

## Part I

# Imperfect Capital Mobility

This note examines flexible exchange rates with less than perfect capital mobility.

What happens to our model if there is imperfect capital mobility? Consider a monetary expansion. We know that the impact effect of expansionary monetary policy is a decrease in the interest rate. With Perfect Capital Mobility the depreciation in the currency would cause the IS curve to shift to the right until  $i = i^*$ . With Imperfect Capital Mobility the same shift in LM will cause a smaller capital inflow, and thus a smaller depreciation in the currency. Hence, the IS curve will shift to the right by a smaller amount than with Perfect Capital Mobility. The key point is that with Imperfect Capital Mobility interest rates will be lower with a monetary expansion: the full effect is not offset. Hence, the LL curve shifts to the right by a smaller amount than with Perfect Capital Mobility.

To analyze the effects of policy under flexible exchange rates when there is less than perfect capital mobility it is difficult to operate with the IS and BB curves.<sup>1</sup> The reason is that there is now a tradeoff between movements in the rate of interest and the exchange rate that keeps the goods market in equilibrium. Whenever the exchange rate changes we know that the IS curve shifts. But so does the BB curve if there is less than perfect capital markets. Why?<sup>2</sup> The reason is perhaps easiest to see if we think about zero capital mobility. In that case the BB curve is given by:

$$B = \bar{T} - mY + \phi q = 0 \quad (0.1)$$

which we can solve for  $\Psi$ , the level of income at which we have external balance:

$$\Psi = \frac{1}{m} \bar{T} + \phi q \quad (0.2)$$

Now the important point to notice from (0.2) is that there is a given level of income which maintains external balance for any given value of the exchange

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<sup>1</sup>This is where the lecture got confusing. I tried to analyze the case of zero capital mobility with the BB curve. This note corrects that.

<sup>2</sup>Perhaps another way to see the problem is to note that in the previous paragraph we explained how the smaller capital flow results in a smaller shift in IS than with perfect capital markets, and hence, the interest rate does not return to the world level. But then how can it intersect a positively sloped BB curve? Only if it shifts to the right, so it intersects the new LM curve at a lower interest rate.

rate. Changes in the rate of interest do not affect capital flows because of zero capital mobility. But interest rate changes may result in changes in the exchange rate. An appreciation in the real exchange rate means that  $\dot{P}$  would increase; in effect, the BB curve shifts to the right.

The fact that BB shifts when there is less than perfect capital mobility makes it cumbersome. Fortunately, there is a simpler way to analyze the operation of flexible exchange rates when there is less than perfect capital mobility.

What we will do is simply use the external balance condition in combination with the goods market equilibrium condition. We will eventually see that the horizontal BB curve is just a special case of what we obtain. We know that capital flows depend on interest differentials,  $K = \beta(i - i^*)$ .<sup>3</sup> Notice that the world interest rate is still an exogenous variable; the country is still small.

Now we know that  $B = T + K = 0$ , hence:

$$T = -\beta(i - i^*) \quad (0.3)$$

Because goods market equilibrium requires  $Y = A$ , we can write:

$$Y = \bar{A} + aY - bi - \beta(i - i^*) \quad (0.4)$$

Hence,

$$Y = \frac{\bar{A} - (b + \beta)i - \beta i^*}{1 - a} \quad (0.5)$$

which is the equation of the XX curve. Notice that the slope of the XX curve is less than that of the IS curve:

$$\frac{1 - a + m}{b} > \frac{1 - a}{b + \beta} \quad (0.6)$$

The XX curve takes into account the effects of exchange rate depreciation on goods market equilibrium. Notice that points above the XX curve indicate that the balance of payments is in surplus – the interest rate is too high given the level of income – and vice versa.

Notice that the XX curve is a general tool which we can use to analyze changes under any degree of capital mobility. If we have perfect capital mobility, then

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<sup>3</sup>It is useful assume that  $i^*$  does not change, but not necessary. Hence, we can without loss of generality simply assume  $K = \beta i$ , by setting  $i^* = 0$ . This reduces notation without altering the analysis.

