PART V

International Financial Markets and Their Macroeconomic Implications

CHAPTER 21

The Globalization of Financial Markets

Part IV of this book introduced the international movement of money. It left out, however, the factor that has by now become perhaps the most important aspect of the world monetary system: the international movement of capital. In the 1950s it was possible to ignore international capital flows without seriously endangering the accuracy of the analysis. The world financial system, which had facilitated large volumes of international capital movement in the nineteenth century,[1] had become badly fragmented in the course of two world wars and the Great Depression. Even in the countries where financial markets were the most developed, such as the United States, the United Kingdom, and Switzerland, governments in the 1950s and 1960s maintained controls preventing the free international flow of capital.

Innovative bankers and others began to find ways around these controls. The Euromarkets developed outside the reach of national governments. Then, in the 1970s and 1980s, the larger countries removed their capital controls. Meanwhile, transaction costs were gradually falling because of technological progress in telecommunications and computers. The process of internationalization of financial markets continued as a result of further liberalization by governments and further innovation by the private markets. In the 1990s the scope extended increasingly to emerging markets in developing countries. Chapter 21 traces the process whereby the world's financial markets have become highly integrated over the last 30 years. Then, the primary focus in the remainder of the text is the implications of this financial integration for the operation of the world economy.

The increasing degree of international capital mobility is crucial for macroeconomics in many ways. With large volumes of short-term capital poised to shift back and forth among countries every time investors' preferences change, financial markets are volatile and the prices of stocks, bonds, and foreign exchange are highly variable. Interest rates in each country are increasingly determined by financial conditions abroad rather than by domestic policy alone. Income, employment, and inflation, in turn, are increasingly affected by economic developments abroad.

[1]Section 9.2 discusses portfolio capital in the nineteenth century.

The structure of the world's financial markets over the last quarter century has been profoundly affected by a number of trends. From the viewpoint of individual countries' financial markets, the trend has been *internationalization* or *globalization:* National markets are increasingly influenced by foreign investors, foreign assets, foreign financial institutions, and developments in foreign economies.

Integration—the breakdown of the barriers separating nations' financial markets—began with the development of the Euromarkets. The trend continued with *liberalization* and *deregulation* on the part of national governments through the removal of controls, regulations, and taxes, and *innovation* on the part of the private sector resulting from the development of new financial instruments and new ways of issuing and trading them. Innovation in the 1980s and 1990s includes *securitization:* Where previously a borrower would have relied on bank loans, securities such as stocks and bonds are now increasingly sold directly to investors, often without the participation of banks. We examine the Euromarkets in Section 21.1, liberalization in Section 21.3, and innovation in Section 21.4.

21.1 The Postwar Financial System (1944–1973)

After World War II, the steps taken to restore and encourage international trade in goods did not apply to international trade in financial assets. Although the Articles of Agreement of the International Monetary Fund, worked out in 1944 at Bretton Woods, New Hampshire, incorporated a presumption of the desirability of free trade, there was no analogous presumption that free capital movements were necessarily desirable. No mechanism analogous to GATT (WTO) was set up to negotiate reductions in barriers to capital movements. Most countries retained controls on such movements.

One can make a good theoretical case that the free movement of capital maximizes welfare, just as the free movement of trade in goods does. International trade in assets allows countries to reallocate consumption from high-income periods to low-income periods. It also allows the financing of investment in countries with a high rate of return to capital. (These points are developed in the appendix to this chapter.) Furthermore, international trade in assets allows countries to share risk internationally, thereby reducing the amount of risk that each must bear. Some policy makers, however, including the architects of the Bretton Woods system, have always questioned whether capital markets left to themselves would function as efficiently as the theoretical ideal.

Indeed, in the 1960s the United States adopted more stringent controls in an effort to prevent capital from flowing out of the country: U.S. policy makers were concerned that the United States would run out of international reserves, thereby jeopardizing the viability of the Bretton Woods exchange rate system. For example, there was an "interest equalization tax," designed to reduce the rate of return on foreign assets relative to domestic U.S. assets, thus making the foreign assets less attractive to investors. There was also a "voluntary" foreign credit restraint program that placed ceilings on banks' foreign lending. The controls were not entirely effective, in part because of the development of the Euromarkets.

The Euromarkets

The *Euromarkets* (not to be confused with the euro, the currency created by Europe in 1999) began in the 1960s. Deposits were denominated in U.S. dollars but placed in banks located in London and elsewhere outside the United States. The banks, many of which are European branches of major American banks, accept these deposits and use them to make short-term loans to borrowers of any nationality. This market is like any other for bank deposits and bank loans, except that the transaction is not denominated in the currency of the country where it takes place. Indeed, the fundamental purpose of this market is to sever the location of the bank from the nationality of the currency in which it deals.

