Ec 102

Seminar in Advanced Macroeconomics

Week 5 Assignment: Expectations, Nominal Rigidities, and Monetary Policy – 2

Professor S. O'Connell Fall 2012

This week we build further towards the New Keynesian synthesis model to be encountered next week.

Readings:

Romer, chapter 6, section 6.5 to end of chapter (this includes review of 6.5 and 6.6 from last week).

PROBLEM SET #2

1. As we have seen, RBC models emphasize an efficiency condition that equates the marginal rate of substitution between leisure and consumption with the real wage: $u_{1-l}/u_c = W/P$. On the other side of the labor market, efficiency requires that the real wage also equal the marginal product of labor: $W/P = \partial Y/\partial L$. The second condition holds when all markets are competitive and there are no distortions, as in the basic RBC model. Consider now the model of imperfect competition Romer develops in Section 6.5.
   - 1.1. Verify that the first of these conditions holds in Romer's model. [Hint: Look at equations (6.50) and (6.38).]
   - 1.2. Consider the second condition, in the context of Romer's model. Looking at equation 6.37, the real wage would apparently be a constant if it equaled the marginal product of labor. But it's not a constant (see equation 6.56). So, why doesn't the second condition hold in Romer's model? What is the nature of the inefficiency: are employment and output too low or too high?

2. Referring again to the model in Romer's section 6.5: The aggregate demand curve, in logs, is $y = m - p$. What has happened to the consumption Euler equation? What has happened to the IS curve?

3. Referring again to the model in Romer's section 6.5: Define the 'natural' level of GDP, y^n (in logs) as the level that would emerge in the absence of any barriers to nominal price (or wage) adjustment.
   - 3.1. Show that the desired price of firm *i* can be written as follows [Hint: Use equations 6.58 and 6.59.]:

$$p_i^* = p + (\gamma - 1)(y - y^n)$$

   - 3.2. Last we introduced the New Keynesian concept of real rigidity, and showed that it is intimately involved in determining the degree of stickiness of nominal prices. What does the above equation tell us about real rigidity in this model?

4. "There is no contradiction between the view that recessions have large costs and the hypothesis that they are caused by falls in aggregate demand and small barriers to price adjustment." (Romer, page 276.)

4.1. Explain this statement by Romer (p. 276), making clear what a *real rigidity* is and how real rigidities affect the pricing decisions of firms.
4.2. What are some potentially important real rigidities?

5. The *Lucas critique* (Lucas, 1976) was developed as part of an effort to dismantle the proposition that the empirical Phillips curve, defining an upward-sloping relationship between inflation and real activity, or a downward-sloping one between inflation and unemployment – represented a menu of choices that policymakers could exploit, depending on their preferences for inflation and real activity. Does the *Lucas supply curve* embody this critique? What does it say about the natural rate hypothesis? What light does it shed on the empirical collapse of the Phillips curve in the 1970s?

6. This problem gives you some further practice with second-order differential equation systems, following our study of the Dornbusch overshooting model last week. It draws on Blanchard (1981), who describes a short-run demand-side model in which the price level is fixed and the value of the stock market is determined via arbitrage between short-term bonds and shares of stock.

   Suppose that desired real spending, d, depends linearly on the real value of the stock market, q, real income, y, and real government spending, g, so that $d(t) = \alpha q(t) + \beta y(t) + g(t)$ (these variables are all in logs). Suppose further that actual spending, which equals output because firms simply meet spending at fixed prices, adjusts gradually to desired spending over time, according to $\dot{y}(t) = \sigma(d - y)$. It follows that the dynamics of output satisfy

$$\dot{y}(t) = \sigma[\alpha q(t) + g(t) - by(t)], \qquad (1)$$

   where $\alpha, \sigma > 0$, $0 \le \beta < 1$, and $b \equiv 1 - \beta > 0$.

   The LM curve is $i(t) = cy(t) - hm(t)$, where $i(t)$ is the short-term interest rate and $m(t)$ is the log of the nominal (= real) money supply. With prices fixed, the nominal and real interest rates are the same, so

$$r(t) = cy(t) - hm(t). \qquad (2)$$

   Equations (1) and (2) look like an IS/LM model, except that what appears in (1) is the value of the stock market, not the interest rate. We can relate $q(t)$ to the interest rate in two steps. First, note that the instantaneous yield on the stock market is equal to the flow of profits per dollar invested, plus the capital gain. If real profits of firms are given by π, and are an increasing function of output, so that

$$\pi(t) = \alpha_0 + \alpha_1 y(t), \quad \alpha_1 > 0,$$

   then the yield on the stock market is

$$\frac{\dot{q}(t)}{q(t)} + \frac{\alpha_0 + \alpha_1 y(t)}{q(t)}.$$

   But arbitrage requires that this yield equal the yield on short-term bonds. Thus

$$r(t) = \frac{\dot{q}(t)}{q(t)} + \frac{\alpha_0 + \alpha_1 y(t)}{q(t)}. \tag{3}$$

Equations (1) – (3) comprise our dynamic model. The interest rate can be substituted out so that the system is expressed in terms of output and the stock market.

6.1. Draw the $\dot{y}(t) = 0$ schedule in $[y, q]$ space.

6.2. Assume that the economy always operates with a positive nominal interest rate (implying a positive real rate, because inflation is zero). Now consider two possible stationary states: one in which the steady-state value of q satisfies $\bar{q} > \alpha_1/c$, and one in which the steady-state value of q satisfies $\bar{q} < \alpha_1/c$. Show that the $\dot{q}(t) = 0$ must be downward-sloping in the neighborhood of the stationary state in the first case (Blanchard calls this the "bad news" case, in which increases in output tend to depress the stock market) and upward-sloping in the neighborhood of the stationary state in the second ("good news") case. [Hint use the implicit function theorem on the $\dot{q}(t) = 0$ locus.]

6.3. In the good news case, put in the dynamic arrows and characterize the impact of an unanticipated, permanent monetary expansion on output and the stock market.

6.4. In the bad news case, it is possible that there will be more than one intersection of the two loci, i.e., more than one stationary state. Focus on the one in which the $\dot{q}(t) = 0$ locus cuts $\dot{y}(t) = 0$ schedule from above (this one always exists, as Blanchard points out in footnote 5). Characterize the dynamic adjustment of output and the stock market to a permanent monetary expansion in this case.

6.5. Blanchard integrates equation (3) forward to solve for $q(t)$. After imposing a transversality condition, he gets

$$q(t) = \int_t^{\infty} \pi(s) e^{-\int_t^s r(v)dv}. \tag{4}$$

What is the economic interpretation of equation (4)?

References

Blanchard, Olivier (1981) "Output, the Stock Market, and Interest Rates" *American Economic Review*