Intermediate Macroeconomics
ECN323

- Topic 2 -

by

Charbel BASSIL

Outline

« The Data of Macroeconomics »
Macroeconomics Eighth Edition
by Gregory Mankiw

▶ Measuring the GDP
▶ Measuring the CPI
▶ Measuring the unemployment rate

Measuring the GDP
1- Three definitions

1. GDP is the total expenditure on domestically-produced final goods and services.

2. GDP is the total income earned by domestically-located factors of production, regardless of nationality.

   NB
   In every transaction, the buyer's expenditure becomes the seller's income.

   $$\Rightarrow \text{total expenditure} = \text{total income}$$

3. GDP is the market value of all final goods and services produced within an economy in a given period of time.

Measuring the GDP

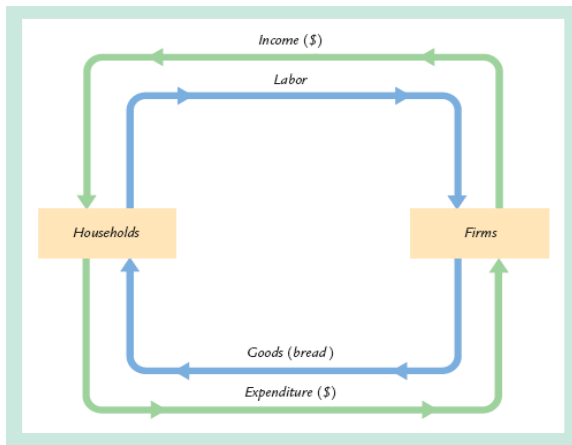2- Income, expenditure and the circular flow

Figure: The circular flow

GDP = income = wages + profits

Measuring the GDP

Adding Apples and Oranges

GDP = (Price of Apples × Quantity of Apples) +
        (Price of Oranges × Quantity of Oranges)
    = ($0.50 × 4) + ($1.00 × 3)
    = $5.00

Used Goods

GDP measures the value of currently produced goods and services. Thus, the sale of used goods is not included as part of GDP.

Measuring the GDP

Inventories

- ▶ The unsold spoiled stock does not alter GDP.
- ▶ The stock sold next year rise the current GDP but not the next year GDP

Intermediate goods and value added

- ▶ The GDP includes only the value of final goods and services produced.
- ▶ The value of all final goods and services is the sum of the value added at each stage of production.

$$\textbf{GDP} = \sum VA$$

- ▶ The value added of a firm equals the value of the firm's output less the value of the intermediate goods that the firm purchases.
  <u>Example:</u> Hamburger's production

Housing services and other imputations

- Some goods are sold in the black market or the underground economy and do not have an **imputed value**.
  Example:
    1. Domestic workers paid "off the books"
    2. illegal drug trade

- Some services do not have a market price but have an **imputed value**.
  Example:
    1. Housing services enjoyed by homeowners
    2. Government services

- Not all the owned durable goods or services have an imputed value.
  Example:
    1. owned cars, jewelry, meals cooked at home, child care

Nominal GDP is the GDP measured at current prices

$$NGDP_{2010} = P^1_{2010} \times Q^1_{2010} + P^2_{2010} \times Q^2_{2010}$$

$$NGDP_{2011} = P^1_{2011} \times Q^1_{2011} + P^2_{2011} \times Q^2_{2011}$$

NGDP doesn't accurately reflect how well the economy can satisfy the demand

Changes in *NGDP* can be due to:

1. Changes in prices
2. Changes in quantities of output produced

Practice problem 1

If you buy a new car, the entire purchase is counted as consumption in the year in which you make the transaction. Explain briefly why this is in one sense an « error » in national income accounting. How might you correct this error ?

Answer to practice problem 1

The pizza is entirely consumed in the year it was produced while the car will last many years. A car is in reality a capital good. To correct for this, we could count just the value of the services provided by the car *each year*. For example, if the car lasts five years, then 20% of its value could be counted in each year's GDP.

Measuring the GDP

Real GDP is the GDP measured using a constant set of prices (prices of a base year)

$$RGDP_{2010} = P_{2010}^1 \times Q_{2010}^1 + P_{2010}^2 \times Q_{2010}^2$$

$$RGDP_{2011} = P_{2010}^1 \times Q_{2011}^1 + P_{2010}^2 \times Q_{2011}^2$$

$$RGDP_{2012} = P_{2010}^1 \times Q_{2012}^1 + P_{2010}^2 \times Q_{2012}^2$$

Changes in real GDP can only be due to changes in quantities, because real GDP is constructed using constant base-year prices.

NB: real GDP provides a better measure of economic well-being than nominal GDP.

