14.02 – Fall 2001 – Problem Set 7

Posted 5 November, 2001
Due 16 November, 2001

Part I: True, False or Uncertain? 20 points

Explain your answer completely yet briefly.

1. The natural rate of unemployment is unaffected by policy changes. (4 points)

2. If employment is increasing, then the unemployment rate must be declining. (4 points)

3. All of the following will make the economy move along the Aggregate Supply curve (in the short run): an increase in the money supply, an increase in government spending, an increase in taxes. (4 points)

4. All of the following will shift the Aggregate Supply curve upwards: an increase in the firm's markup of price over costs, an increase in the expected price level, an increase in the generosity of unemployment benefits. (4 points)

5. If equilibrium output is above its natural level, firms will lay off excess workers. This depresses wage demands and therefore prices, thus bringing the economy back to its natural level. (4 points)

Part II: Labor Market Equilibrium. 35 Points

Suppose that, in a certain economy, wages are set according to the following equation (Wage-Setting Relation):

$$W = P(1-u)z$$

where W is the nominal wage, P is the price level, u is the unemployment rate and z captures all other variables affecting the outcome of the wage setting, such as institutional factors.

Assume that, in this economy, firms produce goods using labor as the only factor of production, and according to the (aggregate) production function

$$Y = 2A\sqrt{N}$$

where Y is output, A is a parameter indexing the level of technological progress, and N is employment. For a given level of employment, then, labor productivity (at the margin –also called the marginal product of labor–) will be $\frac{A}{\sqrt{N}}$. Therefore, in order to produce one more unit of output firms will need $\frac{1}{A}\sqrt{N}$ additional units of labor.

1. Write down the marginal cost of production (i.e.: the cost of producing one more unit of output). (3 points)

2. Firms will charge a price higher than their marginal cost by a factor $1+\mu$, where μ is the markup of price over cost. Write down the the Price-Setting Relation. Is P independent of N in this economy? Why or why not? Provide intuition. (6 points)

3. Plot the Wage-Setting and Price-Setting Relations in terms of the real wage and the unemployment rate, with the latter on the horizontal axis. (3 points)

4. Plot the Wage-Setting and Price-Setting Relations in terms of the real wage and the level of employment, with the latter on the horizontal axis. (3 points)

5. Solve algebraically for the equilibrium unemployment rate, real wage and output. (10 points)

6. A new government is elected, which has welfare reform on top of its agenda. Unemployment benefits are immediately and significantly reduced. In terms of the model, what variable is exogenously changed? What will be the direction of the effect on real wages? On unemployment? On output? (5 points).

7. The opposition party argues that, instead of cutting Unemployment Insurance, the Government should focus on reducing the market power of firms, by adopting and enforcing a more strict anti-trust legislation. What parameter of the model would be changed by this proposal? What would be the direction of its effect on real wages? On unemployment? On output? (5 points).

Part III: Aggregate Supply-Aggregate Demand. 45 p.

Consider the general equilibrium of an economy described by the following equations:

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\begin{aligned}
\text{Labor Market} &: \\
\text{wage-setting} &: \quad W_t = P_t^e F(u_t, z_t) \\
\text{price-setting} &: \quad P_t = (1+\mu)\frac{W_t}{A} \\
\text{Goods market} &: \quad Y_t = C(Y_t - T_t) + I(Y_t, i_t) + G_t \\
\text{Money Market} &: \quad \frac{M_t}{P_t} = Y_t L(i_t) \\
\text{Production Function} &: \quad Y_t = AN_t \\
\text{Expectations} &: \quad P_t^e = P_{t-1} \\
\text{Normalized labor force} &: \quad L = N + U = 1
\end{aligned}
$$

1. Derive the natural level of output, the natural rate of unemployment, the actual level of output and the actual rate of unemployment. Derive the AS (Aggregate Supply) schedule, and show that it implies a positive relation between output and prices. (7 points)

2. Derive the AD (Aggregate Demand) schedule as a function of taxes, government spending, the stock of money and the price level. Show that it implies a negative relation between output and prices. (7 points)

3. Fiscal expansion, short run: Assume that the economy is initially (at $t = 0$) at the natural level of output (i.e.: aggregate supply and aggregate demand intersect at Y_n). Draw the AS-AD framework, and then the IS-LM right below, with output on the horizontal axis.

   Now assume government spending increases. What happens to AD and AS in the short run? Show in the graph and explain with words.

   What happens to IS-LM? Show graphically and explain. Show the equilibrium point in the IS-LM both before and after the change in prices. (8 points)

4. Fiscal expansion, long run: In the same graph –or in a new one if you think it will be more clear–, show what the final equilibrium is going to be, and explain how the economy moves to that point. What is the final effect on Y, Y_n, P, and M/P ? Is there any change in the composition of output? (8 points)

5. Now, suppose a more generous Unemployment Insurance program is introduced. What happens to the natural rate of unemployment?

   Show the effect of the increase in unemployment benefits in the AS-AD setting. Does the AS shift, and if so, by how much? What happens in the long run? Show graphically and explain with words. (7 points)

6. Now, let us combine all the previous changes. Draw a new AS-AD and show what the equilibrium is going to be in the short run after both policies discussed above are implemented (this is, after the increase in G and in UI). Remember we are starting from an equilibrium at Y_n.

   Then, show the long run equilibrium point. Is output higher in the long run? Is the final result somewhat "paradoxical" given that the fiscal policy applied is expansionary? Explain. (8 points)