

CHAPTER 22

The Mundell-Fleming Model with Partial International Capital Mobility

This chapter adds international capital flows to the basic model, continuing the process of adding new factors one by one to our analysis of the balance of payments. Chapter 16 examined the effects of changes in the exchange rate, holding everything else constant. Then Chapter 17 introduced the level of income, and Chapter 18, the interest rate. Chapter 19 focused on international money flows and the price level.

In Chapter 21 we saw in detail that the degree of international capital mobility has increased steadily over the past 30 years. This chapter and those to follow will demonstrate that international capital mobility has important implications for the operation of macroeconomic policy. For example, the most dramatic shift of the 1980s in the economic interaction of the industrialized countries, the emergence of large trade deficits in the United States, was not primarily caused by changes in trade policy or competitiveness. Rather, it had its origin in the international flow of capital to the United States. This flow of capital, in turn, was caused primarily by fiscal and monetary policies enacted in Washington, D.C. An analogous shift in fiscal and monetary policies in Germany in the early 1990s had similar consequences for that country. In some ways the United States is repeating the experiment in the current decade.

In reality, international capital flows depend on many factors. Perhaps the most important are the rates of return that various countries are offering on their assets. We will simplify and assume that the rates of return on all assets offered by a given country (other than money) move together sufficiently closely within the country that they can be represented by a single nominal interest rate, i . In other words, we aggregate together bonds, stocks, and other nonmonetary assets. It is further assumed here that the differential between the domestic and foreign interest rate is the only determinant of the net capital inflow or outflow. Chapters 27 and 28 will add other determinants of the behavior of the international portfolio investor besides interest rates: in particular, investors' awareness that future changes in exchange rates will affect the returns they earn.

When investors in a low-interest-rate country buy assets in a high-interest-rate country, they exploit the principle of comparative advantage, just as consumers do when buying goods from a foreign country that can produce them at lower cost. Chapters 2 and 3 introduced the concept of autarky—the hypothetical situation that would prevail

if a country were closed off from international trade in goods (for example, because of prohibitively high tariff barriers), so that agents could consume only those goods produced domestically. It was shown that once the country opens up to international trade, the pattern of trade is dictated by the prices that would hold in autarky: If one good sells for a lower price in the foreign country than in the domestic country (whether because demand for it is lower or supply higher), then domestic residents will import that good as soon as they have the opportunity.

A similar concept can be applied to international trade in bonds. Autarky now would prevail if a country were closed off from international trade in bonds, that is, from borrowing or lending abroad (for example, because of prohibitively high capital controls). In autarky the interest rate in each country would be determined so as to equilibrate the supply and demand for bonds versus money. The last part of Chapter 18 introduced monetary policy and the interest rate, i , into the model, but did not allow for international capital flows. In Figure 18.7, for example, a high interest rate was required for equilibrium in the home country. There had been an increase in government demand for funds that reduced total national saving, and thus drove up the interest rate and crowded out private investment. (Do not be concerned if your recollection of the graph is hazy; it will be covered again momentarily.)

Imagine now that in autarky a lower interest rate prevails in the foreign country. Once the countries open up to international capital flows, the pattern of trade in bonds is dictated by the rates of return. If the home country has the higher interest rate, then domestic residents will borrow from abroad, where the cost of funds is lower. Equivalently, foreign residents will lend to the home country, where the rate of return is higher. Either way, the point is that capital flows from the low-interest-rate country to the high-interest-rate country.¹

We represent the net (private) capital account balance by KA . Thus

$$KA = \overline{KA} + k(i - i^*) \quad (22.1)$$

To the extent that the domestic interest rate, i , rises above the foreign rate, i^* , foreign investors will find domestic assets more attractive than their own and will seek to acquire them; domestic residents will be less eager to buy foreign assets and may even borrow abroad at the lower foreign interest rate. Whether foreigners invest in the home country or domestic residents borrow abroad, the transaction counts as a capital inflow and the domestic capital account shows a surplus: KA is positive. Conversely, if the domestic interest rate falls below the foreign rate, domestic residents will buy foreign assets and foreign residents will borrow in the home country; there is a capital outflow and KA is negative.

Why, if one country is offering a higher interest rate than another, would investors be willing to hold *any* assets of the low-rate country? This is a question well worth asking, and there will be an answer to it that holds even under conditions of perfect integration of financial markets (that is, the possibility of future changes in the exchange

¹To carry the analogy with the two-good trade model one step further, the “good” that the foreign country obtains is the ability to consume more in the future in exchange for consumption today. This point was spelled out in Section 21.5.

rate, to be introduced in Chapter 27). For the moment, assume there are still some transaction costs, capital controls, or other impediments to the movement of capital across national borders that prevent investors from completely arbitraging away interest differentials.²

This chapter inserts the capital flow equation, Equation 22.1, into the model used to determine national income, Y , in Chapters 17 and 18. The chapter thus returns to the Keynesian assumption made there that the speed of adjustment of goods prices is so slow that it can be ignored in the short run, so that changes in demand are entirely reflected as changes in output. (As before, much of the analysis developed here would also apply in a world of flexible prices, with changes in the price level substituting for changes in output when there are changes in aggregate demand.) Because Chapter 18 assumed a capital account constrained to zero, the model did not look radically different from the *IS-LM* model of traditional closed-economy textbooks. Now, however, international capital flows will change the model radically, particularly regarding the effects of monetary and fiscal policy.

In this chapter we hold the exchange rate constant. Then in Chapter 23 we consider a floating exchange rate regime. At every stage, the discussion explores not just what difference it makes to have *some* degree of capital mobility ($k > 0$) but also the different implications of high versus low capital mobility. Section 23.3 will also consider the limiting case of perfect capital mobility ($k = \text{infinity}$). This logical progression—from no capital mobility to low, high, and finally perfect capital mobility—mirrors the historical evolution of the international financial system as the processes of innovation and liberalization have gradually diminished the barriers between countries.

22.1 The Model

We set down equations for the *IS* and *LM* relationships from Chapter 18:

$$IS: Y = [\bar{A} - b(i) + \bar{X} - \bar{M}]/(s + m) \quad (22.2)$$

$$LM: M/P = L(i, Y) \quad (22.3)$$

The curves appear in the figures used throughout this chapter.

To review, the *LM* curve is the relationship between income, Y , and the interest rate, i , that gives equilibrium in the money market, where equilibrium is defined as real money supply (M/P) equal to real money demand. A given curve represents a given real money supply. The curve slopes upward because i and Y have opposite effects on money demand. An increase in Y raises the demand for money because people undertake more transactions. If there is no accommodating increase in the money supply, then the interest rate will be driven up, reducing the demand for money back to its original level. If the central bank adopts an expansionary monetary policy, under the

²Again, to point out the analogy with trade in goods, the existence of transportation costs, tariffs, or other impediments to the movement of goods across national boundaries would prevent the prices for the identical goods from being equalized between the two countries.

assumption that the short-run price level is fixed, the increase in the nominal money supply is also an increase in the real money supply. It shifts the LM curve to the right so that a higher level of Y can be sustained for any given interest rate.