Measuring the GDP

GDP deflator measures the price of output relative to its price in the base year.

$$
\begin{aligned}
GDP\ Deflator_t &= \frac{Nominal\ GDP_t}{Real\ GDP_t} \times 100 \qquad (1)\\[2mm]
GDP\ deflator_t &= \frac{P_{1t}Q_{1t} + P_{2t}Q_{2t} + P_{3t}Q_{3t} + \cdots}{RGDP_t} \times 100\\[2mm]
GDP\ deflator_t &= \left[\frac{Q_{1t}}{RGDP_t}P_{1t} + \frac{Q_{2t}}{RGDP_t}P_{2t} + \frac{Q_{3t}}{RGDP_t}P_{3t} + \ldots\right] \times 100
\end{aligned}
$$

The GDP deflator is a weighted average of prices. The weight on each price reflects that good's relative importance in GDP. Note that the weights change over time.

The GDP deflator reflects what's happening to the overall level of prices in the economy.

Practice problem 2

	2002		2003		2004	
	P	Q	P	Q	P	Q
Good A	$1	10	$2	15	$3	17
Good B	$10	3	$15	4	$17	5

1- Compute nominal GDP in 2002, 2003 and 2004. What is the growth rate between 2002-2003 and 2003-2004?

2- Compute real GDP in each year using 2002 as the base year. What is the growth rate between 2002-2003 and 2003-2004?

3- Compute the GDP deflator in 2003 and 2004 using 2002 as the base year.

4- Compute the inflation rate .

$$\text{GDP} = \text{Y} = \text{C} + \text{I} + \text{G} + \text{NX}$$

Consumption (C) is the value of all goods and services bought by households. It includes:

1. Durable goods: last a long time ex: cars, home appliances
2. Non-durable goods: last a short time ex: food, clothing
3. Services: work done for consumers by individuals and firms ex: dry cleaning, air travel

Investment (I) consists of any spending on capital and the goods bought for future use. It Includes:

1. Business fixed investment: spending on plant and equipment that firms will use to produce other goods and services

2. Residential fixed investment: spending on housing units by consumers and landlords

3. Inventory investment: the change in the value of all firms' inventories

Government purchases (G) includes all government spending on goods and services. It excludes transfer payments (e.g. unemployment insurance payments), because they do not represent spending on goods and services.

Net exports is the value of total exports **(EX)** minus the value of total imports **(IM)**

Practice problem 3

Place each of the following transactions in one of the four components of expenditure: consumption, investment, government purchases, and net exports.

a. Boeing sells an airplane to the Air Force.
b. Boeing sells an airplane to American Airlines.
c. Boeing sells an airplane to Air France.
d. Boeing sells an airplane to an American aviator.
e. Boeing builds an airplane to be sold next year.

Practice problem 4

Steel Firm		Car firm		Lobster firm	
Revenue	$400	Revenue	$1,000	Revenue	$200
wage	$340	wage	$500	wage	$160
profit	$60	Steel expenditure	$400	profit	$40
		profit	$100		

Compute GDP using the three methods:
1- the income approach
2- the expenditure approach
3- the value added approach.

Measuring the GDP

GNP: Gross National Product is the total income earned by the nation's factors of production, regardless of where located.

GNP = GDP + (factor payments from abroad)
            - (factor payments to abroad)

NB

GDP measures the total income produced *domestically*

GNP measures the total income earned by *nationals*

NNP Net National Product is GNP - Depreciation

National Income = NNP - statistical discrepancy

Measuring the GDP

Personal income is the amount of income that households and noncorporate businesses receive.

Personal Income = National Income

- Corporate Profits
- Indirect Business Taxes
- Social Insurance Contributions
- Net Interest
+ Dividends
+ Government Transfers to Individuals
+ Personal Interest Income

Disposable Personal Income is the amount households and noncorporate businesses have available to spend after satisfying their tax obligations to the government.

Disposable Personal Income = Personal Income - Personal Tax and Nontax Payments

CPI: Consumer price index is a measure of the overall level of prices

Used to

1. Track changes in the typical household's cost of living.
2. Adjust many contracts for inflation.
3. Allow comparisons of dollar figures from different years.

How we construct the CPI?

1- Survey consumers to determine composition of the typical consumer's « basket » of goods.

2- Every month, collect data on prices of all items in the basket; compute cost of basket

3- CPI in month t equals:

$$CPI_t = \frac{\text{Cost of basket in that month}}{\text{Cost of basket in base period}} \times 100 \qquad (2)$$

$$CPI_t = \frac{P_{1t}C_1 + P_{2t}C_2 + P_{3t}C_3 + \ldots}{P_{1base}C_1 + P_{2base}C_2 + P_{3base}C_3 + \ldots} \times 100$$

$$CPI_t = [\frac{C_1}{CPI_{base}}P_{1t} + \frac{C_2}{CPI_{base}}P_{2t} + \frac{C_3}{CPI_{base}}P_{3t} + \ldots] \times 100$$

The CPI is a weighted average of prices. The weight on each price reflects that good's relative importance in the CPI's basket. Note that the weights remain fixed over time.

