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The IS-LM-BP=0 Model (aka "Mundell-Fleming") under Floating Rates (rev'd)

This set of notes describes the workings of the IS-LM-BP=0 model under floating exchange rates. In this case, the real exchange rate can no longer be considered exogenous, and will respond to the interest rate insofar as it exceeds the interest rate consistent with external balance.

1. The Model

Retain the IS, LM and BP schedules as in the previous set of notes.

(1) $$Y = \overline{\alpha}[\overline{A} + \overline{EXP} - \overline{IMP} + (n+v)q - bi]$$ <IS curve>

(1') $$\boxed{i = \frac{\overline{A} + \overline{EXP} - \overline{IMP} + (n+v)q}{b} - \left(\frac{1 - c(1-t) + m}{b}\right)Y}$$ <IS curve>

(2) $$\boxed{i = \frac{\mu}{h} - \left(\frac{1}{h}\right)\left(\frac{\overline{M}}{P}\right) + \left(\frac{k}{h}\right)Y}$$ <LM curve>

(3) $$\boxed{i = -\left(1/\kappa\right)[(\overline{EXP} - \overline{IMP} + \overline{KA}) + (n+v)q] + \bar{i}^* + \left(\frac{m}{\kappa}\right)Y}$$ <BP=0 curve>

Notice that the slope of this curve is positive (m/κ), and that anything that changes the autonomous components of exports, imports and capital flows will change the position of the schedule. Also note that changes in q will shift the curve.

The interpretation of the BP=0 schedule is as follows. Along all points on this curve, the trade balance and private capital flows are such that the overall balance of payments (in an economic sense) equals zero, so ORT equals zero.

In the fixed exchange rate case, q could be treated as a constant, changed only when the government decides to devalue or revalue the currency. In a floating exchange rate case, q is endogenous. When the equilibrium interest rate is above (below) that consistent with external equilibrium, the currency tends to appreciate (depreciate). However, this difference is not apparent when the economy is at both internal and external equilibrium.

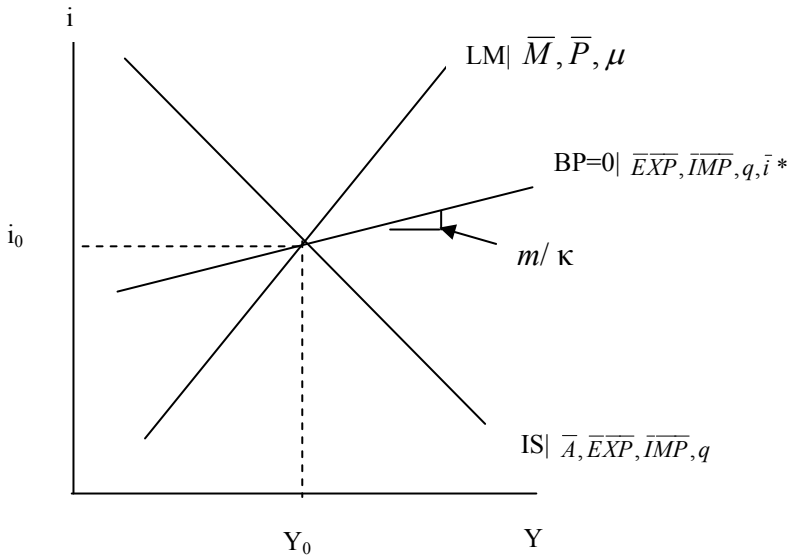

Figure 1: IS-LM-BP=0 in equilibrium

The differences from the fixed exchange rate situation only become apparent when one examines fiscal and monetary policy.

2. Fiscal Policy under Floating Exchange Rates

Shifts in the IS and LM curves occur for the same reasons as before. Consider what happens if one increases government spending.

