

# Lecture 16 - Recommended Problems Solutions

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Intermediate Macroeconomics, Econ 102

## ☆☆ Chapter 20, Problem 3

Policy choices when the real exchange rate is “too high” and the nominal exchange rate is fixed. An overvalued real exchange rate is a rate such that domestic goods are too expensive relative to foreign goods, net exports are too small, and by implication the demand for domestic goods is too low.

This leads to difficult policy choices for the government and central bank. The equations that describe the economy are:

- The IS curve:

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

- The Phillips curve for the domestic and the foreign economy:

$$\begin{aligned}\pi - \bar{\pi} &= \frac{\alpha}{L} (Y - Y_n) \\ \pi^* - \bar{\pi}^* &= \frac{\alpha^*}{L^*} (Y^* - Y_n^*)\end{aligned}$$

In the text and in this question, we are going to make two critical assumptions. These are explored in parts (a) and (b). Then we move to the analysis of the policy options when a country is experiencing an overvalued exchange rate.

- a. We are going to assume that the foreign economy is always in medium-run equilibrium. What are the implications of that assumption for foreign output and foreign inflation?

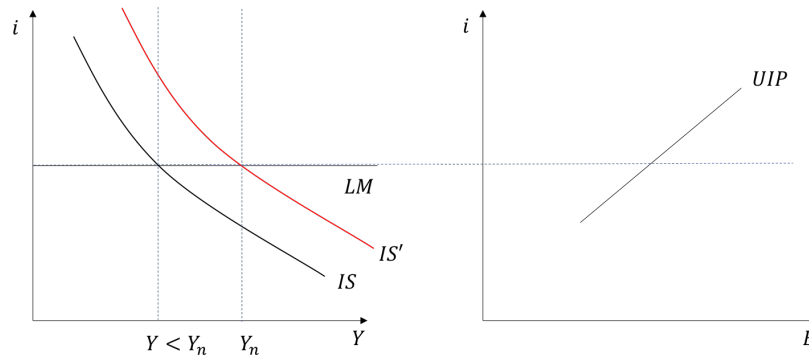
If the foreign economy is always in medium run equilibrium, then foreign income is at the natural level  $Y^* = Y_n^*$  and foreign inflation is constant  $\pi^* = \bar{\pi}^*$ .

- b. We are going to assume that the domestic and foreign economies share the same anchored value for the level of expected inflation denoted  $\bar{\pi}$  and  $\bar{\pi}^*$ . What is the implication of that assumption once both the domestic and foreign economies are both in medium-run equilibrium?

When both economies are in medium run equilibrium, they will share the same value of inflation at the anchored level  $\pi = \pi^* = \bar{\pi} = \bar{\pi}^*$

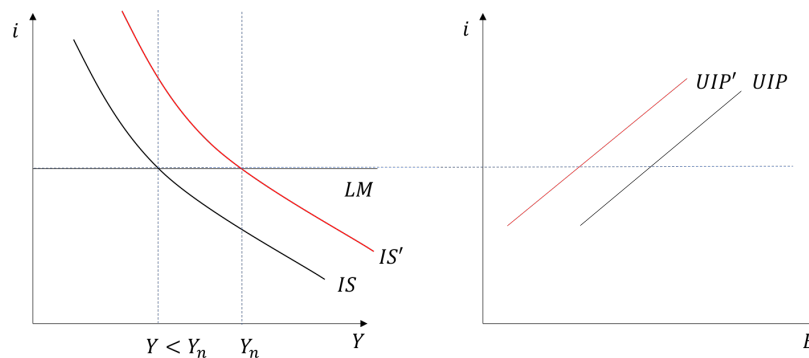
- c. Draw the IS-LM-UIP diagram for the case where the domestic country has an overvalued nominal exchange rate. What is the key feature of that diagram? Under fixed exchange rates without a devaluation, how does the economy return to its medium-run equilibrium?

The key feature of the diagram will be that the domestic country will be in a short run equilibrium where the actual level of output  $Y$  will be less than the natural rate of output  $Y_n$ , because net exports will be too low. To return to a medium run equilibrium, inflation in the domestic country will need to be less than  $\bar{\pi}$  for a prolonged period according to  $\pi - \bar{\pi} = \frac{\alpha}{L}(Y - Y_n)$ . As this occurs, then the real exchange rate will gradually depreciate and the IS curve will shift to the right.



