

Mathematical Economics

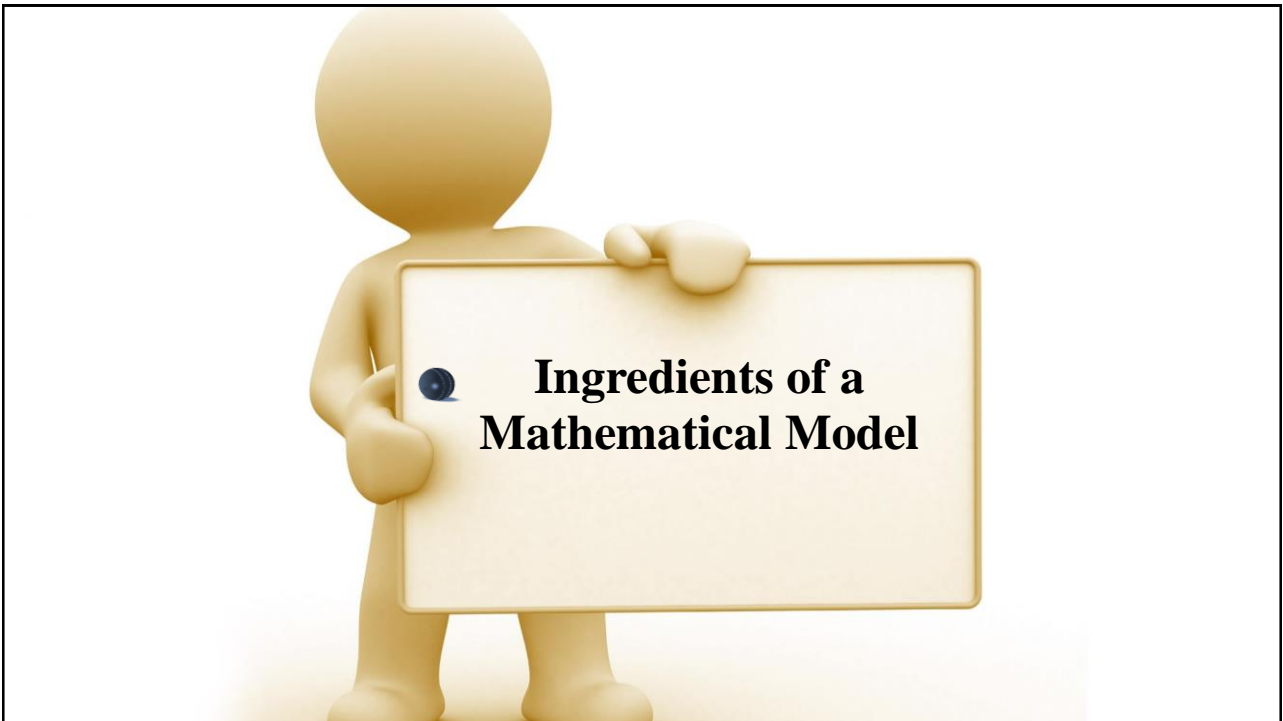
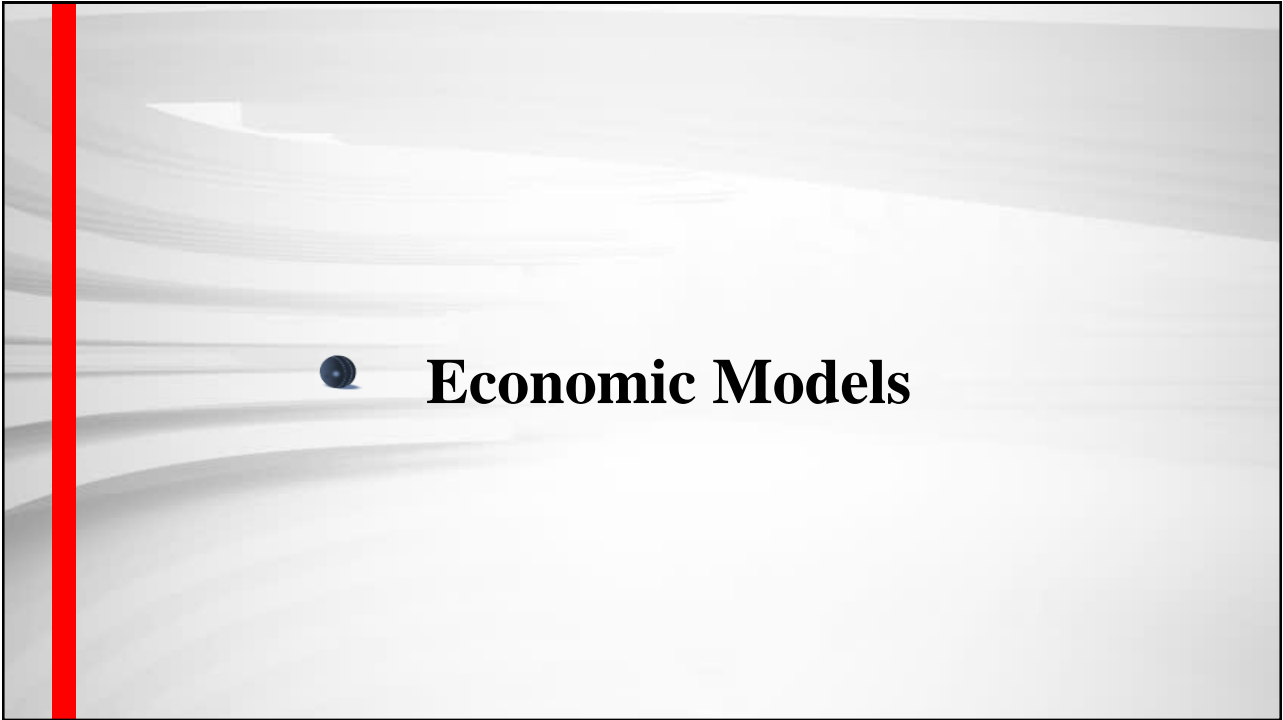
Lec.3

