

# The Data of Macroeconomics

1. Measuring the value of economic activity: GDP
2. Measuring the cost of living: price indices
3. Measuring joblessness: unemployment rate

# 1 Gross Domestic Product (GDP)

Definition 1.1 *Nominal GDP is the total value of goods and services produced in an economy during a particular time period.*

Three different ways of measuring nominal GDP:

1. GDP by production:  
adding together the value of production in all different industries in the economy.
2. GDP by expenditure:  
adding together the spending on goods and services.
3. GDP by income:  
adding together all the income that is generated from the production process.

## 1.1 Computing GDP Through Production

$$\begin{aligned}\text{Nominal GDP} &= (\text{Price of Apples} \times \text{Quantity of Apples}) \\ &\quad + (\text{Price of nuts} \times \text{Quantity of nuts}) \\ &= (\$0.50 \times 4) + (\$1.00 \times 3) \\ &= \$5.00\end{aligned}$$

Intermediate goods and value added

Example:

US steel produces a ton of steel and sells it to GM for \$1500.

GM then uses this steel to build a car that it sells for \$10,000.

Assume for the moment that a car can be produced only with steel and labor, should the contribution to GDP be the whole \$11,500, the sum of total sales?

Definition 1.2 *Value Added measures how much a firm, in its production process, added to the value of the intermediate goods it purchased from its suppliers.*

Roughly, value added of a firm equals its revenues from sales minus the purchases of intermediate goods -goods that the firm bought from other firms and used to produce its own products.

When measuring nominal GDP through production, we sum up the value added of all industries in the economy.

Table 1

Industries	Value Added	% of GDP
Total Nom. GDP	8110.9	100.0%
Agriculture, Forestry, Fishing	131.7	1.6%
Mining	120.5	1.5%
Construction	328.8	4.1%
Manufacturing	1378.9	17.0%
Transportation, Publ. Utilities	676.3	8.3%
Wholesale Trade	562.8	6.9%
Retail Trade	712.9	8.8%
F.I.R.E.	1570.3	19.4%
Services	1656.8	20.4%
Government	1027.6	12.7%
Statistical Discrepancy	-55.8	-0.7%

F.I.R.E.: Finance, Insurance, Real Estate

Table 1 shows the contribution of different industries to nominal GDP for 1997. The numbers in column 2 are in billions of dollars.

## 1.2 Computing GDP through Spending

Nominal GDP can also be computed by summing up the total spending on goods and services by the different sectors of the economy. Formally, let

$C$  = Consumption

$I$  = (Gross) Investment

$G$  = Government Purchases

$X$  = Exports

$M$  = Imports

$Y$  = Nominal GDP

Then

$$Y = C + I + G + (X - M)$$

## The Components of GDP (1):

- Consumption ( $C$ ) : spending of households on all goods
  - durable goods (cars, TV's, Furniture)
  - nondurable goods (food, clothing, gasoline)
  - services (financial services, education, health care)
- Gross Investment ( $I$ ): spending of firms on plant, equipment and inventories, and the spending of households on new houses
  - residential fixed investment (the spending of households on the construction of new houses)
  - nonresidential fixed investment (the spending of firms on buildings and equipment for business use)

## The Components of GDP (2):

- inventory investment (the change in inventories of firms)

### Digression about Stocks and Flows

Definition 1.3 *A stock is a quantity measured at a given point in time.*

Definition 1.4 *A flow is a quantity measured per unit of time.*

Example 1: filling a bathtub with water.

Example 2: investment and the capital stock.

Other flow variables: GDP and its other components

## The Components of GDP (3):

- Government spending ( $G$ ): the sum of federal, state and local government purchases of goods and services.

Remark: The following government outlays are *not* included in government spending  $G$ :

- transfer payments to households (such as welfare, social security or unemployment benefit payments)
  - interest payments on public debt are part of government outlays
- 
- Net Exports ( $NX$ ) : exports minus imports

## Discussions:

1. Should the purchases of old houses be counted as GDP?
2. What about the housing services enjoyed by the owners themselves?
3. What about meals cooked at home?
4. Mankiw 2,3,4,8

## Relation between GDP and National Income

$$\begin{aligned} & \text{Gross Domestic Product (8110.9)} \\ & + \text{Factor Income from abroad (265.5)} \\ & - \text{Factor Income to abroad (273.5)} \\ = & \text{Gross National Product (8102.9)} \\ & - \text{Depreciation (871.8)} \\ = & \text{Net National Product (7231.1)} \\ & - \text{Sales and Excise Taxes (627.2)} \\ & - \text{Other Adjustments (42.6)} \\ = & \text{National Income (6646.5)} \end{aligned}$$

The numbers in brackets are for the US in 1997, in billions of US dollars.

