Chapter 19. Output, the Interest Rate, and the Exchange Rate (7e)

Assumptions

- The *domestic and foreign price levels* are assumed to be *fixed*.

- Accordingly, expected domestic inflation and expected foreign inflation are assumed to be zero, which implies that the real interest rate equals the nominal interest rate throughout the world.

- Production is assumed to respond to changes in demand without changes in price, so *demand determines output*.

- Foreign currency is assumed to have no transactions value for domestic residents.

- Domestic and foreign bonds are considered *perfect substitutes*, and there is perfect capital mobility, so *uncovered interest parity holds*.

- The *expected future exchange rate* is assumed to be constant.

19.1 Equilibrium in the Goods Market

- Equilibrium in the goods market equilibrium can be written as

$$Y = C(Y-T) + I(Y,r) + G - IM(Y,\varepsilon)/\varepsilon + X(Y^*,\varepsilon).$$

$$\quad\quad (+)\quad (+,-)\quad\quad\quad (+,+)\quad\quad (+,-)$$

- In the short run, *assume that P and P* are fixed* and (for convenience) equal to one, so that $E=\varepsilon$.

- Since *P* is fixed, assume that *expected inflation is zero*, so that *r=i*.

- Under these assumptions, goods market equilibrium can be rewritten as

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

$$\quad\quad (+)\quad\quad (+,-)\quad\quad\quad (-,+,-)$$

19.2 Equilibrium in Financial Markets

- Initially when we looked at financial markets in the *IS-LM* model we assumed there were only two possible assets, money and bonds.

- However, in an open economy we can now also choose *foreign bonds*.

- Under the assumptions of *perfect asset substitutability* (i.e., *no risk premium*) and *perfect capital mobility*, the expected return on domestic and foreign bonds must be the same.

- This arbitrage condition is called the *uncovered interest parity condition*, and can be written as $(1+i_t) = (1+i^*_t)E_t/E^e_{t+1}$.

- The chapter assumes that the *expected future exchange rate is fixed at* $\bar{E}^e$.

- Under this assumption and dropping time subscripts, uncovered interest parity can be rewritten as $E = [(1+i)/(1+i^*)]\,\bar{E}^e$.

- The domestic currency tends to appreciate (*E* tends to increase) when

    o the *expected exchange rate increases*, when

    o the *domestic interest rate increases*, and when

    o the *foreign interest rate falls*.

- Note that when the exchange rate equals the expected exchange rate ($E = \bar{E}^e$), i.e., when the domestic currency is not expected to gain or lose value, the *domestic interest rate equals the foreign interest rate.*

- When the domestic currency is expected to depreciate ($E > \bar{E}^e$), the domestic interest rate is greater than the foreign interest rate.

- In this case, the difference between the domestic and the foreign interest rate compensates financial investors for the expected depreciation of the domestic currency.

- When the domestic currency is expected to appreciate ($E < \bar{E}^e$), the domestic interest rate is less than the foreign interest rate.

  - In this case, the difference between the foreign and the domestic rate compensates financial investors for the expected depreciation of the foreign currency.

[Figure 19-1: Interest parity condition]

Figure 19-1 The Relation between the Interest Rate and the Exchange Rate Implied by Interest Parity

A higher domestic interest rate leads to a higher exchange rate—an appreciation.

Interest parity relation (given $i^*, \bar{E}^e$)

Domestic interest rate, i

Exchange rate, E
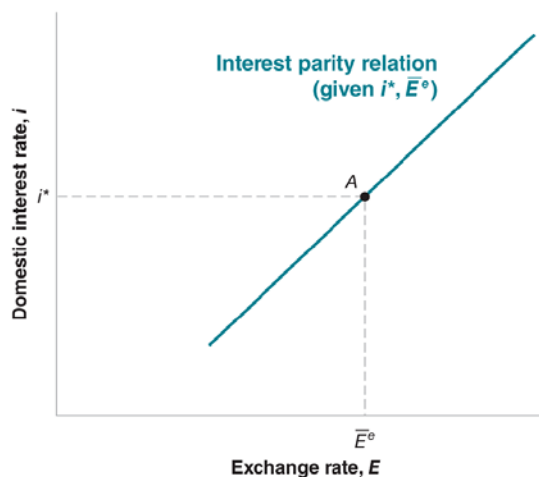
19.3 Putting Goods and Financial Markets Together

