14.05 Intermediate Applied Macroeconomics
Problem Set 5

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1. Rational exchange rate expectations and overshooting

The UK has a flexible exchange rate and perfect capital mobility. In the 1980's, under Prime Minister Margaret Thatcher, it experienced a decrease in money supply.

(a) What is the effect of this policy in the Mundell-Fleming model with static expectations? What happens to output and the exchange rate? Draw a graph in the (ε,Y) space to illustrate your answer.
With perfect capital mobility, the domestic interest rate must be equal to the foreign interest rate (i=i*). The decrease in money supply, shifts the LM curve to the left in the (ε,Y) space. Output decreases and the exchange rate appreciates.

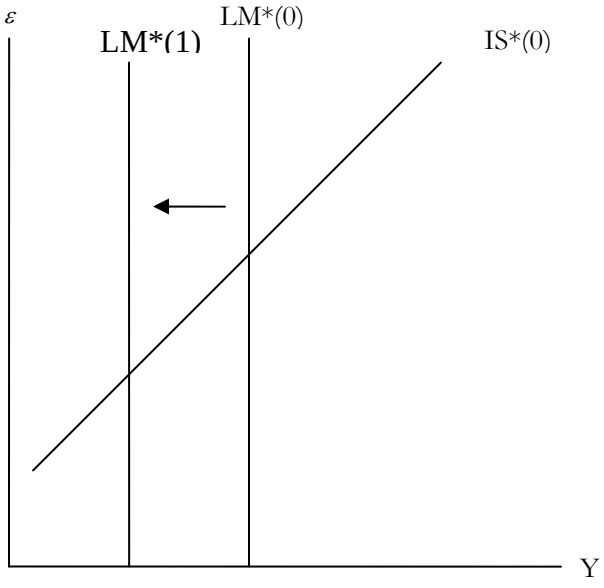

Figure 1

(b) Now suppose that investors have rational expectations. Explain why, with rational expectations, the condition i=i* no longer holds. Write down the Uncovered Interest Parity (UIP) condition and explain the intuition behind it.
The condition i=i* no longer holds with rational expectations because investors form expectations about the exchange rate. If they expect the domestic currency to depreciate, they will require a higher return on domestic assets and the opposite if they expect an appreciation.

The UIP condition is given by:

$i=i^*+E(\dot{\varepsilon}/\varepsilon)$

The second term in the right hand side of this condition is the expected rate of depreciation of the domestic currency. If the domestic interest rate is lower than the foreign interest rate ($i<i^*$), the domestic exchange rate must be expected to appreciate for investors to be willing to invest in domestic assets. The opposite occurs when $i>i^*$. So, the UIP simply says that rates of return must be equalized across countries once we take into account expected changes in the exchange rate.

(c) Assume that the IS is not very responsive to the real exchange rate (through net exports), so that it shifts very little when the exchange rate changes. What is the effect of the decrease in money supply on output, the interest rate and the exchange rate under rational expectations? Is there overshooting in the exchange rate? Explain. Draw graphs in the (i,Y) and (ε,Y) spaces to illustrate your answer.

The decrease in money supply shifts the LM curve to the left. From figure 3, we see that the exchange rate appreciates at the time of the shock. This appreciation reduces net exports (because it reduces competitiveness) and shifts the IS to the left. Output decreases. If the IS is not very responsive to changes in the exchange rate, the shift in the IS is not very large and the new equilibrium interest rate is above i^*. By the UIP condition, this implies that there must be an expected depreciation of the pound. So, the exchange rate overshoots its long run value.

