HE1002 Macroeconomics I

Problem Sheet 3 – Problems & Solutions

Academic Year 2025/2026, Semester 1

Quantitative Research Society @NTU

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Problem 3-1

For each of the following situations, is Rick Alexander (from the chapter-opening story) counted as employed, unemployed, or not in the labor force by the Bureau of Labor Statistics?

(a) Alexander is self-employed in his old job as a carpenter.

Solution:

Employed. Self-employment is considered as employed.

(b) Alexander moves to Florida and begins looking for work.

Solution:

Unemployed. Alexander no longer has a job but is looking for one.

(c) Alexander feels discouraged looking for work and stops applying for jobs.

Solution:

Not in the labour force. Alexander doesn't have a job but isn't looking, so he is neither employed nor unemployed.

(d) Alexander starts looking for work again.

Solution:

Unemployed. Alexander still doesn't have a job but is now looking for one.

(e) Alexander starts work at a new job.

Solution:

Employed. Alexander finally has a job again.

Problem 3-2

Consider the economy whose data appear in Table 9P-1.

Table 9P-1

Category	Number of people (thousands)
Working-age Population	130
Labor force	65
Employed	53
Unemployed	12

(a) What is the unemployment rate?

   Solution:

$$\text{Unemployment rate} = \frac{\text{Unemployed}}{\text{Labor force}} = \frac{12,000}{65,000} = 0.185 \text{ or } \mathbf{18.5\%}$$

(b) What is the labor-force participation rate?

   Solution:

$$\text{Labor-force participation rate} = \frac{\text{Labor force}}{\text{Population}} = \frac{65,000}{140,000} = 0.50 \text{ or } \mathbf{50\%}$$

Problem 3-3

Table 9P-2 uses data for the year 2018, adjusted to be comparable to each other. All population values are in thousands.

Table 9P-2

Country	Working-age Pop	Labor Force	Emply	Unemply	Unemply Rate (%)	LF Part (%)
Japan	74,518	(1)	67,124	1,934	(2)	(3)
France	(6)	29,620	(4)	2,365	(5)	88.0
Germany	52,967	41,674	(9)	(8)	3.57	(7)

(a) Fill in the blanks in the table.

Solution:

Formulas used:

$$\text{Labor Force} = \text{Employed} + \text{Unemployed}$$
$$\text{Unemployment Rate} = \frac{\text{Unemployed}}{\text{Labor Force}} \times 100$$
$$\text{LF Participation Rate} = \frac{\text{Labor Force}}{\text{Working-age Population}} \times 100$$

Calculations:

$$(1): \text{LF} = 67,124 + 1,934 = \textbf{69,058}$$
$$(2): \text{Unemployment Rate} = \frac{1,934}{69,058} \times 100 = \textbf{2.80\%}$$
$$(3): \text{LF Participation} = \frac{69,058}{74,518} \times 100 = \textbf{92.7\%}$$
$$(4): \text{Employed} = 29,620 - 2,365 = \textbf{27,255}$$
$$(5): \text{Unemployment Rate} = \frac{2,365}{29,620} \times 100 = \textbf{7.98\%}$$
$$(6): \text{WAP} = \frac{29,620}{0.88} = \textbf{33,659}$$
$$(7): \text{LF Participation} = \frac{41,674}{52,967} \times 100 = \textbf{78.7\%}$$
$$(8): \text{Unemployed} = 0.0357 \times 41,674 = \textbf{1,488}$$
$$(9): \text{Employed} = 41,674 - 1,488 = \textbf{40,186}$$

Completed Table:

Country	Working-age Pop	Labor Force	Emply	Unemply	Unemply Rate (%)	LF Part (%)
Japan	74,518	69,058	67,124	1,934	2.80	92.7
France	33,659	29,620	27,255	2,365	7.98	88.0
Germany	52,967	41,674	40,186	1,488	3.57	78.7

(b) In part (a), you should have found that the unemployment rates of the three countries differ significantly from one another. Suggest three possible reasons to explain why the countries might have different unemployment rates.