- Now, the open economy version of IS curve becomes,

$$Y = C(Y-T) + I(Y,i) + G + NX(Y, Y^*, \bar{E}^e[(1+i)/(1+i^*)]).$$

- Graphically, the *IS* curve slopes down in *Y-i* space.

  - An increase in the interest rate reduces investment, as in the closed economy, and in addition, causes the currency to appreciate, reducing net exports.

  - Moreover, in an open economy, the position of the *IS* curve is affected by foreign output and the foreign interest rate.

- Since the interest rate is the policy rate set by the central bank the *LM* relation is given by the equation, $i = \bar{\imath}$

- Together the *IS* and the *LM* equations determine the interest rate and equilibrium output.

- Increasing the interest rate now leads to lower domestic investment and a decrease in output.

- However, now in an open economy it causes the currency to appreciate which makes domestic goods relatively more expensive and also pushes output lower.

[Figure 19-2: IS-LM Model in Open Economy]

Figure 19-2 The *IS–LM* Model in the Open Economy
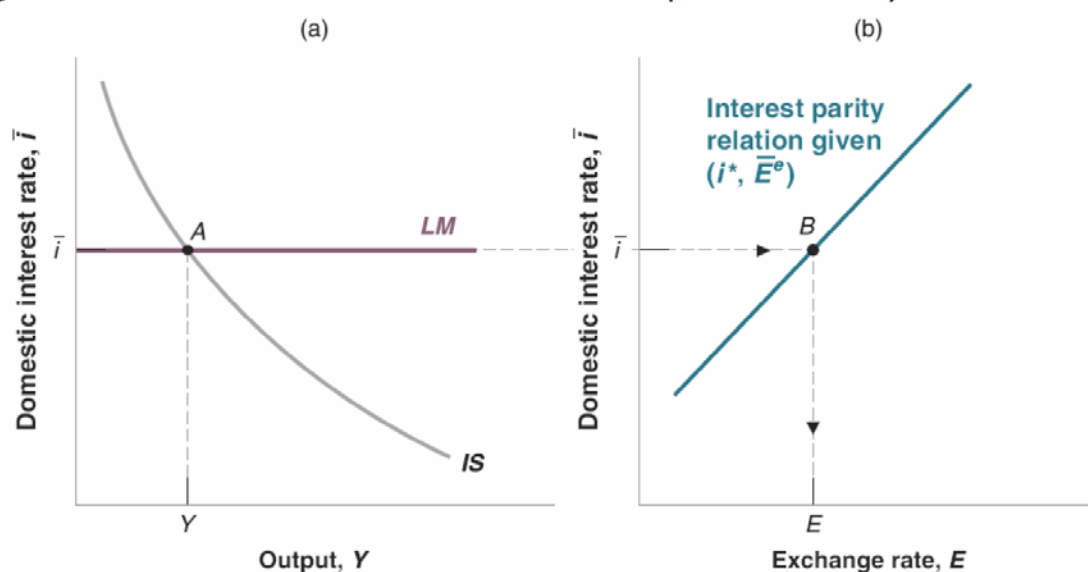
An increase in the interest rate reduces output both directly and indirectly (through the exchange rate). The *IS* curve is downward sloping. The *LM* curve is horizontal, as in Chapter 6.

19.4 The Effects of Policy in an Open Economy
- A decrease in the money supply *[Figure 19-3]*

   o LM shifts upward.

   o No shifts for IS and IP.

   o Equilibrium: Output falls, the interest rate increases, and exchange rate increases (i.e. appreciates).

