Intermediate Macroeconomics:
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Problem Set 4: Policy Ineffectiveness Proposition and the Barro-Gordon Model; Open Economy Macroeconomics

Answer all the parts of the questions separately giving your reasons for your answer.

1. **Policy Ineffectiveness Proposition**

The purpose of this question is to highlight the sensitivity of the Policy Ineffectiveness Proposition to the nature of the rigidities on the supply and demand side of the economy and to the information available to the private sector and to the government respectively.

Consider the sticky wage model of Aggregate Supply and suppose that wage contracts are set simultaneously throughout the economy and they last two periods (the nominal wage may be different in each period of the contract). Workers have rational expectations, so that they use all available information (including the structure of the economy) in forming their expectations of the future price level.

Recall that the Lucas' surprise supply function can be written as:

$$Y = \bar{Y} + \alpha\left(P - P^e\right)$$

Suppose that potential GDP, $\bar{Y} = 0$. The supply function for the economy during the first half of the contract is thus given of the form $Y = \alpha(P - P^e)$, with P^e being the best available estimate of the price level given information available at the start of the period. The supply function for the second half of the contract is then also of the form $Y = \alpha(P - P^e)$, but P^e is now based on information that is a period out of date.

Now consider Aggregate Demand. Suppose that the Aggregate Demand curve is given by $Y = A + e\frac{M}{P}$, where A is subject to random fluctuations. You can think of this as just a reformulation of the Quantity Equation presented in lecture notes, or a shortened form of

the Aggregate Demand equation that was derived in lecture notes and used in question 3 in problem set 3.

(a) During the first half of the life of the contract, is there scope for stabilization policy:

(i) if the authorities observe the current value of A;

(ii) if they only observe A with one period delay?

(b) During the second half of the life of the contract, is there scope for stabilization policy:

(i) if the authorities observe the current value of A;

(ii) if they onely observe A with a one-period delay and fluctuations in A are not generally correlated over time (that is the value in A in any period is independent of its value in the previous period);

(iii) if they only observe A with a one period delay and fluctuations in A are correlated over time (the value of A in any period is related to its value in the previous period)?

[Hint: For each part above, try to think about what information the government has relative to the workers who formed expectations about prices in advance. It may help you to draw out a timeline to show when price expectations are being set, when shocks occur and when the government could do something about offsetting any shocks that hit the economy (based on the information that they have)].

2. **Barro-Gordon Model**

Suppose that the government in a Xantia cares about unemployment and inflation. They would like to see as little of both as possible. The Phillips Curve in Xantia is represented by equation (1) below:

$$u = u^n - 0.28\,(\pi - \pi^e) \tag{1}$$

where u is the unemployment rate, u^n (the natural rate of unemployment) equals 0.05, π is the inflation rate, and π^e represents the level of inflation expected by agents in the

economy. The government's preference for inflation and unemployment are represented by the following Loss function:

$$\mathcal{L} = u + 4\pi^2 \tag{2}$$

a. Describe the intuition behind the Loss function.

b. Minimize the loss function with respect to inflation and hence, solve for the discretionary solution (i.e. find the level of inflation that the government should target whilst following discretionary policy).

c. Assuming rational expectations, what is the expected level of inflation in the economy? Calculate the value of the loss function $\left(\mathcal{L}^d\right)$ at the discretionary solution.

Consider an alternative optimal policy strategy where the government announces a target level of zero inflation.

d. Calculate the value of the loss function for this alternative policy, $\mathcal{L}^r$.

e. Using a graph, or otherwise, show why this optimal policy rule will not work.

f. Considering your answer to part (e), suggest two possible solutions that might resolve the issue above.

3. Consider an economy described by the following equations:

$$\begin{aligned} Y &= C + I + G + NX \\ Y &= 5000;\ G = 1000;\ T = 1000 \\ C &= 250 + 0.75(Y - T) \\ I &= 1000 - 50r \\ NX &= 500 - 500\varepsilon \\ r &= r^* = 5 \end{aligned}$$

a. In this economy, solve for national saving, investment, the trade balance, and the equilibrium exchange rate.

b. Suppose now that G rises to 1250. Solve for national saving, investment, the trade balance, and the equilibrium exchange rate..Explain what you find.

c. Now suppose that the world interest rate rises from 5 to 10 percent. (G is again 1000). Solve for national saving, investment, the trade balance, and the equilibrium exchange rate. Explain what you find.