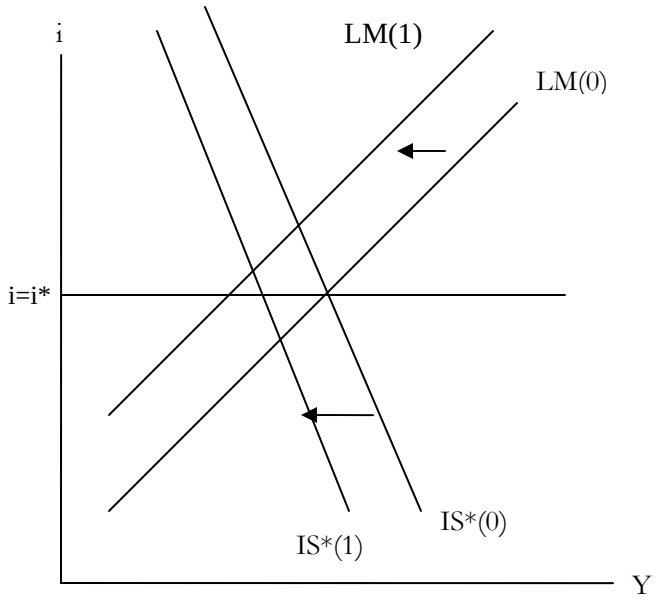

Figure 2

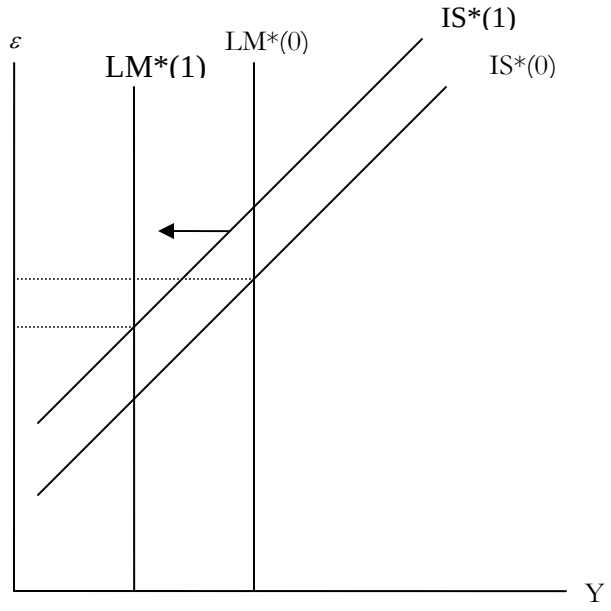

Figure 3

(d) How does your answer to part (c) change if the IS is very responsive to changes in the exchange rate? Can there be undershooting? Explain. Draw graphs in the (i,Y) and (ε,Y) spaces to illustrate your answer.

Like in part (c), the decrease in money supply would lead to an appreciation of the pound (figure 5). Because the IS is very responsive to the exchange rate, British net exports fall a lot and the IS moves more than before. It may move so much that the interest rate in Britain falls below the international interest rate ($i<i^*$). In that case, the UIP condition implies that the pound is expected to appreciate even more. So, the exchange rate undershoots its long run level (it initially appreciates by less than its long run change). Notice that the IS shifts to the right in figure 5 because of the decrease in the interest rate (which increases investment).

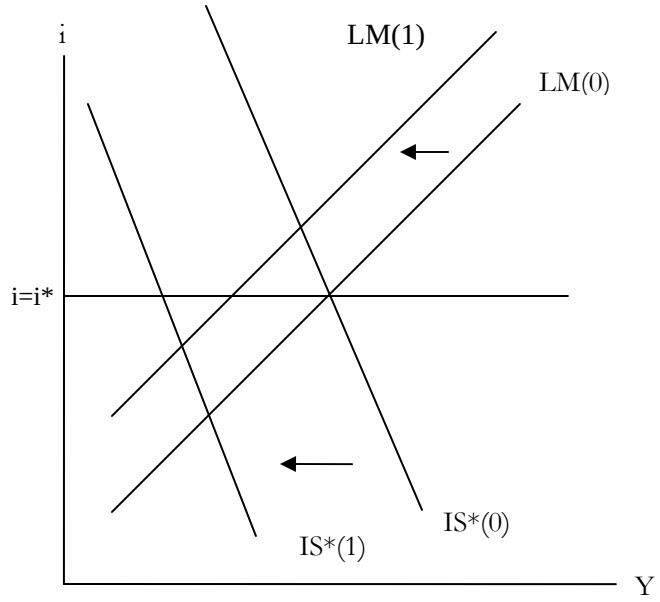

Figure 4

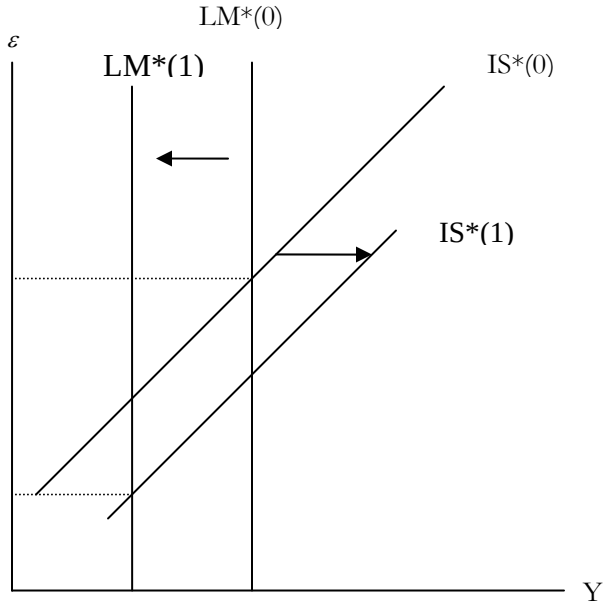

Figure 5

2. Mundell-Fleming Model

(a) Briefly describe the difference between a Mundell-Fleming model with fixed exchange rates and a Mundell-Fleming model with flexible exchange rates. Draw

diagrams in the (i, Y) and (ε,Y) spaces to illustrate your answer. Assume perfect capital mobility.

