Economics 2301

Lecture 1

Mathematical Framework of Economic Analysis

Economic Analysis

Economists are trained in the use of explicit economic models to analyze economic issues. These models are usually expressed as sets of relationships that take a mathematical form. Thus an important part of an economist's training is acquiring a command of the mathematical tools and techniques used in constructing and solving economic models.

Economic Models and Economic Reality

- A framework based on a formal mathematical model has certain advantages. It demands logical rigor.
- In most cases, the assumptions of a formal mathematical model are explicit and transparent.
- Mathematical techniques often enable us to solve the model in a straightforward manner even if the problem is complicated.
- Mathematical models often offer conclusions that are directly testable against real data.

Drawbacks of Economic Models

Any mathematical model simplifies reality and, in so doing, may present an incomplete picture.

Characteristics of Economic Models

- Economic models attempt to explain the behavior of a set of variables through the behavior of other variables and through the way the variables interact.
- **Exogenous variables**, are variables that are determined outside the context of the model.

Characteristics of Economic Models

- Variables determined by the model are called **endogenous variables**.
- The model captures the link between the exogenous variables and the endogenous variables.
- What is exogenous is an assumption of the model.
- An economic model links its exogenous and endogenous variables through a set of relationships called **functions**.

3 categories of relationships used in economic models.

- A **definition** is an expression in which one variable is defined to be identically equal to some function of one or more other variables.
- A **behavioral equation** represents a modeling of people's actions based on economic principles.
- An **equilibrium condition** is a relationship that defines an **equilibrium** or **steady state** of the model.

Macroeconomic Example

$C = \alpha + \beta Y$ (behavioral equation)

$I = I_0$ (Exogenous variable)

$Y = C + I$ (Equilibrium Condition)

C = consumption

I = investment

Y = National Income

α , β = parameters

More Definitions

- The **solution** to a model is a set of values of its endogenous variables that correspond to a given set of values of its exogenous variables.
- The values of the endogenous variables in equilibrium are their **equilibrium values.**

Solution to our model

$$Y = \frac{\alpha}{1-\beta} \cdot \frac{1}{1-\beta} I_0$$

$$C = \frac{\alpha}{1-\beta} \cdot \frac{\beta}{1-\beta} I_0$$