Solution:

Possible reasons for different unemployment rates:

- **Cyclical unemployment:** Countries experiencing economic contraction are likely to have higher cyclical unemployment.

- **Frictional unemployment:** Countries with more effective job search technologies, supportive government policies that facilitate hiring and job matching are likely to have lower frictional unemployment.

- **Structural unemployment:** Countries that experienced rapid economic shifts such as technological change are likely to have higher structural unemployment.

- **Real-wage (classical) unemployment:** Countries with higher minimum wages or strong unions that managed to bargain for higher wages (relative to market clearing wage) are likely to have higher unemployment rates.

- **Unemployment benefits:** Countries with more generous unemployment benefits are likely to have higher unemployment rates.

Problem 3-4

Assume the equilibrium wage rate is $6. Draw a graph of the labor market to answer the following questions.

(a) When the government introduces a minimum wage of $5.50, does unemployment increase, decrease, or stay the same compared to unemployment at the equilibrium wage?

Solution:

Since the equilibrium wage is above the government-mandated minimum wage ($6 ¿ $5.50), the minimum wage will be **non-binding**. Firms will already be paying above the minimum wage. Thus, the minimum wage will have **no effect** on the wage paid or the unemployment rate.

(b) When the government introduces a minimum wage of $6.50, does unemployment increase, decrease, or stay the same compared to unemployment at the equilibrium wage?

Solution:

Since the government-mandated minimum wage is above the equilibrium wage ($6.50 ¿ $6), the minimum wage is **binding**. The wages paid to workers will rise, but so will **unemployment increase**.

Problem 3-5

Assume that the labor demand equation for a fictional country is $L_d = 60 - 2w$, where w is the wage per hour worked and L_d is the number of workers demanded by firms. Assume also that the labor supply equation for that country is $L_s = 0.4(w)$, where L_s is the number of people willing to work.

(a) Find the equilibrium wage and quantity of labor employed.

Solution:

Set $L_d = L_s$:

$$60 - 2w = 0.4(w)$$
$$60 = 2.4w$$
$$w = 25$$

Substitute $w = 25$ into either equation:

$$L_d = 60 - 2(25) = 10 \text{ or } L_s = 0.4(25) = 10$$

Equilibrium wage: \$25 per hour

Quantity of labor employed: 10 workers

(b) At the equilibrium wage, how many people are unemployed?

Solution:

Since $L_d = L_s$, there is **no unemployment**. The quantity demanded equals the quantity supplied at the equilibrium wage.

(c) How would the number of unemployed change if the supply of workers increased?

Solution:

If the supply of workers increases, then the labor supply curve will shift to the right. As long as the wage is free to quickly adjust, L_d will still exactly equal L_s, so no unemployment will occur. The equilibrium wage will fall, and employment will rise.

However, if wages do not quickly adjust to changes in labor supply or demand (as often happens in the real world), the labor market is not always in equilibrium, and unemployment may increase.

Problem 3-6

Suppose a firm's labor demand equation is $L_d = 60 - 2(w)$ and the labor supply equation that it faces is $L_s = -20 + 3(w)$, where w is the wage per hour worked, L_d is the number of workers demanded by firms, and L_s is the number of people willing to work.

(a) Find the equilibrium wage and quantity of labor employed.

Solution:

Set $L_d = L_s$:

$$60 - 2w = -20 + 3w$$
$$80 = 5w$$
$$w = 16$$

Substitute $w = 16$ into either equation:

$$L_d = 60 - 2(16) = 28 \text{ or } L_s = -20 + 3(16) = 28$$

Equilibrium wage: \$16 per hour

Quantity of labor employed: 28 workers

(b) The workers, thinking that their wages are too low, decide to strike. After tense negotiations, the firm decides to raise the wage by 50 percent. After the wage increase, how many people are unemployed?