Because there is perfect capital mobility i=i*. With fixed exchange rates, the exchange rate is given by $\varepsilon = \bar{\varepsilon}$:

Money supply adjusts endogenously to keep the exchange rate fixed. So, there is not really an LM curve. The IS is given by:

$$Y = E(Y, i^* - \pi^e, G, T, \frac{\bar{\varepsilon} P^*}{P})$$

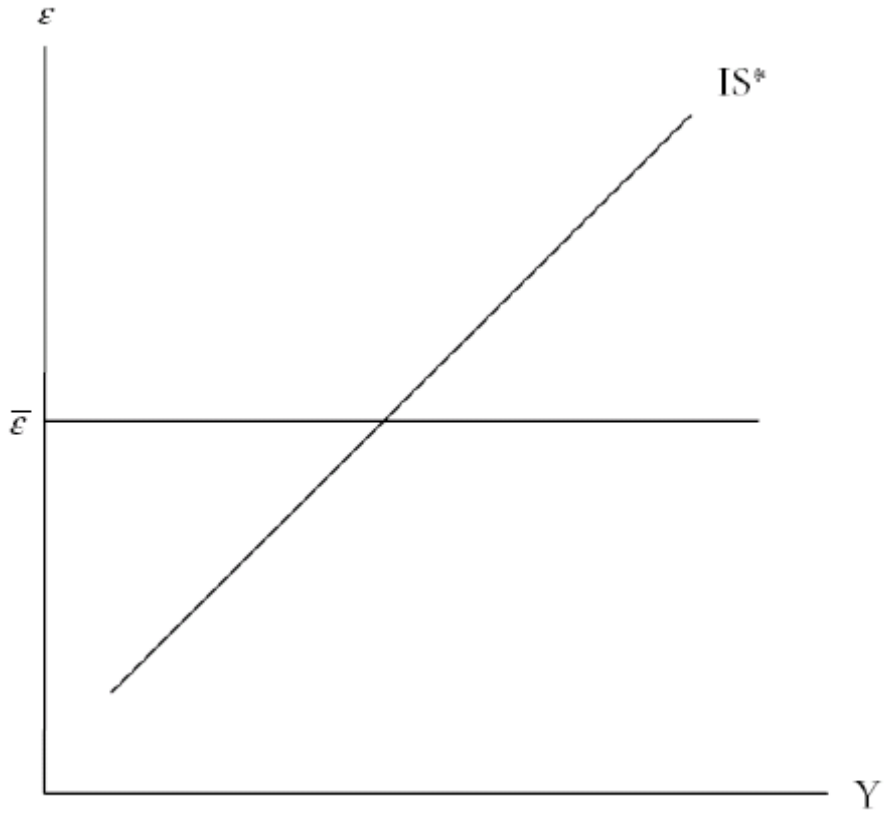

Figure 1

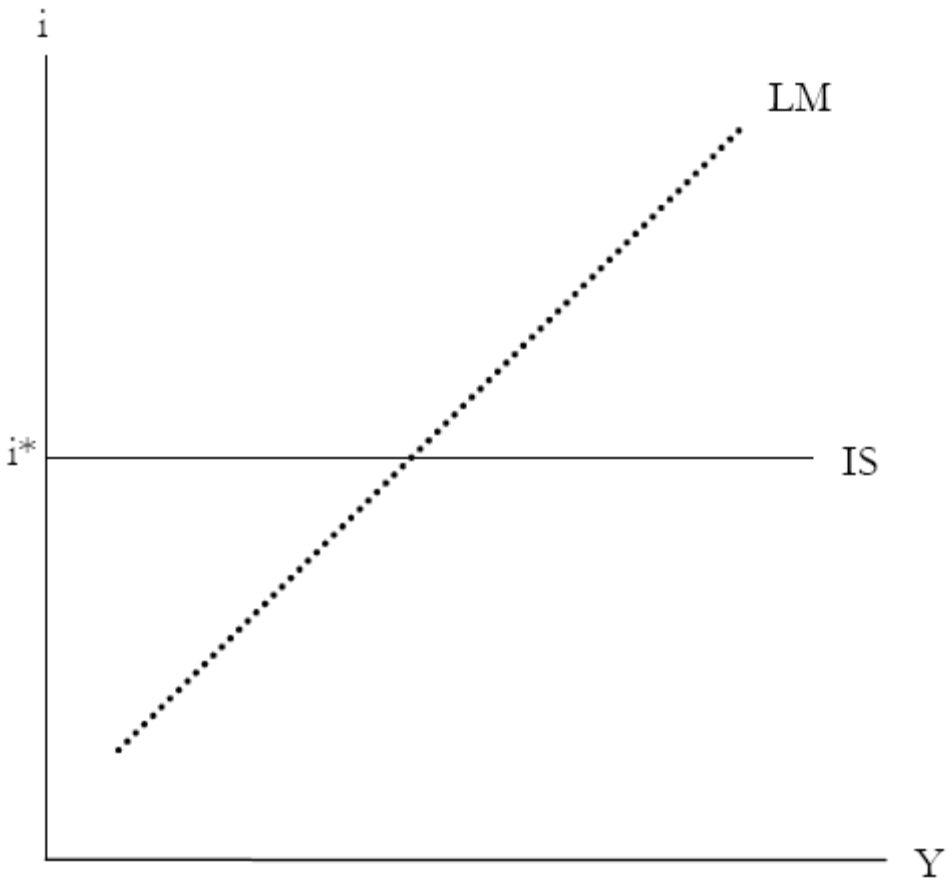

Figure 2

With flexible exchange rates, ε can change. Money supply is decided exogenously by the central bank. The IS and LM curves are given by:

$$Y = E(Y, i^* - \pi^e, G, T, \frac{\varepsilon P^*}{P})$$

$$\frac{M}{P} = L(i^*, Y)$$

In the (i, Y) space, we have the same situation as in figure 2. In the (ε, Y) space, we have:

