ECO111: Economy, Society & Public Policy

Inflation and Unemployment

Prices

- From a macroeconomic perspective, one can think about prices in different ways:

1. Aggregate price index,
2. Interest rates,
3. Exchange rates.

Aggregate Price Level and Inflation

- Aggregate price index is a weighted measure of all output (or consumption) prices.
- Inflation: sustained increase in aggregate price index.
- Inflation often responds to macroeconomic imbalances.
- Low unemployment puts upward pressure on inflation, but the form of the relation depends very much on how people and firms form expectations.
- Will discuss the link between inflation and unemployment via a model of the labour market.

Wage Determination

- Wages are either set by employers or by bargaining between employers and employees.
- Although there might be institutional differences between countries, there are some common forces at work in all countries.

1. Workers are typically paid a wage that exceeds their **reservation wage**.
2. Wages typically depend on labour market conditions: the lower the unemployment rate, the higher the wages.

Wage Determination

- The wage determination relation is captured via the following relationship:

$$W = P^e F(u, z)$$

- The aggregate nominal wage W depends on three factors:

1. The expected price level P^e
2. The unemployment rate u
3. Other variables z that may affect the outcome of wage setting.

Expected Price Level

- Why does the price level affect nominal wages?
- Firms and workers care about **real wages**, and nominal wages.
- Workers do not care about how many rupees they receive, but about how many goods they can buy with those rupees.
- Firms do not care about the nominal wages they pay, but about the nominal wages they pay relative to the price of goods they sell.

Expected Price Level

- If workers expect price level to double, they will ask for a doubling of their nominal wage.
- If firms expect the price level to double, they will be willing to double the nominal wage they pay.
- If both workers and firms expect the price level to double, they will agree to double the nominal wage.
- Why do wages depend on the expected price level, P^e rather than the actual price level P?
- When wages are set, the relevant price level is often not known.

Unemployment Rate

- Wages are also affected by the unemployment rate u.
- Typically an increase in the unemployment rate decreases wages, that is $\frac{\partial F}{\partial u} < 0$.
- If wages are determined by bargaining, higher unemployment weakens workers' bargaining power, forcing them to accept lower wages.
- Higher unemployment also allows firms to pay lower wages and still keep workers willing to work.

Other Factors

- Unemployment insurance: more generous unemployment benefits increase wages at a given unemployment level.
- Minimum wages: increases in minimum wages lead to an increase in the average wage W.
- Employment protection: increases bargaining power of workers.
- z : catch-all variable that stands for all the factors that affect wages given the expected price level and the unemployment rate.
- Define z so that an increase in z implies an increase in the wage: that is $\frac{\partial F}{\partial z} > 0$.

Price Determination

- Prices set by firms depends on the costs they face.
- The costs depend on the nature of the production function.
- Assume that firms produce goods using labour as the only factor of production:

$$Y = AN,$$

where Y is output, A is labour productivity and N is employment.

Price Determination

- Given that we have labour productivity is assumed to be constant, one can make a further simplification.
- Choose the units of output so that one worker produces one unit of output, that is $A = 1$.
- The production function then becomes

$$Y = N.$$

- Cost of producing one more unit of output is the cost of employing one more worker, at wage W.

Price Determination

- If perfect competition in the goods market: the price of a unit of output would be equal to the marginal cost: $P = W$.
- If markets are not competitive, firms charge a price higher than their marginal cost.
- One way to capture this is by assuming firms set price according to

$$P = (1 + m)\, W$$

where m is the markup of the price over the cost.

Natural Rate of Unemployment

- We can now look at the implication of wage and price determination for unemployment.
- Let's first assume that $P = P^e$. [We will relax this later on]
- Under this assumption, wage setting and price setting determine the equilibrium rate of unemployment, which is known as the **natural rate of unemployment**.
- Equilibrium in the labour market requires that the real wage chosen in wage setting be equal to the real wage implied by price setting.

