

# Elements of Macroeconomics Spring 2024

Week 4

## 6 Working with Growth rates

### 6.1 Calculating Growth rates

Growth rates are percentage changes of variables over time:

$$\text{Growth Rate in \%} = \frac{X_t - X_{t-1}}{X_{t-1}} * 100$$

For instance, GDP in Q4 2022 was 26,132.458 Billion US\$ while in Q3 2022 it was 25,723.941 (<https://fred.stlouisfed.org/series/GDP>). To calculate the growth rate, we use:

$$\text{Growth Rate in \%} = \frac{26,132.458 - 25,723.941}{25,723.941} * 100 = 1.588\%$$

### 6.2 Annualizing growth rates

We often have monthly or quarterly growth rates. How do we **annualize** them, eg convert into a yearly growth rate? We multiply them multiple times:

$$\text{Annualized Growth Rate in \%} = \left( \left( \frac{X_t}{X_{t-1}} \right)^{q/n} - 1 \right) * 100$$

where:

- $q$ : number of periods that fit in a year, i.e., 12 periods for monthly
- $n$ : number of periods covered in the calculation

**Example 1:** quarterly inflation is 0.5%. What is annualized inflation? For this we multiply  $(1 + 0.5\%)$  with itself as often as there are quarters in a year and subtract 1.

$$(1 + 0.5\%) * (1 + 0.5\%) * (1 + 0.5\%) * (1 + 0.5\%) - 1 = (1 + 0.5\%)^4 - 1 = 2.015\%$$

**Example 2:** Similarly, when we have data for longer than a year. Eg GDP growth between 5 quarters was 3.5%. What is the annualized growth rate? Again, we multiply  $(1 + 3.5\%)$  with itself as often as there are 5 quarters in a year  $(4/5)$ .

$$(1 + 3.5\%)^{4/5} - 1 = 2.79\%$$

## 7 National Accounting

### 7.1 Gross National Product, National Income, Personal Income, Disposable Income

Sometimes it is useful to apply other concepts other than GDP as well.

**Gross NATIONAL Product** While GDP looked at **domestic** production, eg within the country's borders, GNP looks at **national** production, eg production from the country's residents and firms!

For instance, if GM (a US company) produces cars in Mexico, the production counts as GDP of Mexico and GNP of the US.

**National Income** For GDP we said it is *gross* and we do not care about depreciation. For national income we do!

$$\text{National Income} = \text{GDP} - \text{Depreciation of Capital}$$

**Personal Income** Personal income can be seen as **gross** income of households. It covers all gross payments the households receive, eg all gross wages, dividends, transfer payments. In practice, we use

$$\text{Personal Income} = \text{National Income} - \text{Corporation savings} + \text{government transfers and bonds interests}$$

**Disposable Personal Income** Disposable personal income is the amount households can actually spend or save. For this, we subtract taxes from personal income.

$$\text{Disposable Personal Income} = \text{Personal Income} - \text{Taxes}$$

#### Question 1 (textbook 3.4)

Suppose the information in the following table is for a simple economy that produces only four goods and services: shoes, hamburgers, shirts, and cotton. Assume that all the cotton is used in the production of shirts.

Product	2009		2018		2019	
	Quantity	Price	Quantity	Price	Quantity	Price
Shoes	90	\$50.00	100	\$60.00	100	\$65.00
Hamburgers	75	2.00	100	2.00	120	2.25
Shirts	50	30.00	50	25.00	65	25.00
Cotton	100	0.80	800	0.60	120	0.70

- Use the information in the table to calculate real GDP for 2018 and 2019, assuming that the base year is 2009.
- What is the growth rate of real GDP during 2019?
- What is the annualized growth rate from 2009 to 2018?

## 8 Inflation

Inflation rate is the percentage change in the price level.

### The Consumer Price Index (CPI)

- The CPI is a weighted average of a basket of goods using current prices!
- The CPI market basket illustrates the consumption basket of an urban family of four.