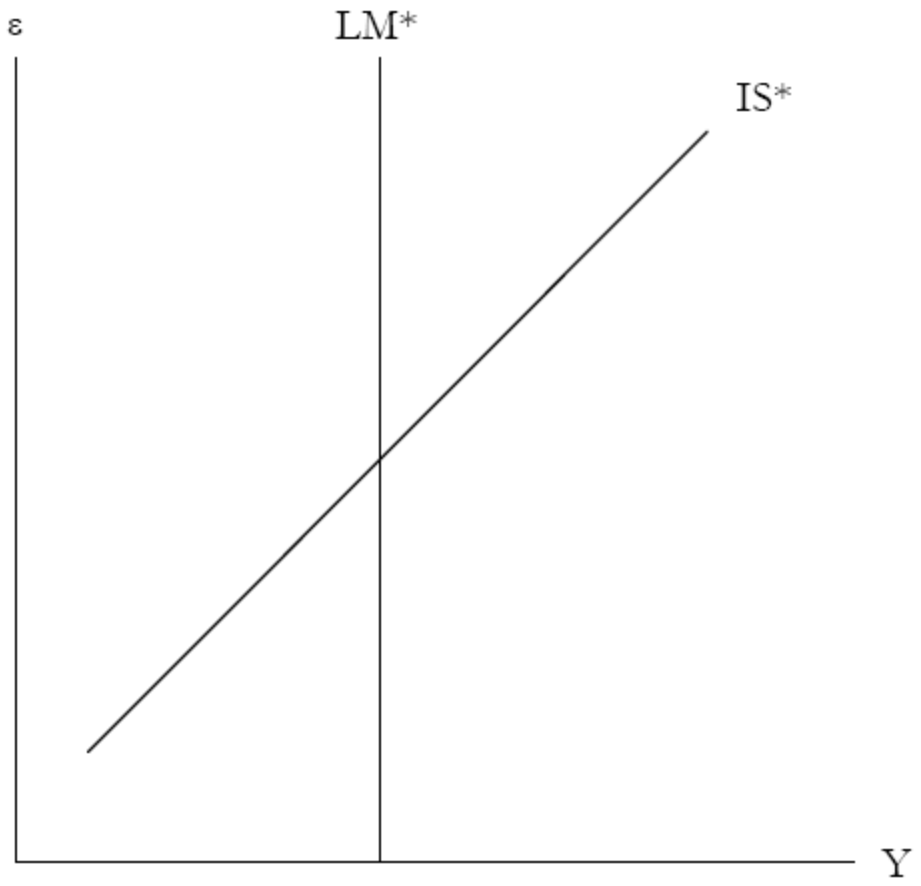

Figure 3

(b) Germany must keep a fixed exchange rate vis-a-vis the other countries in the Euro Area. What is the effect of a tax cut in Germany on output, the European interest rate and the exchange rate? Draw a diagram in the (ε,Y) space to illustrate your answer. Assume perfect capital mobility and assume Germany is not large enough to affect the European interest rate.

A tax cut is an expansionary fiscal policy. The IS shifts to the right in the (ε, Y) space. Because the exchange rate is fixed, money supply will have to increase to accommodate the larger output. There is no effect on the interest rate and the exchange rate. Output increases.