The index tells us how much it costs now to buy a basket of goods relative to how much it costs to buy the same basket of goods in the base year.

Why the CPI may overstate inflation?

1. **Substitution bias**: The CPI uses fixed weights, so it cannot reflect consumers' ability to substitute toward goods whose relative prices have fallen.

2. **Introduction of new goods**: The introduction of new goods makes consumers better off and, in effect, increases the real value of the dollar. But it does not reduce the CPI, because the CPI uses fixed weights.

3. **Unmeasured changes in quality**: When a firm changes the quality of a good it sells, not all of the good's price change reflects a change in the cost of living. Thus, the measured CPI rises faster than it should.

PPI: Producer price index measures the price of a typical basket of goods bought by firms rather than consumers.

Same method of calculation

Prices of capital goods
- ▶ Included in GDP deflator (if produced domestically)
- ▶ Excluded from CPI

Prices of imported consumer goods
- ▶ Included in CPI
- ▶ Excluded from GDP deflator

The basket of goods
- ▶ CPI: fixed
- ▶ GDP deflator: changes every year

Goods bought by firms and government
- ▶ Included in GDP deflator
- ▶ Excluded from CPI

Practice problem 5

A typical consumer buys 5 apples and 2 oranges each year. In 2009, each apple cost $1 and each orange cost $3. In 2010, each apple cost $1.5 and each orange cost $4.

Compute the CPI for each year. Assume that 2009 is the base year.

Measuring the unemployment rate

Employed: working at a paid job

Unemployed: not employed but looking for a job

Labor force: the amount of labor available for producing goods and services; all employed plus unemployed persons

Labor Force = Number of Employed + Number of Unemployed

Not in the labor force: not employed, not looking for work

Unemployment rate: percentage of the labor force that is unemployed

$$\text{Unemployment Rate} = \frac{Number\ of\ Unemployed}{labor\ force} \times 100$$

Labor force participation rate: the fraction of the adult population that "participates" in the labor force

$$\text{Labor-Force Participation Rate} = \frac{Labor\ Force}{Adult\ Population} \times 100$$

Working with percentage changes

For any variables X and Y:

1. % change in $(X \times Y) \approx$ (% change in X + % change in Y)
2. % change in $(\frac{X}{Y}) \approx$ (% change in X - % change in Y)
3. % change in $(X^a \times Y^b) \approx$ (% change in $X \times a$ + % change in $Y \times b$)

NB: These rules will be used to calculate a growth rate.

Working with percentage changes

$$
\begin{aligned}
y &= x \times z \\
dy &= d(xz) \\
dy &= xdz + zdx \\
\frac{dy}{y} &= \frac{xdz}{y} + \frac{zdx}{y} \\
\frac{dy}{y} &= \frac{xdz}{xz} + \frac{zdx}{xz} \\
\frac{dy}{y} &= \frac{dz}{z} + \frac{dx}{x}
\end{aligned}
\tag{3}
$$

Working with percentage changes

$$
\begin{aligned}
y &= \frac{x}{z} \qquad\qquad\qquad (4)\\
dy &= d(\frac{x}{z})\\
dy &= \frac{1}{z}dx - \frac{x}{z^2}dz\\
dy &= \frac{zdx - xdz}{z^2}\\
dy &= \frac{dx}{z} - \frac{x}{z}\frac{dz}{z}\\
\frac{dy}{y} &= \frac{\frac{dx}{z}}{y} - \frac{\frac{x}{z}\frac{dz}{z}}{y}\\
\frac{dy}{y} &= \frac{dx}{x} - \frac{dz}{z}
\end{aligned}
$$

Working with percentage changes

$$\begin{aligned}
y &= x^a \times z^b & (5)\\
dy &= d(x^a z^b)\\
dy &= ax^{a-1}z^b dx + bz^{b-1}x^a dx\\
dy &= ax^a z^b \frac{dx}{x} + bz^b x^a \frac{dz}{z}\\
dy &= ay\frac{dx}{x} + by\frac{dz}{z}\\
\frac{dy}{y} &= \frac{ay\frac{dx}{x}}{y} + \frac{by\frac{dz}{z}}{y}\\
\frac{dy}{y} &= a\frac{dx}{x} + b\frac{dz}{z}
\end{aligned}$$

Practice problem 6

	RGDP	GDP deflator	NGDP
year 1	100	2	200
year 2	103	2.1	216.3

What is the percentage change in NGDP = GDP deflator $\times$ RGDP?

	GDP	L
year 1	100000	100
year 2	110000	103

What is the percentage change in GDP per person = GDP/L?

- Read Chapter 3 of Gregory Mankiw
- Next time: Chapter 3 of Gregory Mankiw « National Income: Where it Comes From and where it Goes »