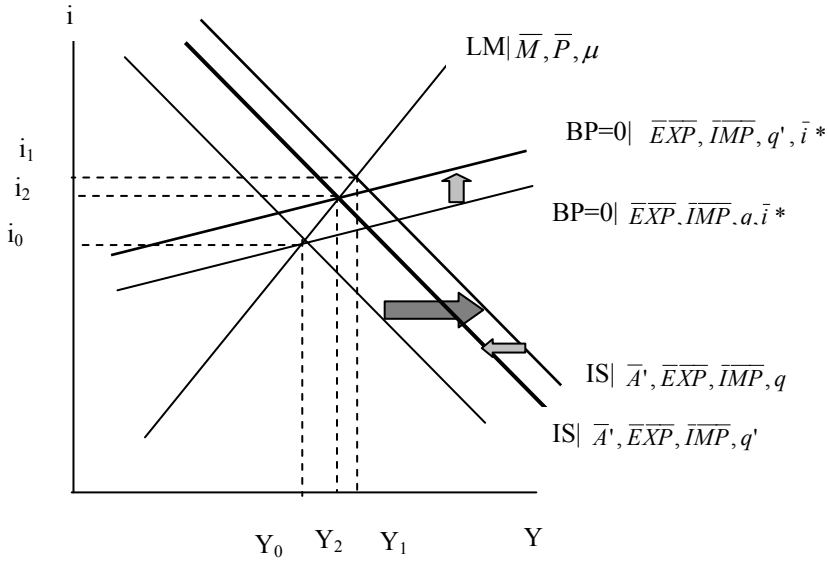

Figure 2: Expansionary fiscal policy under fixed exchange rates, high capital mobility

The IS curve shifts out. Initially, output is at Y_1 and interest rates at i_1. However, the equilibrium interest rate is greater than that consistent with external equilibrium; this means capital is flowing into the economy at a rate greater than that necessary to offset the trade balance. In the fixed exchange rate system, this would mean increases in official reserves. However, under the floating exchange rate system, the home currency experiences pressure to appreciate, i.e., q falls.

As q falls, this affects two curves: the IS and the BP=0. Inspect equation (1'); a fall in q reduces the vertical intercept in the IS curve, so the curve shifts in. Now examine equation (3); a fall in q makes the vertical intercept larger, i.e., shifts up the BP=0 curve. These two shifts are depicted in Figure 2. Notice then that equilibrium income falls to Y_2 and interest rates to i_2 (although both of these are higher relative to the initial starting values of Y_0 and i_0).

Why do these shifts occur? As q falls (appreciates), exports fall and imports increase and hence aggregate demand declines and the IS shifts in. As exports and imports increase, for external balance to hold, capital inflows must be higher for any given income level. This can only be accomplished by a higher interest rate. Hence, the BP=0 curve is shifted higher.

In the end, in an open economy, some of the fiscal expansion is offset by reduced "net exports" (exports minus imports). Another way of thinking about this phenomenon is that there is now an additional channel for "crowding out". There are essentially two interest rate sensitive components of aggregate demand now: investment spending and net exports. Net exports are not literally interest sensitive, but to the extent that they depend upon the exchange rate and the exchange rate is in turn dependent upon interest rates, they are implicitly interest sensitive.

Of course, there is nothing that guarantees that the BP=0 line is flatter than the LM curve as depicted in Figure 2. Recall the slope of the LM curve is (k/h), while that of the BP=0 curve is (m/κ), and one can imagine that for a small, developing country, international investors might not wish to place their financial capital in the country without a very high rate of return; in other words financial capital may not be very sensitive to interest differentials, so that κ is small. Then the slope of the BP=0 curve will be steep, perhaps steeper than the LM curve.

As depicted below in Figure 3, the fiscal expansion shifts out the IS curve, output and interest rates rise as before (dark gray arrow). Now, however, the equilibrium interest rate is not as high as that required for external equilibrium. ~~Hence, BP < 0, ORT > 0, and foreign exchange reserves decline. If the central bank does not sterilize the foreign reserves decline, then the LM curve will shift in, until external equilibrium is restored. If the central bank does sterilize, then the LM remains where it was. Of course, this must come to an end when foreign exchange reserves are exhausted.~~ Hence, the exchange rate depreciates, shifting out the IS curve, and shifting down the BP=0 schedule (light gray arrows).