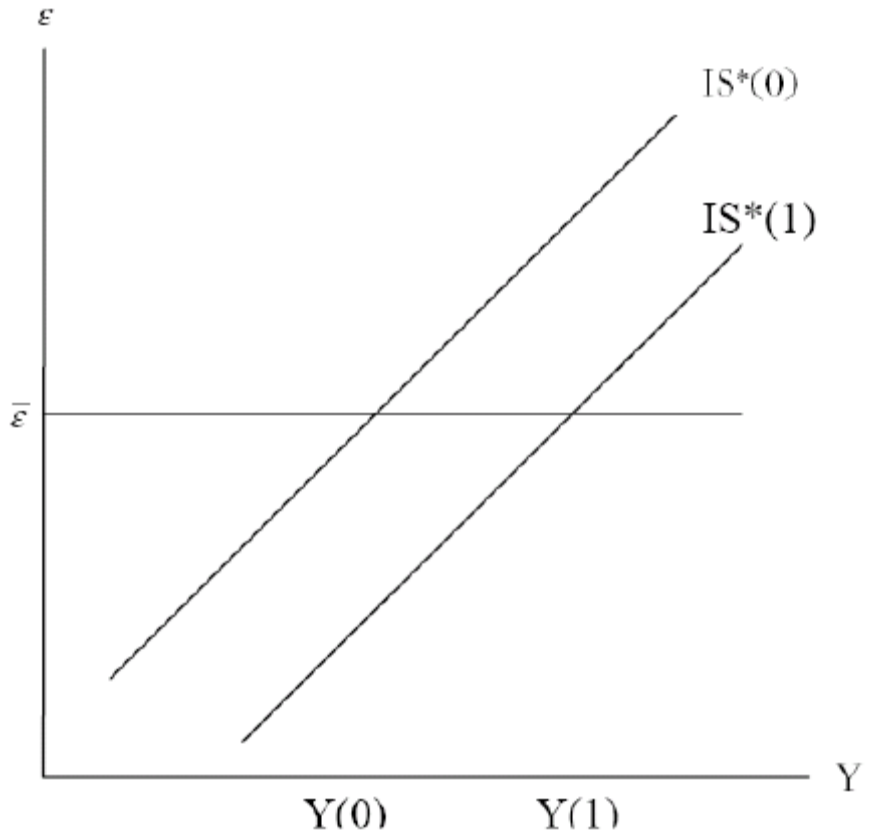

Figure 4

(c) How does your answer change when Germany is large enough to affect the European interest rate?
In this case, Germany affects the European interest rate, and therefore the LM curve is upward-sloping in the (i, Y) space – i is no longer constant and given. Therefore, as the IS curve shifts out, interest rate increases and output still increases, but by less than in the previous case when Germany did not affect the European interest rate.

(d) Countries in the Euro Area are not allowed to have a budget deficit exceeding 3% of GDP. Germany and France have exceeded this threshold. Use the Mundell-Fleming model to explain why some countries in the Euro Area use their budget deficits to make macroeconomic policy. What are the policy options available to them?
Countries in the Euro Area have a fixed exchange rate regime. They must keep a fixed exchange rate vis-a-vis each other. Therefore, monetary policy is ineffective because money supply adjusts endogenously to keep the fixed exchange rate. So, the only policy option available to them is fiscal policy. This is why they use their budget deficits to affect output.

(e) Japan has a flexible exchange rate. Use the Mundell-Fleming model with perfect capital mobility to analyze the effects of a tax cut in Japan on output, the interest rate and the exchange rate. Draw a diagram in the (ε,Y) space to illustrate your answer. How is

your answer different from part (b) and why? [Hint: Assume Japan is a small country and does not affect the world interest rate].
Japan has a flexible exchange rate. The tax cut will not have any effect on output and the interest rate. The exchange rate appreciates. Unlike in (b), where the tax cut increases output, here there is no effect on output. The assumption that drives the difference in the results is flexible exchange rates, so that money supply does not have to adjust to keep the exchange rate fixed.