The IS curve is the relationship between output, Y , and the interest rate, i , that gives equilibrium in the goods market, where equilibrium is defined as a point where the amount of goods produced equals the amount of goods demanded. The curve slopes downward because i has a second role (in addition to the return paid to households on nonmonetary assets). It is the cost to firms of borrowing funds to finance investment in plant and equipment or the cost to households of borrowing to finance the purchase of an automobile or other consumer durable. An increase in i reduces such expenditures, and in turn (through the multiplier effect) leads to a lower level of output throughout the economy. Just as the LM curve is drawn contingent on a given level of the money supply, so too is the IS curve drawn contingent on a given level of government expenditure, G . G is subsumed in the intercept term for the equation, along with the exogenous components of consumer spending and business investment. An increase in any of these exogenous components of spending ($\Delta \bar{A}$) shifts the IS curve to the right by an amount equal to the simple Keynesian multiplier, which is $\Delta Y = [1/(s + m)]\Delta \bar{A}$. Similarly, a reduction in the tax rate would leave households with more disposable income and would exogenously increase consumption. The multiplier, $1/(s + m)$, is smaller than it would be if the economy were closed to international trade ($1/s$) because some of the spending leaks out into imports from abroad. The effect on income in complete $IS-LM$ equilibrium is smaller still because the higher transaction demand for money drives up the interest rate and discourages investment.

The IS curve shifts to the right not only when there is an exogenous increase in demand for domestic goods coming from domestic residents (A), but also when there is an exogenous increase in demand for domestic goods coming from foreign residents, that is, when there is an increase in net exports (TB). This would be the case, for example, if there is a shift in foreign tastes toward domestic products or if quotas are imposed on imports. The same occurs if there is a devaluation (assuming the Marshall-Lerner condition is satisfied). It will often be necessary to take into account these sources of shifts in the IS curve.

The Balance-of-Payments Relationship

In Chapter 18 a third line, labeled $TB = 0$, was drawn. At that stage in the analysis the balance of payments consisted solely of the trade balance because there was no capital account. That can be considered the approximate situation of the world economy in the 1950s, when capital flows were not free to respond to rates of return. (This is not to say that the capital account was literally zero. There was an exogenous component, \bar{KA} .) The interest rate had no effect on the balance of payments, so the line representing the balance of payments was vertical: A unique level of income Y was consistent with balance-of-payments equilibrium. Any point to the right was a point of deficit because higher income means higher imports, and any point to the left a point of surplus because lower income means lower imports. The position of this line, however, like the position

of the IS curve, shifts to the right when there is a change in the exchange rate. Some points that previously represented a trade deficit now represent a trade surplus.

In this chapter the third line, which we will now call the BP line, still represents equilibrium in the overall balance of payments, but this no longer means the trade balance alone. It includes both the trade balance, TB , which depends negatively on income and positively on the exchange rate as before, and the capital account, KA , which depends positively on the interest differential ($i - i^*$) as in Equation 22.1:

$$BP = TB + KA = 0$$

$$BP = \bar{X} - \bar{M} - mY + \bar{KA} + k(i - i^*) = 0. \quad (22.4)$$

The third line represents combinations of income and the interest rate that would give an overall balance of payments equal to zero. To help graph it on the same diagram as the IS and LM curves, we can solve the equation to show the level of the interest differential that corresponds to any given level of income, Y :

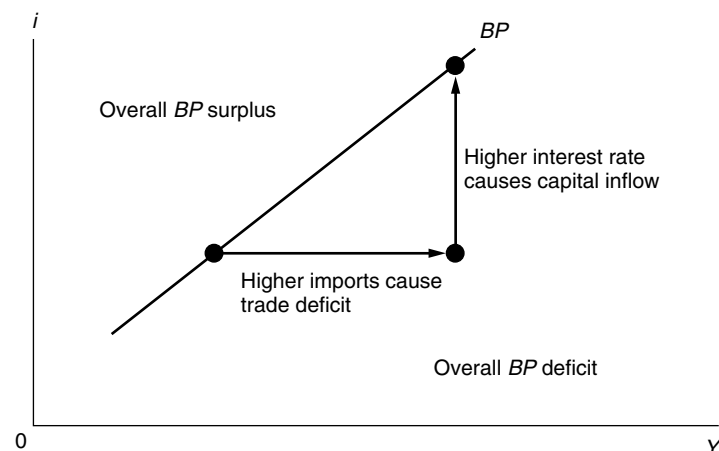
$$i - \bar{i}^* = -(1/k)(\bar{X} - \bar{M} + \bar{KA}) + (m/k)Y. \quad (22.5)$$

This chapter will assume the home country is relatively small in world financial markets, so it can take the rest of the world's interest rate as given ($i^* = \bar{i}^*$). Figure 22.1 graphs the relationship shown in Equation 22.5. Notice that an increase in income must be associated with an increase in the interest differential to maintain a zero overall balance of payments. This is because imports increase with income, and the interest rate must be raised to attract the capital inflow to finance the trade deficit. Notice also that the slope of the line depends inversely on the degree of international capital mobility, k . The larger is k , the flatter is the $BP = 0$ line: The smaller is the increase in the interest rate necessary to attract a given required capital inflow. If k is small, the $BP = 0$ line is steep: It would take a large increase in the interest rate to attract the required capital inflow. The previous case of no capital mobility ($k = 0$) is the case where the line is

FIGURE 22.1

Balance of Payments Equilibrium Schedule

The BP schedule appears on the same axes as $IS-LM$. An increase in income Y raises imports and causes a trade deficit; it thus requires an increase in the interest rate i to attract a capital inflow if the overall balance of payments is to remain at zero.



vertical: No finite increase in the interest rate would be enough to attract the capital. The slope also depends positively on the marginal propensity to import, m .³

Notice also that an increase in the exchange rate, or anything else that exogenously increases the trade balance, still shifts the BP curve to the right: For any given interest rate, the condition that the balance of payments is zero would now permit a higher level of income. (The BP curve shifts to the right by precisely the same distance as it did in the absence of capital mobility: $(1/m)\Delta\bar{X}$.)

The economy is always at the intersection of the IS and LM curves, under the assumption that there is always equilibrium in the goods and asset markets. The demand for goods equals the output of goods supplied, and the demand for money equals the supply of money. There is not necessarily any reason to be also on the BP curve. The balance of payments will be nonzero, and the economy will be off the BP curve, if the central bank is buying or selling foreign exchange reserves. The following discussion assumes that the starting point just happens to be a point where the balance of payments equals zero, so all three curves intersect.

We now use the model to examine the effects, first, of a fiscal expansion and, second, of a monetary expansion.

22.2 Fiscal Policy and the Degree of Capital Mobility Under Fixed Rates

Consider an increase in government expenditure, beginning with the case of zero capital mobility, shown again in Figure 22.2(a) for convenience. The IS curve shifts right to IS' , with the new intersection at point G . Income, Y , increases, and the higher transaction demand for money drives up the interest rate. There are now different implications for the balance of payments, however. In the case of no capital mobility shown in Figure 22.2(a), the only effect on the balance of payments came via imports and the trade deficit. The balance of payments went into deficit, with the central bank buying up the unwanted domestic currency (under the regime of fixed exchange rates, the one considered in this section). But now, when we include the capital account, the higher interest rate attracts a capital inflow into the country, which works to improve the balance of payments. Conversely, the higher level of income still draws in imports and worsens the trade balance, which works to worsen the balance of payments. Which effect dominates? It depends on the degree of capital mobility. If capital flows are not very sensitive to interest rates, then the improvement in the capital account will be small and the trade deficit will dominate. However, if capital flows *are* highly responsive to the interest rate, then the capital inflow will dominate and the overall balance of payments will improve.

