Lecture 5 Sample Question 3

In our labor market model, an increase in the minimum wage means and increase in the catch-all variable z. it is because when there is an increase in the minimum wage, given same unemployment rate, the wage setters have to set higher wage for the workers. WS curve shifts up.
By referring the labor market equilibrium with WS and PS curves, we get the new equilibrium unemployment rate. u_n increase to u_n'.
By definition,

$$u = \frac{U}{L} = \frac{U}{N+U},\ E + U = L$$

where U is total unemployment, N is total employment, and L is total labor force. We implicitly assume that labor force L is fixed.
When the natural rate of unemployment increases, the natural level of unemployment increases. Since sum of employment and unemployment is total labor force, the natural level of employment decreases. The production function we have here is $Y = N$. With this production function, a decrease in the natural level of employment implies an reduction of the natural level of output.

Suppose the expected inflation rate has the following form:

$$\pi_t^e = (1-\theta)\bar{\pi} + \theta\pi_{t-1}$$

It means that expected inflation this year depends partly on a constant value $\bar{\pi}$ with weight $(1-\theta)$ and partly on inflation last year π_{t-1} with weight θ.
In general, price and wage determination in the economy tell us the following equation holds:

$$\pi_t = \pi_t^e + (m+z) - \alpha u_t$$

When $\theta = 0$, we have the original Phillips curve:

$$\pi_t = \bar{\pi} + (m+z) - \alpha u_t$$

When $\theta = 1$, we have the accelerationist Phillips curve:

$$\pi_t = \pi_{t-1} + (m+z) - \alpha u_t \Longrightarrow \pi_t - \pi_{t-1} = (m+z) - \alpha u_t$$

We define the natural rate of unemployment to be the unemployment rate when $P^e = P$. If $P_t^e = P_t$, then obviously, we have:

$$\pi_t^e = \frac{P_t^e - P_{t-1}}{P_{t-1}} = \frac{P_t - P_{t-1}}{P_{t-1}} = \pi_t$$

So, the natural rate of unemployment is also the unemployment rate in the economy when $\pi_t^e = \pi_t$.
By taking the original equation we have for actual inflation, expected inflation, and unemployment rate:

$$\pi_t = \pi_t^e + (m+z) - \alpha u_t$$

If we impose $\pi_t^e = \pi_t$., then we have

$$0 = 0 + (m+z) - \alpha u_t$$

The unemployment rate u_t which satisfies the equation above is defined as the natural rate of unemployment. So in this model structure:

$$u_n = \frac{m+z}{\alpha}$$

Then, we have

$$\pi_t = \pi_t^e + (m+z) - \alpha u_t$$

$$\pi_t - \pi_t^e = (m+z) - \alpha u_t = \alpha\frac{m+z}{\alpha} - \alpha u_t = \alpha u_n - \alpha u_t = -\alpha(u_t - u_n)$$

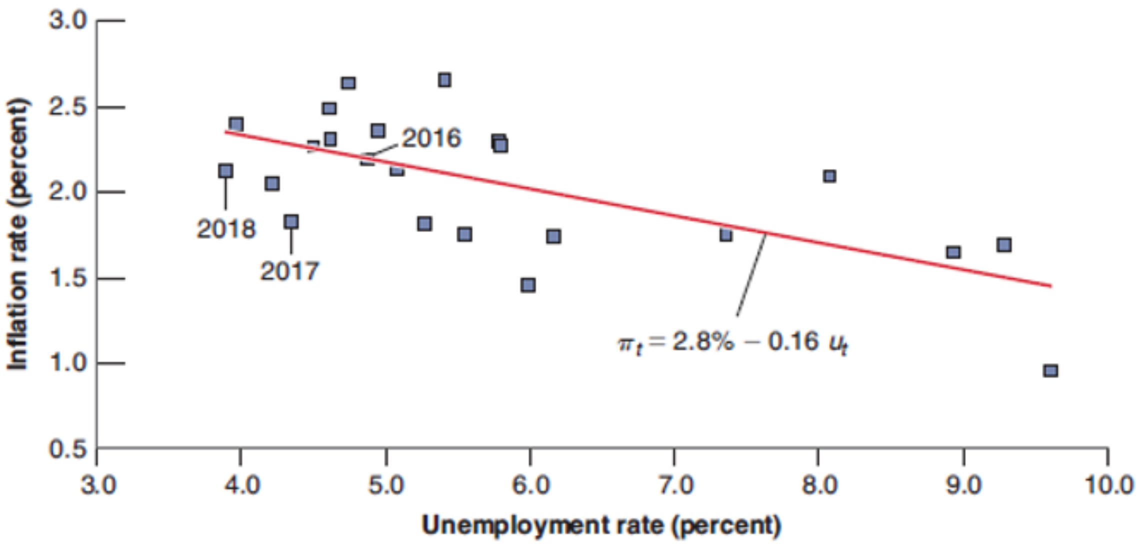
So we get equation (6.9)

$$\pi_t - \pi_t^e = -\alpha(u_t - u_n)$$

This is an important equation that links the inflation rate, the expected inflation rate, and the deviation of the unemployment rate from the natural rate.

How to get a rough estimate of the natural unemployment rate (Slide 29)

From the data, we have the plot below, and there is one best fit linear line $\pi_t = 2.8\% - 0.16u_t$ for these points



Then think about the original Phillips curve equation:

$$\pi_t = \bar{\pi} + (m + z) - \alpha u_t$$

If we use the equation above, then we have

$$\alpha = 0.16, \bar{\pi} + (m + z) = 2.8\%$$

To get u_n, the natural rate of unemployment, we impose $\pi_t = \pi_t^e$. We know in the United States, the central bank successfully keep the inflation rate roughly 2% and it is consistent with people's expectation. Then we have:

$$2\% = 2\% + (m + z) - \alpha u_n$$

Since $\bar{\pi}+(m+z) = 2.8\%, \bar{\pi} = 2\%, \alpha = 0.16$, we are ready to calculate the natural rate of unemployment:

$$u_n = \frac{m+z}{\alpha} = \frac{0.8\%}{0.16} = 5\%$$

We successfully use the best fit linear line and the targeted value of the inflation rate estimate the natural rate of unemployment in this economy.