4. The Mundell-Fleming model takes the world interest rate, r^* as an exogenous variable. Lets consider what happens when this variable changes.

a. What might cause the world interest rate to rise?

b. In the Mundell-Fleming model with a floating exchange rate, what happens to aggregate income, the exchange rate, and the trade balance when the world interest rate rises?

c. In the Mundell-Fleming model with a fixed exchange rate, what happens to aggregate income, the exchange rate, and the trade balance when the world interest rate rises?

5. Suppose that higher income implies higher imports and thus lower net exports. That is, the net exports function is:

$$NX = NX(e, Y)$$

Examine the effects in a small open economy of a fiscal expansion on income and the trade balance under:

a. A floating exchange rate

b. A fixed exchange rate

6. **Uncovered Interest Rate Parity**

A. Consider a £10000 deposit in a London bank in a year when the interest rate on pounds is 10 percent and the \$/£ exchange rate moves from \$1.50 per pound to \$1.38 per pound.

i. Calculate the dollar rate of return on the £10000 deposit in the London bank

ii. What is the real rate of return if inflation was 10 percent in the US over that year?

B. Now under a different scenario, suppose that the dollar interest rate and the pound sterling interest rate are the same at 5 percent per year.

i. What is the relationship between the current equilibrium \$/£ exchange rate and its expected future level?

ii. Suppose that the \$/£ exchange rate remains constant at \$1.52 per pound whilst interest rates in Britain rise to 10% per year. If US interest rates remain unchanged, what is the new equilibrium \$/£ exchange rate? Does the dollar appreciate or depreciate?

C. Suppose that traders in asset markets suddenly learn that the interest rate on dollars will decline in the near future. What will be the effect on the *current* dollar/euro exchange rate assuming that current interest rates on dollar and euro deposits do not change.

7. [Very Hard] **Dornbusch Overshooting Effect**

Consider a large open economy such as the US. Suppose that due to growing worries about a recession ahead, the Fed decides to pursue expansionary monetary policy by cutting interest rates.

a. What are the effects of this monetary expansion in the money market in the short run and in the long run? Describe what happens to interest rates, (nominal) money balances, real money balances and prices.

b. Using the IS-LM framework, examine the impact of the monetary expansion in both the short run and in the long run. Describe what happens to output, interest rates and prices. (You may assume that we start off at the natural rate of output).

c. Recall that the Uncovered Interest rate Parity (UIP) shows what happens to exchange rates in the short run. Describe the impact of the monetary expansion on exchange rates in the short run, assuming that there is no change in the expected future exchange rate? (Hint: Use UIP to show what is it predicts will happen to the exchange rate in the short run).

d. Recall that there is some evidence in the data to show that Purchasing Power Parity (PPP) holds in the long run. Using your answer to parts (a) and (b), what does PPP predict will happen to the nominal exchange rate in the long run as a result of the monetary expansion? You may assume that there is no change in the foreign price level. [Hint: use your answers in parts (a) and (b) to show what happens to prices to determine the prediction for exchange rates here].

e. Impact on **Exchange Rate Expectations**: use your answers to parts (a) and (b) (in particular what you predict will happen to prices) to determine what happens to exchange rate expectations. Will the exchange rate be expected to appreciate/depreciate in the future?

f. Based on your answer to part (e), use UIP to predict which way the exchange rate will move over the long run.

g. How can you reconcile your answers to parts (c), (d) and (f)? Show what happens to the path of nominal exchange rates over time if the Fed announces the expansionary monetary policy at time period T. [Note: For this last part, I am expecting you to graph the time profile of exchange rates. In particular, assume that exchange rates were constant up to period T. Show what kind of path the exchange rate must take after time period T, in order for it to be consistent with your answers to parts (c), (d) and (f)].