Macroeconomics

3. Measuring Macroeconomic Data

Bachelor's Degrees in Management and in Finance and Accounting

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Gross Domestic Product

- **Definition of GDP** – the **market value** of **final** goods and services produced **within the geographical boundaries** of a country during a **given period of time**, **regardless of the origin** of the factors of production used.
  - Graphical example for the USA (source: Performance Magazine):

- **National income accounting identity** – GDP can be measured using the expenditure, production, and income approaches, all of which are equivalent.

GDP from the expenditure approach

- **Expenditure approach** – the sum of total expenditure on final goods and services produced domestically.

$$GDP = C + I + G + NX$$

  - C: total consumption expenditure (on domestic and imported goods);
  - I: investment expenditure (on domestic and imported goods);
  - G: government purchases of goods and services (domestic and imported);
  - NX: net exports = exports - imports.

GDP from the income approach

- **Income approach** – the sum of the income earned by the factors of production employed within the country:

$$GDP = \text{Compensation of employees} + \text{Taxes net of subsidies} +$$
$$+ \text{Rents, interest, and corporate profits} + \text{Depreciation}$$

  - NFI: income created abroad but paid to nationals minus income created domestically but paid to foreign residents.
  - Depreciation: to obtain firms' net income, depreciation is subtracted; therefore, to calculate gross income, we need to add it back (otherwise, we obtain net domestic product).

GDP from the production approach

- **Production approach** – the sum of the value added generated domestically in the production of goods and services:

$$GDP = \sum GVA$$

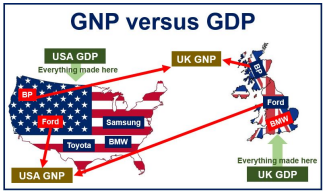
  - GVA stands for Gross Value Added.
- **Value-added method** – the value of each firm's output minus the cost of the intermediate goods and services purchased by the firm:
  - This avoids double counting.

Gross National Product (National Expenditure)

- **Definition of GNP**: the **market value** of **final** goods and services produced during a **given period of time** by **national factors of production**, **regardless of where production takes place**.

$$GNP = GDP + NFI$$

  - Example illustrating the difference between GDP and GNP (source: Market Business News):



National Income Accounting

Exercises in Pluto

- Exercise 1 (What counts as GDP? I).
- Exercise 2 (What counts as GDP? II).
- Exercise 3 (Approaches to estimate GDP).
- Exercise 4 (Pandora vs Utopia).
- Exercise 5 (GDP and its shares).
- Exercise 6 (GDP, GNP, and Welfare).
- Exercise 7 (Income vs Product).

Nominal variables vs real variables with a fixed base year

Definitions, notation, and examples

- **Nominal variables**: measured in period t at current prices – $X_t,\ \forall t \in [t_0, t_f]$.
  - Example: an economy with 2 goods.

t	**1910**		**1911**	
	Quantity	Price	Quantity	Price
Bread	250	1	255	1.5
Rabbits	50	5	50	6
GDP_t	$250 \times 1 + 50 \times 5 = 500$		$255 \times 1.5 + 50 \times 6 = 682.5$	

Nominal variables vs real variables with a fixed base year

Definitions, notation, and examples

- **Real variables**: measured in period t at constant prices / fixed prices / base-year prices – $X_{t,\text{base}},\ \forall t \in [t_0, t_f]$.
  - Example: an economy with 2 goods - the base year is 1910.

t	**1910**		**1911**	
	Quantity	Price	Quantity	Price
Bread	250	1	255	1.5
Rabbits	50	5	50	6
$GDP_{t,1910}$	$250 \times 1 + 50 \times 5 = 500$		$255 \times 1 + 50 \times 5 = 505$	

Nominal variables vs real variables with a fixed base year

Definitions, notation, and examples

- To convert nominal variables into real variables, we use price indices measured between period t and the base year, $I^P_{t,\text{base}}$:

$$X_{t,\text{base}} = \frac{X_t}{I^P_{t,\text{base}}}$$

  - Example: an economy with 2 goods.

t	**1910**	**1911**
GDP_t	$250 \times 1 + 50 \times 5 = 500$	$255 \times 1.5 + 50 \times 6 = 682.5$
$GDP_{t,1910}$	$250 \times 1 + 50 \times 5 = 500$	$255 \times 1 + 50 \times 5 = 505$
$I^P_{t,1910}$	$\frac{250\times1+50\times5}{250\times1+50\times5} = \frac{500}{500} = 1$	$\frac{255\times1.5+50\times6}{255\times1+50\times5} = \frac{682.5}{505} = 1.35$

Nominal variables vs real variables with a fixed base year

Inflation rate

- The inflation rate corresponds to the growth rate of the price index between two periods:

$$\pi_{t+i}\ (\%) = \left(\frac{I^P_{t+i,\text{base}} - I^P_{t,\text{base}}}{I^P_{t,\text{base}}} \right) \times 100$$

  - Example: an economy with 2 goods.

t	**1910**	**1911**
$I^P_{t,1910}$	$\frac{250\times 1+50\times 5}{250\times 1+50\times 5} = \frac{500}{500} = 1$	$\frac{255\times 1.5+50\times 6}{255\times 1+50\times 5} = \frac{682.5}{505} = 1.35$
π_{1911}	-	$\frac{1.35-1}{1} = 35\%$

Nominal variables vs real variables with a fixed base year

- **The Fisher equation** – this equation highlights a simple but very important relationship:

$$r = i - \pi$$

  - $i \geq 0$: nominal interest rate;
  - r: real interest rate;
  - π: inflation rate.

Exercises in Pluto

- ☒ Exercise 8 (Price indexes and real GDP).
- ☒ Exercise 11 (Negative real interest rates).

Labour force, participation rate, and unemployment rate

Definitions

- **Labour force**: working-age individuals who are able and willing to work, whether they are employed or unemployed.
- **Participation rate**: measures the share of the labour force in the total population:

$$\text{Participation rate} = \frac{\text{Labour force}}{\text{Total population}}$$

- **Unemployment rate**: measures the proportion of the labour force that is unemployed:

$$\text{Unemployment rate} = \frac{\text{Number of unemployed}}{\text{Labour force}}$$

Different types of unemployment

Concepts

- **Natural rate of unemployment** – the unemployment rate that would prevail if the economy were neither in a boom nor in a recession, and it consists of two components:
  - Frictional unemployment: workers moving between jobs in a dynamic economy;
  - Structural unemployment: the labour market is unable to match workers with firms' needs.
- **Cyclical unemployment** – the difference between the actual unemployment rate and the natural rate of unemployment, associated with short-run fluctuations in output.
- The unemployment rate is the sum of frictional, structural, and cyclical unemployment.

Different types of unemployment

Concepts

Exercises in Pluto

- ☒ Exercise 9 (Unemployment).
- ☒ Exercise 10 (The natural unemployment rate).