- d. Draw the IS-LM-UIP diagram for the case where the domestic country has an overvalued nominal exchange rate. Show how the economy can return to its medium-run equilibrium when a devaluation is a policy choice.

The domestic country would then need to immediately devalue (decrease  $\bar{E}$  and UIP curve shifts left) so the real exchange rate falls and the IS curve shift right (as  $NX$  increases). The economy would then return to full employment immediately.



- e. Recall that the assumption has been made that the interest rate parity holds so  $i = i^*$  at all times. Compare the returns on the domestic bond and the returns on the foreign bond in the period of the devaluation. Will bond holders continue to believe there is a completely fixed nominal exchange

**rate? If bond holders believe another devaluation is possible, what are the consequences for domestic interest rates?**

At the time of devaluation, the return on the domestic bonds will be lower than that of the foreign bonds. It is hard to know if the bondholders will believe the devaluation is a one-time thing, which will never happen again, or if they expect it to occur again in the future. If they believe another devaluation is imminent, perceived domestic interest rates will be higher than foreign interest rates, as  $i_t \approx i_t^* - \frac{E_{t+1}^e - E_t}{E_t}$ . This might contribute to lower output.

## ☆☆ Chapter 20, Problem 4

**Modeling an exchange rate crisis. An exchange rate crisis occurs when the peg (the fixed exchange rate) loses its credibility. Bond holders no longer believe that next period's exchange rate will be this period's exchange rate. the uncovered interest rate parity equation used is the approximation:**

$$i_t \approx i_t^* - \frac{E_{t+1}^e - E_t}{E_t}$$

Period	$i_t$	$i_t^*$	$E_t$	$E_{t+1}^e$
1		3	0.5	0.5
2		3	0.5	0.45
3		3	0.5	0.45
4		3	0.5	0.5
5	15%	3	0.5	0.4
6		3	0.4	0.4

- a. **Solve the uncovered interest rate parity condition for the value of the domestic interest rate in period 1.**

In period 1:

$$i_t \approx i_t^* - \frac{E_{t+1}^e - E_t}{E_t} = 3 - \frac{0.5 - 0.5}{0.5}$$

Therefore:  $i = 3\%$

- b. **In period 2, the crisis begins. Solve the uncovered interest rate parity condition for the value of the domestic interest rate in period 2.**

In period 2, there is a crisis in that investors now expect the currency to depreciate in the future. The domestic interest rate must now be given by:  $i = 0.03 - \frac{0.45 - 0.5}{0.5} = 0.13 = 13\%$ .

- c. **The crisis continues in period 3. However, in period 4, the central bank and government resolve the crisis. How does this occur?**

The resolution of the crisis in period 4 occurs when the central bank indeed sets interest rates equal to 13%, in order to prevent capital flows from attacking the currency in crisis (if the interest rate  $i_t$  is lower than 13%, the investors will just short the currency, that

is borrow in that currency at a rate of  $i_t$ , and do the arbitrage of investing in the other currency). If this is successful, then this brings back the expected future exchange rate changes to 0.5. The peg then becomes credible.

- d. **Unfortunately, in period 5, the crisis returns bigger and deeper than ever. Has the central bank raised interest rates enough to maintain uncovered interest rate parity? What are the consequences for the level of foreign exchange reserves?**

To maintain uncovered interest rate parity, the central bank would actually need to set  $i = 0.03 - \frac{0.4-0.5}{0.5} = 0.23 = 23\%$ , which is higher than 15%. The interest rates are not high enough then: the reason might be that the central bank is worried of hurting investment too much. Then, investors, such as hedge funds, would be able to borrow in the currency, and invest the proceeds in the foreign currency. As the central bank tries to intervene in the foreign exchange market, selling foreign currency against home currency in order to defend the home currency, foreign exchange reserves would eventually fall too much so that the central bank has to abandon the peg.

- e. **How is the crisis resolved in period 6? Does this have implications for the future credibility of the central bank and the government?**

The central bank gives in and devalues the currency, and gives in to the market's expectations. The expected exchange rate equals the actual exchange rate at the new lower level. It may be difficult for the government and central bank to convince bondholders that they will never devalue again when they just did. Investors will now know that depreciation is always an option, and that the central bank is not willing to let unemployment increase too much in order to defend a peg.