- o Effect on various components of demand:
  - C(Y-T) decreases (Y decreases)
  - I(Y, i) decreases (Y decreases, i increases)
  - NX(Y, Y*, E) ambiguous (Y* constant, E increases, Y decreases)
    - The fall in output tends to increase the trade balance while the exchange rate appreciation tends to reduce the trade balance.

Figure 19-3 The Effects of an Increase in the Interest Rate
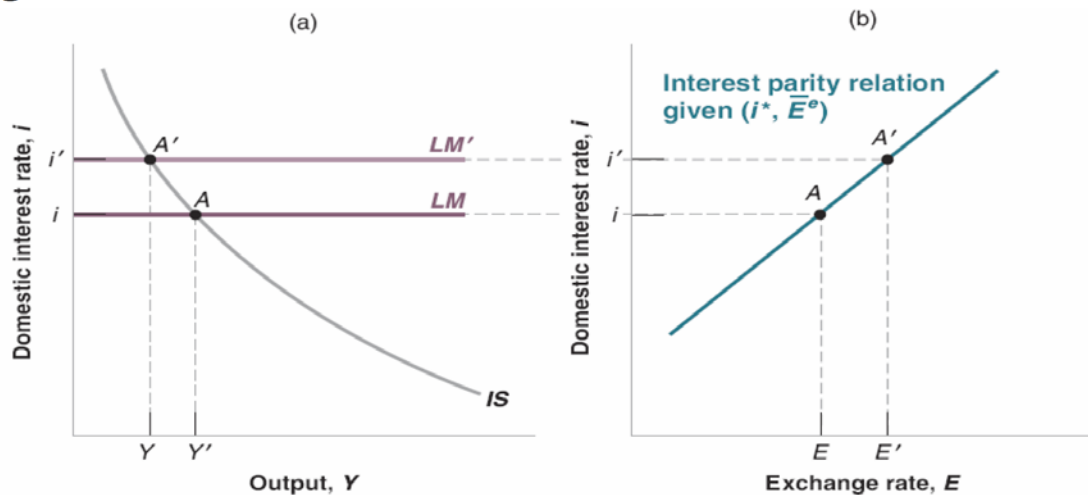
An increase in the interest rate leads to a decrease in output and an appreciation.

- The effects of an increase in government spending *[Figure 19-4]*
  - o *IS* curve shifts to the right.
  - o No shifts for LM and IP.
  - o Equilibrium: Output increases and unchanged interest rate and exchange rate.
  - o Effect on various components of demand:
    - C(Y-T) increases (Y increases)
    - I(Y, i) increases (Y increases, i unchanged)
    - NX(Y, Y*, E) decreases (Y* constant, E unchanged, Y increases)