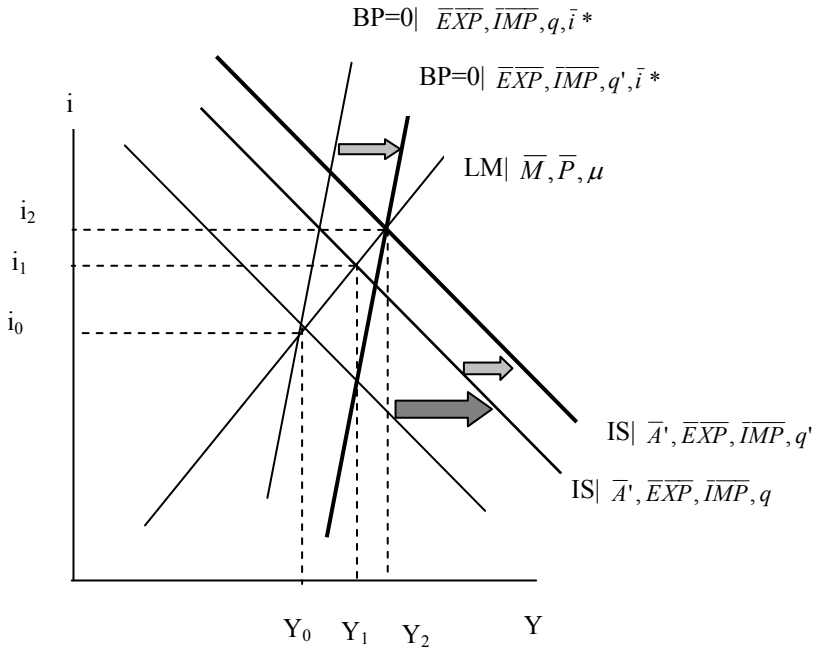

Figure 3: Expansionary fiscal policy under fixed exchange rates, low capital mobility

In this case, output rises to Y_1, and interest rates to i_1; but then with a balance of payments deficit, the exchange rate begins to depreciate, and hence the BP=0 curve to shift out. The depreciation also stimulates net exports, so the IS curve shifts out. Then output and interest rates rise to Y_2 and i_2.

3. Monetary Policy under Floating Exchange Rates

It is instructive to consider what happens if a monetary expansion is undertaken. Examine the high capital mobility case.

In the figure below, the resulting equilibrium interest rate i_i is less than required for external equilibrium. As a consequence, there is an incipient balance of payments deficit and the exchange rate depreciates. The resulting increase in net exports means that the required interest rate for external equilibrium falls (the BP=0 curve shifts downward). The increase in net exports means that domestic aggregate demand rises, and the IS curve shifts out. The equilibrium settles at income level Y_2 and interest rate i_2.

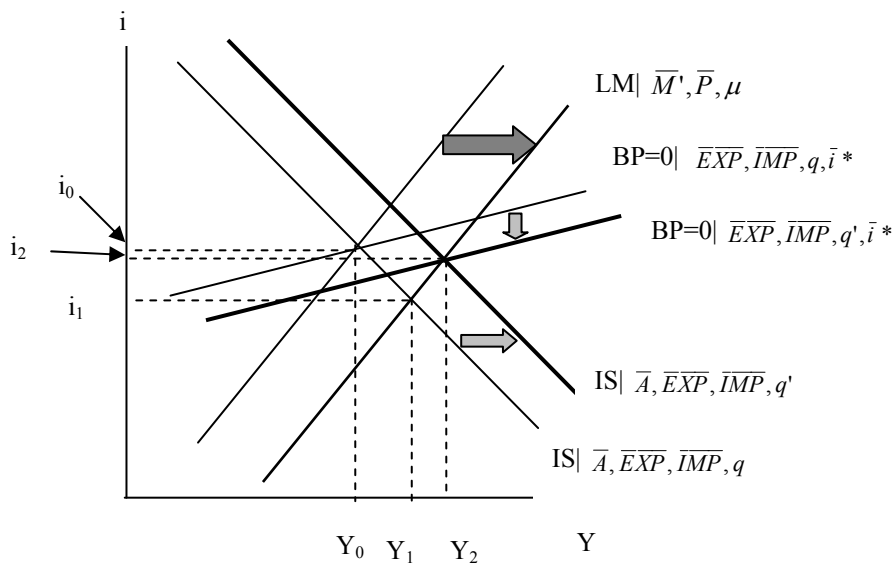

Figure 4: Expansionary monetary policy under floating exchange rates, high capital mobility