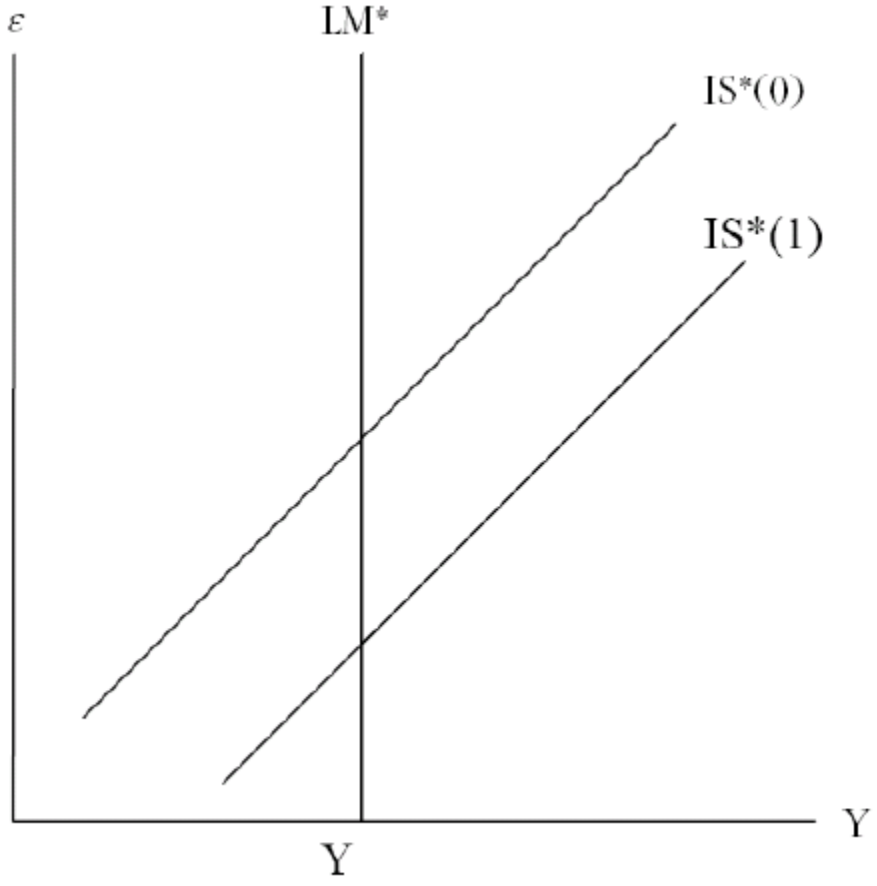

Figure 5

(f) Assume there is imperfect capital mobility for the US. Write out the condition that describes the IS curve in this case. What would be the effect of the Bush tax cuts on output, the interest rate and the exchange rate? Draw a diagram in the (i; Y) space to illustrate your answer.
With imperfect capital mobility, i does not have to be equal to i*. The crucial equation is the balance of payments condition:

$$CF(i - i^*) + NX(\frac{\varepsilon P^*}{P}) = 0$$

Substituting in the IS, we get:

$$Y = E^D(Y, i - \pi^e, G, T) - CF(i - i^*)$$

The IS curve is downward sloping in the (i, Y) space. The tax cut will increase output and the interest rate. The exchange rate appreciates, but not by as much as with perfect capital mobility, so that we can get some movement in the interest rate and output level.

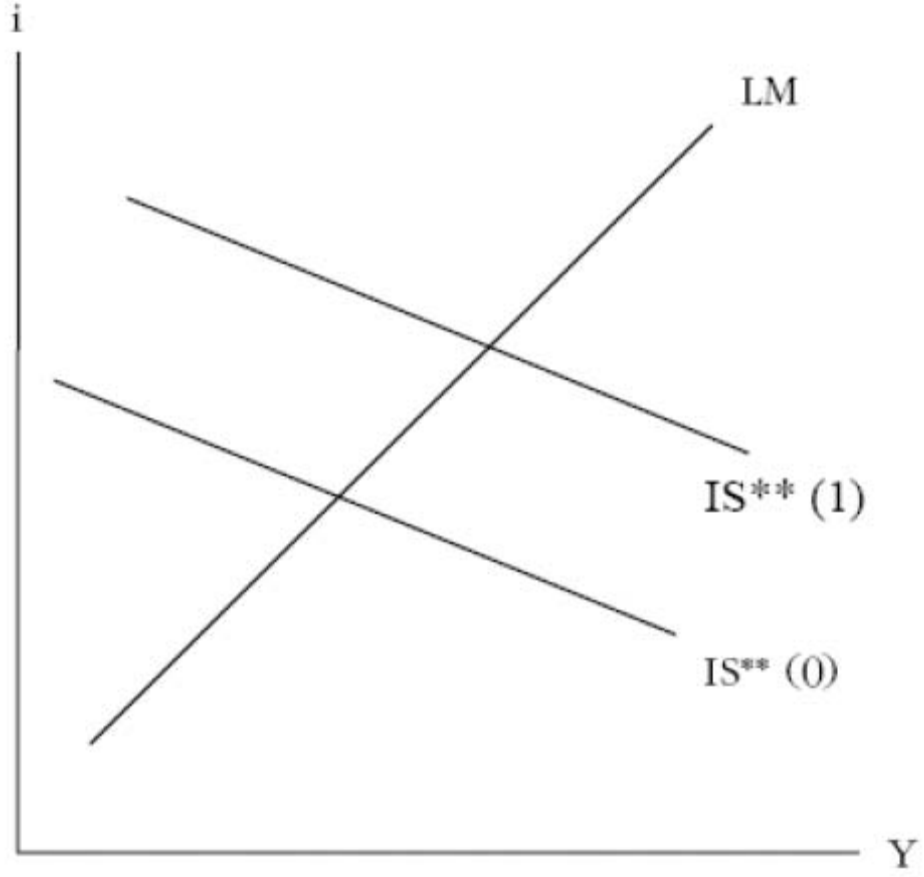

Figure 6

3. Asian Currency Crisis

The Asian currency crisis of 1997 led to the biggest recession in Asia in the past 50 years. This third problem looks at some of the issues for the case of Thailand.