Figure 19-4 The Effects of an Increase in Government Spending with an Unchanged Interest Rate
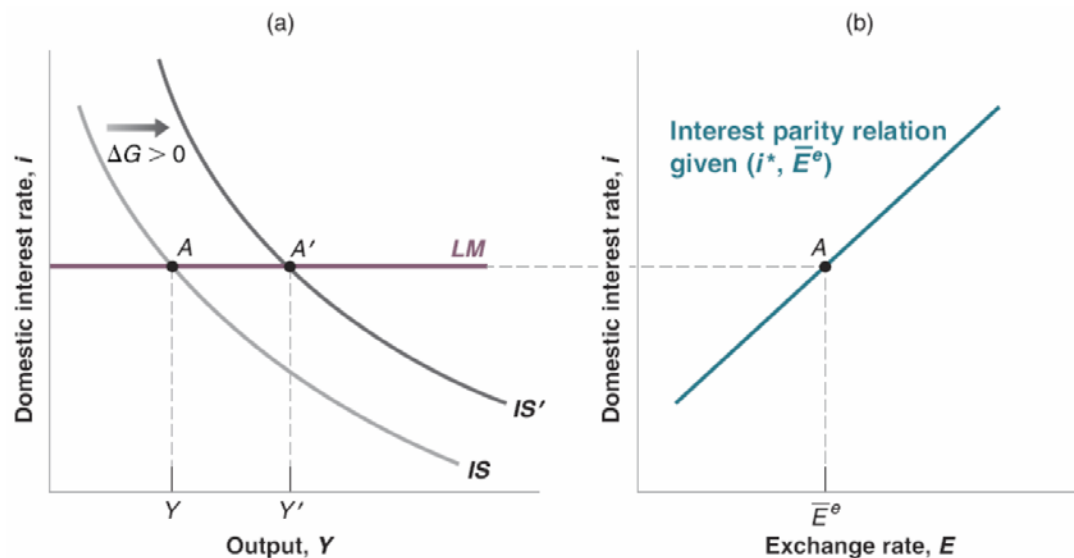
An increase in government spending leads to an increase in output. If the central bank keeps the interest rate unchanged, the exchange rate also remains unchanged.

19.5 Fixed Exchange Rates

- Some countries allow exchange rates to float freely (i.e. Canada, U.S., U.K.) while others fix their currency to another currency (i.e. Argentina, several African countries).

- Countries that fix, or peg, their currencies must often intervene in the foreign exchange market to maintain their peg.

- The dedication to maintaining the peg varies. Some countries move slowly (i.e. crawling peg) while others move more rapidly.

- Monetary Policy when the Exchange Rate is Fixed

    o Suppose a country decides to peg its exchange rate at some chosen value, $\bar{E}$

    o Current exchange rate $E_t=\bar{E}$.

    o If financial and foreign exchanges markets believe that the exchange rate will remained pegged => $E^e_{t+1}=\bar{E}$.

    o From interest parity condition, $(1+i_t) = (1+i^*_t)E_t/E^e_{t+1}$, $i_t=i^*_t$.

- o Under a fixed exchange rate and perfect capital mobility, the central bank gives up monetary policy as a policy instrument, the domestic interest rate must be equal to the foreign interest rate.

- Fiscal Policy when the Exchange Rate is Fixed

    - o Effect is the same as shown in *figure 19-4*.

    - o If the increase in spending is not accompanied by a change in the interest rate, the exchange rate doesn't move.

    - o Thus, when government spending increases whether or not the country pegs its exchange rate makes no difference.

<u>Exercise</u>

<u>Q19-4. Flexible exchange rates and foreign macroeconomic events</u>

Consider an open economy with flexible exchange rates. Let UIP stand for the uncovered interest parity condition.

a. In an IS-LM–UIP diagram, show the effect of an increase in foreign output, Y*, on domestic output (Y) and the exchange rate (E), when the domestic central bank leaves the policy interest rate unchanged.

b. In an IS-LM–UIP diagram, show the effect of an increase in the foreign interest rate, i*, on domestic output (Y) and the exchange rate (E), when the domestic central bank leaves the policy interest rate unchanged.

Answer:

a. The IS curve shifts right, because net exports tend to increase as foreign output rises. Domestic output increases if the central bank leaves the interest rate unchanged (the LM curve does not shift). The exchange rate will be unchanged.

(similar to figure 19-4)

b. When the foreign interest rate rises, at the same domestic rate of interest, the domestic interest rate is relatively lower. The UIP curve will shift in so that the domestic currency depreciates. Note that the IS curve also contains a term in the foreign interest rate. The higher foreign interest rate, at the same domestic interest rate, will depreciate the domestic currency and increase net exports. The IS curve will shift out. Domestic output rises when the foreign country tightens its monetary policy. The exchange rate depreciates.

$Y = C(Y\text{-}T) + I(Y,i) + G + NX(Y,Y^*, \bar{E}^e[(1+i)/(1+i^*)])$