Economics 302
Spring 2012
University of Wisconsin-Madison

Menzie D. Chinn
Social Sciences 7418

The Open Economy in the Short Run

This set of notes outlines the IS-LM model of the open economy. First, it covers an accounting identity. Then the open economy IS curve, which incorporates an exchange rate/interest rate relationship, is derived, and combined with the LM curve. The model is used to examine policy in an open economy, under floating exchange rates. Finally, policy under fixed exchange rates is examined.

1. The National Saving Identity

Consider the open economy definition of GDP, from the spending side:

$$Y \equiv C + I + G - IM / \varepsilon + X$$

(Where all the variables are "ex post" values, not "planned" or "ex ante values"). Income can only be disposed of by being taxed, saved or consumed:

$$Y \equiv C + S + T$$

Combining these two definitions leads to:

$$C + S + T \equiv Y \equiv C + I + G - IM / \varepsilon + X$$

Cancelling out consumption, and rearranging yields:

$$(S - I) + (T - G) \equiv -IM / \varepsilon + X \equiv NX$$

Where *NX* is net exports, which is defined as exports minus imports; and $\varepsilon = (EP / P^*)$, the real exchange rate.

2. A Model of Income Determination in the Open Economy

Equilibrium is given by the condition output equals aggregate demand

$$Y = Z$$

Aggregate demand in the open economy is given by:

$$Z \equiv C + I + G - IM / \varepsilon + X \qquad (19.1)$$

Where all the variables now denote "planned" or "ex ante" values. Assume imports and exports behave as in (19.2) and (19.3):

$$IM = IM(Y, \varepsilon) \qquad \frac{\partial IM}{\partial Y} > 0, \frac{\partial IM}{\partial \varepsilon} > 0 \qquad (19.2)$$

$$X = X(Y^*, \varepsilon) \qquad \frac{\partial X}{\partial Y^*} > 0, \frac{\partial X}{\partial \varepsilon} < 0 \qquad (19.3)$$

Let net exports be re-written:

$$NX(Y,Y^*,\varepsilon) = X(Y^*,\varepsilon) - IM(Y,\varepsilon)/\varepsilon$$

Substituting into equation (19.1), using the functional forms for the domestic components of aggregate demand from Chapter 14 yields the IS curve for the open economy:

$$Y = C(Y-T) + I(Y,r) + G + NX(Y,Y^*,\varepsilon) \qquad (20.1)$$

If one assumes that prices are constant at home and abroad, and $P/P^* = 1$, then $\varepsilon = E$. Further, with constant price level, inflation is zero, and the real interest rate equals the nominal. Hence, equation (20.1) becomes:

$$Y = C(Y-T) + I(Y,i) + G + NX(Y,Y^*,E) \qquad (20.2)$$

The problem with this formulation of the IS curve is that any change in the exchange rate shifts the curve; if one could make *E* a function of the interest rate, that would solve that problem. There is a relationship that one can exploit, called the interest rate parity condition:

$$(1+i_t) = (1+i_t^*)\frac{E_t}{E_{t+1}^e}$$

This is a "no arbitrage profits condition", which states that one can't expect to get a higher return in one location versus another, expressed in a common currency. Rearranging:

$$E_t = \frac{(1+i_t)}{(1+i_t^*)}E_{t+1}^e \qquad (20.4)$$

If the foreign interest rate stays constant, the exchange rate appreciates whenever the home interest rate rises. It also rises if the future expected exchange rate rises, which complicates matters. As a first approximation, assume the future expected exchange rate stays constant. Then:

$$E_t = \frac{(1+i)}{(1+i^*)}\overline{E}^e \qquad (20.5)$$

Equation (20.5) can be substituted into the IS curve to yield:

$$Y = C(Y-T) + I(Y,i) + G + NX\left(Y,Y^*,\left(\frac{1+i}{1+i^*}\right)\overline{E}^e\right)$$

