**Lecture #1 Introduction. Economic models.**

A deliberately simplified analytical framework is called an economic model.

An economical mathematical model consist of a set of equations designed to describe the structure of the model. Related to variables, this set of equations give a mathematical from to the analytical assumptions adopted.

A variable is something whose magnitude can change. Examples of economic variables: price, profit, revenue, cost, national income, consumption, investment, imports and etc.

Endogenous variables are variables, whose solution values we find from the model.

Exogenous variables are variables determined by the external forces.

Types of equations:

A definitional equation ( identity)sets up an identity between two alternate expressions. An example:

π≡TR-TC which means total profit is defined as a total revenue minus total cost.

A behavioral equation specifies the manner in which a variable behaves in response to variations in other variables.

 Examples are cost functions:

 C=75+10Q (1)

 C=110+Q2 (2)

Where Q denotes the quantity of output.

A conditional equation states a requirement to be satisfied. For example, in an equilibrium model, we should set up an equilibrium condition. Two of the most frequently used equilibrium conditions in economics:

Qd=Qs

S=I

**Equilibrium Analysis in Economics**

 **Definition of equilibrium.** State of stable conditions in which all significant factors remain more or less constant over a period, and there is little or no inherent tendency for change.

**Partial market equilibrium- A Linear Model**

Constructing the model

Qd –is the quantity demanded of the commodity;

Qs- is the quantity supplied of the commodity;

P- price of the commodity.

Equilibrium condition is defined as: Qd=Qs.

If we assume that the demand and supply functions are linear, the model can be written as:

 Qd=Qs

Qd=a-bP (a,b>0)

Qs=-c+dP (c,d>0)

The solution values of the three endogenous variables: Qd,Qs, and P that satisfy the three equations simultaneously, we call the equilibrium values.

Solution

Q=QS=Qd =>

Q=a-bP

Q=-c+dP

* a-bP=-c+dP =>
* (b+d)P=a+c =>
* P\*=(a+c)/(b+d)
* Q\*=a-b(a+c)/((b+d)=(ad-bc)/(b+d).

**Partial market equilibrium- A nonlinear Model**

Qd=Qs

Qd=4-P2

Qs=4P-1

4-P2=4P-1 (3)

P2+4P-5=0

ax2+bx+c=0 (a≠0)

$$x\_{1, }^{\*} x\_{2}^{\*}= \frac{-b\pm \sqrt{(b^{2}-4ac)}}{2a}$$

Therefore the solution for the system of equations (3) is:

$$P\_{1}^{\*},P\_{2}^{\*}=\frac{-4\pm \sqrt{(16+20)}}{2}=1, -5$$

So, the solution is P\* =1 and Q\* =3.

**General Market Equilibrium**

The equilibrium condition of an n-commodity market model:

$E\_{i }≡Q\_{di}-Q\_{si}=0 (i=1,2,…,n)$ (4)

If a solution exists, there will be a set of prices $P\_{i}^{\*} $ and corresponding quantities $Q\_{i}^{\*}$ such that all the n equations in the equilibrium condition will be simultaneously satisfied.

Two –Commodity market Model

$$Q\_{d1}-Q\_{s1}=0$$

$$Q\_{d1}=a\_{0}$$