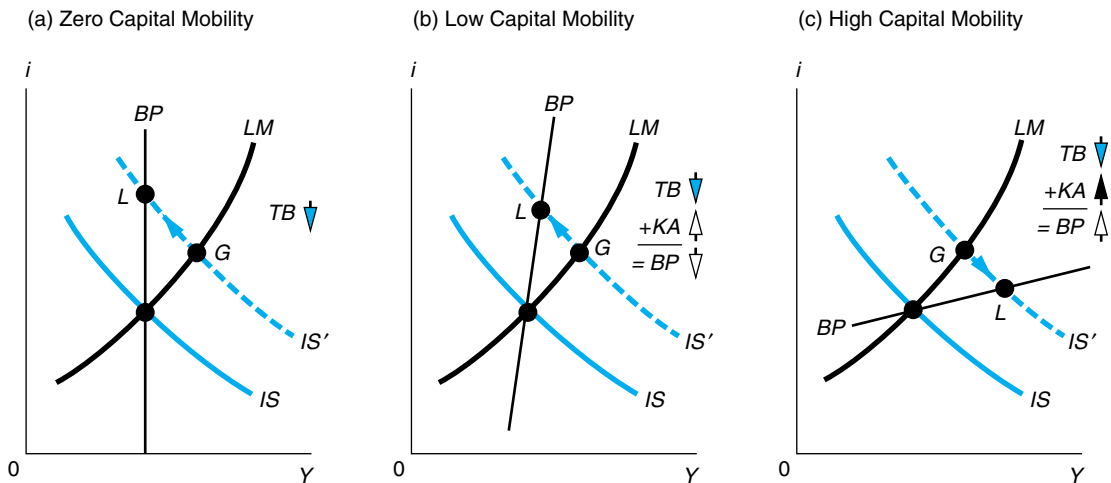
Figure 22.2(b) shows the upward-sloping BP curve as relatively steep—steeper than the LM curve. This is the case of low capital mobility. It is the case where the new

³Most countries have gradually become more open to international trade in the postwar period, so m has gradually been increasing. However, the degree of capital mobility, k , has been increasing more rapidly, so the slope m/k has been gradually diminishing.

FIGURE 22.2

Fiscal Expansion Under Fixed Exchange Rates

(a) Regardless of the degree of capital mobility, a fiscal expansion shifts the IS curve out, raising Y and i at G and worsening the TB . If capital mobility is low (b), then the capital inflow, KA , is smaller than the trade deficit and the overall BP is negative. If it is high (c), then KA is larger than the trade deficit and BP is positive.



IS - LM intersection at point G occurs to the right of or below the BP curve. Any point to the right of or below the BP curve is a point of deficit: Either the level of income, and therefore imports, is too high for balance-of-payments equilibrium, or the level of the interest rate, and therefore the capital inflow, is too low. Thus the fiscal expansion in Figure 22.2(b) gives a balance-of-payments deficit, as in the case of zero capital mobility, with the central bank buying up the unwanted domestic currency on the foreign exchange market. Yet there is a difference: The deficit is not as large as in Figure 22.2(a) because the capital inflow does partially offset the trade deficit. This is the *only* difference. Y and i are the same as in the earlier case.

In Figure 22.2(c) the BP curve is relatively flat—flatter than the LM curve. This is the case of high capital mobility. The fiscal expansion again produces the same increases in Y and i . Now, however, the new intersection of the IS and LM curves occurs at a point, G , to the left of or above the BP curve. The increase in i attracts a capital inflow more than sufficient to finance the higher imports resulting from the increase in Y . Thus the overall balance of payments is in surplus. Under fixed exchange rates, the central bank is accumulating foreign exchange reserves, not losing them, as with a lower degree of capital mobility.

Which case, (a), (b), or (c), is most realistic in practice? Clearly, all countries have at least some degree of capital mobility. The degree of capital mobility for the United States and Canada has been high enough to put them in category (c) ever since capital

controls were removed in 1974. Still, many other countries have lagged behind in liberalizing their financial markets, as we noted in Chapter 21. The United Kingdom was still in category (b) in 1978, and Japan in 1984. By now, these countries are in category (c). None is on fixed exchange rates, so the complete analysis relevant to them will have to await Chapter 23, which deals with floating rates.

Nevertheless, many continental European countries have tried to maintain fixed exchange rates against each other—first, starting in 1979, as part of the European Monetary System (EMS). Since 1999 many have locked their currencies together permanently, in the EMU. So this analysis can be applied to them. Consider the example of France, which undertook an expansion when the socialists were elected in 1981. At the time, capital controls placed the country in category (b). The balance of payments went into deficit, so the French franc was in excess supply (vis-à-vis the German mark) and President Mitterrand was forced to reverse the expansion. In other words, France had difficulty attracting the foreign capital to finance fiscal expansion.

Subsequently, liberalization moved France from category (b) to category (c), where most Western European countries are now. Deficits are easily financed. Germany in 1991–1992 undertook quite a large increase in government spending in an effort to rebuild the economies of the newly reincorporated Eastern *länder*. The macroeconomic effect was to push interest rates up sharply, which attracted a large capital inflow into Germany and put strong upward pressure on the mark.

Fixed exchange rates are common in small developing countries. However, small countries usually have a high marginal propensity to import, so a fiscal expansion leads to a large trade deficit. Most developing countries naturally have less developed financial markets. As a result, interest rates may not be free to rise in response to a fiscal expansion. Even if interest rates do rise above the level in the rest of the world, the degree of capital mobility is likely to be low enough that the overall balance of payments worsens rather than improves. In other words, they are in case (b).

This analysis has assumed that the central bank holds the money supply constant. The effect of the fiscal expansion would be greater if the central bank at the same time were to follow an expansionary, or “accommodating,” monetary policy so as to prevent interest rates from rising. The Federal Reserve generally followed such a policy in the 1960s when expansionary fiscal policies were adopted: the 1964 tax cut originally proposed by President Kennedy and the subsequent increases in spending by President Johnson during the Vietnam era. We now consider the effects of an increase in the money supply itself.