# Components of National Income

1. Compensation of Employees: wages, salaries and fringe benefits earned by workers
2. Proprietors' Income: income of noncorporate business, such as small farms and law partnerships
3. Rental Income: income that landlords receive from renting, including the "imputed" rent that homeowners pay themselves, less expenses on the house, such as depreciation
4. Corporate Profits: income of corporations after payments to their workers and creditors
5. Net interest: interest paid by domestic businesses plus interest earned from foreigners

Table 2

	Billion \$	% of Natl. Inc.
National Income	6646.5	100.0%
Compensation of Employees	4687.2	70.5%
Proprietors' Income	551.2	8.3%
Rental Income	158.2	2.4%
Corporate Profits	817.9	12.3%
Net Interest	432.0	6.5%

Above are the national income and its component for the US in 1997.

## Relation between National Income and Personal Income

$$\begin{aligned} & \text{National Income (6646.5)} \\ & - \text{Retained Earnings (557.6)} \\ & - \text{Contributions for Social Insurance (727.0)} \\ & - \text{Net Interest (432.0)} \\ & + \text{Personal Interest Income (747.3)} \\ & + \text{Government and Business Transfers (1106.8)} \\ = & \text{Personal Income (6784.0)} \end{aligned}$$

$$\begin{aligned} & \text{Personal Income (6784.0)} \\ & - \text{Personal Tax and Nontax Payments (989.0)} \\ = & \text{Disposable Personal Income (5795.1)} \end{aligned}$$

The numbers in brackets are for 1997 in billion \$US.

## 2 Price Indices

Definition 2.1 *A price index is a ratio between the price of a particular basket of goods in period  $t$  and the price of the same basket in a base period, say period 0.*

Two important questions involved in constructing a price index:

- a) what period to chose as base period
- b) what basket of goods to chose.

Two Types of Indices:

compare how expensive the basket of goods consumed in period 0 are in period  $t$ . The result is

$$L_t = \frac{p_{ht}h_0 + p_{ct}c_0}{p_{h0}h_0 + p_{c0}c_0}$$

Such a price index is called a Laspeyres price index. If, on the other hand, we take as our basket the goods purchased in period  $t$ , then we have

$$Pa_t = \frac{p_{ht}h_t + p_{ct}c_t}{p_{h0}h_t + p_{c0}c_t}$$

Such a price index is called a Paasche price index.

Question: Which index overstates the inflation?

## 2.1 GDP Deflator

Definition 2.2 *GDP deflator is the ratio between nominal and real GDP.*

$$\text{GDP deflator} = \frac{\text{Nominal GDP}}{\text{Real GDP}}$$

Suppose that our economy produces only hamburgers and coke. Nominal GDP in 2000 would be given by

$$\text{Nominal GDP} = h_{2000}p_{h2000} + c_{2000}p_{c2000}$$

Real GDP would be given by (assuming 1996 is the base year)

$$\text{Real GDP} = h_{2000}p_{h1996} + c_{2000}p_{c1996}$$

From the previous formula we get

$$\text{GDP deflator} = \frac{h_{2000}p_{h2000} + c_{2000}p_{c2000}}{h_{2000}p_{h1996} + c_{2000}p_{c1996}}$$

Question: Which type of index is the GDP deflator?

## 2.2 The CPI (Consumer Price Index)

*Definition 2.3 The BLS determines a basket of goods and services that a typical American household buys in a typical month of the base year. The CPI for this month equals the ratio between the price of a basket in this period and the price in the base period.*

Suppose that the BLS decided that the correct basket was composed only of hamburgers and coke (and the base year is 1996), then the CPI for 2000 is given by

$$\text{CPI} = \frac{h_{1996}p_{h2000} + c_{1996}p_{c2000}}{h_{1996}p_{h1996} + c_{1996}p_{c1996}}$$

Question: What are the differences between the GDP deflator and the CPI?

Definition 2.4 *The inflation rate from period  $t - 1$  to period  $t$  is defined as*

$$\pi_t = \frac{P_t - P_{t-1}}{P_{t-1}}$$

where  $P_t$  is the price level in period  $t$ .

A Graphic Comparison of Inflation Rates Computed Using Above Two Indices

Question: Does CPI overstate or understate inflation?

- People may substitute away from goods that have become relatively more expensive.
- New goods are not included in the base year basket, they have no effect on the CPI.
- The changes in quality are unmeasured.

### 3 Measuring Joblessness: The Unemployment Rate

Definition 3.1 *The Employed refer to those who spent most of the previous week working at a paid job.*

Definition 3.2 *The Unemployed refer to those who are not employed and are waiting for the start date of a new job, are on temporary payoff, or have been looking for a job.*

Labor force is defined as the sum of the employed and the unemployed. Those who do not have job right now and are not searching for a job either but are willing to work if a job offer falls on their doorstep are not included in the labor force.

Definition 3.3

$$= \frac{\text{Unemployment rate}}{\text{Number of the unemployed}} \times 100$$
$$= \frac{\text{Labor force}}{\text{Labor force}} \times 100$$

Definition 3.4

$$= \frac{\text{Labor force participation rate}}{\text{Labor Force}} \times 100$$
$$= \frac{\text{Adult population}}{\text{Adult population}} \times 100$$

Definition 3.5 *The adult population is referred to people between age 15 and 65 at this point in the US. It tries to measure the total number of people who are able to work.*

Question: Are you in the labor force?

Okun's Law