ECO 209Y MACROECONOMIC THEORY AND POLICY

LECTURE 14: LABOUR MARKET RIGIDITIES AND THE AS CURVE

THE NEOCLASSICAL CONCEPT OF FULL-EMPLOYMENT

- We can distinguish three main types of unemployment:
 - Frictional unemployment: individuals shifting between jobs or entering the labour force for the first time
 - Structural unemployment: mismatches between labour demand and labour supply characteristics
 - Cyclical unemployment: additional unemployment during recessions
- Neoclassical theory considers the economy to be at *full-employment* when there is only frictional and structural unemployment
- The natural rate of unemployment is the rate that exists when the economy is at full-employment
 - Also known as NAIRU (the non-accelerating inflation rate of unemployment)

NEOCLASSICAL LABOUR MARKET THEORY

- Neoclassical theory considers that the labour market is always in *equilibrium* and that there is no *money illusion*
 - That is, the wage rate adjust rapidly to any change in the supply or demand for labour
 - The rate of unemployment, therefore, is always equal to the natural rate
- The neoclassical view, however, is contradicted by two empirical facts:
 - The rate of unemployment *fluctuates* far more than is consistent with all unemployment being frictional/structural
 - The wage appears to *adjust slowly* in response to shifts in aggregate demand

U.S.: OPEN UNEMPLOYMENT AND THE NAIRU, 1970-2017



Source: "How Low Can Unemployment Really Go?", The New York Times, February 28, 2018.

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THE PHILLIPS CURVE

- The empirical evidence also suggests that wages *adjust slowly* in response to changes in AD
 - Increases in AD first affect output and employment, and only then wages and prices
 - > This notion is made precise in the *Phillips curve*
- The *Phillips curve* is an inverse relationship between the rate of unemployment and the rate of increase of money wages
- The Phillips curve suggests that there is a trade-off between wage inflation and unemployment
 - It shows that the rate of wage inflation decreases as the unemployment rate rises

THE PHILLIPS CURVE (CONT'D)



THE PHILLIPS CURVE (CONT'D)

• We can write the *simple* Phillips curve as:

g_w = – ε (u – u*)

where g_w is the rate of wage inflation, u^* is the natural rate of unemployment, and ε measures the sensitivity of wages to changes in the level of unemployment (or employment)

- The equation for the simple Phillips curve states that wages are falling when u > u*, and that wages are rising when u < u*</p>
- The simple Phillips curve implies that wages adjust slowly to changes in aggregate demand

For wages to rise, unemployment must fall below the natural rate

THE PHILLIPS CURVE (CONT'D)



WAGE- AND PRICE-PHILLIPS CURVES

- Phillips's own curve relates wage inflation to unemployment
 This is called the wage-Phillips curve
- However, the term "Phillips curve" is also used to describe the relation between *price inflation* and unemployment
 - This is called the *price-Phillips* curve
- Therefore, the Phillips curve also suggests a trade-off between the rate of inflation and the rate of unemployment
 - That is, it suggests that policy makers could choose different combinations of *unemployment* and rates of *inflation*
 - Thus, this is an *ethical* (and *political*) rather than an *economic* choice

THE RATE OF WAGE INFLATION

The *rate of wage inflation* is defined as:

$$g_{w} = \frac{W - W_{-1}}{W_{-1}}$$

where ${\bf W}$ is the wage this period and ${\bf W}_{-1}$ is the wage in the previous period

THE WAGE-PHILLIPS CURVE

$$g_W = -\epsilon (u - u^*)$$

$$\frac{W - W_{-1}}{W_{-1}} = -\varepsilon (u - u^*)$$

$$W - W_{-1} = -W_{-1} \epsilon (u - u^*)$$

$$W = W_{-1} - W_{-1} \epsilon (u - u^*)$$

$$W = W_{-1} [1 - \epsilon (u - u^*)]$$



SHORT-RUN AND LONG-RUN PHILLIPS CURVES

- In the late 1960s, Friedman and Phelp argued that the Phillips curve would shift over time as workers and firms became used to and began to expect continuing inflation
 - Therefore, a long-run trade-off between inflation and unemployment was illusory
 - In the long run the economy will move to the natural rate of unemployment
 - > That is, the *long-run Phillips curve* is vertical
- More recently, Graham and Snower (and others) have argued that the long-run Phillips curve is also negatively sloped
 - They consider a model with wage rigidities and show that a permanent increase in money growth leads to a permanent increase in the rate of inflation and a permanent reduction in the level of unemployment

