The Open Economy Revisited: The Mundell-Fleming Model and the Exchange-Rate Regime

When conducting monetary and fiscal policy, policymakers often look beyond their own country’s borders. Even if domestic prosperity is their sole objective, it is necessary for them to consider the rest of the world. The international flow of goods and services and the international flow of capital can affect a country in profound ways. Policymakers ignore these effects at their own peril.

In this chapter we extend our analysis of the aggregate demand to include international trade and finance. The model developed in this chapter is a version of the Mundell-Fleming model. This model has been described as “the dominant policy paradigm for studying open-economy monetary and fiscal policy”. In 1999, Robert Mundell was awarded the Nobel Prize for his work in open-economy macroeconomics, including this model.1

The Mundell-Fleming model is a close relative of the IS-LM model. Both models assume that the price level is fixed and then show what causes short-run fluctuations in aggregate income (or, equivalently, shifts in the aggregate demand curve). The key difference is that the IS-LM model assumes a closed economy, whereas the Mundell-Fleming model assumes an open economy. The Mundell-Fleming model extends the short-run model of national income from Chapters 10 and 11 by including the effects of international trade and finance as suggested in Chapter 5.

The Mundell-Fleming model makes one important and extreme assumption: it assumes that the economy being studied is an open economy with perfect mobility of financial capital. As we will see, this assumption of an open economy with perfect capital mobility will prove useful in developing a tractable and illuminating model.

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1 This document is written to replace chapter 12 in Gregory Mankiw’s Macroeconomics (New York: Worth Publishers, 7th edition, 2010). The text follows Mankiw as closely as possible, but the analysis is modified somewhat.

The analysis in this text differs from Mankiw’s in three respects. First, and most importantly, we do not assume that interest rates must be identical in all countries. In countries with a floating exchange rate, central banks often conduct monetary policy by setting a nominal interest rate, and this interest rate can deviate from nominal interest rates abroad.

Second, we assume that the central bank conducts monetary policy by setting a short nominal interest rate rather than money supply. The outcome in the money market is then irrelevant for the goods market and the LM curve need not be included in the analysis. Monetary policy could have been treated similarly in the derivation of the IS-LM model in Mankiw’s chapters 10-11, and the LM curve would then have been replaced by a horizontal interest rate line.

Third, we ignore Mankiw’s section 12-6 where the transition from the short to the long run is analyzed. This transition is more easily and realistically analyzed in the framework presented in Mankiw’s chapter 14.

One lesson from the Mundell-Fleming model is that the behavior of an economy depends on the exchange-rate system it has adopted. Indeed, the model was first developed in large part to understand how alternative exchange-rate regimes work and how the choice of exchange-rate regime impinges on monetary and fiscal policy. We begin by assuming that the economy operates with a floating exchange rate. That is, we assume that the central bank allows the exchange rate to adjust to changing economic conditions. We then examine how the economy operates under a fixed exchange rate. After developing the model, we will be in a position to address an important policy question: What exchange-rate system should a nation adopt?

### 12-1 The Mundell-Fleming Model

In this section we build a version of the Mundell-Fleming model, and in the following sections we use the model to examine the impact of various policies. As you will see, the Mundell-Fleming model is mostly built from components we have used in previous chapters. But these pieces are put together in a new way to address a new set of questions.

#### The Key Assumption: Open Economy with Perfect Mobility of Financial Capital

Let us begin with the assumption of an open economy with perfect capital mobility. As we saw in Chapter 5, this assumption means that the return on investments in the home country must be equal to the return on investments abroad.\(^2\) Let us make this statement a bit more formal.

Consider the returns of investing in the United States (home) at the nominal interest rate \(i\) or in Japan (abroad) at the nominal interest rate \(i^*\). If $1 is invested in the United States, the investor will have \(1+i\) dollars in the beginning of next period. If $1 is invested in Japan, the investor must first convert dollars to yen; $1 gives \(e\) yen if the exchange rate is \(e\) yen per dollar. The investor thus invests \(e\) yen in the Japanese market, and is repaid \(e(1+i^*)\) yen in the beginning of next period. These yen are then expected to be converted to dollars at tomorrow’s expected exchange rate, \(Ee\). The investor then gets \(e(1+i^*)/(Ee)\) dollars.

For expected returns to be the same in both countries, the **interest rate parity condition**

\[
1 + i = \left(1 + i^*\right)e/(Ee)
\]

must therefore be fulfilled. The left-hand side in this equation shows the gross return on an investment in the home country while the right-hand side shows the expected gross return on an investment abroad. The interest rate parity condition thus states that if the domestic interest rate is lower than the foreign interest rate, the exchange rate must be expected to appreciate, and if the domestic interest rate is higher than the foreign, the exchange rate must be expected to depreciate. Suppose for example that the U.S. interest rate is \(i = 3\%\) and that the Japanese interest rate is \(i^* = 5\%\). The interest rate parity condition then implies that

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\(^2\) In Chapter 5, we claimed that the real interest rate in the home country must equal that abroad. Here we will relax that assumption slightly and only require that financial capital is perfectly mobile in the short run. Physical capital is assumed mobile in the long run, but not in the short run. As a consequence, the real interest rate may differ between countries in the short run.
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\[ \frac{Ee'}{e} = \frac{1 + i^*}{1 + i} = \frac{1.05}{1.03} \approx 1.02, \]

i.e. that the dollar is expected to appreciate by two percent against the yen. In this example, investments in the United States result in a lower interest rate return, but this is compensated for by the currency appreciation.

**More Assumptions**

The assumptions behind the Mundell-Fleming model are similar to those behind the IS-LM model. The important difference is that we allow for trade with other countries. We assume that foreign variables are exogenous, i.e. we assume that they are not affected by what happens in the country we analyze. This assumption is particularly justified if we analyze a small country like Sweden.

We will also assume that next period’s nominal exchange rate, \( Ee' \), is exogenous. This assumption is less obvious and can at most be justified as an approximation. Recall that the IS-LM and Mundell-Fleming models analyze the short run – we mostly consider temporary policy reactions in response to business cycle fluctuations. An exception is when we look at fixed exchange rate regimes; we will assume that the announcement of an exchange rate peg affects both today’s exchange rate, \( e \), and the expected future exchange rate, \( Ee' \). But as long as the policy regime is stable, we assume that temporary reactions have negligible effects on the longer run.

