

**Summer School**  
**Exercise 3**  
**Wages, Prices and Unemployment**

1. An economy has the following Phillips curve:

$$\pi = \pi^e + \varepsilon(u - u^*)$$

where  $u^*$  is the natural rate of unemployment,  $\pi$  is the inflation rate at time  $t$  and  $\pi^e$  is the expected inflation rate at  $t$ .

- (i) Describe briefly what sign you expect on parameter  $\varepsilon$ . Explain the economic significance of the sign.
- (ii) Assume  $\varepsilon = -0.4$ ,  $u^* = 0.08$ , and  $\pi^e = 0.05$  for all  $t$ . Graph the short run and long run Phillips curves (PC).
- (iii) Now assume that  $\varepsilon = -0.4$ ,  $u^* = 0.08$  and  $\pi^e = \pi_{t-1}$ , so that inflation in the current period  $t$  depends on unemployment and the inflation of the last period,  $t$ . What is the Non-Accelerating Inflation Rate of Unemployment (NAIRU)? Explain the intuition behind the NAIRU.
- (iv) If the government of the economy wants to reduce inflation by 4%, how much does the Phillips curve suggest unemployment will change?

2. Suppose the Phillips curve is

$$\pi - \pi^e = -0.5(u - 0.06)$$

- (i) What is the natural rate of unemployment?
- (ii) Graph the short-run and the long-run relationship between inflation and unemployment.
- (iii) How much cyclical unemployment is necessary to reduce inflation by 5 percentage points immediately?

3. Suppose that the Phillips curve is approximated by the following equation:

$$\pi - \pi^e = -1.1(u - u^*)$$

Assume that the natural rate of unemployment  $u^*$  is 5%,  $\pi_0 = 0.05$  and that  $\pi^e = \pi_{t-1}$ . Actual unemployment is

Year	0	1	2	3	4
Actual unemployment (u)	5%	7%	6%	5%	5%

What is inflation in year 3? Year 4?

4. Suppose that the Phillips relation stated above still holds. Assume again that the natural rate of unemployment  $u^*$  is 5% and the actual unemployment data is

Year	0	1	2	3	4
Actual unemployment (u)	5%	2%	3%	5%	5%

What is inflation in year 3?

5. Given the following table, calculate  $u^*$ , the national natural rate of unemployment:

Group	$u^*$ for the group	fraction
Teenagers	10%	20%
20-40	6%	40%
40-60	4%	30%
>60	7%	10%

6. Suppose that a fraction  $\lambda$  of the population follows wage indexation (i.e., those workers adjust immediately and precisely to the actual inflation rate). The remaining fraction has perfectly adaptive expectations. Write down the respective average (weighted) inflation of the population and the Phillips equation (Hint: this question is discussed in your textbook!)