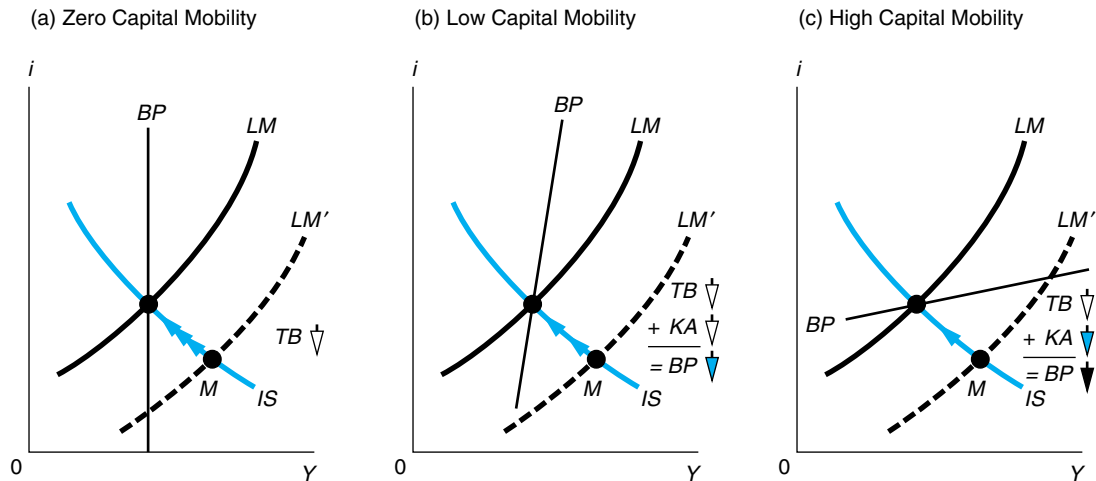
22.3 Monetary Policy and the Degree of Capital Mobility Under Fixed Rates

Figures 22.3(a), (b), and (c) again illustrate the cases of zero, low, and high capital mobility, respectively. From the initial equilibrium, a monetary expansion shifts the *LM* curve to the right. The effects of the increase in the money supply on the interest rate and income are precisely the same in each of the three cases. The interest rate, *i*, falls, stimulating spending and raising income, *Y*, to the new intersection point *M*. In each

FIGURE 22.3

Monetary Expansion Under Fixed Exchange Rates

(a) Regardless of the degree of capital mobility, a monetary expansion shifts the LM curve out, lowering i and raising Y at M , and worsening the TB . (b) With low capital mobility, an outflow through the KA supplements the trade deficit, so that the overall BP deficit and speed of reserve outflow are greater. (c) With high capital mobility, the speed of reserve outflow is greater still.



case, higher income means higher imports and a trade deficit. However, the presence of international capital mobility has implications for the balance of payments. This time there is a capital outflow, resulting from the fact that i has fallen below the foreign rate, i^* . Because the capital account moves in the same direction as the trade balance, the overall balance of payments is in deficit in each of the three cases. Because the lower interest rate causes larger capital outflows at higher degrees of capital mobility, the overall balance of payments must deteriorate by more in case (b) than in case (a), and by more in case (c) than in case (b).

If a country is running a balance-of-payments deficit, as in Figure 22.3(a), (b), and (c), it is losing foreign exchange reserves continuously over time. Because it has only a certain level of reserves, it cannot continue to do this indefinitely. Eventually, it must adjust. One way would be deliberately reversing the monetary expansion. Yet there is also the possibility of automatic adjustment of the money supply through the balance-of-payments deficit if the central bank does not sterilize reserve outflows. We consider nonsterilized reserve flows momentarily.

A final way to adjust is to let the exchange rate change. A deliberate devaluation would stimulate net exports and shift the BP curve to the right. The automatic version of this mechanism of adjustment is to *allow* the currency to depreciate on the foreign exchange market, when the central bank follows a rule of not intervening, as we will see in our discussion of floating exchange rates.

So far in this chapter, capital mobility has affected only the balance of payments, not income. However, under either of these two possible (automatic) mechanisms of adjustment—reserve flows or exchange rate changes—the changes in the balance of payments already derived will, in turn, have implications for the level of income.

22.4 When Money Flows Are Not Sterilized

If the central bank does choose to sterilize reserve flows, the economy can remain at point M in Figure 22.3 or at point G in Figure 22.2 as long as the stock of reserves holds out. Now, however, the analysis adopts the assumption of the monetary approach to the balance of payments: Changes in the level of reserves are not sterilized and thus are allowed to be reflected one for one as changes in the level of the total money supply. The preceding analysis still explains what happens to income and the interest rate in the short run, but now it is necessary to trace the implications of the money flow over time.

Monetary Expansion and the Capital-Account Offset

We begin by picking up the experiment where the central bank undertakes a deliberate increase in domestic credit. The combination of a lower interest rate and higher level of income at point M is only a short-run equilibrium. Even without any capital mobility, as in Figure 22.3(a), the trade deficit at point M in itself implies that reserves are flowing out of the country over time. If the central bank does not choose to sterilize this loss in reserves, then the money supply is decreasing, which means the LM curve is shifting back to the left over time. The sequence of intersections back along the IS curve is shown by the arrows in Figure 22.3(a). They bring to mind the principle illustrated in Figure 19.1 where the monetary approach to the balance of payments was first encountered. As the money supply falls, the interest rate rises, discouraging business investment and other interest-sensitive components of spending. This process continues as long as the balance of payments is still in deficit. In the long run, the economy is back where it started. The entire increase in the money supply has flowed out through the balance of payments, leaving no permanent effect on income.

The story is similar when we add some degree of capital mobility as in Figure 22.3(b). Because the lower interest rate induces a deficit on the capital account as well, the overall balance of payments at point M is in greater deficit than it was in the absence of capital mobility. As in the case without capital mobility, if the central bank opts not to sterilize the reserve outflow, then the economy follows the sequence of arrows until in the long run it is back where it started, with no effects. Is this case then identical to the case illustrated in Figure 22.3(a)? The two graphs look quite similar, but there is a difference. Because the balance-of-payments deficit is greater in the case of capital mobility illustrated in Figure 22.3(b), the rate at which the money supply decreases over time is greater, and therefore the economy returns to its starting point more rapidly.

The case of high capital mobility, illustrated in Figure 22.3(c), proceeds in the same way. The balance-of-payments deficit at point M means that the addition to the money

supply is flowing out of the country over time. In the long run the economy is again back where it started. What difference does the higher degree of capital mobility make? Because the capital outflow is greater for the same differential in interest rates, the rate of reserve loss is even greater in Figure 22.3(c) than in Figure 22.3(b), and so the return to the long-run equilibrium will be that much faster. The speed with which increases in domestic credit flow out through the capital account is called the speed of *offset*.

Fiscal Expansion and Capital Mobility

We now turn from the experiment where the government undertakes a deliberate monetary expansion to the experiment where it undertakes a deliberate fiscal expansion, such as an increase in government expenditure. Figure 22.2 showed an outward shift in the *IS* curve and an increase in income. Recall that the higher level of income resulted in a trade deficit, just as in the monetary expansion.

When a fiscal expansion results in a balance-of-payments deficit, the money supply will gradually decrease over time if the central bank does not sterilize the reserve outflow. The declining money supply will shift the *LM* curve leftward and the interest rate will rise. We now move up the new *IS* curve (*IS'*) in a sequence of *IS-LM* intersections, with interest-sensitive expenditures declining. As expenditure declines, the trade balance improves. This process continues until the economy has returned to a zero balance of payments. Only then are we in long-run equilibrium, because only then is the money supply no longer changing. The arrow in Figure 22.2(a) shows this process for the case of zero capital mobility and reminds us of the lesson learned from Figure 19.B.1: In the long run (point *L*), the fiscal expansion is completely offset by the outflow of money and there is no effect on the level of output. In the case of low capital mobility illustrated in Figure 22.2(b), the balance-of-payments deficit that exists at point *G* again means that reserves will be flowing out over time and that under the nonsterilization assumption the money supply and level of income will be declining over time. In this case, however, the long-run equilibrium at point *L* features a level of income that, although below the short-run level at point *G*, is still somewhat higher than before the fiscal expansion.

