches of science.

Econometrics may be considered as the integration of economics, mathematics and statistics for the purpose of providing numerical values for the parameters of economic relationships and verifying economic theories. Starting from the relationships of economic theory, we express them in mathematical terms. (i.e.) \rightarrow We build a model] so that they can be measured. We then use specific methods, called econometric methods, in order to obtain numerical estimates of the coefficients of the economic relationships.

An example will take the above clear. Economic theory postulates that the demand for a commodity depends on its price, on the prices of other commodities, on consumer's income and on tastes. This is an exact relationship, because it implies that demand is completely determined by the above four factors, no other factor, except those explicitly mentioned, influences the demand. In mathematical economics we express the above abstract economic relationship of demand in mathematical terms.

Thus we may write the following demand equation.

$$Q = b_0 + b_1 \cdot P + b_2 P_0 + b_3 Y + b_4 t$$

Where

Q = Quantity demanded of a particular commodity

P = Price of the commodity

P_0 = Prices of other commodities

Y = Consumer's income

t = taste

b_0, b_1, b_2, b_3, b_4 = Co-efficients of the demand of equation

Goals of Econometrics:

We can distinguish three main goals of econometrics.

- (i) Analysis \Rightarrow i.e. \Rightarrow testing of economic theory
- (ii) Policy making \Rightarrow i.e. \Rightarrow Supplying numerical estimates of the co. efficients of economic relationships, which may be then used for decision making
- (iii) Forecasting \Rightarrow i.e. \Rightarrow Using the numerical estimates of the co. efficients in order to forecast the future values of the economic magnitudes.

1.) Analysis : Testing economic theory:

The earlier economic theories started from a set of observations concerning the behaviour of individuals as consumers or producers. Some basic assumptions were set regarding the motivation of individual economic units. Thus in demand theory it was assumed that the consumer aims at the maximization of his satisfaction (utility) from the expenditure of his income, given the prices of the commodities, similarly, producers were assumed to be motivated by maximisation of their profits.

Econometrics aims primarily at the verification of economic theories. In this case we say that the purpose of the research is analysis. i.e. ⇒ Obtaining empirical evidence to test the explanatory power of economic theories, to decide how well they explain the observed behaviour of the economic units.

2) Policy Making:

Obtaining numerical estimates of the co. coefficients of economic relationships for policy simulations.

In many cases we apply the various econometric techniques in order to obtain reliable estimates of the individual co. coefficients of the economic relationships from which we may evaluate the other parameters of economic theory.

(Marginal costs, Marginal revenues, etc).

The knowledge of the numerical value of these co. coefficients is very important for the decisions of firms as well as for the formulation of the economic policy of the government. It helps to compare the effects of alternative policy decisions.

3.2 Fore. casting.

The future values of economic magnitudes.

In formulating policy decisions it is essential to be able to forecast the value of the economic magnitudes.

For example, suppose the government wants to decide its employment policy. It is necessary to know what is the current situation of employment as well as what the level of employment will be, say, in five years time, if no measure what so ever is taken by the government. With econometric techniques we may obtain such an estimate of the level of employment. If this level is too low, the government will take appropriate measures to avoid its occurrence. If the forecast values of employment is higher than the expected labour force, the government must take different measures in order to avoid inflation.

Divisions of Econometrics:

Econometrics may be distinguished into two branches, theoretical econometrics and applied econometrics.

Theoretical econometrics includes the development of appropriate methods for the measurement of economic relationships.

As mentioned above, econometric techniques are basically statistical techniques which have been adapted to the particular characteristics of economic relationships.

Econometric methods may be classified into two groups. (1) single equation techniques, which are methods that are applied to one relationship at a time. and (2) simultaneous equation techniques, which are methods applied to all the relationships of a model simultaneously.

Applied econometrics includes the applications of econometric methods to specific branches of economic theory. It summarizes the problems encountered and the findings of applied research in the fields of demand, supply, production,

investment, consumption and other sectors of economic theory. Applied econometrics involves the application of the tools of theoretical econometrics for the analysis of economic phenomena and forecasting economic behaviour.

Desirable properties of an econometric model:

An econometric model is a model whose parameters have been estimated with some appropriate econometric technique.

The "goodness" of an econometric model is judged according to the following desirable properties:

(1) Theoretical plausibility:

The model should be compatible with the postulates of economic theory. It must describe adequately the economic phenomena to which it relates.

(2) Explanatory ability:

The model should be able to explain the observations of the actual world. It must be consistent with the observed behaviour of the economic variables whose relationship it determines.

(3). Accuracy of the estimates of the

Parameters:

The estimates of the coefficients should be accurate in the sense that they should approximate as best as possible the true parameters of the structural model.

(4). Forecasting ability:

The model should produce satisfactory predictions of future values of the dependent variables.

(5). Simplicity:

The model should represent the economic relationships with minimum simplicity. The fewer the equations and the simpler their mathematical form the better the model is considered.

Specification of the model:

The first, and the most important step the econometrician has to take in attempting the study of any relationship in mathematical form i.e. to specify the model with the economic phenomenon will be explored empirically. This is called the specification of the model.

It involves the determination of the dependent and explanatory variables which will be included in the model.

The priori theoretical expectations about the sign and size of the parameters of the function.

The mathematical form of the model (the number of equations, linear or non-linear form of these equations etc.)

The specification of the econometric model will be based on economic theory and on any available information relating to the phenomenon being studied.

Estimation of the model:

The estimation of the model is purely technical stage which requires knowledge of the various econometric methods, their assumptions, and the economic implications for the estimates of the parameters.

