

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

Econometrics ■ Unit I: Introduction and generalized least squares

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# This lecture

## Previous lecture

Lecture 5: Types of data; sources and quality of data.

## Today

- Objectives behind building econometric models
- Model building

An econometric model is built for one or more of the following purposes.

1. **Structural analysis (testing economic theory).** We measure economic relationships and check whether they agree with theory. For example, theory says the demand curve slopes downward; an estimated demand equation tells us whether the price coefficient is in fact negative and how large it is.
2. **Estimation of economic parameters.** Many decisions need numerical values such as a price elasticity, an income elasticity or a marginal propensity to consume.

3. **Forecasting.** An estimated model is used to predict future values, for example next year's demand for electricity or tax revenue.
4. **Policy evaluation.** Government and the central bank compare policies before applying them. For example, an estimated consumption function helps to judge how much spending will rise if income tax is reduced.

These objectives are connected. A model used for forecasting or policy must first be estimated and checked.

Econometric model building (the methodology of econometrics) proceeds in the following stages. We follow one example, the consumption function, through all stages.

**Stage 1: Statement of the economic theory.** Keynes stated that consumption increases with income, but by less than the increase in income. So the marginal propensity to consume lies between 0 and 1.

**Stage 2: Mathematical model.** The theory is written as  $C = \beta_0 + \beta_1 Y$  with  $0 < \beta_1 < 1$ .

**Stage 3: Econometric model.** A disturbance is added and assumptions are stated:

$$C_i = \beta_0 + \beta_1 Y_i + \varepsilon_i,$$
$$E(\varepsilon_i) = 0, \quad \text{Var}(\varepsilon_i) = \sigma^2, \quad \text{Cov}(\varepsilon_i, \varepsilon_j) = 0 \quad (i \neq j).$$

At this stage we decide which variables to include, the form of the equation and the assumptions about the disturbances.

**Stage 4: Collection of data.** Data on  $C$  and  $Y$  are collected, for example from a household survey. We check that both variables use the same units and the same time period.

**Stage 5: Estimation.** A suitable method, for example OLS, is used to estimate  $\beta_0$  and  $\beta_1$ .

**Stage 6: Evaluation of the estimates.** The estimates are judged by three kinds of criteria.

- *Economic criteria:* Do the signs and sizes agree with theory? For example, is  $0 < \hat{\beta}_1 < 1$ ?
- *Statistical criteria:* Are the estimates significant? How good is the fit ( $R^2$ )?
- *Econometric criteria:* Are the assumptions about the disturbances satisfied? Here we check for multicollinearity, heteroskedasticity and autocorrelation (Chapters 3–5) and for correlation between regressors and disturbances (Chapters 6–8).

If the model fails these checks, we go back to Stage 3 and revise it.

**Stage 7: Forecasting and policy use.** The accepted model is used for prediction or for policy analysis. Its forecasting performance is checked with new data.

### Practice

- Exercises 1.4, 1.6 and 1.7 (Exercises and Solutions booklet).

### Next lecture

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