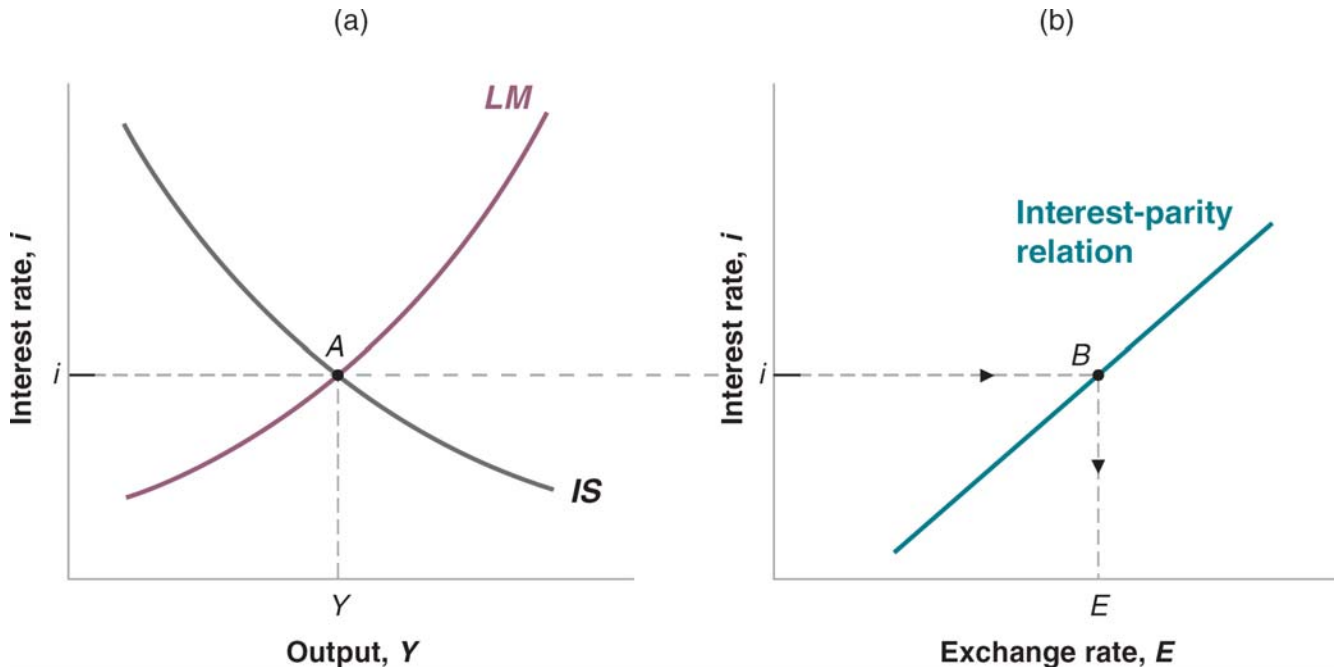
The LM curve is as in Chapter 4:

$$\frac{M}{P} = YL(i)$$

Solving this system of equations would lead to the following equilibrium:

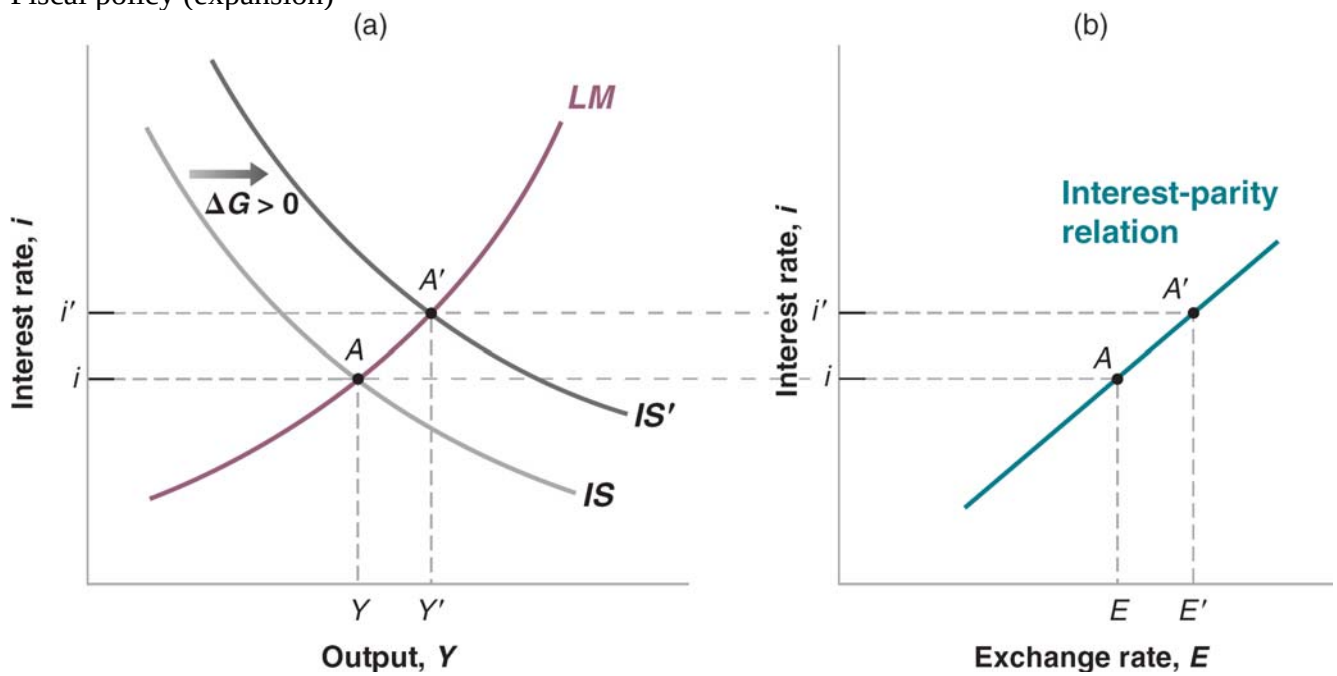
$$Y_0 = Y\left(G,T,\left(\frac{M}{P}\right),Y^*,\left(\frac{1}{1+i^*}\right)\overline{E}^e\right)$$