What about the case of high capital mobility, illustrated in Figure 22.2(c)? We have already seen that the short-run equilibrium at point *G* is a point of balance-of-payments surplus, rather than deficit. The capital inflow is more than enough to offset the trade deficit. This represents a qualitative departure from the other five cases illustrated. It means that the stock of international reserves is increasing over time, not decreasing. If the central bank opts not to sterilize, but rather allows the total money supply to increase over time, then the *LM* curve will again shift, but to the *right* this time. From point *G*, the economy moves to the right along the *IS'* curve, with the higher money supply driving down the interest rate and stimulating spending. The long-run equilibrium occurs at *L*, where the capital inflow is no more than is needed to finance the trade deficit. Unlike the case with low capital mobility, the level of income in the long run is not just higher than it was before the fiscal expansion, it is also higher than in the short run.

Are Capital Flows and Money Flows the Same Thing?

It is appropriate here to note a pitfall that may be encountered when analyzing international money flows. A capital inflow, such as that resulting from the increase in interest rates shown in Figure 22.2, is sometimes referred to as an “inflow of money.” This is permissible terminology because foreign residents are usually paying for the stocks and bonds they buy with money. However, it is important to realize that at the same time that money is “flowing in” through the capital account, it may be “flowing out” through the trade account. It takes money to buy goods, just as it takes money to buy securities. Money is only truly flowing in, on net, if the total balance of payments is in surplus—that is, both the trade account and the capital account—as in the short-run equilibrium at point G in Figure 22.2(c). Even then, the total money supply does not increase unless the central bank allows it to, by refraining from sterilizing the inflow. It is probably safest to avoid altogether using the term *inflow of money* to describe an inflow of capital. Then there will be no danger of confusing it with a change in the money supply. There are many other more suitable synonyms for capital inflow to choose from (borrowing from abroad, foreign financing, foreign investment in the domestic country, decrease in the net international investment position, foreign purchases of domestic assets, etc.).

As we have seen repeatedly, under the monetary approach to the balance of payments, the overall balance is zero in the long run. At point L in Figure 22.2, however, there must be a continuing capital inflow because the domestic interest rate remains above the world interest rate. “Money” is flowing in through the capital account at precisely the same rate as it is flowing out through the current account. Another implication is that in the long run all three curves intersect (at the same point L), not just the IS and LM curves.

22.5 Other Automatic Mechanisms of Adjustment

Within the context of the monetary approach to the balance of payments, the findings of Figure 22.2(b) and (c) are unfamiliar. As a general rule, it is expected that in the long run, when the economy has had enough time to adjust to a change in macroeconomic policy, there are no real effects left. Yet it has just been shown that under conditions of capital mobility, a fiscal expansion seems to have a permanent effect on real output. It is clear why some effect on output can remain even in the long run in this model: The only automatic mechanism of adjustment is the flow of money through the balance of payments, which is shut off at point L . However, there are other automatic mechanisms of adjustment that have been omitted here.

One is the adjustment of the price level over time in response to an excess demand for goods and labor. Inflationary pressure may exist at points like G in Figure 22.2 or M in Figure 22.3, assuming that the starting point before the fiscal or monetary expansion was near the point at which the economy was at potential output and full employment. Chapter 19 showed that an increase in the price level reduces the real money supply, which works to discourage expenditure and return the economy to its long-run

equilibrium. Chapter 26 will add the gradual adjustment of goods prices to the model of this chapter.

Another possible automatic mechanism of adjustment omitted here is changes in the stock of bonds. This point is particularly relevant in Figure 22.2(b) and 22.2(c). At point *L* the government is still running a budget deficit and—as a consequence—the country is still running a current-account deficit, even though the capital inflow is large enough to finance these deficits. When the government runs a budget deficit, the supply of government bonds in the hands of the public increases over time, assuming that the deficit is not monetized (i.e., assuming that the bonds are not bought by the central bank—which they are not, under the assumption that the central bank is holding the money supply constant). Analogously, when the country runs a current-account deficit, the supply of foreign bonds in the hands of the public decreases over time. In other words, the public borrows, or runs down the asset position vis-à-vis foreigners that it has accumulated in the past, to pay for its trade deficit.

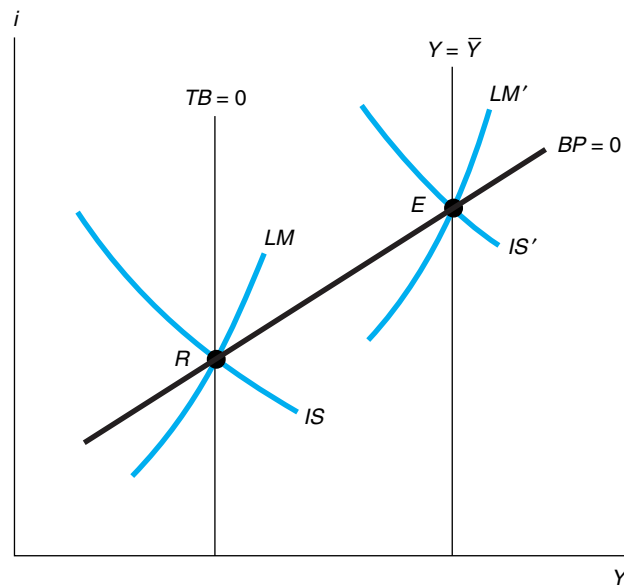
The *stock* of bonds (i.e., the accumulated *level* of bonds issued, as opposed to the *flow*, i.e., the deficits), either domestic or foreign, has no role to play in the model developed in this chapter. However, there are possible effects left out of the model. For example, holdings of bonds, along with money and other assets, are a component of the *wealth* or *net worth* of households and thus have an effect on the level of spending. If spending declines at point *L* in Figure 22.2(c) because households are running down their holdings of foreign bonds at the rate of the current-account deficit, then the *IS* curve will shift back to the left, just as it does when there is any exogenous fall in domestic spending. The process may continue until the current account is back to zero and the stock of bonds back to where it started. There is an analogy with the monetary approach to the balance of payments, in which the adjustment process continues until the overall balance of payments is back to zero and the money supply is back to where it started. This added possible mechanism of adjustment will not be pursued here. The discussion, rather, is based on the model in which changes in the stock of bonds have no effect, so that it does not matter whether it is changing over time or not.⁴

22.6 The Pursuit of Internal and External Balance

The last section of Chapter 18 introduced a fundamental principle of policy-making: To attain the two independent policy targets of internal balance (output equal to a desired level) and external balance (the trade balance at a desired level), at least two independent policy instruments are required. In Chapter 18 the two policy instruments were spending and the exchange rate. In this chapter we have been keeping the exchange rate fixed, ruling out one of the instruments. (Chapter 23 will return to the case of flexible exchange rates.) A new policy instrument, the money supply, has been

⁴These effects are modeled in the portfolio-balance approach. One statement of the approach under fixed exchange rates is Lance Gorton and Dale Henderson, “Financial Capital Movements and Central Bank Behavior in the Two-Country Short-Run Portfolio-Balance Model,” *Journal of Monetary Economics* (1976): 33–61. Chapter 28 will explain the portfolio-balance approach in the context of floating exchange rates.