In the following, we will also assume that the central bank conducts monetary policy by setting the interest rate rather than by controlling the money supply. The specification with the interest rate as the instrument is more similar to how most central banks operate today, and that specification also simplifies the analysis.

**The Goods Market and the IS\(^+\) Curve**

The Mundell-Fleming model describes the market for goods and services much as the IS-LM model does, but it adds a new term for net exports. In particular, the goods market is represented with the following equation:

\[ Y = C(Y - T) + I(r) + G + NX(e). \]

This equation states that aggregate income \( Y \) is the sum of consumption \( C \), investment \( I \), government purchases \( G \), and net exports \( NX \). Consumption depends positively on disposable income \( Y - T \). As we noted in Chapter 3, investment depends negatively on the real interest rate \( r \), and as we noted in Chapter 5, net exports depend negatively on the real exchange rate \( e \).

Recall also that we have seen how the real interest and exchange rates are related to the nominal interest and exchange rates. The Fisher equation in Chapter 4 states that the real interest rate equals the nominal interest rate minus expected inflation, \( r = i - E\pi \). And in Chapter 5 we defined the real exchange rate as \( e = eP/P^* \), where \( e \) is the nominal exchange rate, defined as the amount of foreign currency per unit of domestic currency, \( P \) is the domestic price level, and \( P^* \) is the foreign price level.
We ignored net exports when we derived the IS curve for a closed economy in Chapter 10, but in an open economy we must consider how net exports depend on the interest rate. The interest rate parity condition can be written as

\[ e_1 \left(1 + i^*\right) = e_2 \left(1 + i\right), \]

which demonstrates that a higher domestic interest rate leads to an appreciation of the exchange rate if the foreign interest rate and the future exchange rate are constant. Since the price level is fixed in the short run, the nominal appreciation (higher \( e \)) implies that the real exchange rate also appreciates (higher \( \epsilon \)). The currency appreciation makes domestic products more expensive relative to foreign goods, resulting in lower net exports. Figure 12-1 summarizes these mechanisms and shows that there is a negative relation between the interest rate and net exports.

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Note that both investment and net exports fall if the interest rate increases. To find combinations of the interest rate and income that are consistent with goods market equilibrium in an open economy, we proceed as in Chapter 10 except that the interest-rate effects on investments are now reinforced by effects also on net exports. Figure 12-2 shows how the IS+ curve is derived in an open economy.3

There are two reasons why the IS+ curve slopes downward in an open economy. The first reason is the same as in a closed economy; a higher interest rate reduces investment which

3 The schedule is now labelled IS+ rather than IS to indicate that it captures the interest-rate effects on net exports in addition to the effects on investment.
causes planned investment to fall, which in turn causes income to fall. We will refer to this as the investment channel. The other reason is that a higher interest rate causes the exchange rate to appreciate. The appreciation causes net exports to fall, which in turn reduces planned expenditure and causes income to fall. We will refer to this as the exchange-rate channel.

The Money Market

The money-market equilibrium is characterized by the same equation as in a closed economy:

\[ M/P = L(i,Y). \]

This equation states that the money market is in equilibrium when real money balances \( M/P \) equal the demand for money \( L(i,Y) \). From this equation we could have derived an upward sloping LM curve, just as in chapter 10. We will, however, assume that the central bank sets the nominal interest rate \( i \), and that money supply \( M \) adjusts so that the money market is in equilibrium at the interest rate \( i \) and the income level \( Y \). \(^4\)

Equilibrium

According to the Mundell-Fleming model, an open economy can be described by four equations:

\(^4\) In the following analysis we will often ignore what happens in the money market since there are typically no direct implications from the money market to the equilibria in other markets.
The first equation describes equilibrium in the goods market, the second equation is the interest rate parity condition which describes equilibrium in the market for foreign exchange, and the third equation just states the definition of the real exchange rate. The final equation is the Fisher equation from Chapter 4, stating the relation between the real interest rate, the nominal interest rate, and expected inflation. The exogenous variables are the interest rate $i$, which is determined by the central bank, the fiscal-policy variables $T$ and $G$, the foreign interest rate $i^*$, the expected future exchange rate $Ee'$, domestic and foreign price levels $P$ and $P^*$, and inflation expectations $E\pi$.

The four equations above then determine the equilibrium values for the four endogenous variables which are income $Y$, the nominal exchange rate $e$, the real exchange rate $\bar{\varepsilon}$, and the real interest rate $r$.

### 12-2 The Small Open Economy under Floating Exchange Rates

Before analyzing the impact of policies in an open economy, we must specify the international monetary system in which the country has chosen to operate. That is, we must consider how people engaged in international trade and finance can convert the currency of one country into the currency of another.

We start with the system relevant for most major economies today: floating exchange rates. Under a system of floating exchange rates, the exchange rate is set by market forces and is allowed to fluctuate in response to changing economic conditions.

**Equilibrium under Floating Exchange Rate**

Since prices are exogenous in the Mundell-Fleming model, we can ignore any differences between real and nominal variables unless we consider exogenous changes to prices or inflation expectations. Assuming equality between the real and nominal interest rates, $r = i$, and between real and nominal exchange rates, $\bar{\varepsilon} = e$, the Mundell-Fleming model is conveniently summarized by two equations:

$$Y = C(Y - T) + I(i) + G + NX(\bar{e})$$  \hspace{1cm} IS^+

$$e = (1+i)Ee'/(1+i^*)$$  \hspace{1cm} IRP

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\bar{e} = eP/P^*
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$$r = i - E\pi$$  \hspace{1cm} FISHER

Figure 12-3 illustrates these two relationships together with a chosen interest rate. The central bank’s interest-rate choice is represented by a horizontal line in the figure; as long as the

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5 In Section 12-1, the Mundell-Fleming model was described by four equations. The Fisher equation and the equation for the real exchange rate can be suppressed as long as prices are fixed. If we want to consider exogenous changes in price levels or inflation expectations, we must recall that investment depends on the real interest rate rather than the nominal interest rate, and that net exports depend on the real exchange rate rather than the nominal exchange rate.
central bank maintains this interest rate, any equilibrium outcome must be consistent with this interest rate level. The equilibrium in the goods market is then found where the IS curve and the interest rate line intersect in panel (a) in the figure. This intersection shows the level of income where the goods market is in equilibrium. The equilibrium in the market for foreign exchange is found where the interest rate parity curve and the interest rate line intersect in panel (b). This intersection shows the exchange rate where the foreign exchange market is in equilibrium. With this diagram we can use the Mundell-Fleming model to show how aggregate income \( Y \) and the exchange rate \( e \) respond to policy changes in an economy with a floating exchange rate.