The solution to this is shown in the below graph. Notice that the higher the domestic interest rate, the stronger the nominal exchange rate (value of the home economy).



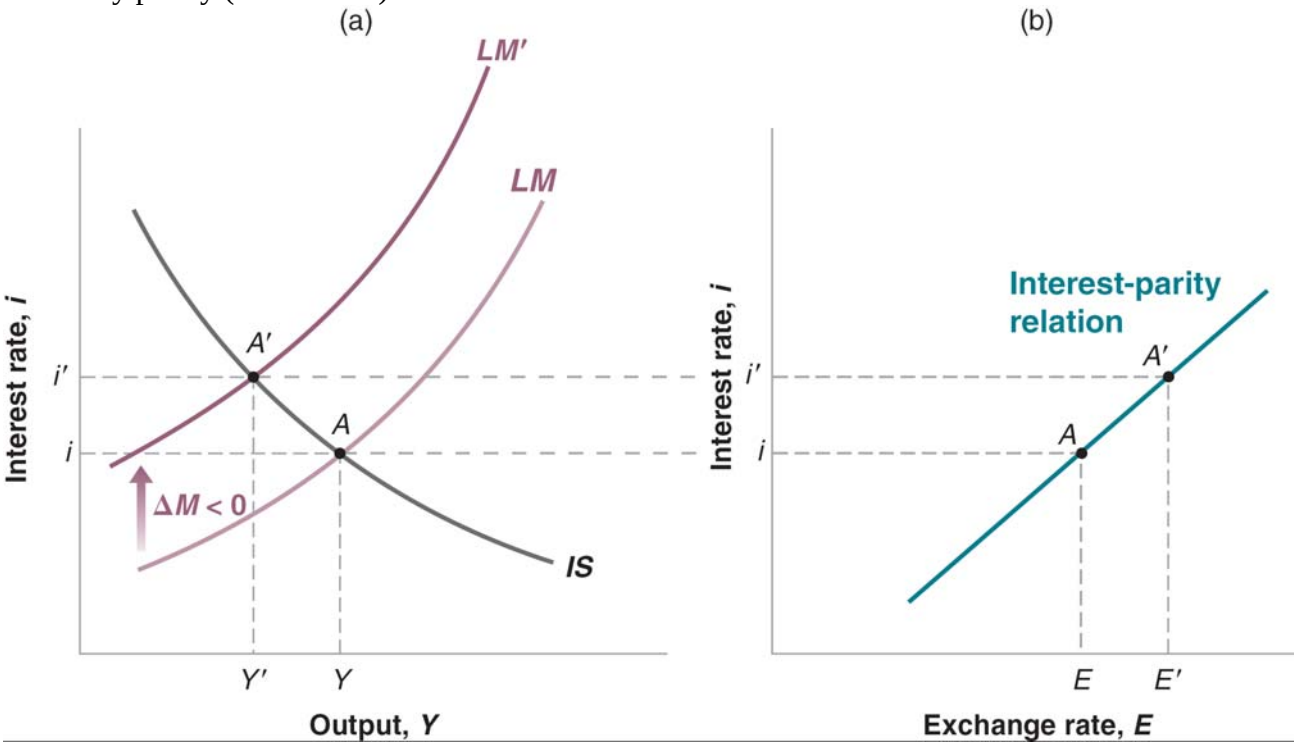
3. Policy in an Open Economy, with Flexible Exchange Rates

Fiscal policy (expansion)



A fiscal expansion induces an increase in the interest rate which appreciates the currency. With the higher interest rate, both investment and net exports are “crowded out”. Because income is higher than initial, then net exports are unambiguously lower than before.

Monetary policy (contraction)



The higher interest which results from a monetary contraction induces a strengthening of the currency. Imports tend to rise, and exports fall, from the currency appreciation. However, because income falls, imports fall somewhat. The net impact on net exports is ambiguous.

<u>An Example: the United States 1980-90</u>

Soon after being appointed Fed Chairman in August 1979, Paul Volcker raised the Fed funds rate to record highs, in order to reduce inflation.