FIGURE 22.4
External and Internal Balance



added, however, since the issue was last considered. Monetary and fiscal policy are each thought of as domestic policy instruments. Will the two, used together, nevertheless allow the two targets of external and internal balance to be attained simultaneously? The answer turns out to be yes, but only because the model now allows for international capital movements.⁵

Figure 22.4 repeats the earlier depiction of the Mundell-Fleming model under fixed exchange rates but emphasizes the government's objectives more explicitly. The vertical line labeled $TB = 0$ marks the unique level of income that corresponds to a trade balance of zero, a possible interpretation of the external balance objective. This level of income, however, is incompatible with another objective in this illustration, internal balance. The vertical line labeled $Y = \bar{Y}$ marks the level of income that corresponds to potential output and the natural rate of unemployment. Any point further to the right is assumed to be undesirable because the excess demand for goods leads to inflationary pressures. (Workers are working overtime and demand higher wages; bottlenecks in factory capacity and supplies of inputs lead suppliers to charge higher prices.) Any point to the left of $Y = \bar{Y}$, such as point R , is undesirable because it represents high unemployment and idle factories. There is no way to use our two policy instruments to attain both objectives simultaneously: The two vertical lines don't intersect.

Consider now what happens if the external balance objective is defined as an overall balance of payments equal to zero, rather than a trade balance of zero. Then we are

⁵This section, and especially the elaboration in the appendix, is based on R. A. Mundell, "The Appropriate Use of Monetary and Fiscal Policy Under Fixed Exchange Rates," *IMF Staff Papers*, 9 (March 1962): 70–77. Mundell (a native Canadian) had in mind particularly the example of policy-making in Canada. Capital mobility became crucial for Canada because of the high degree of integration with the United States, earlier than for many other countries.

happy to run a trade deficit, so long as it is offset by a surplus on the capital account. There exists a particular combination of monetary and fiscal expansion, shifting the economy from the $IS-LM$ intersection of point R to the intersection of IS' and LM' at point E , that gives us both internal and external balance. Notice that point E lies on $Y = \bar{Y}$, and so is a point of internal balance. At the same time, it lies on the $BP = 0$ schedule, which Section 22.1 showed to be upward sloping. Intuitively, even though the higher income implies higher imports and therefore a trade deficit at point E , *the interest rate is also higher, implying a capital inflow*. If the capital inflow is large enough to finance the trade deficit, the overall balance of payments is zero. This is the case at point E . Both objectives are attained. In practice, of course, such a carefully calculated combination of policies may be difficult to attain.

Difficulties of Policy-Making

The model and diagrams discussed so far make it sound as if policy-making should be perfectly easy. The government simply ascertains where the economy lies relative to internal and external balance, calculates how much it needs to move the monetary and fiscal policy levers to restore equilibrium, and proceeds. Is it possible that policy-making is this easy in practice?

Four problems make policy-making much more difficult than this. First, there are considerable *lags* between the time a policy instrument is changed and the time the economy responds. Chapter 16 considered a major lag, between an exchange rate change and its effect on the trade balance: the J-curve. There are also important lags between the time that monetary or fiscal policy is changed and the time that households and firms fully adjust their plans for consumer spending and business investment.

If lags were the only problem, it would not be so difficult to select the appropriate policies. The policy makers would simply need to plan ahead so that their policy changes would have the desired effects at the right time. However, the process is complicated enormously by the existence of *uncertainty*. There are three kinds of uncertainty: (1) uncertainty about the current position of the economy relative to the “full employment” level of output and the desired external balance; (2) uncertainty about future disturbances or “shocks” (such as sudden shifts in the demand for money or in private spending); and (3) uncertainty about the correct model (such as the correct value of the marginal propensities to save and import, the slope of the LM curve, and other parameters). Any of these three forms of uncertainty can lead to policy errors.

In the 1970s, for example, policy makers saw the United States and the world as being at levels of income substantially below full employment, and therefore they decided to use both fiscal and monetary policy to expand. The expansion began with a tax cut by the Ford administration in 1975 and was continued by the Carter administration from 1977 to 1979. Inflation reached double digits by the end of the decade and—in retrospect—the expansion is considered to have been excessive. One way of interpreting the error is that there were unanticipated shifts in some key economic relationships. There was a sizable downward shift in the demand for money—an outward shift in the LM curve—which meant that the planned rate of money growth translated into a higher demand for goods than had been anticipated. In 1979 there was also an

unexpected new increase in oil prices associated with the fall of the shah of Iran. (Chapter 26 will examine the effects of such supply shocks.)

The third problem for policy-making is the elusive factor of public *expectations*, particularly as they relate to inflation. If moving into a zone of excess demand caused the inflation rate in the current period to rise but had no further implications thereafter, then policy makers would have the relatively straightforward task of picking the preferred point in their inflation/unemployment trade-off. The internal balance line would be interpreted as the level of demand corresponding to this point, which might not be precisely the same as the level corresponding to full employment. In truth, however, there are future periods to consider as well. The trade-off between output and inflation does not stay put over time, as Chapter 26 will show. If inflation is high this period, then the public—particularly workers—will enter the next period with higher expectations of inflation and higher wage demands, raising the level of inflation (for any given level of output) in the next period. Chapter 26 will show that complications resulting from such expectations, even aside from the problems of lags and uncertainty, offer a reason for policy makers to reduce the frequency with which they adjust their instrument settings in response to new developments in the economy (*fine-tune*, to use a pejorative word). Indeed, some economists believe that government should abandon such discretionary policy-making altogether and instead should follow preset rules for monetary and fiscal policy.

The fourth difficulty for policy makers is that even if a politician or economist feels confident of exactly what policy changes should be made, in practice there are always formidable political constraints that must be overcome before enacting any changes. The government is not a unified, rational agent. Most politicians give at least some weight to their own selfish interests, and even those who might genuinely have the public welfare at heart will disagree over their interpretation of how to maximize that welfare. Most questions are decided more on the basis of simplistic slogans, bureaucratic turf wars, special interest lobbying, congressional politics, and arbitrary historical precedents, than on the basis of sound economic logic.

22.7 Summary

This chapter began to show the difference that international capital mobility makes in the modern world economy in regard to the important questions of policy-making, particularly the effects of monetary and fiscal policy.

The key new assumption is that a country's capital account depends on the difference between its interest rate and foreign interest rates. We considered fixed exchange rates in this chapter. A monetary expansion leads to a balance-of-payments deficit, a loss in reserves, and consequently a loss over time of any expansionary effects on income as the money flows out of the country. In this case, capital mobility simply speeds up the process as the money flows out not just through the trade account but also through the capital account. Although capital mobility changes the results in one direction in the case of monetary policy (giving it a smaller effect on total GDP over time), it changes it in the opposite direction in the case of fiscal policy (giving it a larger effect over time).