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Ingredients of a Mathematical Model



Variables, Constants, and Parameters

Definition 1: A Variable

- It is something whose **magnitude** can change.
- It is something that can take on different **values**.
- It must be represented by a symbol instead of a specific number.
- Two types: **Endogenous & Exogenous**
- Two more types: **fixed & non-Fixed**

Examples:

Price (P)	Revenue (R)	Cost (C)	Consumption (C)
Imports (M)	Exports (X)	Investment (I)	Profit (π)
			National Income (Y)

Exercise: create equations from the above-listed variables

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Definition 2: A Variable at Equilibrium

- In economic model, a variable at equilibrium is the variable at the point where all **forces** affecting that variable are **equal** (in balance).
- It is the point where an **optimal solution** form an **economic equation** is **obtained**.

Definition 3: Endogenous Variable

- A variable whose values are obtained from **solved economic model**. (Originated by factors within the model/ derived **internally**)

Definition 4: Exogenous Variable

- A variable whose values are assumed to be determined by forces **external** to the **economic model**. (Originated by factors outside the model/derived **externally**). **Symbolically**, it is attached with subscript 0. for example, P_0 is an exogenously determined price.

It should be noted that:

- An **endogenous** variable in one model could be **exogenous** in another model

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Definition 5: A Fixed Variable

- It is a variable that remains constant throughout the model. It is usually used to control for an experiment/action

Definition 5: A constant

- It is a magnitude that does **not change** and is therefore the antithesis of a variable.

Definition 5: A coefficient

- It is a constant that is **joined** to a variable. It has **two types**:
- **A numerical coefficient**: A coefficient that take a numerical value.
- **Parametric coefficient** (simply parameter): A coefficient that is symbolic rather than numerical.

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Example (Total Cost, Revenue, and Profit)

Total Cost (C)



$$C = c_0 + wL + vK$$

Assumption: one fixed variable (exogenous variable; i.e., Fixed Cost (C_0))
only two variable inputs, Capital and Labor
 $C = f(L, K)$

C_0 (exogenous/fixed
variable/control for
experiment)

Total Revenue (TR)



$$PQ_x$$

Assumption: only one output
 $TR = f(Q_x)$

w, v, p are considered
parameters

Profits (π)



$$PQ - C_0 - wL - vK$$

Assumption: $\pi = f(L, K)$, given that all prices (P, W, and V) are fixed

$$Q = f(L, K)$$

Thank you