Let us now consider two policies that can change the equilibrium: monetary policy and fiscal policy. Our goal is to use the Mundell-Fleming model to show the impact of policy changes and to understand the economic forces at work as the economy moves from one equilibrium to another.

**Monetary Policy**

Suppose that the central bank reduces its policy rate, the short-term nominal interest rate. Figure 12-4 illustrates the effects of this policy change. When the interest rate line shifts down, the equilibrium income level in panel (a) increases and the exchange rate depreciates in panel (b).

The rise in equilibrium income comes from an outward movement along the IS curve, and this movement is caused by both higher investment and higher net exports when the interest rate is reduced. The depreciation of the currency follows from the interest rate parity condition. If the domestic interest rate is lower than the foreign interest rate, the currency must be expected to appreciate over time and to obtain appreciation when the long-run exchange rate is unaffected, the currency must depreciate immediately.

This analysis shows that the effects of expansionary monetary policy (a lower policy rate) are similar to those in the closed economy; a lower policy rate stimulates investment. The difference in an open economy with a floating exchange rate is that this effect is reinforced by a currency depreciation that stimulates net exports.

The policy change also has consequences for the equilibrium on the money market. The lower interest rate raises money demand both because of its direct effect on money demand and
because of an indirect effect via higher income. The central bank therefore must let money supply increase for the new interest rate to be consistent with equilibrium on the money market.

**Fiscal Policy**

Suppose now that the government stimulates domestic spending by increasing government purchases or by cutting taxes. Because such expansionary fiscal policy increases planned expenditure, it shifts the IS\(^+$\) curve to the right, as in Figure 12-5. The outcome is similar to that in the IS-LM model for closed economies: income increases if the central bank holds the interest rate constant. Investment, the exchange rate, and net exports are unaffected since the interest rate is held constant. Private consumption increases since households’ disposable income increases.

On the money market, higher income implies higher money demand. The central bank must therefore let money supply increase if it holds the interest rate constant.
12-3 The Small Open Economy under Fixed Exchange Rates

We now turn to the second type of exchange-rate system: fixed exchange rates. Under a fixed exchange rate, the central bank announces a value for the exchange rate and stands ready to buy and sell the domestic currency to keep the exchange rate at its announced level. In the 1950s and 1960s, most of the world’s major economies, including the United States, operated within the Bretton Woods system – an international monetary system under which most governments agreed to fix exchange rates. The world abandoned this system in the early 1970s and most exchange rates were allowed to float. Yet fixed exchange rates are not merely of historical interest. More recently, China fixed the value of its currency against the U.S. dollar – a policy that, as we will see, was a source of some tension between the two countries.

In this section we will discuss how such a system works, and we examine the impact of economic policies on an economy with a fixed exchange rate. Later in the chapter we examine the pros and cons of fixed exchange rates.

How a Fixed-Exchange-Rate System Works

Under a system of fixed exchange rates, a central bank stands ready to buy or sell the domestic currency for foreign currency at a predetermined price. For example, suppose that the Fed announced that it was going to fix the exchange rate at 100 yen per dollar. It would then stand ready to give $1 in exchange for 100 yen or to give 100 yen in exchange for $1. To carry out this policy, the Fed would need a reserve of dollars (which it can print) and a reserve of yen (which it must have purchased previously).

A fixed exchange rate dedicates a country’s monetary policy to the single goal of keeping the exchange rate at the announced level. In other words, the essence of a fixed-exchange-rate system is the commitment of the central bank to allow the interest rate and money supply to adjust to whatever level will ensure that the equilibrium exchange rate in the market for foreign-currency exchange equals the announced exchange rate. Moreover, as long as the central bank stands ready to buy or sell foreign currency at the fixed exchange rate, the interest rate and money supply adjust automatically to the necessary level.

To see how the interest rate is determined, suppose that the central bank has announced that the exchange rate is fixed at the level \( \tilde{e} \). If this announcement is credible, both today’s exchange rate and the expected future rate will equal this announced rate. That is, \( e = \tilde{e} \) and \( Ee' = \tilde{e} \). The interest rate parity condition \( e = (1 + i)Ee'/(1 + i^*) \) therefore reduces to \( i = i^* \). This implies that a country that has fixed its exchange rate must have the same interest rate as the foreign country.

It is important to understand that this exchange-rate system fixes the nominal exchange rate. Whether it also fixes the real exchange rate depends on the time horizon under consideration. If prices are flexible, as they are in the long run, then the real exchange rate can change even while the nominal exchange rate is fixed. Therefore, in the long run described in Chapter 5, a policy to fix the nominal exchange rate would not influence any real variable, including the real exchange rate. A fixed nominal exchange rate would influence only the money supply and the price level. Yet in the short run described in the Mundell-Fleming model, prices are fixed, so a fixed nominal exchange rate implies a fixed real exchange rate as well.
The discussion above clarifies that a country that chooses to fix its nominal exchange rate at \( e = \bar{e} \) also must have the same interest rate as the foreign country, i.e. \( i = i^* \). The two equations describing equilibrium for an open economy with a fixed exchange rate therefore reduce to

\[
Y = C\left[ Y - T \right] + I\left( i \right) + G + NX\left( \bar{e} \right) \quad \text{IS}^* \\
\]

\[
i = i^* \quad \text{IRP}
\]

Figure 12-6 illustrates these two relationships. The equilibrium in the goods market is found where the IS\(^*\) curve and the interest rate line intersect in panel (a). This intersection thus shows the level of income where the goods market is in equilibrium. Panel (b) shows the equilibrium in the market for foreign exchange. The central bank’s exchange-rate choice is represented by a vertical line, and the equilibrium is at its intersection with the horizontal interest rate parity schedule.

Panel (b) in Figure 12-6 shows that any choice for the level of the exchange rate is consistent with equilibrium. When fixing the exchange rate at some level, money supply has to adjust to make this exchange rate level the equilibrium outcome. Recall however that the Mundell-Fleming model focuses on the short run, and the short-run equilibrium implied here may imply imbalances that must be corrected in the longer run. We return to such issues in connection to Chapter 14 where we consider the longer-run implications of this model.

**CASE STUDY**

**The International Gold Standard and Exchange Rate Stability**

During the late nineteenth and early twentieth centuries, most of the world’s major economies operated under a gold standard. Each country maintained a reserve of gold and agreed to exchange one unit of its currency for a specified amount of gold. Through the gold standard, the world’s economies maintained a system of fixed exchange rates.
To see how an international gold standard fixes exchange rates, suppose that the U.S. Treasury stands ready to buy or sell 1 ounce of gold for $100, and that the Bank of England stands ready to buy or sell 1 ounce of gold for 100 pounds. Together, these policies fix the rate of exchange between dollars and pounds: $1 must trade for 1 pound. Otherwise, the law of one price would be violated, and it would be profitable to buy gold in one country and sell it in the other.

For example, suppose that the market exchange rate were 2 pounds per dollar. In this case, an arbitrageur could buy 200 pounds for $100, use the pounds to buy 2 ounces of gold from the Bank of England, bring the gold to the United States, and sell it to the Treasury for $200 – making a $100 profit. Understanding this arbitrage opportunity, no one would be willing to pay two pounds in exchange for one dollar, and the market exchange rate must approach unity.

This system did not completely fix exchange rates, because shipping gold across the Atlantic was costly. Yet the international gold standard did keep the exchange rate within a range dictated by transportation costs. It thereby prevented large and persistent movements in the exchange rates.6

**Fiscal Policy**

Let us now examine how economic policies affect a small open economy with a fixed exchange rate. Suppose that the government stimulates domestic spending by increasing government purchases or by cutting taxes. This policy shifts the IS\(^+\) curve to the right and increases aggregate income, just as it did under floating exchange rates in Figure 12-5. Thus, under a fixed exchange rate, a fiscal expansion raises aggregate income.

The higher income raises money demand and puts an upward pressure on the domestic interest rate and the value of the domestic currency. But because the central bank stands ready to trade foreign and domestic currency at the fixed exchange rate, arbitrageurs quickly respond to the rising exchange rate by selling foreign currency to the central bank, leading to an automatic monetary expansion that restores equilibrium on the markets for money and foreign exchange.

**Monetary Policy**

As we have already noted, if the central bank credibly fixes the exchange rate, the interest rate parity condition states that the interest rate must equal the foreign interest rate. The central bank can then not control monetary policy – it must accept the interest rate that is set by the foreign central bank, and it must let money supply adjust so that the markets for foreign exchange and money are in equilibrium at this exchange rate.

Suppose for example that the foreign central bank decides to reduce its policy rate. To maintain the fixed exchange rate, the domestic central bank must also reduce its interest rate as in panel (b) in Figure 12-7. Panel (a) shows that aggregate income rises as a consequence

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6 For more on how the gold standard worked, see the essays in Barry Eichengreen, ed., *The Gold Standard in Theory and History* (New York: Methuen, 1985).
of this foreign policy change. The lower interest rate stimulates investment, but net exports are unaffected since the exchange rate is held constant.

A country with a fixed exchange rate can, however, conduct a type of monetary policy: it can decide to change the level at which the exchange rate is fixed. A reduction in the official value is called a **devaluation**, and an increase in the official value is called a **revaluation**. In the Mundell-Fleming model with fixed prices, a devaluation also implies a real depreciation, which in turn increases net exports as demonstrated in Figure 12-8. The IS$^*$ curve then shifts...
to the right and aggregate income increases. Conversely, a revaluation reduces net exports, shifts the IS* curve to the left, and lowers aggregate income.

**CASE STUDY**

**Devaluation and the Recovery from the Great Depression**

The Great Depression of the 1930s was a global problem. Although events in the United States may have precipitated the downturn, all of the world’s major economies experienced huge declines in production and employment. Yet not all governments responded to this calamity in the same way.

One key difference among governments was how committed they were to the fixed exchange rate set by the international gold standard. Some countries, such as France, Germany, Italy, and the Netherlands, maintained the old rate of exchange between gold and currency. Other countries, such as Denmark, Finland, Norway, Sweden, and the United Kingdom, reduced the amount of gold they would pay for each unit of currency by about 50 percent. By reducing the gold content of their currencies, these governments devalued their currencies relative to those of other countries.

The subsequent experience of these two groups of countries conforms to the prediction of the Mundell-Fleming model. Those countries that pursued a policy of devaluation recovered quickly from the Depression. The lower value of the currency stimulated exports and expanded production. By contrast, those countries that maintained the old exchange rate suffered longer with a depressed level of economic activity.7

**Policy in the Mundell-Fleming Model: A Summary**

The Mundell-Fleming model provides a framework for analyzing the effects of economic policy on a small open economy, and shows how these effects depend on whether the exchange rate is floating or fixed. Table 12-1 summarizes our analysis of the short-run effects of fiscal and monetary policies on income, the exchange rate, and the trade balance. The most important insight is that monetary policy cannot affect income under fixed exchange rates. The normal potency of monetary policy is lost because interest rate decisions and money supply are dedicated to maintaining the exchange rate at the announced level.

Another insight is that the effects of monetary policy are larger in open economies with floating exchange rates than in closed economies. As we have seen, the reason is that monetary policy in open economies has effects both on investment (just as in closed economies) and on net exports via the exchange-rate channel. The effects through the exchange-rate channel reinforce those through the investment channel.

It should also be noted that the effects reported in Table 1 are derived under the assumption that economic policy in one area does not affect other economic policies. But in many real-world situations there may be interactions between monetary and fiscal policies. In some situations monetary and fiscal policy may be coordinated to achieve specific economic

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outcomes (see Problem 3 at the end of this chapter). In other situations monetary policy may be used to mitigate or neutralize the effects of fiscal policy (see Problem 4).

### 12-4 Fixed Exchange Rates: Devaluation Risk and Currency Crises

So far, our analysis has assumed that the announcement of a fixed exchange rate is credible. But we also noted that in some situations the central bank may choose to deviate from its announcement and devaluate the currency. Let us now examine how the economy is affected if the people understand this possibility and anticipate a currency devaluation.

Recall that the interest rate parity condition states that \( e = \frac{1+i}{1+i^*} \). Since people expect that the currency will fall in value, the expected future value is lower than the present value of the currency, which equals the announced level. That is, \( Ee' < e = \bar{E} \). To compensate for the devaluation risk, domestic assets must earn a higher return than foreign assets, and the

![FIGURE 12-9](image-url)
interest rate parity condition therefore states that the domestic interest rate must be higher than the foreign interest rate. Figure 12-9 illustrates how the devaluation risk raises the interest rate and causes a movement up and to the left along the IS\(^+\) schedule, resulting in lower income.

Interestingly, if people expect the currency to fall in value, it may become more attractive for policy makers to devaluate the currency. Suppose that a country is in a recession with low growth and rising unemployment as in point K in Figure 12-10. An attractive policy option may then be to stimulate the economy by devaluing the currency. The IS\(^+\) curve then shifts out and income rises so that the economy returns to a long-run equilibrium in point C.

If people expect this development, they will demand a higher interest rate to compensate for the devaluation risk. The higher interest rate reduces investment and moves the economy up and to the left along the IS\(^+\) curve to point D. As a result, aggregate income falls and the recession is aggravated. The expectations of a devaluation therefore make devaluation a more attractive option – expectations may be self-fulfilling or at least precipitate a devaluation.

**CASE STUDY**

**International Financial Crisis: Europe 1992**

After the breakdown of the Bretton Woods system in the early 1970s, there were attempts to stabilize exchange rates within Europe. During the 1970s, most European currencies were linked to a currency basket (the “snake”). In 1979 the system was formalized and reformed with the establishment of European Monetary System (EMS) and the European Exchange Rate Mechanism (ERM). Members of the ERM had their currencies pegged to the ECU, an artificial currency unit based on a basket of the European currencies. Although inflation rates initially differed substantially in the countries joining the ERM, the system seemed successful throughout the 1980s, and inflation differences diminished. Germany with a history of low inflation developed a special position in the European currency system, and European monetary policy was effectively controlled by the German central bank, the Bundesbank.

In the early 1990s, many European countries were facing economic downturns. At the same time, the German economy was booming after the 1990 reunification. To prevent inflation from increasing, the Bundesbank tightened monetary policy and let the interest rate rise. The tight monetary policy further deepened the downturn in other European countries.
In this situation, some investors questioned the sustainability of the fixed exchange rates, and starting in September 1992, there were speculative attacks against several of the ERM currencies.8 Facing these speculative attacks, some countries chose to defend the fixed exchange rates. An extreme case was Sweden where the central bank raised the short interest rate to 500%.9 Facing similar speculative attacks, Italy and the United Kingdom chose to leave the ERM and let their currencies float. After further attacks in November 1992, Sweden also let its currency float.

Figure 12-10 illustrates much of the developments in September 1992. Suppose that both Sweden and the United Kingdom were in point K when speculations began. By raising the interest rate to defend the krona, Sweden would move to point D implying a deep recession. By devaluing the pound, the U.K. would instead move to point C and escape the recession.10

CASE STUDY

International Financial Crisis: Mexico 1994-1995

In August 1994, a Mexican peso was worth 30 U.S. cents. A year later, it was worth only 16 cents. What explains this massive fall in the value of the Mexican currency? Country risk is a large part of the story.

At the beginning of 1994, Mexico was a country on the rise. The recent passage of the North American Free Trade Agreement (NAFTA), which reduced trade barriers among the United States, Canada, and Mexico, made many people confident about the Mexican economy. Investors around the world were eager to make loans to the Mexican government and to Mexican corporations.

Political developments soon changed that perception. A violent uprising in the Chiapas region of Mexico made the political situation in Mexico seem precarious. Then Luis Donaldo Colosio, the leading presidential candidate, was assassinated. The political future looked less certain, and many investors started placing a larger risk premium on Mexican assets, and therefore demanded a higher interest rate when lending to the country.

At first, the rising premium did not affect the value of the peso, because Mexico was operating with a fixed exchange rate. As we have seen, under a fixed exchange rate, the central bank agrees to trade the domestic currency (pesos) for a foreign currency (dollars) at a predetermined rate. Thus, when an increase in the country risk premium put downward pressure on the value of the peso, the Mexican central bank either had to raise its interest rate to compensate for the risk premium, or alternatively accept pesos and pay out dollars.

8 An important speculator was George Soros and his Quantum Fund. For more on Soros and this crisis episode, see chapter 7 in Paul Krugman, The Return of Depression Economics (New York: W. W. Norton, 1999).
9 Sweden was not a member of the ERM. Throughout the 1980s, however, Sweden had fixed the krona against a currency basket, and in 1991 it unilaterally fixed the krona against the ECU.
10 More correctly, since the pound was floated and not devaluated, the U.K. exchange rate system changed and the interest rate could be set freely. The United Kingdom may then move to a point right under point C in the figure.
Although Mexican interest rates rose in 1994, this was not enough to stop capital from flowing out of the country, and when Mexico ran out of dollars at the end of 1994, the government announced a devaluation of the peso. This decision had repercussions, however, because the government had repeatedly promised that it would not devalue. Investors became even more distrustful of Mexican policymakers and feared further Mexican devaluations.

Investors around the world (including those in Mexico) avoided buying Mexican assets. The country risk premium rose once again, adding to the upward pressure on interest rates and the downward pressure on the peso. The Mexican stock market plummeted. When the Mexican government needed to roll over some of its debt that was coming due, investors were unwilling to buy the new debt. Default appeared to be the government’s only option. In just a few months, Mexico had gone from being a promising emerging economy to being a risky economy with a government on the verge of bankruptcy.

Then the United States stepped in. The U.S. government had three motives: to help its neighbor to the south, to prevent the massive illegal immigration that might follow government default and economic collapse, and to prevent the investor pessimism regarding Mexico from spreading to other developing countries. The U.S. government, together with the International Monetary Fund (IMF), led an international effort to bail out the Mexican government. In particular, the United States provided loan guarantees for Mexican government debt, which allowed the Mexican government to refinance the debt that was coming due. These loan guarantees helped restore confidence in the Mexican economy, thereby reducing to some extent the country risk premium.

Although the U.S. loan guarantees may well have stopped a bad situation from getting worse, they did not prevent the Mexican meltdown of 1994-1995 from being a painful experience for the Mexican people. Not only did the Mexican currency lose much of its value, but Mexico also went through a deep recession. Fortunately, by the late 1990s, the worst was over, and aggregate income was growing again. But the lesson from this experience is clear and could well apply again in the future: changes in perceived country risk, often attributable to political instability, are an important determinant of interest rates and exchange rates in small open economies.

CASE STUDY


In 1997, as the Mexican economy was recovering from its financial crisis, a similar story started to unfold in several Asian economies, including Thailand, South Korea, and especially Indonesia. The symptoms were familiar: high interest rates, falling asset values, and a depreciating currency. In Indonesia, for instance, short-term nominal interest rates rose above 50 percent, the stock market lost about 90 percent of its value (measured in U.S. dollars), and the rupiah fell against the dollar by more than 80 percent. The crisis led to rising inflation in these countries (because the depreciating currency made imports more expensive) and to falling GDP (because high interest rates and reduced confidence depressed spending). Real GDP in Indonesia fell about 13 percent in 1998, making the downturn larger than any U.S. recession since the Great Depression of the 1930s.
What sparked this firestorm? The problem began in the Asian banking systems. For many years, the governments of in the Asian nations had been more involved in managing the allocation of resources – in particular, financial resources – than is true in the United States and other developed countries. Some commentators had applauded this “partnership” between government and private enterprise and had even suggested that the United States should follow the example. Over time, however, it became clear that many Asian banks had been extending loans to those with the most political clout rather than to those with the most profitable investment projects. Once rising default rates started to expose this “crony capitalism”, as it was then called, international investors started to lose confidence in the future of these economies. The risk premiums for Asian assets rose, causing interest rates to skyrocket and currencies to collapse.

International crises of confidence often involve a vicious circle that can amplify the problem. Here is one story about what happened in Asia:

1. Problems in the banking sector eroded international confidence in these economies.
2. Loss of confidence raised risk premiums and interest rates.
3. Rising interest rates, together with the loss of confidence, depressed the prices of stock and other assets.
4. Falling asset prices reduced the value of collateral being used for bank loans.
5. Reduced collateral increased default rates on bank loans.
6. Greater defaults exacerbated problems in the banking system. Now return to step 1 to complete and continue the circle.

Some economists have used this vicious-circle argument to suggest that the Asian crisis was a self-fulfilling prophecy: bad things happened merely because people expected bad things to happen. Most economists, however, thought that the political corruption of the banking system was a real problem, which was then compounded by this vicious circle of reduced confidence.

As the Asian crisis developed, the IMF and the United States tried to restore confidence, much as they had with Mexico a few years earlier. In particular, the IMF made loans to the Asian countries to help them over the crisis; in exchange for these loans, it exacted promises that the governments would reform their banking systems and eliminate crony capitalism. The IMF’s hope was that the short-term loans and longer-term reforms would restore confidence, lower the risk premium, and turn the vicious circle into a virtuous circle. This policy seems to have worked: the Asian economies recovered quickly from their crisis.

12-5 Should Exchange Rates Be Floating or Fixed?

Having analyzed how an economy works under floating and fixed exchange rates, let’s consider which exchange-rate regime is better.

Pros and Cons of Different Exchange-Rate Systems

The primary argument for a floating exchange rate is that it allows monetary policy to be used for other purposes. Under fixed rates, monetary policy is committed to the single goal of maintaining the exchange rate at its announced level. Yet the exchange rate is only one of
many macroeconomic variables that monetary policy can influence. A system of floating exchange rates leaves monetary policymakers free to pursue other goals, such as stabilizing employment or prices.

Advocates of fixed exchange rates argue that exchange-rate uncertainty makes international trade more difficult. After the world abandoned the Bretton Woods system of fixed exchange rates in the early 1970s, both real and nominal exchange rates became (and have remained) much more volatile than anyone had expected. Some economists attribute this volatility to irrational and destabilizing speculation by international investors. Business executives often claim that this volatility is harmful because it increases the uncertainty that accompanies international business transactions. Despite this exchange-rate volatility, however, the amount of world trade has continued to rise under floating exchange rates.

Advocates of fixed exchange rates sometimes argue that a commitment to a fixed exchange rate is one way to discipline a nation’s monetary authority and prevent excessive growth in the money supply. Yet there are many other policy rules to which the central bank could be committed. In Chapter 15, for instance, we discuss policy rules such as targets for nominal GDP or the inflation rate. Fixing the exchange rate has the advantage of being simpler to implement than these other policy rules, because the money supply adjusts automatically, but this policy may lead to greater volatility in income and employment.

In practice, the choice between floating and fixed rates is not as stark as it may seem at first. Under systems of fixed exchange rates, countries can change the value of their currency if maintaining the exchange rate conflicts too severely with other goals. Under systems of floating exchange rates, central banks often use formal or informal targets for the exchange rate when deciding whether to raise or reduce the interest rate. We rarely observe exchange rates that are completely fixed or completely floating. Instead, under both systems, stability of the exchange rate is usually among many of the central bank’s objectives.

**CASE STUDY**

**Monetary Union in the United States and Europe**

If you have ever driven the 3,000 miles from New York City to San Francisco, you may recall that you never needed to change your money from one currency to another. In all fifty U.S. states, local residents are happy to accept the U.S. dollar for items you buy. Such a monetary union is the most extreme form of a fixed exchange rate. The exchange rate between New York dollars and San Francisco dollars is so irrevocably fixed that you may not even know that there is a difference between the two. (What’s the difference? Each dollar bill is issued by one of the dozen local Federal Reserve Banks. Although the bank of origin can be identified from the bill’s markings, you don’t care which type of dollar you hold because everyone else, including the Federal Reserve System, is ready to trade them one for one.)

If you made a similar 3,000-mile trip across Europe during the 1990s, however, your experience was very different. You didn’t have to travel far before needing to exchange your French francs for German marks, Dutch guilders, Spanish pesetas, or Italian lira. The large number of currencies in Europe made traveling less convenient and more expensive. Every time you crossed a border, you had to wait in line at a bank to get the local money, and you had to pay the bank a fee for the service.
Today, however, the situation in Europe is more like that in the United States. Many European countries have given up having their own currencies and have formed a monetary union that uses a common currency called the Euro. As a result, the exchange rate between France and Germany is now as fixed as the exchange rate between New York and California.

The introduction of a common currency has its costs. The most important is that the nations in Europe are no longer able to conduct their own monetary policies. Instead, the European Central Bank, with the participation of all member countries, sets a single monetary policy for all of Europe. The central banks of the individual countries play a role similar to that of regional Federal Reserve Banks: they monitor local conditions but they have no control over the money supply or interest rates. Critics of the move toward a common currency argue that the cost of losing national monetary policy is large. When a recession hits one country but not others in Europe, that country does not have the tool of monetary policy to combat the downturn. This argument is one reason some European nations, such as the United Kingdom, have chosen not to give up their own currency in favor of the Euro.