Natural Rate of Unemployment

- Under the assumption that $P = P^e$, the wage setting relation becomes:

$$\frac{W}{P} = F(u, z)\,.$$

- Wage determination implies a negative relation between the real wage, W/P and the unemployment rate u.
- Higher the unemployment rate, weaker the workers' bargaining position, and the lower the real wage.

Natural Rate of Unemployment

- The price determination relation can be written as

$$\frac{W}{P} = \frac{1}{1+m}$$

- Price-setting decisions determine the real wage paid by the firms.
- An increase in the markup leads firms to increase their prices given the wage they have to pay, that is it leads to a decrease in the real wage.

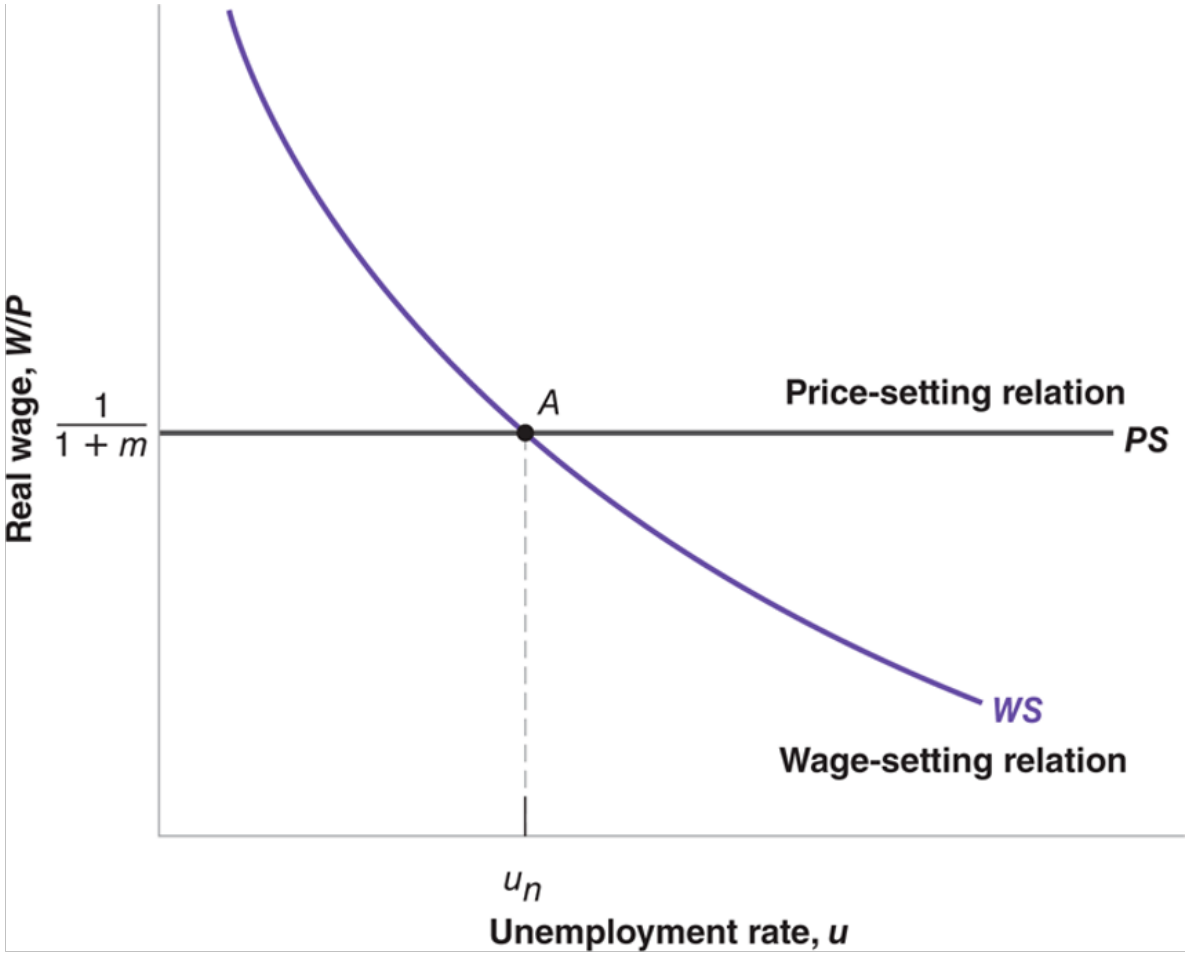
Natural Rate of Unemployment

- The equilibrium unemployment rate, u_n, is such that the real wage chosen in wage setting is equal to the real wage implied by price setting
- Algebrically we get,

$$F(u_n, z) = \frac{1}{1+m}.$$

- Note that the equilibrium rate of unemployment depends on both z and m.

Natural Rate of Unemployment



Natural Rate of Unemployment

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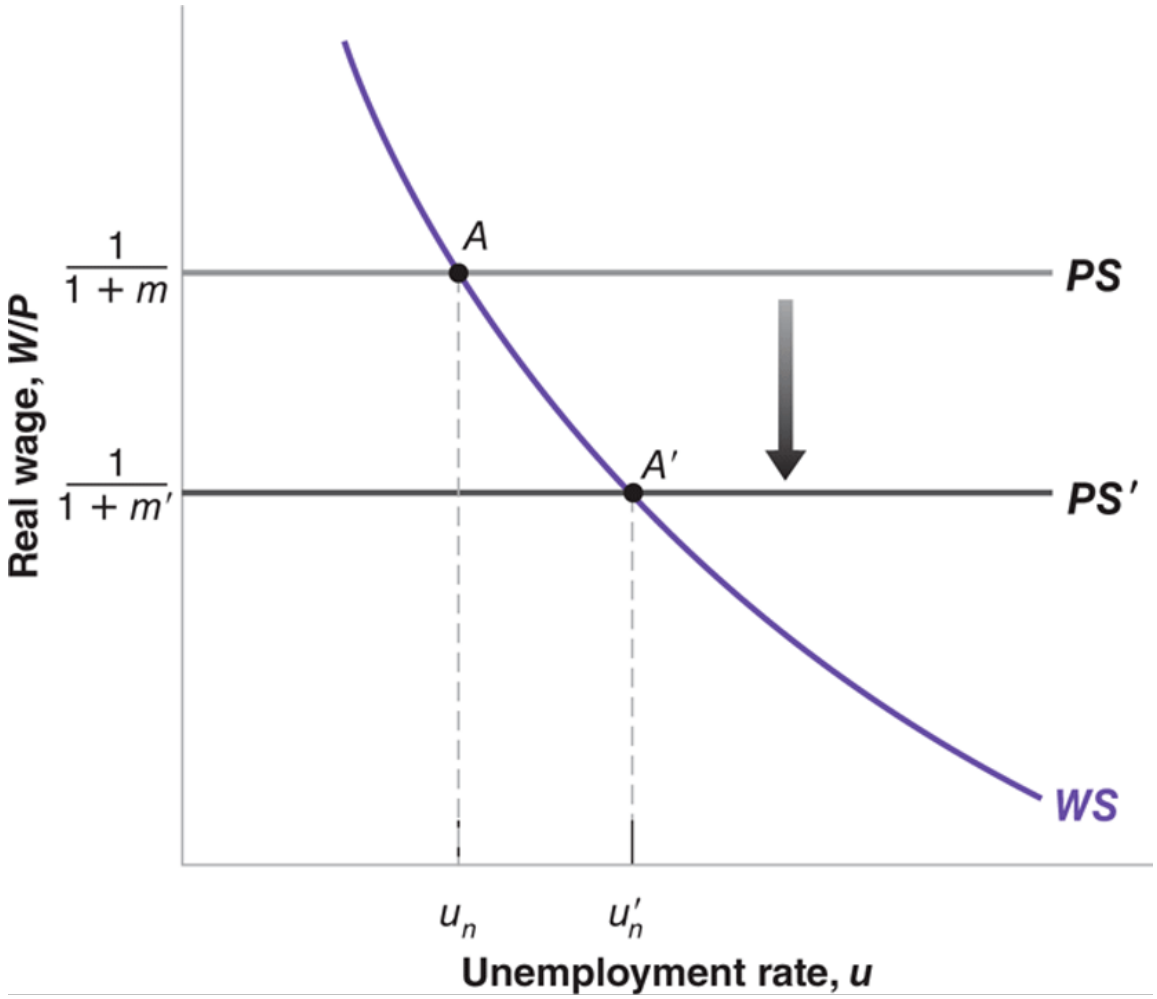