A fiscal expansion causes capital to flow into the country in response to a higher interest rate. If capital mobility is sufficiently high, then the overall balance of payments increases rather than decreases. Over time, reserves are gained rather than lost.

Capital mobility will make even more of a difference under floating exchange rates. We turn to this case in the next chapter.

CHAPTER PROBLEMS

1. A country that maintains a fixed exchange rate suffers from unemployment and a balance-of-payments deficit. What combination of G and i is appropriate? (See Appendix.)
2. For this question, it will help to use linearized versions of Equations 22.2 and 22.3:

$$Y = (\bar{A} - bi + \bar{X} - \bar{M})/(s + m)$$

$$M/P = KY - hi$$

The appendix presents an economic argument as to why the YY schedule must be steeper than the BB schedule, as long as the degree of capital mobility, k , is greater than zero. The slope of the YY line is given by the increase in Y resulting from a fiscal expansion, divided by the increase in Y given by a monetary expansion. The slope of the BB line is given by the decrease in BP resulting from a fiscal expansion, divided by the decrease in BP resulting from a monetary expansion. Show that the ratio of the two slopes is greater than 1.

SUGGESTIONS FOR FURTHER READING

- Mundell, Robert. "The International Disequilibrium System," *Kyklos*, 14 (1961): 154–227. The original model under fixed exchange rates, including the role of non-sterilized reserve flows.
- Swoboda, Alexander. "Equilibrium, Quasi-Equilibrium and Macroeconomic Policy Under Fixed Exchange Rates," *Quarterly Journal of Economics* (February 1972): 162–171. A clear early explanation of the Mundell-Fleming model, emphasizing the adjustment to reserve flows over time.

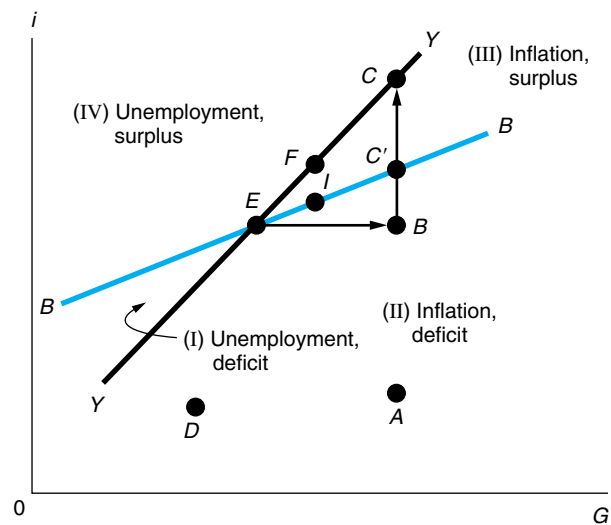
APPENDIX

Zones of Internal and External Balance

To study further the problem of internal and external balance from the viewpoint of the government policy maker, we view the same model with a different graph than was used in Section 22.6. In Figure 22.4, changes in fiscal or monetary policy showed up as

FIGURE 22.A.1**External and Internal Balance**

The YY schedule shows internal balance (Y at full employment). It slopes upward because an increase in G would cause excess demand for goods at B (which is inflationary), which would require that the monetary authority raise i to eliminate the excess demand at C . However, the BB schedule is not as steep as the YY schedule when an increase in i has the added effect of attracting a capital inflow.



shifts of the IS or LM curves. Figure 22.A.1, however, shows the two policy instruments directly on the axes. Here the level of government expenditure, G , appears on the horizontal axis. The interest rate, i , the instrument of monetary policy, appears on the vertical axis.

Why do we put the interest rate on the vertical axis instead of the money supply? In the absence of exogenous shifts in money demand, it makes no difference which we choose: When the central bank sets a money supply, it implicitly determines the interest rate as well. Here we use the interest rate for the policy instrument, so that the implications for international capital flows can readily be seen.⁶ Furthermore, innovations in banking, such as payment of interest on checking accounts, have blurred the distinction between money and other assets. Consequently, the money supply is no longer considered the superior measure of monetary policy that it was at the beginning of the 1980s. It has once again become standard to focus on the interest rate as the instrument of monetary policy.

We use Figure 22.A.1 to see the combinations of the two policy instruments consistent with the targets. Assume that internal balance and external balance both hold at the starting point, E . Consider an increase in government expenditure, G , a rightward movement from point E . Figure 22.2 showed that such a fiscal expansion affects both policy targets. It raises income and, as a result, raises imports and worsens the trade balance. (The discussion here is concerned only with the short-run equilibrium at point G in Figure 22.2. Endogenous effects of reserve flows on the money supply are not under consideration for the moment because the focus is deliberate changes in monetary and fiscal policy.)

⁶Also because this is the way Robert Mundell did it originally.

Consider first external balance. At point B the increase in government spending has moved the trade balance into deficit. To eliminate the balance-of-payments deficit resulting from the trade deficit, the government must generate a surplus on the capital account. It can do this by following a contractionary monetary policy. The higher interest rate for any given level of income will attract a capital inflow into the country. This policy mix, a fiscal expansion with monetary policy kept sufficiently tight to allow interest rates to rise, describes well the United States expansion in the years 1981 to 1984. The predicted result emerged: a large trade deficit, financed by large-scale borrowing from abroad attracted by high interest rates.

If the interest rate rises far enough, the surplus in the capital account will be sufficient to offset the deficit in the current account and the overall balance of payments will be restored to zero. In terms of Figure 22.A.1, if the increase in G (a rightward movement) is accompanied by a sufficiently large increase in i (an upward movement), then overall external balance will be maintained at point C' . Thus the set of combinations of G and i that give external balance constitutes an upward-sloping relationship, which is labeled the BB curve. There is no reason necessarily to be on the BB curve because there is no reason why the balance of payments must necessarily be zero. Indeed, the advantage of the graph is that it shows where the economy is *relative* to the policy goals. Any point below and to the right of the BB schedule is a point of balance-of-payments deficit because policy is expansionary. One way of thinking of it is that the capital-account balance is low because the interest rate is low. The other way of thinking of it is that the current-account balance is low because income is high. Any point above and to the left of the schedule is a point of balance-of-payments surplus because policy is tight. The capital-account balance is high because the interest rate is high, or the current-account balance is high because income is low.

Now consider internal balance. When the government increases G , income goes up. Thus the rightward movement from point E to point B in Figure 22.A.1 causes a move into the zone of excess demand, where the level of income exceeds the full-employment level and creates inflationary pressure. If the government is to restore internal balance, it must undertake a monetary contraction, raising the interest rate to dampen demand. If the interest rate is increased by enough, it will restore income back to the full-employment level. In terms of the graph, if the increase in G is accompanied by a sufficiently large increase in i , to a point like C , then internal balance is maintained. Thus the set of combinations of G and i providing internal balance constitute another upward-sloping relationship, which is labeled the YY curve. Again, there is not necessarily any reason to be on the YY curve because in the absence of instantaneous flexibility in wages and prices there is no reason why output should necessarily be at the full-employment level. Any point below or to the right of the YY schedule is a point of excess demand. Any point above and to the left is a point of excess supply.

