Problem Set 9

ECON 30020: Intermediate Macroeconomics
Professor Sims
University of Notre Dame, Spring 2018

Instructions: You may work on this problem set in groups of up to four people. Should you choose to do so, please make sure to legibly write each group member's name on the first page of your solutions. This problem set is due in class on Thursday April 19.

1. **Dynamics in the New Keynesian Model After an IS Shock:** Suppose that you have a standard partial sticky price New Keynesian model as presented in class. The AS curve is given by:

$$P_t = \bar{P}_t + \gamma(Y_t - Y_t^f) \quad \gamma \geq 0$$

Suppose that the economy initially begins in the efficient, neoclassical equilibrium. Then there is an exogenous *reduction* in f_t.

   (a) Use the five part graph to show how this exogenous shock will affect Y_t, P_t, r_t, N_t, and w_t in the short run.

   (b) What happens to Y_t^f after an exogenous reduction in f_t? What happens to the output gap in the short run, $Y_t - Y_t^f$?

   (c) At the new short run equilibrium, is the firm hiring more or less labor than it would find optimal, taking prices as given? Be clear and justify your answer.

   (d) Given the opportunity, how will the firm adjust $\bar{P}_t$ in response to the conditions prevailing in the short run subsequent to the reduction in f_t? Show the effects graphically.

2. **A Flexible Price Level Target:** Consider the standard sticky price New Keynesian model as presented in class. The key equations of the model are:

$$C_t = C^d(Y_t - G_t, Y_{t+1} - G_{t+1}, r_t)$$

$$N_t = N^s(w_t, \theta_t)$$

$$P_t = \bar{P}_t + \gamma(Y_t - Y_t^f)$$

$$I_t = I^d(r_t, A_{t+1}, f_t, K_t)$$

$$Y_t = A_t F(K_t, N_t)$$

$$Y_t = C_t + I_t + G_t$$

$$M_t = P_t M^d(i_t, Y_t)$$

$$r_t = i_t - \pi^e_{t+1}$$

In the baseline model, we assume that M_t is exogenous. Let us instead assume that M_t is instead endogenous. In particular, suppose that the central bank targets a price level of P_t^*. Hence, we add one equation to the above system of equations:

$$P_t = P_t^*$$

P_t^* is exogenous, and now M_t is endogenous.

(a) Argue that if $P_t^* = \bar{P}_t$, then the equilibrium will feature $Y_t = Y_t^f$.

(b) Suppose that this is the rule the central bank follows. Suppose that there is an exogenous increase in A_t. In which direction must M_t adjust to implement the price level target? Explain briefly.

(c) Instead suppose that there is an exogenous increase in G_t. In which direction must M_t adjust to implement the price level target?

(d) Suppose that the central bank follows a price level target, but the target is exogenous and does not necessarily correspond to $\bar{P}_t$. Suppose that $\bar{P}_t$ changes but P_t^* does not. What will happen to Y_t and M_t as a consequence? Explain briefly.

3. **An Output Target:** Consider the same model as above. But instead of a price level target, suppose that the central bank follows an output target. That is, the money supply, M_t, is now endogenous, and adjusts so that:

$$Y_t = \bar{Y}_t$$

$\bar{Y}_t$ is exogenous.

(a) Suppose that there is an exogenous increase in f_t and the central bank follows the output target. In which direction must the money supply move to implement the output target? Show graphically. Is this the same direction or not as what would need to happen to M_t if the central bank were instead following a price level target?

(b) Suppose instead there is an exogenous increase in θ_t and the central bank follows an output target. In which direction must the money supply move in order to implement the output target? Show graphically. Is this the same direction or different than what would need to happen to M_t if the central bank were to instead follow a price level target?