The stage of estimation includes the following steps.

(i) Gathering of statistical observations (data) on the variables included in the model.

(ii) Examination of the identification conditions of the function in which we are interested.

(iii) Examination of the aggregation problems involved in the variables of the function.

(iv) Examination of the degree of correlation between the explanatory variables.

(v) Choice of the appropriate econometric technique for the estimation of the function.

1.) Gathering Data for the estimation of the model:

The data used in the estimation of a model may be of various types

(i) Time series

(ii) Cross-section data

(iii) Panel data

(iv) Engineering data

(v) Data constructed by the econometrician.

2) Examination of the Identification of the function:

Identification is the procedure by which we attempt to establish that the co-efficients which we shall estimate by the application of some appropriate econometric technique are actually the true co-efficients of the function in which we are interested.

3) Examination of the Aggregation

Problems of the function:

Aggregation problems arise from the fact that we use aggregative variables in our functions. Such aggregative variables may involve

- (a) Aggregation over Individuals
- (b) Aggregation over Commodities
- (c) Aggregation over Time periods
- (d) Spatial Aggregation

(4) Examination of the degrees of correlation among the explanatory variables.

Most economic variables are correlated in the sense that they tend to change simultaneously during the various phases of economic activity. Income, employment, exports, imports, taxes tend to grow in booms and decline in periods of depression. Thus a certain degree of multicollinearity is inherent in the economic variables due to the growth and technological progress.

(5) Choice of the appropriate econometric technique.

The coefficients of economic relationships may be estimated by various methods which may be classified in two main groups.

(i) single equation techniques

These are techniques which are applied to one equation at a time. The most important are, the classical least squares (OLS) ordinary least squares method.

(ii) simultaneous - equation techniques.

These are techniques which are applied to all the equations of a system at once, and give estimates of the co. efficient of all the functions simultaneously.

Evaluation of estimates.

After the estimation of the model the econometrician must proceed with the evaluation of the results of the calculations. i.e. with the determination of the reliability of these results. The evaluation consists of deciding whether the estimates of the parameters are theoretically meaningful and statistically satisfactory. For this purpose we use various criteria which may be classified into three groups. Firstly, economic a priori criteria, which are determined by economic theory. Secondly, statistical criteria, determined by statistical theory. Thirdly, econometric criteria, determined by econometric theory.

(1) Economic 'A priori' Criteria:

These are determined by the principles of economic theory and refer to the sign and size of the parameters of economic relationships.

(2) Statistical Tests: First-order Tests:

These are determined by statistical theory and aim at the evaluation of the statistical reliability of the estimates of the parameters of the model. The most widely used statistical criteria are the correlation coefficient and the standard deviation of the estimates.

(3) Econometric Criteria: Second order Tests

These are set by the theory of econometrics and aim at the investigation of whether the assumptions of the econometric method employed are satisfied or not in any particular case.

The econometric criteria serve as second order tests.

From the above discussion, it should be clear that the evaluation of the results obtained from the estimation of the model, is a very complex procedure.

3 The econometrician must use all the above ~~data~~ criteria, economic, statistical and econometric, before one can accept or reject the estimates.

Forecasting Power of the estimated Model.

We know that the objective of any econometric research is to obtain good numerical estimates of the coefficients of economic relationships and to use them for the prediction of the values of economic variables. Forecasting is one of the prime aims of econometric research.

Before using an estimated model for forecasting the value of the dependent variable, we must assess by some way or another the predictive power of the model. It is understood that the model is economically meaningful and statistically and econometrically correct for the sample period for which the model has been estimated.

One way of establishing the forecasting power of a model is to use the estimates of the model for a period not included in the sample. The estimated value (forecast value) is compared with the actual (realised) magnitude of the relevant dependent variable. Usually, there will be a difference between the actual and the forecast value of the variable, which is tested with the aim of establishing whether it is statistically significant. If after conducting the relevant test of significance, we find ^{that} the difference between the realised value of the dependent variable and that estimated from the model is statistically significant, we conclude that the forecasting power of the model is poor.

There may be various reasons for a model's poor forecasting performance

(a) The values of the explanatory variables used in the forecast may not be accurate.

(b) The estimates of the coefficients may be poor due to deficiencies of the sample data.

(1) The old estimates are not good for forecasting.

In this event the whole model needs re-estimation it can be used for prediction

Scope of econometrics:

- (i) Developing statistical method for the estimation of economic relationship
- (ii) Testing economic theories and hypothesis
- (iii) Evaluation and applying economic policies.
- (iv) Forecasting
- (v) Collecting and analyzing non experimental (or) observational data.
- (vi) The area of application of econometrics is expanding constantly.
- (vii) The econometrics is the application of specific method in the general field of economic science.
- (viii) Econometrics is widely used in policy formation by government business men and other economic thinkers.
- (ix) Econometrics are used to estimate price elasticities with the help of demand functions of import and export commodities price elasticity and its study will place the country in a advantageous situation.

(x) With the help of econometric method, a producer can maximize his profit by choosing the level of production which gives minimum cost and maximum outputs.

(xi) Econometric analysis helps to know the effect of the taxation on consumers or effect of Government expenditure on consumers standard of living.

(xii) In capitalistic economic demand functions, price, elasticity and constraints help the producer to choose his field of investment.

(xiii) Econometrics helps the producers in making rational calculations.

(xiv) The scope of econometrics can be grouped into three categories.

- * Forecasting study.

- * Econometric researches such as analysis of demand function, production function, cost function, supply function, distribution of wealth, etc.

- * Theory of programming associated with planned and socialistic economics.