THE AS CURVE AND GRADUAL ADJUSTMENTS OF THE ECONOMY

- We'll derive an AS curve that produces gradual adjustments of the economy after a disturbance has taken place
 - The assumption that wages adjust slowly to changes in demand is essential in the derivation of such an AS curve
 - The assumption of gradual wage adjustments allows monetary or fiscal expansion to affect output and employment
- Why do wages adjust slowly to changes in demand?
 - To answer this question we need to go back to the *simple* wage-Phillips curve:

EMPLOYMENT CONCEPTS

Let's first distinguish three different employment concepts:

- 1) Actual employment $\rightarrow N$
- 2) The neoclassical equilibrium level of full employment (unemployment at the natural rate) $\rightarrow N^*$
- 3) The level of employment that would exist if there were zero unemployment (total labour force) \rightarrow LF

ACTUAL AND NATURAL RATE OF UNEMPLOYMENT

We can define the *actual* rate of unemployment (u) as:

$$u = \frac{LF - N}{LF}$$

And we can define the *natural* rate of unemployment (u*) as:

THE DERIVATION OF THE AS CURVE

We will derive the aggregate supply curve from the simple wage-Phillips curve

$$W = W_{-1} [1 - \epsilon (u - u^*)]$$

- To do so we need to specify three main relations:
 - 1) Between *wages* and *employment*
 - 2) Between *output* and *employment*
 - 3) Between *prices* and *costs* of production

1. THE WAGE-EMPLOYMENT RELATION

Consider the equation for the simple wage-Phillips curve we derived before:

W = W₋₁ [1 -
$$\epsilon$$
 (u - u*)]

Also consider the expressions for u and u*:

$$u = \frac{LF - N}{LF}$$
$$u^* = \frac{LF - N^*}{LF}$$

WAGE-EMPLOYMENT RELATION (CONT'D)

$$\blacksquare \left[W = W_{-1} \left[1 - \varepsilon \left(u - u^* \right) \right] \right]$$

$$u - u^* = \frac{LF - N}{LF} - \frac{LF - N^*}{LF}$$
$$= \frac{N^* - N}{LF}$$

• Therefore, $W = W_{-1} [1 - \varepsilon (N^* - N)/LF]$

or
$$W = W_{-1} [1 + \epsilon (N - N^*)/LF]$$

THE WAGE-EMPLOYMENT CURVE (WN)

- The equation W = W₋₁ [1 + ε (N N*)/LF] describes the wageemployment relation, i.e., the WN curve
 - The wage this period is equal to last period's wage adjusted for the level of employment
 - At full-employment (N = N*) the wage this period is equal to last period's wage
 - If employment is above the full-employment level (N > N*), the wage increases above last period's wage (W > W₋₁)
- The extent to which W responds to changes in N depends on ε, the sensitivity of W to changes in N
 - If ε is large, changes in W have a large effect on W and the WN line is steep

THE WN CURVE

$$W = W_{-1} [1 + \epsilon (N - N^*)/LF]$$



THE WN CURVE AND THE LABOUR MARKET



Suppose that an increase in P causes the demand for labour to increase to D_0^N . Therefore, N will increase to N₀ and W will increase to W₀.

> In period 1, workers start to adjust their decision as to how much labour to supply since they become aware of the increase in P and the decrease in W/P. Therefore, the supply of labour decreases to S_1^N . Note that workers are able to negotiate higher wages because N > N* (and u < u*).

2. THE OUTPUT-EMPLOYMENT RELATION

- The *production function* links the level of employment (N) to the level of output (Y)
 - The simplest production function is one in which output is proportional to labour input: Y = aN
- The implicit assumption in this production function is that the productivity of labour is constant

 \rightarrow MP_N = AP_N = a

Given this production function, we can define different levels of output according to our definitions of employment:

1) current output: $Y = aN \rightarrow N = Y/a$

- 2) full-employment output: $Y^* = aN^* \rightarrow N^* = Y^*/a$
- **3)** potential output: YF = $aLF \rightarrow LF = YF/a$

3. THE PRICE-COST RELATION

- Let's assume the following:
 - 1) Labour costs are the main component of costs of production
 - 2) Firms set price as a mark-up, z, over unit labour cost of production
 - 3) The mark-up, z, covers the cost of other factors of production and the firm's normal profit
- Since each unit of labour produces "a" units of output and the cost of 1 unit of labour is W, the labour cost per unit of output is W/a

W/a is called the unit labour cost

Since firms set price as a mark-up (z) over unit labour cost:

P = (1 + z)
$$\frac{W}{a} = \frac{(1 + z)}{a} W$$

$$P_{-1} = \frac{(1 + z)}{a} W_{-1}$$

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REQUIREMENTS FOR THE DERIVATION OF THE AS CURVE

• Wage-employment relation: $W = W_{-1} [1 + \varepsilon (N - N^*)/LF]$

Output-employment relation:

Price-cost relation:

P = [(1 + z)/a] W

DERIVATION OF THE AS CURVE

$$W = W_{-1} [1 + \epsilon (N - N^*)/LF]$$

$$\frac{N - N^*}{LF} = \frac{(Y/a) - (Y^*/a)}{YF/a} = \frac{Y - Y^*}{YF}$$

$$W = W_{-1} [1 + \varepsilon (N - N^*)/LF]$$
$$= W_{-1} [1 + \varepsilon (Y - Y^*)/YF]$$
$$= W_{-1} [1 + \lambda (Y - Y^*)]$$
where $\lambda = \varepsilon/YF$

DERIVATION OF THE AS CURVE (CONT'D)

$$W = W_{-1} [1 + \lambda (Y - Y^*)]$$

$$P = \frac{(1 + z)}{a} W$$
$$= \frac{(1 + z)}{a} W_{-1} [1 + \lambda (Y - Y^*)]$$

 $P = P_{-1} [1 + \lambda (Y - Y^*)]$

$$P = \frac{(1+z)}{a} W$$

- The position of the AS curve depends on the past level of prices
- Therefore, the AS curve also shifts over time
- If output this period is above Y*, P will increase and the AS curve will shift up in the next period

THE AS CURVE

$$P = P_{-1} [1 + \lambda (Y - Y^*)]$$



THE EFFECT OF MONETARY EXPANSION



THE SUPPLY ADJUSTMENT OF ANINCREASE IN ADIn period 2, the increase in P causes
the demand for labour to increase



In period 1, Y increases to Y_1 and P to P_1 . The increase in P causes the demand for labour to increase, and thus N increases to N_1 and W to W_1 .

In period 2, workers realize that P has increased and that W/P might have not. Therefore, the supply of labour decreases and the AS shifts to AS_2 , and Y decreases to Y_2 and P increases to P_2 .

SUPPLY SHOCKS

- A supply shock is a disturbance to the economy that causes the AS to shift
 - A positive supply shock causes the AS curve to shift down (e.g., a technological improvement)
 - A negative supply shock causes the AS curve to shift up (e.g., an oil-price increase)
- To offset the impact of a supply shock, the government could use *accommodating* policies
 - That is, the government could use fiscal and/or monetary policy to offset the effect of a supply shock

A NEGATIVE SUPPLY SHOCK



A negative supply shock increases costs of production and causes the AS curve to shift up.

> The result of a negative shock is *stagflation*, i.e., lower Y and higher P.

$$P = \frac{(1+z)}{a} W$$

Firms increase the mark up "z" in order to cover the higher cost of production.

A NEGATIVE SUPPLY SHOCK AND ACCOMMODATING POLICIES



The result of a negative shock is stagflation, i.e., lower Y and higher P.

The government could implement contractionary fiscal and/or monetary policy to avoid the increase in P, thus causing a deeper recession.

The government could instead implement expansionary fiscal and/or monetary policy to avoid the fall in Y, thus causing an even higher increase in P.

NEGATIVE SUPPLY SHOCK: LONG-RUN Adjustment



POSITIVE SUPPLY SHOCK: LONG-RUN Adjustment

