PROBLEMS AND APPLICATIONS

1. Derive the long-run equilibrium for the dynamic *AD–AS* model. Assume there are no shocks to demand or supply ($\epsilon_t = \upsilon_t = 0$) and inflation has stabilized ($\pi_t = \pi_{t-1}$), and then use the five equations in Table 15-1 to derive the value of each variable in the model. Be sure to show each step you follow.

2. Suppose the monetary-policy rule has the wrong natural rate of interest. That is, the central bank follows this rule:

   $$i_t = \pi_t + \rho' + \theta_\pi(\pi_t - \pi_t^*) + \theta_Y(Y_t - \bar{Y}_t)$$

   where ρ' does not equal ρ, the natural rate of interest in the goods demand equation. The rest of the dynamic *AD–AS* model is the same as in the chapter. Solve for the long-run equilibrium under this policy rule. Explain in words the intuition behind your solution.

3. "If a central bank wants to achieve lower nominal interest rates, it has to raise the nominal interest rate." Explain in what way this statement makes sense.

4. The *sacrifice ratio* is the accumulated loss in output that results when the central bank lowers its target for inflation by 1 percentage point. For the parameters used in the text simulation (see the FYI box), what is the implied sacrifice ratio? Explain.

5. The text analyzes the case of a temporary shock to the demand for goods and services. Suppose, however, that ϵ_t were to increase permanently. What would happen to the economy over time? In particular, would the inflation rate return to its target in the long run? Why or why not? (*Hint*: It might be helpful to solve for the long-run equilibrium without the assumption that ϵ_t equals zero.) How might the central bank alter its policy rule to deal with this issue?

6. Suppose a central bank does not satisfy the Taylor principle; in particular, assume that θ_π is slightly less than zero, so the nominal interest rate rises less than one-for-one with inflation. Use a graph similar to figure 15-13 to analyze the impact of a supply shock. Does this analysis contradict or reinforce the Taylor principle as a guideline for the design of monetary policy?

7. The text assumes that the natural rate of interest ρ is a constant parameter. Suppose instead that it varies over time, so now it has to be written as ρ_t.

   a. How would this change affect the equations for dynamic aggregate demand and dynamic aggregate supply?

   b. How would a shock to ρ_t affect output, inflation, the nominal interest rate, and the real interest rate?

   c. Can you see any practical difficulties that a central bank might face if ρ_t varied over time?

8. Suppose that people's expectations of inflation are subject to random shocks. That is, instead of being merely adaptive, expected inflation in period t, as seen in period $t - 1$, is $E_{t-1}\pi_t = \pi_{t-1} + \eta_{t-1}$, where η_{t-1} is a random shock. This shock is normally zero, but it deviates from zero when some event beyond past inflation causes expected inflation to change. Similarly, $E_t\pi_{t+1} = \pi_t + \eta_t$.

   a. Derive both the dynamic aggregate demand (*DAD*) equation and the dynamic aggregate supply (*DAS*) equation in this slightly more general model.

   b. Suppose that the economy experiences an *inflation scare*. That is, in period t, for some reason people come to believe that inflation in period $t + 1$ is going to be higher, so η_t is greater than zero (for this period only). What happens to the *DAD* and *DAS* curves in period t? What happens to output, inflation, and nominal and real interest rates in that period? Explain.

   c. What happens to the *DAD* and *DAS* curves in period $t + 1$? What happens to output, inflation, and nominal and real interest rates in that period? Explain.

   d. What happens to the economy in subsequent periods?

   e. In what sense are inflation scares self-fulfilling?

9. Use the dynamic *AD–AS* model to solve for inflation as a function of only lagged inflation and supply and demand shocks. (Assume target inflation is constant.)

a. According to the equation you have derived, does inflation return to its target after a shock? Explain. (*Hint*: Look at the coefficient on lagged inflation.)

b. Suppose the central bank does not respond to changes in output but only to changes in inflation, so that $\theta_Y = 0$. How, if at all, would this fact change your answer to part (a)?

c. Suppose the central bank does not respond to changes in inflation but only to changes in output, so that $\theta_\pi = 0$. How, if at all, would this fact change your answer to part (a)?

d. Suppose the central bank does not follow the Taylor principle but instead raises the nominal interest rate only 0.8 percentage point for each percentage-point increase in inflation. In this case, what is θ_π? How does a shock to demand or supply influence the path of inflation?

QUESTIONS FOR REVIEW

1. On a carefully labeled graph, draw the dynamic aggregate supply curve. Explain why it has the slope it has.

2. On a carefully labeled graph, draw the dynamic aggregate demand curve. Explain why it has the slope it has.

3. A central bank has a new head, who decides to raise the target inflation rate from 2 to 3 percent. Using a graph of the dynamic *AD–AS* model, show the effect of this change. What happens to the nominal interest rate immediately upon the change in policy and in the long run? Explain.

4. A central bank has a new head, who decides to increase the response of interest rates to inflation. How does this change in policy alter the response of the economy to a supply shock? Give both a graphical answer and a more intuitive economic explanation.