In the 1960s the markets offered a way to avoid capital controls and other U.S. financial regulations. Banks are required to hold a certain ratio of reserves (that do not pay interest to the bank) against deposits in the United States, whereas there is no reserve requirement for deposits in the Euromarket. From early on, depositors in the Eurodollar markets included U.S. corporations, which earned a higher return on their liquid balances there than at home. Depositors also include many non-Americans who transact large volumes of business in dollars and so prefer to hold funds in dollars.

The Euromarkets grew rapidly after 1973. In the aftermath of the oil price increase of that year, the OPEC countries had far larger dollar earnings than they could usefully spend, and they invested these *petrodollars* in Euromarket bank deposits. The banks in turn "recycled" these dollars by lending them to developing countries and other oil-importing countries that needed to finance current-account deficits.

The Euromarkets expanded along several dimensions in addition to size. First, they began to deal not just in U.S. dollars, but in pounds, yen, marks, and all other major currencies. Second, the geographical location spread, first from London to European capitals such as Zurich, then to the Caribbean such as in the Bahamas and the Cayman Islands, and more recently to rapidly growing Asian financial centers such as Hong Kong, Singapore, and Bahrain. As a result of this geographical extension, the markets are effectively open 24 hours a day. Third, the instruments that the system uses to re-lend deposits to borrowers on a longer-term basis have evolved over time. In the 1970s the money reached developing countries and other borrowers by means of the syndicated bank loan—a large number of banks lending together under the same terms. In the latter part of the decade, innovation was evident in the shift from loans at fixed interest rates at long terms to loans indexed to short-term dollar interest rates, usually the London Interbank Offered Rate (LIBOR) or the U.S. Treasury bill rate. The goal was to protect against the risk of changes in inflation and interest rates. The process of innovation accelerated with the growth of Eurobonds and other new instruments, as we see in Section 21.4.

There has been a steady trend of reduced costs related to improved communications and transaction technology. Between 1930 and 1990, the cost of a three-minute telephone call from New York to London fell from $245 to $3. The *Economist* magazine and *Financial Times* of London are now available in the United States on the day they are published. The revolution in international finance has been pushed even further by

information technology—new computer advances merged with new telecommunications technology. Financial news services like Bloomberg's and Reuters provide continuous updates on market-relevant developments. Regardless of home base, an investor can now analyze the day's developments in Washington, monitor reactions in the financial markets in Tokyo, take a position in a foreign currency in London, and make payment through a bank in New York, all with little effort and little time lag. As a result of the reduction in communications and transaction costs, together with the other processes of liberalization and innovation to be discussed in Sections 21.3 and 21.4, the boundaries between the Euromarkets and many countries' domestic financial markets have broken down.

21.2 The Foreign Exchange Market

The foreign exchange market is really a loose network of banks and other financial institutions, linked by telephone and computer, that buy and sell currencies. Because there are so many participants, and the products being traded are so homogeneous (i.e., a yen deposit is the same wherever you buy it), this market fits the classical economists' model of perfect competition.

The daily flow through the world's foreign exchange markets is very large. In April 2004, the world's major central banks surveyed the markets. When the results were compiled by the Bank for International Settlements, they showed that global foreign exchange trading had continued to grow, a 36 percent increase over a similar survey three years earlier. The volume had reached a remarkable $1.9 trillion per day. This figure includes, along with regular spot transactions (35 percent), trading in forward contracts and some other derivative contracts. (The figure does not include the "over the counter" market in derivatives, which is of roughly similar size.) A "spot" purchase of foreign exchange is the purchase of a contract for immediate delivery of the currency (actually within two business days). The other contracts are explained in Section 21.4. They are ways to manage risk.

Trading tends to be focused in major centers. Arguably, there is a natural equilibrium consisting of one major center in each of three 8-hour time zones. London continues to handle the greatest volume of foreign exchange transactions, with the U.K. share of world turnover equal to 31 percent. (Frankfurt, Paris, and Zurich are competitors in the European time zone.) New York is the main center in the Western Hemisphere, with U.S. volume accounting for 19 percent of world turnover. Tokyo has long dominated the Asian time zone, but Singapore and Hong Kong are competitors.