Why, according to the Euro critics, is monetary union a bad idea for Europe if it works so well in the United States? These economists argue that the United States is different from Europe in two important ways. First, labor is more mobile among U.S. states than among European countries. This is in part because the United States has a common language and in part because most Americans are descended from immigrants, who have shown a willingness to move. Therefore, when a regional recession occurs, U.S. workers are more likely to move from high-unemployment states to low-unemployment states. Second, the United States has a strong and centralized government that can use fiscal policy – such as the federal income tax – to redistribute resources among regions. Because Europe does not have these two advantages, it bears a larger cost when it restricts itself to a single monetary policy.

Advocates of a common currency believe that the loss of national monetary policy is more than offset by other gains. With a single currency in all of Europe, travelers and businesses no longer need to worry about exchange rates, and this encourages more international trade. In addition, a common currency may have the political advantage of making Europeans feel more connected to one another. The twentieth century was marked by two world wars, both of which were sparked by European discord. If a common currency makes the nations of Europe more harmonious, it benefits the entire world.

**Speculative Attacks, Currency Boards, and Dollarization**

Imagine that you are a central banker of a small country. You and your fellow policymakers decide to fix your currency – let’s call it the peso – against the U.S. dollar. From now on, one peso will sell for one dollar.

As we discussed earlier, you now have to stand ready to buy and sell pesos for a dollar each. The money supply will adjust automatically to make the equilibrium exchange rate equal to your target. There is, however, one potential problem with this plan: you might run out of dollars. If people come to the central bank to sell large quantities of pesos, the central bank’s dollar reserves might dwindle to zero. In this case, the central bank has no choice but to abandon the fixed exchange rate and let the peso depreciate.
This fact raises the possibility of a *speculative attack* – a change in investors’ perceptions that make the fixed exchange rate untenable. Suppose that, for no good reason, a rumor spreads that the central bank is going to abandon the exchange-rate peg. People would respond by rushing to the central bank to convert pesos into dollars before the pesos lose value. This rush would drain the central bank’s reserves and could force the central bank to abandon the peg. In this case, the rumor would prove self-fulfilling.

To avoid this possibility, some economists argue that a fixed exchange rate should be supported by a *currency board*, such as that used by Argentina in the 1990s. A currency board is an arrangement by which the central bank holds enough foreign currency to back each unit of the domestic currency. In our example, the central bank would hold one U.S. dollar (or one dollar invested in a U.S. government bond) for each peso. No matter how many pesos turned up at the central bank to be exchanged, the central bank would never run out of dollars.

Once a central bank has adopted a currency board, it might consider the natural next step: it can abandon the peso altogether and let its country use the U.S. dollar. Such a plan is called *dollarization*. It happens on its own in high-inflation economies, where foreign currencies offer a more reliable store of value than the domestic currency. But it can also occur as a matter of public policy, as in Panama. If a country really wants to see its currency be irrevocably fixed to the dollar, the most reliable method is to make its currency the dollar. The only loss from dollarization is the seigniorage revenue that a government gives up by relinquishing its control over the printing press. The U.S. government then gets the revenue that is generated by growth in the money supply.\footnote{Dollarization may also lead to a loss in national pride from seeing American portraits on the currency. If it wanted, the U.S. government could fix this problem by leaving blank the center space that now has George Washington’s portrait. Each nation using the U.S. dollar could insert the face of its own local hero.}

### The Impossible Trinity

The analysis of exchange-rate regimes leads to a simple conclusion: you can’t have it all. To be more precise, it is impossible for a nation to have free capital flows, a fixed exchange rate, and independent monetary policy. This fact, often called the *impossible trinity*, is illustrated in figure 12-11. A nation must choose one side of this triangle, giving up the institutional feature at the opposite corner.

The first option is to allow free flows of capital and to conduct an independent monetary policy, as the United States has done in recent years. In this case, it is impossible to have a fixed exchange rate. Instead, the exchange rate must float to equilibrate the market for foreign-currency exchange.

The second option is to allow free flows of capital and to fix the exchange rate, as Hong Kong has done in recent years. In this case, the nation loses the ability to run an independent monetary policy. The money supply and interest rate must adjust to keep the exchange rate at its predetermined level. In a sense, when a nation fixes its currency to that of another nation, it is adopting that other nation’s monetary policy.

The third option is to restrict the international flow of capital in and out of the country, as China has done in recent years. In this case, the interest rate is no longer fixed by world interest rates but is determined by domestic forces, much as is the case in a completely closed economy.
The Open Economy Revisited: The Mundell-Fleming Model and the Exchange-Rate Regime

It is then possible to both fix the exchange rate and conduct an independent monetary policy.

History has shown that nations can, and do, choose different sides of the trinity. Every nation must task itself the following question: Does it want to live with exchange-rate volatility (option 1), does it want to give up the use of monetary policy for purposes of domestic stabilization (option 2), or does it want to restrict its citizens from participating in world financial markets (option 3)? The impossible trinity says that no nation can avoid making one of these choices.

The Impossible Trinity

It is impossible for a nation to have free capital flows, a fixed exchange rate, and independent monetary policy. A nation must choose one side of this triangle, giving up the opposite corner.

The Chinese Currency Controversy

From 1995 to 2005 the Chinese currency, the yuan, was pegged to the dollar at an exchange rate of 8.28 yuan per U.S. dollar. In other words, the Chinese central bank stood ready to buy and sell yuan at this price. This policy of fixing the exchange rate was combined with a policy of restricting international capital flows. Chinese citizens were not allowed to convert their savings into dollars or Euros and invest abroad.

Many observers believed that by the early 2000s, the yuan was significantly undervalued. They suggested that if the yuan were allowed to float, it would increase in value relative to the dollar. The evidence in favor of this hypothesis was that to maintain a fixed exchange rate, China was accumulating large dollar reserves. That is, the Chinese central bank had to supply yuan and demand dollars in foreign-exchange markets to keep the yuan at the pegged value. If this intervention in the currency market ceased, the yuan would rise in value compared to the dollar.