What determines the relative slope of these two upward-sloping curves? It might seem, reasoning from the BP curve in the earlier graphs, that the answer to this question depends on the degree of capital mobility. It is true that the higher the degree of capital mobility, the flatter the slope of the BB curve because if k is higher, then it takes a smaller increase in i to attract the necessary capital inflow to finance any given trade

deficit. However, it turns out that even if the degree of capital mobility is relatively low, so that the BB curve is relatively steep, it cannot be any steeper than the YY curve. To see this, consider the movement from point E to point C , a simultaneous fiscal expansion and monetary contraction calculated to leave income unchanged at the full-employment level. Is point C a point of balance-of-payments surplus or deficit? There is no reason for the trade balance to have changed, as income is unchanged, but because the interest rate is higher, there is a capital inflow that puts the balance of payments in surplus. Only points above and to the left of the BB schedule are points of surplus. Therefore C must be above the BB schedule, which implies that the YY schedule is steeper.

This logic applies whatever the degree of capital mobility k , so long as it is greater than zero. In the event that k is zero, the balance of payments is no higher at C than at C' or E . In this case the BB curve has the same slope as the YY curve. This is a return to the situation of no capital mobility, as in Chapter 18, in which case monetary and fiscal policy are not *independent* policy instruments. Monetary policy has no extra effect on the balance of payments beyond the same effect that fiscal policy has via income and imports. In general, C lies above C' because the interest rate has an effect on the capital account above and beyond its effect on the trade balance.

Combinations of Monetary and Fiscal Policy

Figure 22.A.1 is divided into four zones. In zone I there is a payments deficit and excess supply (unemployment), in zone II a deficit and excess demand (inflation), in zone III a payments surplus and excess demand, and in zone IV a surplus and excess supply. There is only one point of full equilibrium, E . Both policy tools are needed to attain it.

We can draw conclusions about the proper direction of change in the policy instruments from Figure 22.A.1. Point A lies in zone II. A deficit and inflationary pressure call for both a contraction of public spending and a rise in the interest rate. The same problems at point B , however, would be solved by a policy of fiscal contraction alone; monetary policy is already tight enough to secure overall balance once the appropriate change in fiscal policy is made. At point C' external balance and inflationary pressure coexist. Fiscal policy must be tightened but monetary policy eased somewhat, to keep the contraction from throwing the balance of payments into surplus as inflationary pressures abate. At point D , however, a monetary contraction must be associated with fiscal expansion to secure a relatively large improvement in the balance of payments while removing only a relatively small amount of inflationary pressure. In zone II, and in zone IV as well, the proper direction of change for both instruments depends on the relative sizes of the internal and external disequilibria.

Conversely, in zone I it is possible to tell unambiguously the right direction of change for both instruments. In zone I unemployment and payments deficit are always fought by expansionary fiscal policy coupled with a tightening of monetary policy. The rising interest rate combats the restoration of full employment but does less harm there than the good it does in eliminating the payments deficit, and the interest rate at any point in zone I is lower than it must be if balance is secured at point E . The corresponding statements apply to zone III.

Were monetary and fiscal policy used as independent instruments during the era of fixed exchange rates in the way that this analysis suggests is possible? In the late 1950s and early 1960s, the United States suffered from unemployment combined with an external deficit (zone I). Some economists urged, on the basis of these theoretical considerations, that fiscal policy should be eased and monetary policy tightened. Indeed, taxes were cut by the Kennedy administration to pull the country out of recession, and for some time an attempt was made to allow short-term interest rates to rise to attract capital from abroad. Yet for the most part, U.S. fiscal and monetary policy moved in the same direction—either relaxed together or tightened together—in the 1950s, 1960s, and 1970s. The first time fiscal and monetary policy went strongly in opposite directions was the 1980s. We will elaborate on this episode in the next chapter.

The Assignment Problem

Governments sometimes deal with the diversity of information and goals within the policy-making arena by decentralizing, parceling out responsibility for various policy targets to different agencies. One agency might be put in charge of trade policy, for example. The danger is that agencies might find themselves working at cross-purposes. In such a situation each views the other as representing the sort of political obstacles to successful policy-making noted toward the end of the chapter.

We now examine a very stylized (simplified) version of decentralization. The two agencies to be examined, the central bank and the treasury, possess the tools of monetary policy (either the interest rate or the money supply) and fiscal policy (either government spending or tax rates), respectively. This analysis will show that internal and external balance (point E in Figure 22.A.1) can be reached if policy makers act independently and without direct coordination. However, just which responsibility goes to which authority turns out to be important. That is, one policy goal can be assigned to each authority, as long as the assignments are made correctly. This is the same problem examined in Chapter 18, only now the two instruments are fiscal and monetary policy, whereas there they were fiscal policy and the exchange rate.

Suppose, arbitrarily, that government policy makers tell the central bank to pursue external balance. It follows the rule: Lower the interest rate when there is an external surplus; raise it when there is a deficit. To the treasury, responsible for fiscal policy, goes the instruction: Raise government spending when there is unemployment; cut it when there is inflationary pressure. Suppose that the country finds itself with the combination of deficit and potential inflation indicated by A . The central bank acts first, leaping into action by raising the interest rate so as to attain external balance at C' . That step mitigates inflationary pressure but does not eliminate it. The treasury therefore cuts government spending, bringing the economy to point F in Figure 22.A.1. The central bank now finds it must back off, as a surplus emerges, and lower the interest rate a bit at point I . Because inflation is revived by the interest rate cut, the treasury keeps cutting government spending. Their separate actions are pulling the economy toward internal and external balance at E . This policy assignment appears to work.

Suppose the policy makers had made the opposite assignment, telling the central bank to look after internal balance and the treasury to mind external balance. Start

again from A , indicating inflation and an external deficit. The central bank girds itself to fight inflation, raising the interest rate and bringing the system to C on the YY schedule. What the treasury now observes, however, is not the initial deficit, but an external surplus, which it attacks by *raising* government expenditure. Here is the problem. If the treasury seeks external balance, the system reaches a point on BB directly east of C . Inflation is again unleashed, and the central bank hastens to raise the interest rate further. The point indicating the economy's actual state, rather than approaching E , proceeds northeast in zone III. Thus it moves away from equilibrium, until some higher authority realizes that something is amiss and changes the policy assignments. What this example indicates is a quite general conclusion: Assigning each target to a single policy instrument can work, but the assignment must be right. The right assignment is determined by a rule of comparative advantage: *Give each target to the authority whose instrument has the relatively greater influence on it.* Figure 22.A.1 shows that monetary policy's comparative advantage under a fixed exchange rate lies in pursuing external balance. That is the whole reason why BB is flatter than YY . Chapter 19's Appendix B referred to the general rule as Mundell's principle of effective market classification.⁷

⁷As we see in Chapter 23, monetary and fiscal policy have very different effects under floating exchange rates than under fixed rates. One implication is that the correct answer to the assignment problem is probably reversed. When exchange rate effects are taken into account, fiscal policy has a greater effect on the trade balance and monetary policy a smaller effect, so that fiscal policy should be assigned to external balance and monetary policy to internal balance. James Boughton, "Policy Assignment Strategies with Somewhat Flexible Exchange Rates," in B. Eichengreen, M. Miller, and R. Portes, eds., *Exchange Rate Regimes and Macroeconomic Policy* (London: Academic Press, 1989).