These numbers do not include the many small countries where there is no large organized private foreign market, often because the government owns the banking system and prohibits private trading. In these countries, the government buys and sells foreign exchange. Informal trading may also go on in an illegal black market or an officially tolerated "parallel market," at an exchange rate usually very different from the official rate.

Bid-Ask Spreads and Arbitrage in the Spot Market

One reason for the large volume of foreign exchange transactions is their low cost. The cost of the transaction usually appears in the form of a "spread between the bid and ask," that is, a gap between the price at which the bank is willing to buy a given currency and the price at which it is willing to sell it. The size of the spread is determined by the type of customer. A tourist who buys foreign exchange at a bank will typically pay a large cost, perhaps 1 percent. A firm that conducts a great deal of international business will receive a much better rate from its bank. When banks or brokers deal with each other, the spread is yet another order of magnitude smaller. The quoted spread on the Reuters screen averages around .05 percent; in practice banks and brokers deal with still smaller margins.

These transaction costs are lower than those in the past. Reasons include the technological factors mentioned previously and the economies of scale involved in large transactions and "thick," or highly liquid, markets.[2] However, the bid-ask spread still widens at times, especially for less important currencies that are thinly traded. A major determinant of the bid-ask spread is the volatility of the spot rate itself. Every time a bank buys foreign currency from a customer, it runs the risk that before it can resell the currency, there will be a large movement in the exchange rate and the currency will lose value. Clearly, this risk is higher when exchange rate volatility is higher—one reason why the bid-ask spread is larger at some times than at others.

Exchange rates in different financial centers are kept nearly identical by foreign exchange arbitrage. As we saw in Chapter 19, *arbitrage* is a general term that means buying something where it is cheap and selling it where it is expensive, thus working to reduce the differential by driving the first price up, the second price down, or both, to an equilibrium. In this case, the commodity being bought and sold is currency. If the dollar price of Swiss francs in New York falls below the dollar price of Swiss francs in London by more than the small transaction cost, it pays to buy in New York and sell in London. The arbitrage will bid up the price of Swiss francs in New York and bid down the price in London, until the difference disappears.

Arbitrage also keeps exchange rates among three or more currencies consistent with each other. Suppose you buy $1000 worth of sterling in New York, sell it in London for euros, then sell the euros for dollars in Frankfurt. If you wind up with either more or less than $1000, the exchange rates were not consistent. If you made a profit, you (and other arbitragers) will repeat the transaction until the market rates are forced to be consistent. If you lost in the transaction, you went around the circuit the wrong way; the opposite series of purchases and sales would have yielded an arbitrage profit. This process is called *triangular arbitrage.* Subject to the limits of transaction costs, it maintains consistency among the bilateral "cross rates," connecting all the world's internationally traded currencies. In other words, the $/£ exchange rate times

[2]Notice the multiple directions of causality. Higher transaction volume is partly a result of low bid-ask spreads, and low bid-ask spreads are partly a function of high transaction volume (the economies of scale).

the euro/$ rate equals the euro/£ rate (as you can tell by crossing out currencies in the numerators and denominators).

Interbank Trading of Foreign Exchange

The large volume of foreign exchange transactions seems puzzling. The 2004 survey showed that the amount of foreign exchange traded in the major markets was in the area of $2 trillion per day. Of this, most consisted of trading the U.S. dollar for another currency. Cross-currency transactions, foreign exchange transactions not involving the dollar, were only 11 percent of the total.

By contrast, U.S. merchandise imports plus exports totaled roughly $2 trillion for the entire *year.* The volume of foreign exchange trading is roughly 100 times greater than the daily volume of global merchandise trade. Why is this?

Briefly, the answer is that most of the foreign exchange transactions involve trading among banks, rather than providing services for importers, exporters, and other customers: Only 14 percent of the foreign exchange trading reported by dealers was with nonfinancial customers.

Consider a bank that buys Swiss francs from a customer who has just earned them from exporting to Switzerland. The bank will not choose to hold the Swiss francs unless (1) it has good reason to expect that another customer will want to buy them before long, or (2) it expects that the foreign exchange value of the francs is about to go up. Otherwise, it will quickly try to unload the Swiss francs to some other bank. That bank may itself try to unload them on another bank, and so on, until the francs find someone who wants them, either to spend on imports from Switzerland or to hold as an investment.[3]

Vehicle Currencies

In any center of foreign exchange trading, most business is carried on in only a few foreign currencies. This does not necessarily imply that the market discriminates against the smaller trading countries. Rather, it demonstrates the convenience to all parties of picking one or two leading currencies—known as *vehicle currencies*—and using them as focal points for trading. For that reason, a high proportion of transactions in the foreign exchange market is explained by exchanges of U.S. dollars for another currency. In an overseas financial center such as Singapore, foreign exchange transactions in U.S. dollars are much more prominent than Singapore's commercial transactions with the United States would suggest.

