Topics

1. functions to express relationships among variables
2. exogenous v. s. endogenous variables
3. stock v.s. flow variables
4. working with percentage changes
5. introducing GDP

1. functions to express relationships among variables

Consider the example of supply and demand in the market for pizza.

There are three essential equations:

Supply:

$$Q^s = S\left(P, P_m\right)$$

Demand:

$$Q^d = D\left(P, Y\right)$$

Equilibrium (market-clearing condition:)

$$Q^s - Q^d = 0$$

2. exogenous v. s. endogenous variables

- Exogenous - taken as given
- Endogenous - determined by the model

For example, in the model above:

- The exogenous variables are

$$Y, P_m$$

- The endogenous variables are

$$P, Q^s, Q^d$$

Key: The goal of the model is to solve for the find the level of prices which clears the market and yields optimal demand (for buyers) and supply (for sellers), for a particular level of income and price of materials.

3. stock v.s. flow variables

- Stock - quantity measured at a given point in time
- Flow - quantity measured per unit of time

Notable examples:

1. GDP is a flow variable; it is interpreted as *the dollar value of output per year*.
2. The total amount of capital in the economy is a stock, and the total amount of investment is a flow.

4. working with percentage changes

1. The percentage change of a product of two variables is approximately the sum of the percentage changes in each of the variables.

Let $P \equiv$ GDP deflator, $Y \equiv$ real GDP. Then,

$$P \cdot Y \equiv \text{nominal GDP}$$

$$\Rightarrow \quad \%\Delta P \cdot Y \approx \%\Delta P + \%\Delta Y$$

Consider the following example.

	Year 1	Year 2
real GDP	100	1003
GDP deflator	2	2.1
nominal GDP	200	216.3

Use the values to compute the LHS and RHS of the formula:

$$\%\Delta P = \frac{2.1 - 2}{2} = \frac{.1}{2} = .05 = 5\%$$

$$\%\Delta Y = \frac{103 - 100}{100} = \frac{3}{100} = .03 = 3\%$$

$$\%\Delta(P \cdot Y) = \frac{216.3 - 200}{200} = \frac{16.3}{200} = .0815 = 8.15\%$$

$\Rightarrow$ Note that $8.15\% \approx 5\% + 3\%$, as the formula suggests.

5. introducing GDP

First, it is important to note that the gross domestic product can be interpreted in two ways:

1. "The total income of everyone in the economy"
2. "The total expenditure on the economy's output of goods and services"

Consider an economy that only produces apples and oranges (no investment, government expenditures, or trade).

Then, with the more precise definition of GDP as the *market value of all final goods and services produced within an economy in a given period of time,* one may compute:

GDP = (price of apples * quantity of apples) +
(price of oranges * quantity of oranges)

Incorporating investment, government expenditures, and trade into the calculation of GDP gives us the following expression:

GDP = Consumption + Investment + Government expenditures + Net exports

$$Y = C + I + G + NX$$