(a) Currency crisis I: Thailand had a fixed exchange rate vis-a-vis the dollar until the Asian crisis in 1997. In a speculative attack, international investors started betting against the Thai Baht. Write down the uncovered interest parity (UIP) condition under rational expectations. Explain why the condition i = i* disappears when investors expect a devaluation. What is the monetary policy that the Thai Central Bank had to do to defend the exchange rate? What is the impact on output? Give an explanation in (ε,Y) space. Hint: denote the Baht/USD exchange rate by ε.

Uncovered interest parity:

$$i = i^* + E(\dot{\varepsilon}/\varepsilon)$$

The condition i = i* disappears if a devaluation is expected because under this condition rational investors would require a higher domestic interest rate in order to invest in domestic assets. Otherwise they would be losing money. We saw that if investors expect a devaluation, UIP implies that i>i*. Therefore, the analysis is completely similar to the case where the foreign interest rate goes up. The situation is depicted in figure 1. There we can see that the Central Bank has to take contractive measures in order to keep the exchange rate. Therefore, the final result is a fall in output.

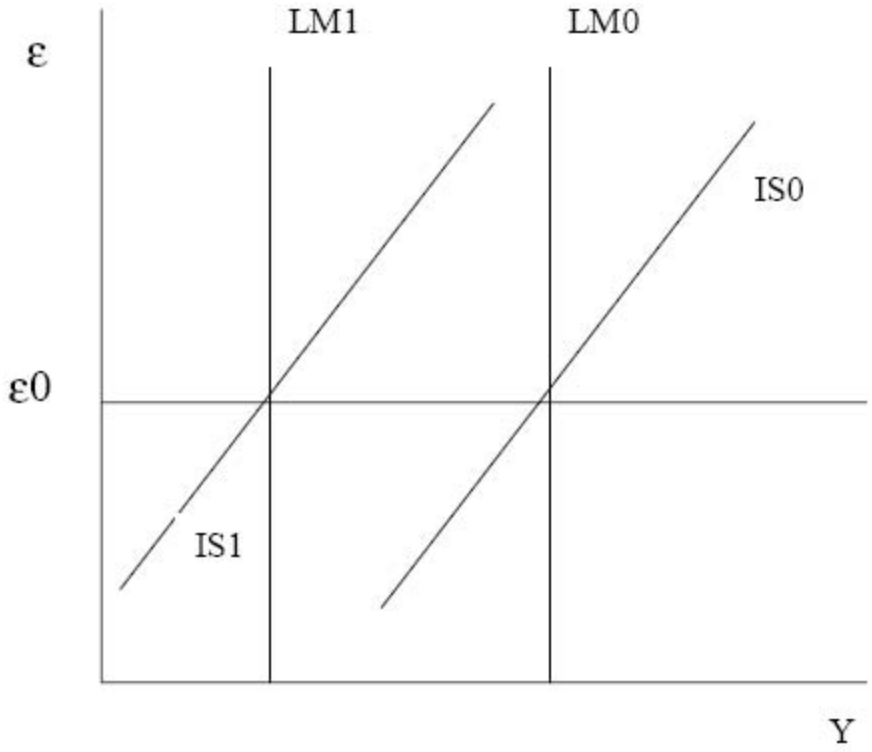

Figure 1:

(b) Currency crisis II: Defending the fixed exchange rate became untenable after several weeks, and the Thai government decided to abandon the fixed exchange rate. Show in (ε,Y) space what happened to output and the exchange rate once Thailand switched to the new exchange rate regime. Using the UIP, explain what happened to the Thai exchange rate.

Here the assumption is that the Thai Central Bank fixes a new fixed value for the exchange rate, which is higher than before. After doing so, the speculation disappears (the expected devaluation is 0), therefore the domestic interest rate has again to be equal to the foreign interest rate. The situation is depicted in figure 2. We see that the effect of the devaluation is (obviously) to raise the exchange rate (rising from ε0 to ε1), and given that the domestic interest rate is higher than i*, the Central Bank has to expand the monetary base in order to keep the new level of interest rate (we move from LM1 to LM2). The result is an increase in output.

