Economics 101b: Fall 2003: Problem Set 7

(Due in section on November 4, 2003)

1. Suppose that an economy starts at an initial inflation level π_0 and that its central bank seeks to reduce inflation down to some final level π_T by pushing the unemployment rate u up above the natural rate of unemployment u*. Suppose that the relationship between inflation and unemployment is given by the adaptive-expectations Phillips Curve equation:

$$\pi_t = \pi_{t-1} + \beta(u^* - u_t)$$

where β is a known parameter. Let S stand for the total cumulative excess of unemployment over the natural rate needed to accomplish this policy. Solve, algebraically, for the total cumulative excess unemployment S. In what units is S measured?

2. Suppose that you are asked to calculate the *sacrifice ratio* $S/(\pi_0 - \pi_T)$. How is the sacrifice ratio related to the parameter β in the Phillips Curve? Write a paragraph explaining how you would go about deciding whether the policy of reducing inflation through higher-than-natural unemployment is a good one or a bad one.

3. Suppose that we have the standard Phillips Curve equation:

$$\pi_t = \pi_t^e + \beta(u_t^* - u_t)$$

in which inflation this year depends on expected inflation and on the gap between the natural rate of unemployment and the current unemployment rate, and suppose that expected inflation is given by:

$$\pi_t^e = (1-\lambda)\pi_{t-1}^e + \lambda\pi_{t-1}$$

for some parameter λ between zero and one. How would this—different—way of forming inflation expectations change your answers to (1) and (2)?

4. Begin our very simple Phillips Curve:

$$\pi_t = \pi_t^e + \beta(u_t^* - u_t)$$

with simple adaptive expectations:

$$\pi_t^e = \pi_{t-1}$$

But add a difference: the natural rate of unemployment depends on what unemployment was last year:

$$u_t^* = (1-\theta)u_{t-1}^* + \theta u_{t-1}$$

for some parameter θ between zero and one. Suppose that the central bank induces a recession and raises the unemployment rate one percentage point above its natural rate for one year, and then lets unemployment fall back to its natural rate. What is the time path of inflation as a result of this one-year shift in policy? What is the time path of unemployment?

5. In question 4, how would you go about deciding whether a policy of reducing inflation by triggering a period of high unemployment was worthwhile?

6. Suppose that a supply shock hits the economy—that is, that for one year the Phillips curve is not:

$$\pi_t = \pi_t^e + \beta\left(u_t^* - u_t\right)$$

But is instead:

$$\pi_t = \pi_t^e + \beta\left(u_t^* - u_t\right) + s_t$$

where s_t is some positive shock to inflation caused by, say, a spike in oil prices. And suppose that inflation expectations are adaptive:

$$\pi_t^e = \pi_{t-1}$$

What happens to inflation over time if the central bank keeps unemployment at its natural rate always? What happens to the unemployment rate over time if the central bank adjusts unemployment to keep inflation at its initial value π_0 always?

7. Write a paragraph on how you would decide which of the two policy options in equation 6 was the better one for the central bank to adopt.

8. Suppose that in problem 6 expectations of inflation are not adaptive but static: that is, the Federal Reserve has a known target π' for the inflation rate, and:

$$\pi_t^e = \pi'$$

always. How is your answer to (6) now different? How is your answer to (7) now different?

9. Former Federal Reserve Vice Chair Alan Blinder has remarked that Alan Greenspan's policies at fighting unemployment have been much more aggressive in attempting to reduce unemployment than any Federal Reserve Chair with less of a reputation as an inflation hawk would dare attempt. Can you make sense of this remark in light of problems (6), (7), and (8)?

10. Suppose that you believe that investors, businesses, and workers in your economy have rational expectations of inflation. Suppose that you have a choice between two candidates to head your central bank—one of whom believes that the central bank must always do whatever is necessary to keep inflation low, and the other of whom believes that if the central bank were to push unemployment above the natural rate to try to reduce inflation it would be making a serious mistake. Which candidate would you prefer to run your central bank, and why?