Inflation and Unemployment

- Let's go back to our original equation for wage determination:

$$W = P^e F(u, z)$$

- We assume a specific functional form for the function F:

$$F = 1 - \alpha u + z$$

- Replacing the function F in the wage determination equation gives:

$$W = P^e (1 - \alpha u + z)$$

Inflation and Unemployment

- Price setting relation gives us:

$$P = W(1 + m)$$

- Replacing the nominal wage in the two equations we get:

$$P = P^e (1 + m)(1 - \alpha u + z)$$

- The above equation gives a relation between the price level, the expected price level and the unemployment rate.

Inflation and Unemployment

- Let π denote the inflation rate and the π^e denote the expected inflation rate.
- Then the relation between the price level, the expected price level and the unemployment rate can be rewritten as:

$$\pi = \pi^e + (m + z) - \alpha u$$

- This is one of the most important relations in macroeconomics.

Inflation and Unemployment

- An increase in expected inflation, π^e, leads to an increase in actual inflation, π.
- Given expected inflation, π^e, an increase in the markup m or an increase in the factors that affect wage determination z lead to an increase in the actual inflation π.
- Given expected inflation, π^e, a decrease in the unemployment rate u leads to an increase in the actual inflation π.

Inflation and Natural Rate of Unemployment

- Let's consider the relation between inflation rate and the natural rate of unemployment.
- When we look at movements in inflation and unemployment in the rest of the chapter, it will be convenient to use time indexes:

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

- The natural rate of unemployment is the unemployment rate at which the actual price level is equal to the expected price level.
- This can be equivalently restated as the natural rate of unemployment is the unemployment rate such that the actual inflation rate is equal to the expected inflation rate.

Inflation and Natural Rate of Unemployment

- Denoting the natural rate of unemployment by u_n, and setting $\pi = \pi^e$, we get

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

- We can rewrite

$$\begin{aligned} \pi_t - \pi_t^e &= (m+z) - \alpha u_t \\ &= \alpha \left[\frac{m+z}{\alpha} - u_t \right] \\ &= -\alpha \left(u_t - u_n \right). \end{aligned}$$

- The link between the inflation rate, the expected inflation rate, the unemployment rate and the natural rate of unemployment:

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

Inflation

- If a higher inflation rate meant just a faster but proportional increase in all prices and wages, inflation would be only a minor issue because relative prices would be unaffected.
- Suppose price inflation was 1% and wage inflation was 4%, then real wage was increasing by 3%.
- Now suppose price inflation rises to 3% and wage inflation rises to 6%, then real wage would still increase by 3%.
- Higher inflation does not affect real wages (or other relative prices) in this case.

Inflation

- In reality, during periods of inflation, prices and wages do not rise proportionately.
- Inflation affects income distribution.
- Variations in relative price leads to more uncertainty - this makes it harder to make decisions about the future.
- Note that deflation would also cause the same problems (distortions and uncertainty) as inflation.
- A low rate of deflation also limits monetary policy tools available to the central bank.