ECO 120-04
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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?

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

    Suppose we mistakenly wrote that the unemployment rate changed by -0.59%; we wrote units of percent instead of percentage points (p.p.). Then unemp rate$_{2020\text{-Mar}} = (100\% - 0.59\%) \times$ 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 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?

$$\text{percent change} = \frac{x_{\text{final}} - x_{\text{initial}}}{x_{\text{initial}}}$$

$$\% \text{ change in nom. gdp} = \frac{\$68 - \$65}{\$65} = 4.62\%$$

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.