Notice that monetary policy is quite powerful. The increase in the money supply decreases interest rate and hence spurs investment, thereby increasing output. But the lower interest rates also puts negative pressure on the balance of payments, and under a free float, this manifests itself in a depreciation of the home currency. This depreciation spurs exports and discourages imports, so the expansionary monetary policy "crowds in" net exports.

4. Interest Rate Shocks

So far we have examined the effects of domestic policies. One can also examine the impact of foreign policies. Consider what happens if the rest of the world's interest rate, $\bar{i}*$, should rise. The initial effect can be discerned by examining equation (3), the BP=0 schedule. Notice that $\bar{i}*$ enters in one-for-one in the determination of the interest rate that equilibrates the balance of payments. Below, in Figure 5, is depicted the outcome in the high capital mobility case.

$$(3) \qquad i = -\left(\frac{1}{\kappa}\right)[(\overline{EXP} - \overline{IMP} + \overline{KA}) + (n+v)q] + \bar{i}^* + \left(\frac{m}{\kappa}\right)Y$$

So to determine how far the BP = 0 line shifts, take the total differential,

$$\Delta i = -\left(\frac{1}{\kappa}\right)[(\Delta EXP - \Delta IMP + \Delta KA) + (n+v)\Delta q] + \Delta i^* + \left(\frac{m}{\kappa}\right)\Delta Y$$

and set ΔY = 0 (as well as the other autonomous components, as well as holding q constant).

$\Delta i = \Delta i^*$ (this is extent of the shift in the BP=0 curve)

For a RoW interest rate shock, see Figure 5, below, which depicts the outcome in the high capital mobility case.

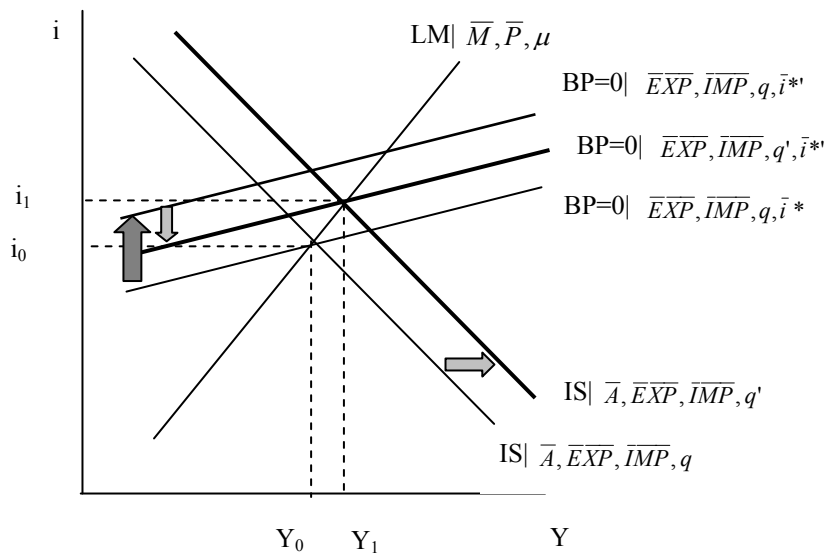

Figure 5: Exogenous increase in RoW interest rate under floating exchange rates, high capital mobility

Notice that home interest rates rise in response to RoW interest rate increases, although not one-for-one. You might want to consider what happens if the monetary authorities at home attempt to keep the home-RoW interest differential constant.

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