### Note: Comparison Inflation, nominal and real GDP

- **CPI:** *fixed* basket to *current* prices
- **nominal GDP:** *current* final goods/services to *current* prices
- **real GDP:** *current* final goods/services to *fixed* prices

Product	CPI weight	Jan-20		Jul-20	
		Quantity	Price	Quantity	Price
Pizza	20	30	10	35	8
Cars	40	50	200	55	205
Bread	30	20	5	25	6
Beer (Imports)	10	10	7	50	14

**Example** Calculate nominal GDP, real GDP, annual growth rates for nominal and real GDP, GDP deflator, CPI, Inflation rate. Compare and explain the differences in GDP deflator and Inflation rate.

## 9 Labor Market

Review concepts:

- **Working Age Population:** Every US citizen above 16
- **Employed:** Worked 1+ hours in reference week (or were temporarily away from job)
- **Unemployed:** If not currently at work but available for work and has actively looked for work during past four (4) weeks
- **Civilian Labor Force:** Employed + Unemployed
- **Discouraged Workers/Marginally Attached:** Not actively looking for jobs, but would have time
- **Unemployment Rate U3**

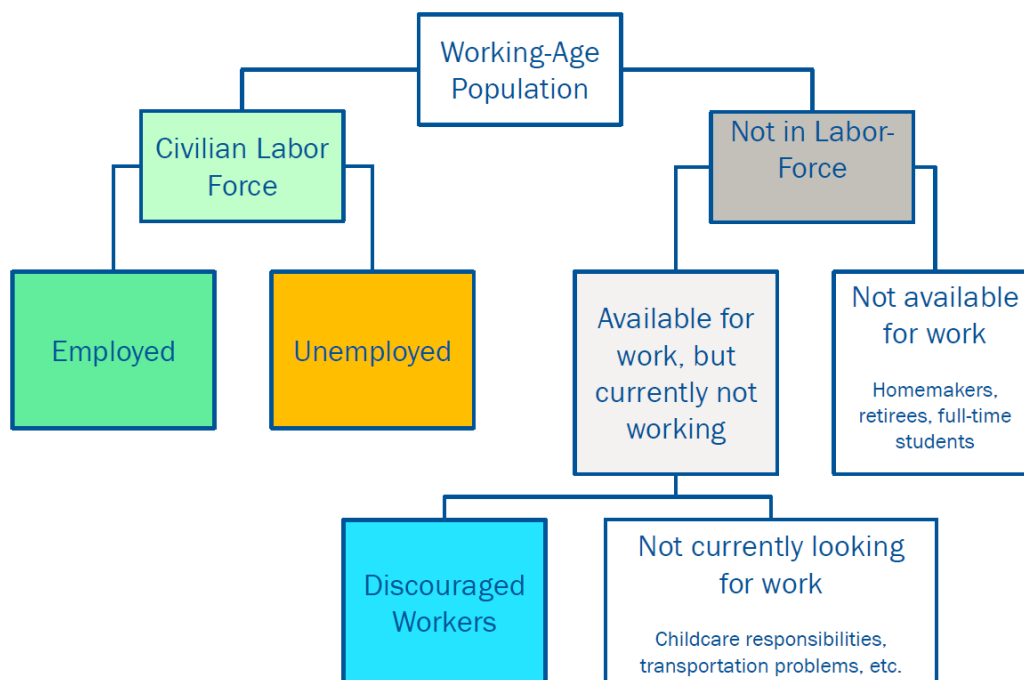
$$\text{Unemployment Rate U3} = \frac{\text{Number of Unemployed}}{\text{Number Labor Force}}$$

- **Unemployment Rate U6**

$$\text{Unemployment Rate U6} = \frac{\text{Number of Unemployed} + \text{Marginally attached} + \text{involuntary part-time}}{\text{Number Labor Force}}$$

### The Employment Status of the Working-Age Population

18



	<b>2025 (In Millions)</b>	<b>2030 (In Millions)</b>
<b>Total Population</b>	<b>120</b>	<b>140</b>
<b>Working-age population</b>	<b>110</b>	<b>130</b>
<b>Number of adults neither working, nor looking for work</b>	<b>10</b>	
<b>Number of adults employed</b>	<b>80</b>	
<b>Number of adults unemployed</b>		<b>25</b>

**Question**

- How many individuals are unemployed in 2025?
- What is the labor force participation rate in 2025?
- What is the unemployment rate in 2025?
- Assume the unemployment rate remains constant from 2025 to 2030. How many individuals are employed in 2030?
- How many adults are neither working nor looking for work in 2030?