Lecture 7: From a question to an estimated model; role of econometrics

Econometrics ▪ Unit I: Introduction and generalized least squares

Kapil Kumar

Department of Statistics
Chaudhary Charan Singh University, Meerut

B.Sc. (Hons) Statistics, Semester V
Academic Session 2026–2027

This lecture

Previous lecture

Lecture 6: Objectives of econometric models; stages of model building.

Today

- Model building
- Role of econometrics
- Summary of key points

From a question to an estimated model

Example 1.3 (From a question to an estimated model)

A researcher asks whether household food expenditure rises with income. Let F_i be monthly food expenditure, Y_i monthly income and H_i household size. A possible econometric model is

$$F_i = \beta_0 + \beta_1 Y_i + \beta_2 H_i + \varepsilon_i.$$

Suppose F and Y are in thousand rupees and the estimated equation is

$$\widehat{F} = 1.5 + 0.12Y + 0.8H.$$

From a question to an estimated model (cont.)

Example 1.3 (cont.)

For a four-member household with income 30,

$$\widehat{F} = 1.5 + 0.12(30) + 0.8(4) = 1.5 + 3.6 + 3.2 = 8.3$$

thousand rupees. At income 40 and the same size,

$$\widehat{F} = 1.5 + 4.8 + 3.2 = 9.5.$$

The increase $9.5 - 8.3 = 1.2$ equals $0.12 \times (40 - 30)$, as expected.

From a question to an estimated model (cont.)

Example 1.3 (cont.)

Before using the model, the researcher must check the assumptions: unequal variability between poor and rich households (heteroskedasticity) and a strong relation between income and household size (multicollinearity) are two possible problems.

Exam tip

For a question on model building, write the stages in order (theory, mathematical model, econometric model, data, estimation, evaluation, forecasting and policy) and illustrate them with one example, such as the consumption function. Mention the three kinds of evaluation criteria.

Role of econometrics

Econometrics plays the following roles.

1. **It gives empirical content to economic theory.** Theory says that demand falls when price rises; econometrics says by how much.
2. **It tests theories.** A theory whose predictions are repeatedly contradicted by data must be revised.
3. **It supports planning and policy.** Government departments, the Reserve Bank of India and planning bodies use econometric models to forecast growth, inflation, revenue and demand, and to compare policies.

Role of econometrics (cont.)

4. **It supports business decisions.** Firms estimate demand, cost and sales functions for pricing, production and inventory planning.
5. **It improves the use of data.** Econometrics makes clear what the data can and cannot tell us, and which assumptions are needed.

Econometrics also has limits.

- Its results depend on the quality of data and on the correctness of the model.
- An association found in data does not by itself prove that one variable causes the other.
- Good econometric work states both the estimates and the assumptions behind them.

Summary of key points

- Econometrics = economic theory + mathematics + statistics, applied to give numerical values to economic relations and to test them.
- Econometric model: $C_i = \beta_0 + \beta_1 Y_i + \varepsilon_i$; the disturbance ε_i covers omitted variables, random behaviour, measurement errors and wrong functional form. If $\mathrm{E}(\varepsilon_i) = 0$, then $\mathrm{E}(C_i) = \beta_0 + \beta_1 Y_i$.
- Types of data: cross-section, time series, pooled cross-section, panel, and qualitative (dummy) data.
- Objectives: structural analysis (testing theory), estimating parameters, forecasting, policy evaluation.
- Stages of model building: theory $\rightarrow$ mathematical model $\rightarrow$ econometric model $\rightarrow$ data $\rightarrow$ estimation $\rightarrow$ evaluation (economic, statistical, econometric criteria) $\rightarrow$ forecasting and policy use.

After this lecture

Practice

- Exercise 1.5 (Exercises and Solutions booklet).
- R practical P02: Engel curve.

Next lecture

Lecture 8: The model with a general covariance matrix; what happens to OLS.