Solution:

Wage rate increases by 50% from \$16 to \$24:

$$w_{\text{new}} = 16 \times 1.5 = 24$$

At $w = 24$:

$$L_d = 60 - 2(24) = 12$$
$$L_s = -20 + 3(24) = 52$$

Since the quantity of labor demanded is 12 and the quantity of labor supplied is 52, there is an excess supply or surplus of labor (unemployment):

$$\text{Unemployment} = L_s - L_d = 52 - 12 = \textbf{40 workers}$$

Problem 3-7

Classify each of the following situations as either frictional, structural, or cyclical unemployment.

Definition:

- **Frictional unemployment:** Unemployment caused by a worker changing job, location, or career.

- **Structural unemployment:** Unemployment due to a mismatch between the skills workers can offer and the skills in demand in the economy.

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- **Cyclical unemployment:** Unemployment when people become temporarily unemployed due to an economic downturn.

(a) Maria has started looking for work after taking time off to have a baby.

Solution: Frictional unemployment

(b) Juan left high school without graduating and can't find any jobs he is qualified for.

Solution: Structural unemployment

(c) Rohit had a job working on Wall Street but lost his job during the financial crisis.

Solution: Cyclical unemployment

(d) Adam has just arrived in a new city and is looking for work.

Solution: Frictional unemployment

(e) Max wants to work as an air steward, but because the airline industry is heavily unionized there are very few jobs available.

Solution: Structural unemployment

(f) Jada has just lost her job in a web start-up that was affected by a downturn in the economy.

Solution: Cyclical unemployment

Problem 3-8

For each of the following situations, would the unemployment rate increase, decrease, or stay the same?

(a) A company begins paying efficiency wages above the equilibrium wage rate.

Solution:

Efficiency wages raise the wage rate above the equilibrium level. At higher wages:

- Quantity of labor demanded decreases
- Quantity of labor supplied increases

Thus, unemployment **increases**.

(b) The number of workers covered by union contracts falls.

Solution:

Unions raise the wage rate above the equilibrium level. A reduction in the number of workers covered by union contracts will bring wage rates closer to the equilibrium level, **reducing unemployment**.

(c) The government extends the duration of unemployment insurance.

Solution:

Increasing the duration of unemployment insurance reduces unemployed workers' incentives to find work, thus **increasing** the unemployment rate.

Problem 3-9

Suppose a country has a 26-week limit on the duration that an unemployed person receives unemployment benefits. You collect some data and notice that workers in their 26th week of unemployment benefits somehow manage to find jobs at a much higher rate than other unemployed workers. What would this statistic tell you about the incentives involved with unemployment insurance?

Solution:

The fact that large numbers of people find jobs during the last week of benefits suggests that **unemployed workers receiving unemployment checks have an incentive to wait until their benefits run out before seriously looking for work or taking new jobs**.

This demonstrates that unemployment insurance creates a disincentive to search for employment while benefits are being received. Workers are more motivated to find employment when they face the threat of losing benefits entirely.

Problem 3-10

Understanding that unemployment benefits give workers the incentive to not look for work until their benefits run out, suppose an economist suggested that instead of giving workers up to 26 weeks of unemployment benefits that end once the person finds work, a person who loses his or her job would just get a single big check for 26 weeks of benefits, regardless of how long the worker is unemployed. What are the advantages and disadvantages of this idea?

Solution:

Because unemployed workers would get 26 weeks of benefits regardless of how soon they find new jobs, these workers have an incentive to look for work right away since they don't lose benefits the moment they find a new job.

Advantages:

- This idea is likely to **reduce unemployment** by increasing the incentives to look for work earlier.

- Workers are not penalized for finding employment quickly, so they have every reason to search actively from day one.

Disadvantages:

- **More costly for the government**. All workers would be compensated for a full 26 weeks of unemployment.

- Under the previous 26-week limit, any workers finding jobs before 26 weeks are up don't receive benefits for the remaining weeks, thus reducing total unemployment payments.

- This system increases government expenditure and may require higher taxes.