The pegged yuan became a contentious political issue in the United States. U.S. producers that competed against Chinese imports complained that the undervalued yuan made Chinese goods cheaper, putting the U.S. producers at a disadvantage. (Of course, U.S. consumers benefited from inexpensive imports, but in the politics of international trade, producers usually shout louder than consumers.) In response to these concerns, President Bush called on China to let its currency float. Charles Shumer, Senator from New York, proposed a more drastic step – a tariff of 27.5 percent on Chinese imports until China adjusted the value of its currency.
In July 2005 China announced that it would move in the direction of a floating exchange rate. Under the new policy, it would still intervene in foreign-exchange markets to prevent large and sudden movements in the exchange rate, but it would permit gradual changes. Moreover, it would judge the value of the yuan not just relative to the dollar but relative to a broad basket of currencies. Five months later, the exchange rate had moved to 8.08 yuan per dollar – a 2.4 percent appreciation of the yuan, far smaller than the 20 to 30 percent that Senator Schumer and other China critics were looking for.

Was the yuan really undervalued by such a large amount? To answer this question, we must first ask, compared to what? The critics of Chinese policy may well have been correct that the yuan would have appreciated substantially if the Chinese had stopped intervening in foreign-exchange markets while keeping their other policies the same. But a movement to a fully floating exchange rate could well have been coupled with a movement toward free capital mobility. If so, the currency implications could have been very different, as many Chinese citizens might have tried to move some of their savings abroad. While the central bank would no longer have been demanding dollars to fix the exchange rate, private investors would have been demanding dollars to add U.S. assets to their own portfolios. In this case, the change in policy could well have caused the yuan to depreciate rather than appreciate.

12-6 [Omitted]

12-7 Conclusion

In this chapter we have examined how an open economy works in the short run when prices are sticky. We have seen how monetary and fiscal policy influence income and the exchange rate, and how the behavior of the economy depends on whether the exchange rate is floating or fixed.

We have seen that economic policy in an open economy may have effects through a new channel – the exchange-rate channel that affects net exports. This channel is typically more important in small open economies like Sweden than in large economies like the United States. It is worth repeating a lesson from Chapter 5. Many countries are neither closed economies nor small open economies: they lie somewhere in between. When analyzing policies in large economies or economies that are not very open to international trade, the exchange-rate channel is less important and we may then consider both the closed-economy logic of Chapter 11 and the open-economy logic developed in this chapter.

Summary

1. The Mundell-Fleming model is the IS-LM model for an open economy. It takes the price level as given and then shows what causes fluctuations in income and the exchange rate.

2. The Mundell-Fleming model shows that fiscal policy influences aggregate income both under floating and fixed exchange rates.

3. The Mundell-Fleming model shows that monetary policy does not influence aggregate income under fixed exchange rates since the interest rate must be set to the same level as
the foreign interest rate. Under floating exchange rates, monetary policy influences aggregate income through two channels; the investment channel and the exchange-rate channel.

4. If investors suspect that a country that has announced a fixed exchange rate will devalue its currency, the interest rate in that country must exceed the foreign interest rate. The higher interest rate will reduce aggregate income in that country.

5. There are advantages to both floating and fixed exchange rates. Floating exchange rates leave monetary policy makers free to pursue objectives other than exchange rate stability. Fixed exchange rates reduce some of the uncertainty in international business transactions. When deciding on an exchange-rate regime, policymakers are constrained by the fact that it is impossible for a nation to have free capital flows, a fixed exchange rate, and independent monetary policy.

KEY CONCEPTS

- Mundell-Fleming model
- Floating exchange rates
- Fixed exchange rates
- Devaluation
- Revaluation

PROBLEMS AND APPLICATIONS

1. The foreign nominal interest rate is 7 percent, the exchange rate is 4 foreign currency units per domestic currency unit, and the expected exchange rate one year from now is 4.2 foreign currency units per domestic currency unit. What is the domestic interest rate?

2. Use the Mundell-Fleming model to predict what would happen to aggregate income, the exchange rate, and the trade balance under both floating and fixed exchange rates in response to each of the following shocks:

   a. A fall in consumer confidence about the future induces consumers to spend less and save more.
   b. The introduction of a stylish line of Toyotas makes some consumers prefer foreign cars over domestic cars.

3. A small open economy with a floating exchange rate is running a trade deficit but employment and production are at the natural levels. If policymakers want to obtain balanced trade while maintaining stable employment and production, what combination of monetary and fiscal policy should they use?

4. Consider a small open economy with a floating exchange rate. Monetary policy has been delegated to an independent central bank with the objective to stabilize economic activity. Suppose that aggregate income is at the natural level and that the ministry of finance uses expansionary fiscal policy prior to an election. How would the central bank react to expansionary fiscal policy? When accounting for the central bank’s reaction, what would be the effects of the expansionary fiscal policy on aggregate income, investment, the exchange rate, and the trade balance?
5. Suppose that Sweden has fixed the krona against Germany’s D-mark at the rate 0.25 mark per krona. The interest rate in Germany is 4 percent, and Germany is in an economic boom while unemployment is rising in Sweden. As a consequence, people think that there is a 50 percent risk that the krona will be devalued to 0.20 mark per krona within the coming year. What is the Swedish interest rate?

6. The Mundell-Fleming model takes the expected long-run exchange rate $Ee'$ as an exogenous variable. Let us now consider what happens when this variable changes in an economy with a floating exchange rate.

   a. What might cause the expected future exchange rate to fall?
   b. What happens to aggregate income, the current exchange rate, and the trade balance when the expected future exchange rate falls?
   c. What are appropriate policy reactions when the expected future exchange rate falls if policymakers want to stabilize aggregate income?

7. Suppose that higher income implies that households want to consume more both of domestic and foreign goods. That is, demand for imports rise (planned net exports fall) if domestic income increases while exports rise if foreign income increases. The net exports function is then

   $NX = NX(e, Y, Y^*)$.

   a. How is the derivation of the IS$^+$ curve affected by this assumption?
   b. What are then the effects of higher foreign income $Y^*$ on income, the exchange rate, and the trade balance in the home country?

8. Consider an economy with a floating exchange rate, and suppose that the central bank reduces the interest rate. Use a graph with real money balances on the horizontal axis and the interest rate on the vertical axis to analyze how the money market is affected by the lower interest rate.

9. Consider an economy with a floating exchange rate, and suppose that the government reduces the demand for foreign goods by imposing an import quota or a tariff. Analyze how the economy is affected by this trade policy.

10. Consider two countries, S and U, both with floating exchange rates. These countries are similar, except that S is more open than U in the sense that imports and exports relative to GDP are larger in S than in U. How does this difference affect the slope of the IS$^+$ in these countries?