

ECO 134: Applied Mathematics I

Chapter 2: Introduction

- Endogenous parameter: Endogenous means “from within”. Endogenous variables are those whose solution we seek from the model.
- Exogenous parameter: Exogenous means “from outside”. These are variables whose information is given from outside of the model - values of variables which are determined by forces external to the model.

For example: Consumption (C) = $kY + a$. C is the endogenous variable whose solution we seek from the model. k , Y and a are all exogenous parameters.

Equations and Identities

There are three types of equations we study in economics:-

1. Definite equations: set up an equality between two expressions that have exactly the same meaning. e.g. $\pi = R - C$. π is profit. $R - C$ is also profit.
2. Behavioral equations: An equation that specifies the manner in which a variable behaves in response to changes in other variables.
3. Conditional equation: This is usually applied when we are trying to satisfy a condition to solve something, for instance the equilibrium condition: $Q_d = Q_s$

The Real Number System

1. Whole numbers: 1, 2, 3, ..., 27, ..., 49, etc. are known as positive integers. Their negative counterpart, -1, -2, -3, ..., -27, ... - 49 etc. are known as negative integers. 0 is neither a positive nor a negative integer.
All positive integers + All negative integers + 0 = Set of all Integers.
2. Fractions such as $\frac{2}{3}$, $\frac{5}{4}$, $\frac{7}{3}$ are the numbers that fall between integers. These are also negative fractions like $-\frac{1}{2}$, $-\frac{8}{3}$. All positive and negative fractions together make up the set of all fractions.
3. All integers and all fractions together form the set of all rational numbers.
4. Numbers that cannot be expressed as ratios of a pair of integers are called irrational numbers, e.g. $\sqrt{2} = 1.4142..$ or $\pi = 3.1415..$. Irrational numbers fall between two rational numbers.

Rational numbers + Irrational numbers = Set of all real numbers

Set of real numbers is often denoted by the symbol, R .

The Concept of Sets

A set is a collection of distinct objects. These objects can be anything – numbers, colors, countries etc. There are two ways to write a set – enumeration and description.

Suppose a set contains three integers – 2, 3 and 4. This can be written in enumeration as

$$S = \{-2, 3, 4\}$$

Let I denote the set of all positive integers. This can be written in descriptive form as:

$$I = \{x | x \text{ is a positive integer}\}$$

This set describes I as a set of all positive numbers, such that x is a positive integer.

Consider the set $J = \{x | 2 < x < 5\}$

Objects of a set are called elements. Set S is a finite set, containing a limited amount of elements – specific numbers. Sets I and J are examples of infinite sets, where each contains an infinite number of elements.

The symbol \in reads as “an element of”

$-2 \in S$: -2 is an element of S or -2 belongs in set S

$x \in R$: denote the set of all real numbers