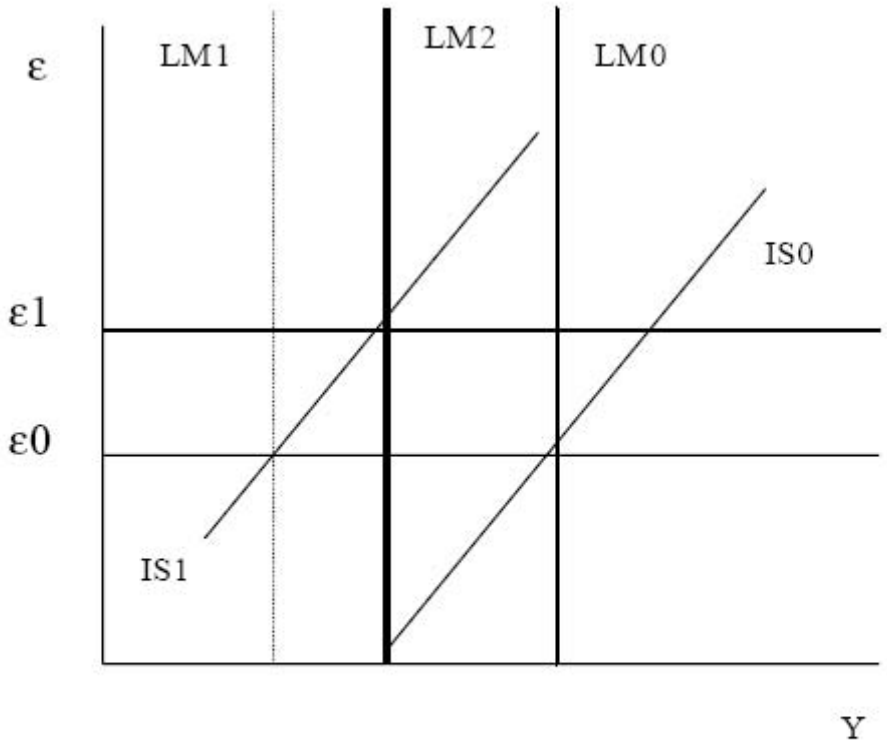

Figure 2:

(c) The currency crisis led to a recession in Thailand. In order to restore the economy, the government asked the International Monetary Fund (IMF) for loans. The IMF forced the Thai government to reduce its expenditures and raise taxes. Represent this policy in space (ε,Y).What happens to the interest rate, the exchange rate and output? Do you see any resemblance with the fiscal policy during the Great Depression?
Fiscal policy is highly effective here, with fixed exchange rate. This can be seen in Figure 3. Increase of taxes and reduction of government expenditure both lead to a shift of the IS curve up and to the left, because aggregate expenditure is reduced. This is the typical result of the Mundell-Fleming model with fixed exchange rate. Thus output goes down, the exchange rate remains constant, logically, and the interest rate is again equal to the international interest rate (as we assumed that after the one shot devaluation the expectations of changes in the exchange rate went back to 0).

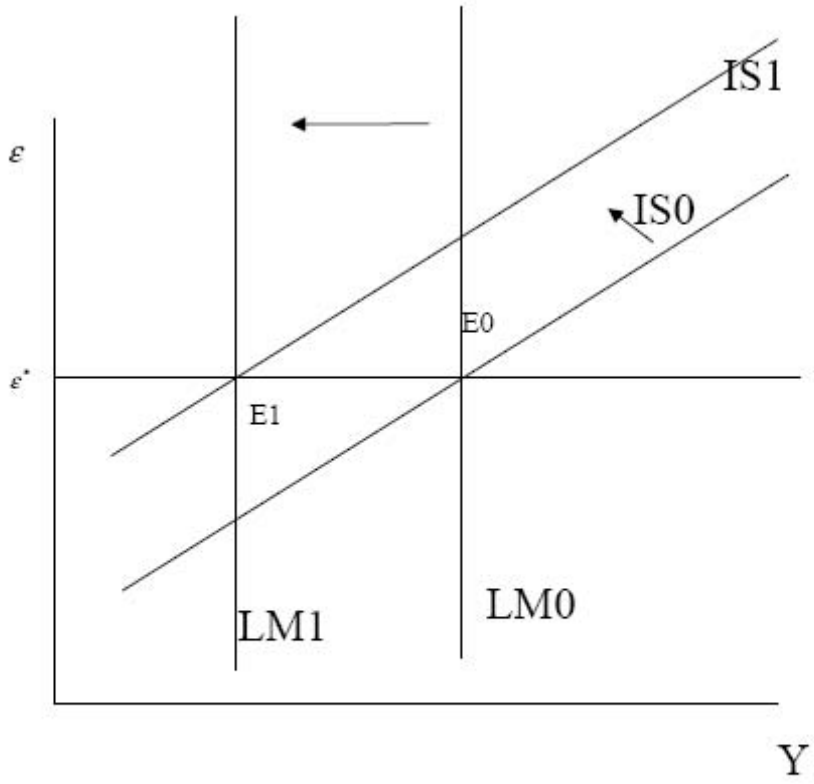

Figure 3: