

Econometrics

Ch1.

The Nature and Scope of Econometrics

What is Econometrics?

- Econometrics - Apply statistical methods to economic data.

It integrates of economic theory, mathematics, and statistical techniques for the purpose of:

1. Estimating coefficients of economic relationships.
2. Testing hypotheses about economic phenomena.
3. Policy evaluation.
4. Forecasting or predicting future values of economic variables or phenomena.
 - What-IF simulations
 - Policy formulation

Why study Econometrics?

- Important to be able to apply economic theory to real world data.
- An empirical analysis uses data to test a theory or to estimate a relationship.
- A formal economic model can be tested.
- Theory may be ambiguous as to the effect of some policy change – can use econometrics to evaluate the program.

How Does Econometrics Differ From Economic Theory?

- Economic theory: qualitative results — Demand Curves Slope Downward
- Econometrics: quantitative results — price elasticity of demand for milk = $-.75$

How Does Econometrics Differ From Statistics?

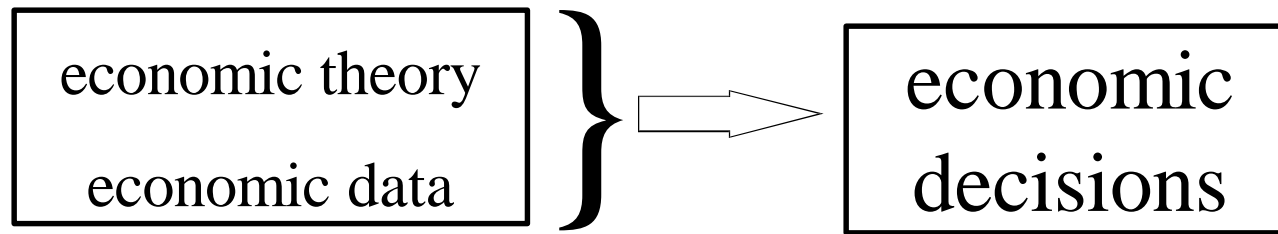
- Statistics: “summarize the data faithfully”; “let the data speak for themselves.”
- Econometrics: “ what do we learn from economic theory AND the data at hand?”

Economists Ask: “What Changes What and How?”

- Higher Income, Higher Saving
- Higher Price, Lower Quantity Demanded
- Higher Interest Rate, Lower Investment

Economic Decisions

To use information effectively:



Econometrics helps us combine economic theory and economic data

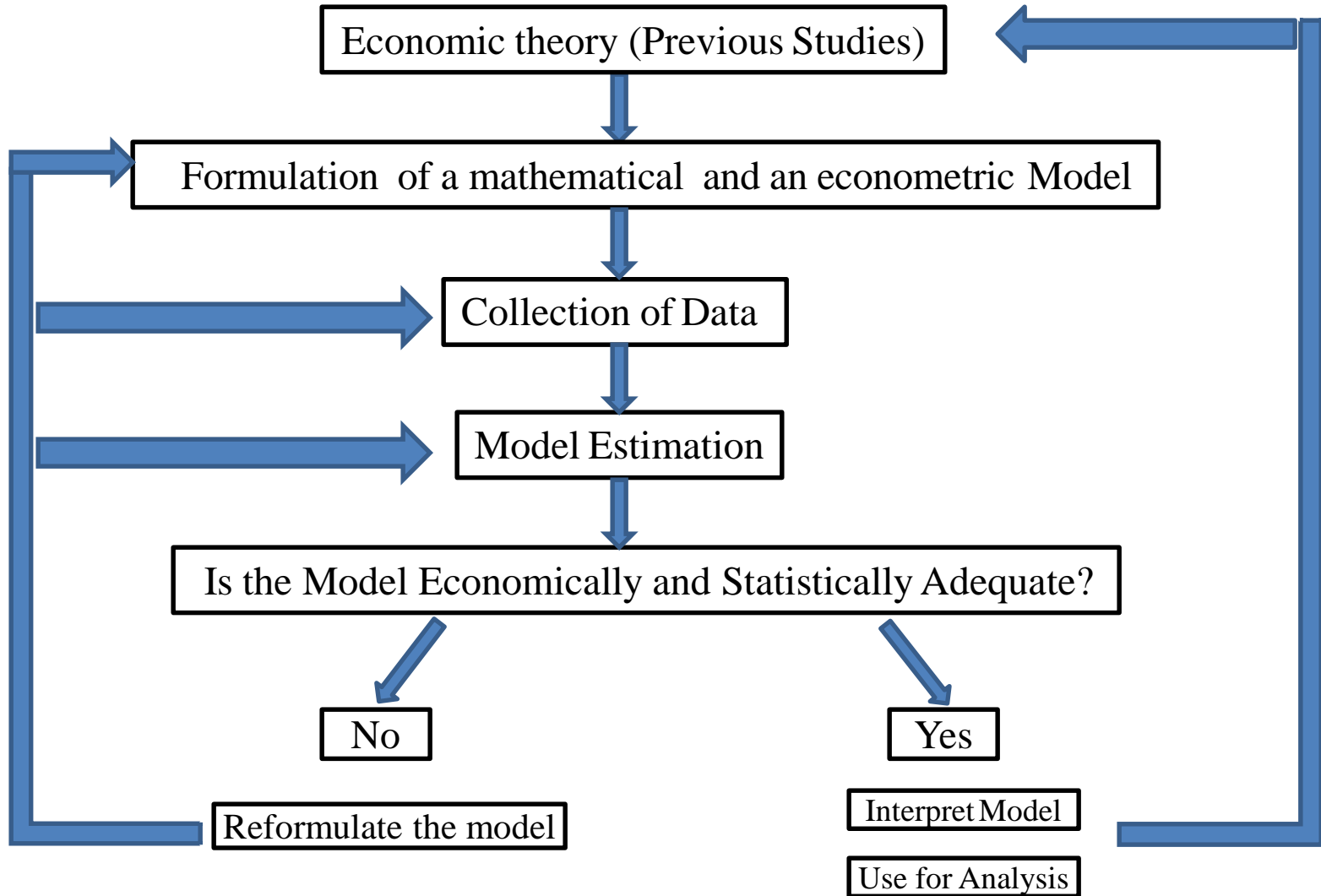
Slope of the Line Is Key!

- Slope is the marginal change in the dependent variable in response to a change in the independent variable.
- Slope is the change in savings with respect to changes in income
- Slope is the derivative of savings with respect to income
- If we know the slope, we've quantified the relationship!

Steps in using econometrics in a research

- 1- Statement of theory and literature review.
- 2- Formulation of a mathematical model.
- 3- Formulation of an econometric model.
- 4- Data collection.
- 5- Model Estimation
- 6- Hypotheses testing
- 7- Analysis of results and/ or forecasting

Steps involved in the formulation of econometric models



Statement of theory and literature review

Benefits of statement of theory and literature review:

1. Knowing the dependent and independent variables.
2. Knowing direction of relationships.
3. Knowing the magnitude of relationships.
4. Knowing functional forms, if any.
5. A base to compare our estimates.

Mathematical model

$$Y=f(x)$$

Deterministic: if X is known then we can know Y without any error.

Possible specification errors:

1. Functional form
2. Exclusion of relevant variables
3. Inclusion of irrelevant variables

Econometric model

We need a nondeterministic model: if I know X I can predict Y with a chance of an error in the predicted Y . This is done by adding an error term- e to the mathematical model.

$$Y=f(x)+e$$

Types of Data

There are 3 types of data which econometricians might use for analysis:

1. Time series data: data has a separate observation for each time period – e.g. stock prices.
2. Cross-sectional data
3. Panel data, a combination of 1. & 2.

Model Estimation

- Moments: means, variance, kurtosis
- Least square errors
- Absolute least errors
- Maximum likelihood

Hypotheses testing

- 1) Economic test:** are the estimated results acceptable in comparison with economic theory (signs, and magnitude) or common sense or literature?
- 2) Statistical test:** is the relative error in our estimates acceptable?

Analysis of the results

- Findings: signs and magnitudes, slopes and elasticity's, comparison with other studies and theory.
- Implications: for stakeholders (decision makers, beneficiaries, burden bearers, etc)
- Recommendations: policy formulation.