With the inauguration of President Ronald Reagan in January 1981, a program of tax cuts, and defense expenditures were implemented.

Real interest rates rose as a consequence.

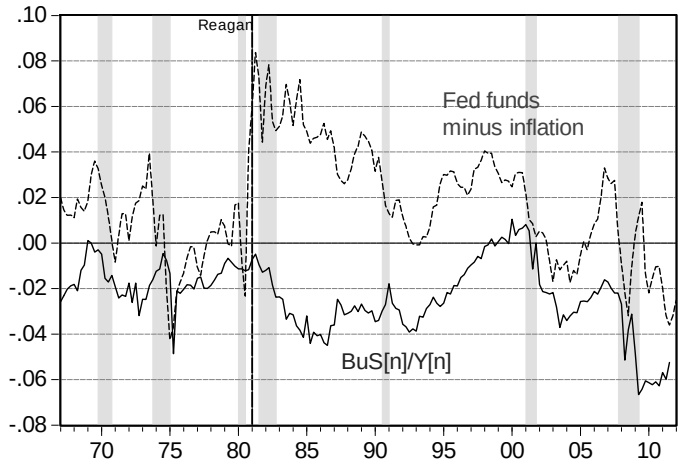


Figure 1: Federal structural budget balance to potential GDP (solid line), and Fed funds interest rate minus lagged one year CPI inflation.

As the US real interest rate rose (and the nominal rate rose relative to the foreign interest rate), the dollar strengthened, as in the interest parity condition.

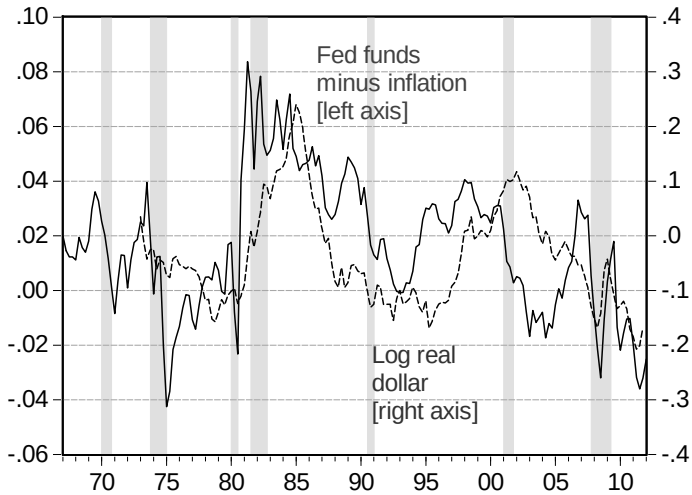
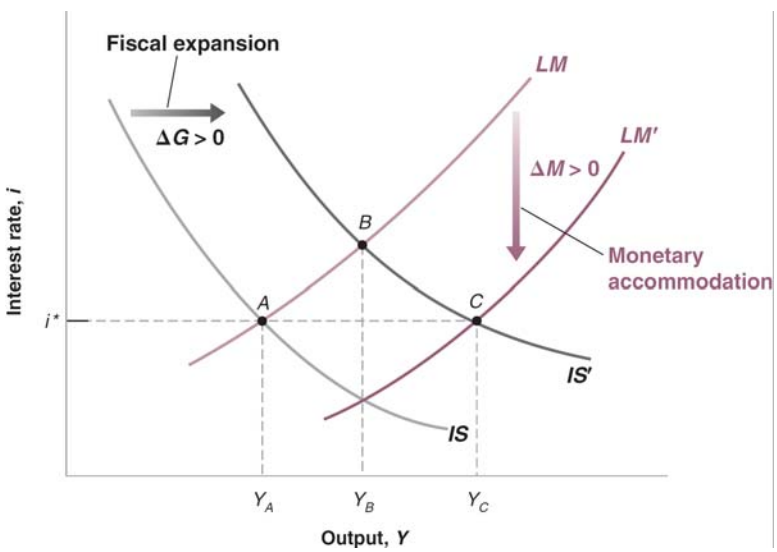


Figure 2: Fed funds rate minus lagged one year inflation, and log real value of the US dollar against a broad basket of currencies.

4. Fiscal Policy in an Open Economy, with Fixed Exchange Rates



When exchange rates are fixed (and there are no controls on capital flows), the monetary authorities are committed to keeping the exchange rate constant. This means the interest rate has to be kept constant, and equal to the foreign interest rate. Hence, if government spending is increased, the monetary authority must increase the money supply.

Note that if the monetary authority tried to undertake an independent monetary contraction or expansion, that would be undone by capital inflows/outflows.

e302_open_s12.docx, 13.4.2012