

## Assignment 6 Solutions

### Part A: BLS definitions

The Bureau of Labor Statistics (BLS) surveys people aged 16 or older and applies these definitions:

- *Employed*: Those who performed any work (including self-employment or on a family farm).
- *Unemployed*: Those who had no employment, were available for employment, and looked for a job in the preceding four weeks.
- *Labor force*: The sum of employed and unemployed people.
- *Unemployment rate*: The number unemployed as a percent of the labor force.
- *Labor force participation rate*: The labor force as a percent of the population.

### Part B: Entering and exiting the labor force

For this section, please

- use four digits after the decimal in your answers,
- specify units, such as percent (%) or percentage points (p.p.) as applicable, and
- use the data in the following table and the BLS definitions above.

| BLS data for the U.S. in February 2020 |                  |
|--|------------------|
| Classification                         | People, millions |
| Employed                               | 158.8            |
| Unemployed                             | 5.8              |
| Working-age population                 | 259.6            |

1. Write the formula for *the labor force participation rate* as a function of *employment*, *unemployment*, and *the working-age population*.

$$\text{labor force participation rate} = \frac{\text{employment} + \text{unemployment}}{\text{the working-age population}}.$$

2. What was the labor force participation rate in February 2020?

$$\text{labor force participation rate} = \frac{158.8 \text{ M people} + 5.8 \text{ M people}}{259.6 \text{ M people}} = \frac{164.6}{259.6} = 0.6341 = 63.41\%.$$

3. What was the unemployment rate in February 2020?

$$\text{unemployment rate} = \frac{\text{unemployment}}{\text{the labor force}} = \frac{\text{unemployment}}{\text{employment} + \text{unemployment}}.$$

$$\text{unemployment rate} = \frac{5.8 \text{ M people}}{158.8 \text{ M people} + 5.8 \text{ M people}} = \frac{5.8}{164.6} = 0.0352 = 3.52\%.$$

4. Suppose that in March 2020, 1 million unemployed people quit looking for a job, and the number of employed people stayed the same as in February 2020.

- a) What would be the unemployment rate in March 2020?

$$\text{unemployment rate} = \frac{4.8 \text{ M people}}{158.8 \text{ M people} + 4.8 \text{ M people}} = \frac{4.8}{163.6} = 0.0293 = 2.93\%.$$

- b) What was the change in the unemployment rate from February 2020 to March 2020?

$$\begin{aligned} \text{change} &= x_{\text{final}} - x_{\text{initial}} \\ \text{change in unemp rate} &= \text{unemp rate}_{2020-\text{Mar}} - \text{unemp rate}_{2020-\text{Feb}} \\ &= 2.93\% - 3.52\% = -0.59 \text{ p.p.} \end{aligned}$$

Suppose we mistakenly wrote that the unemployment rate changed by  $-0.59\%$ ; we wrote units of percent instead of percentage points (p.p.). Then  $\text{unemp rate}_{2020-\text{Mar}} = (100\% - 0.59\%) \times \text{unemp rate}_{2020-\text{Feb}} = (1 - 0.0059) \times 3.52\% = 3.49\%$ . This isn't the true value.

Here, a decrease in the unemployment rate of 0.59 percentage points instead conveys this: the prior rate, 3.52% declined by 0.59 percentage *points*. Doing this simpler arithmetic, we find that  $\text{unemp rate}_{2020-\text{Mar}} = 3.52\% - 0.59 \text{ p.p.} = 2.93\%$ , which is the true value.

- c) Why did the unemployment rate change without any change in employment?

People who switch between employment and unemployment obviously affect the rate.

In this case, however, unemployed people decided to leave the labor force altogether, which affected the unemployment rate.

5. *Now instead suppose* that in March 2020, the number of unemployed people remained the same as in February 2020, while 5 million people quit their jobs to be stay-at-home parents.

- a) In this case, what would be the unemployment rate in March 2020? Please specify units.

$$\text{unemp rate}_{2020\text{-Mar}} = \frac{5.8 \text{ M people}}{153.8 \text{ M people} + 5.8 \text{ M people}} = 4.10\%$$

- b) What was the change in the unemployment rate from February 2020 to March 2020? Please specify units.

$$\text{change in unemp rate} = 4.10\% - 3.52\% = 0.57 \text{ p.p.}$$

- c) Why did the unemployment rate change without any change in unemployment?

Employed people left the labor force. As a result, unemployed people constitute a greater share of the labor force.

## Part C: Production and output

For this section, please use the fictional data below. *Please specify units for each answer.*

| Year | Carrots        |               | Onions         |               |
|------|----------------|---------------|----------------|---------------|
|      | Price (\$/ton) | Output (tons) | Price (\$/ton) | Output (tons) |
| 2019 | 2              | 10            | 3              | 15            |
| 2020 | 3              | 8             | 4              | 11            |

1. What was nominal GDP in 2019?

$$\text{nom. gdp}_{2019} = \frac{\$2}{\text{ton}} \times 10 \text{ tons} + \frac{\$3}{\text{ton}} \times 15 \text{ tons} = \$65$$

2. What was nominal GDP in 2020?

$$\text{nom. gdp}_{2020} = \frac{\$3}{\text{ton}} \times 8 \text{ tons} + \frac{\$4}{\text{ton}} \times 11 \text{ tons} = \$68$$

3. What was the percent change in nominal GDP from 2019 to 2020?

$$\begin{aligned} \text{percent change} &= \frac{x_{\text{final}} - x_{\text{initial}}}{x_{\text{initial}}} \\ \% \text{ change in nom. gdp} &= \frac{\$68 - \$65}{\$65} = 4.62\% \end{aligned}$$

4. For this question, please use 2019 as the base year.

- a) What was real GDP in 2019?

\$65

- b) What was real GDP in 2020?

\$49

- c) What was the percent change in real GDP from 2019 to 2020?

-24.61%

5. For this question, please use 2020 as the base year.

- a) What was real GDP in 2019?

\$90

- b) What was real GDP in 2020?

\$68

- c) What was the percent change in real GDP from 2019 to 2020?

-24.44%

6. Why is the percent change in nominal GDP so different than the percent change in real GDP?

The price of carrots increased by 50%. The price of onions increased by 33%. This inflation made the change in output larger in nominal terms than it was in real terms.