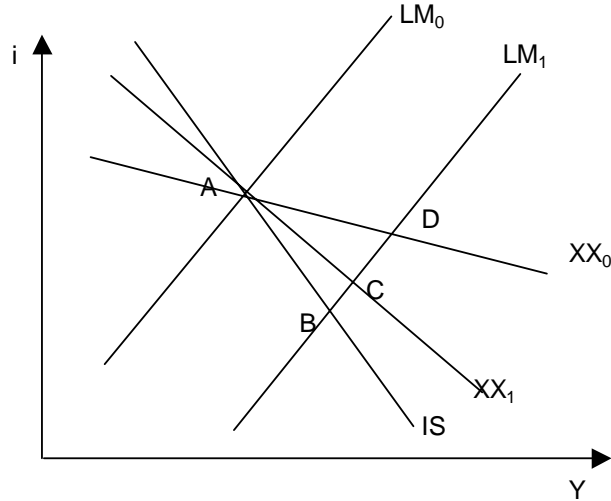


Figure 0.1: Monetary expansion with imperfect capital mobility

$\beta \rightarrow \infty$ , so the slope of the XX curve goes to zero. There is only one interest rate at which the goods market is in equilibrium and external balance is maintained.

The case of zero capital mobility,  $\beta = 0$ , is also easy to analyze. In this case the XX curve becomes steeper than before. But from (0.6) it is clear that it is still flatter than the IS curve, as

$$\frac{1 - a + m}{b} > \frac{1 - a}{b} > \frac{1 - a}{b + \beta} \quad (0.7)$$

In figure 0.1 there are two XX curves:  $XX_0$  refers to the case of low (zero) capital mobility, and  $XX_1$  refers to greater but still imperfect capital mobility.

In 0.1 the monetary expansion shifts the LM curve to the right. At point B the external balance condition is not satisfied; we are below the XX curve. The depreciation of the currency at that point causes the IS curve to shift to the right, and we end up at point C. Notice that even with zero capital mobility the currency depreciates at point B. The reason is that higher income worsens the trade balance. In order to satisfy the expression for external balance  $B = \bar{T} - mY + \phi q = 0$ , the

exchange rate must appreciate to offset the rise in income. This moves us from point B to point C.

If there is imperfect capital mobility, the depreciation of the currency is larger. This follows because at point B there will be a capital outflow; we now have an external imbalance due to the negative interest differential in addition to the trade balance. So the appreciation in the exchange rate is greater, and we end up at point D. Notice that as capital mobility increases the XX curve will be flatter. In the limit it is horizontal at  $i^*$ ; monetary policy has its greatest impact.

## 1. Fiscal policy

What about a change in fiscal policy. With perfect capital mobility there is no effect on income, only on the exchange rate.<sup>4</sup> With less than perfect capital mobility, however, fiscal policy will impact on income and the interest rate as well as the exchange rate.

Consider an expansionary fiscal policy. The IS curve shifts to the right. Notice that the rightward shift of the XX curve is greater than the rightward shift of the IS curve.<sup>5</sup> With zero capital mobility higher income will cause the exchange rate to appreciate: higher income raises imports, so to maintain external balance the exchange rate must appreciate. The IS curve thus shifts further to the right. This is because with zero capital mobility the XX curve is steep (though still less than the IS curve).

Now suppose we have imperfect capital mobility. This means that the fiscal expansion causes a capital inflow as well as a trade balance deterioration. If capital mobility is great enough the former effect overcomes the latter and the exchange rate depreciates. This causes IS to shift left. This weakens the effect of the fiscal expansion. This is hardly surprising; we know that with perfect capital mobility the effect is fully offset.

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<sup>4</sup>A horizontal line cannot shift to the right or left!

<sup>5</sup>It is left for the reader to explain why this is the case.