To see why there are vehicle currencies, recall why there exists any sort of money at all. In theory, we could go through life without money, bartering our goods and services instead. But this would be awkward; we could not sell a good or service until we

[3]Under the existing multiple dealer system, banks must provide quotes on both sides of the markets, both bid and ask, and then must accept a trade offered at the quoted price. An exciting new approach to the foreign exchange market shows how currency is repeatedly passed from one trader to another like a hot potato: Richard Lyons, *The Microstructure Approach to Exchange Rates* (Cambridge, MA: MIT Press, 2001).

found someone who wanted to buy that particular service *and* who happened to have something to sell that we wanted. This is called a "double coincidence of wants." It is much easier to sell our services for money and then use the money to buy what we want from someone else. The same is true about currencies at the international level. Those wanting to exchange South African rand for Malaysian ringgit are too small a group to support an active cross-currency market. Instead, it is more efficient to trade rand for dollars and then dollars for ringgit.

Vehicle currencies are used not only to facilitate foreign exchange transactions but also, to some degree, for invoicing trade in goods and services. This is especially true for homogeneous goods and materials (particularly agricultural and mineral commodities), which are sold on competitive world markets, as opposed to the differentiated finished goods, whose manufacturers control their own prices even if they face substantial competition. This is essentially the same distinction made earlier between auction goods and customer goods.

The widespread use of a currency in one activity will contribute to its widespread adoption in another activity. For example, if all foreign exchange transactions must pass through dollars, then the convenience of settling transactions is an extra incentive to use the dollar for invoicing trade as well. Arguments similar to those made regarding the currency choice for invoicing trade can also be made regarding the choice of vehicle currencies to denominate assets. Another area in which international use of currencies is in evidence, in addition to foreign currency trading, invoicing of merchandise trade, and denomination of assets, is the form in which central banks choose to hold their foreign exchange reserves.

The Dollar and Its Rivals for International Currency Status

Before World War I, the pound sterling was the leading currency in international use. Subsequently, the dollar came to be used more widely, as the United States gained economic power and political prestige relative to Great Britain. Since World War II, the dollar has been the clear choice as the leading international currency. Some observers believe that the dollar might in turn eventually be supplanted in international use by another currency. The mark and yen both gradually rose in prominence in the 1970s and 1980s, at the dollar's expense. This trend leveled off in the 1990s.

Measures of international use of major currencies include both official use (by central banks in other countries, as a currency to peg to or to hold reserves in) and private use (e.g., vehicle currency). The dollar's share remains much greater than the U.S. share in world output or trade.

The world monetary system also features a composite currency—the SDR (Special Drawing Right), created by the IMF. The value of the SDR is determined as a weighted basket of major currencies. However, it has not caught on widely.

A new challenger was created on the first day of 1999: the euro, the currency of the European Economic and Monetary Union (EMU). The euro has now replaced fully the mark, French franc, and ten other European currencies as well. Countries hold reserves in euros and issue debt denominated in it. Because the euro has become the home currency among a set of countries that are collectively almost as large as the

United States, it could aspire eventually to rival the dollar as an international currency. The dollar is still a long way from giving up the number-one position, however. Everyone—banks, importers, exporters, borrowers, lenders, and central banks—tends to use the currencies that other market participants are using. The choice of currency is based not only on the current relative importance of the respective countries in the world economy, but also on the relative use of the various currencies in the recent past. Like the English language, people will continue to use the dollar internationally because everyone else is using it.[4]

What are the pros and cons of being an international currency? The major disadvantage to a country having its currency used as an international currency is that the demand for money may be subject to larger fluctuations than before. The major advantage is that the country earns *seignorage* on the other countries' holdings of its currency: The other countries have to give up real goods and services to add to their currency balances. It has been estimated that roughly 60 percent of U.S. currency, for example, is held abroad. Just as American Express profits whenever people hold its traveler's checks, which they are willing to do without receiving interest, so the United States currently profits whenever people in Argentina or Russia hold dollars that do not pay interest. In the 1960s, the French would complain about America's "exorbitant privilege." Europe would give up goods and factories in exchange for mere pieces of paper (dollar). Today Asia plays the role of dollar accumulator.

Is Most Foreign Exchange Trading "Speculation"?

The dollar's status as a vehicle currency explains why dollar foreign exchange trading is such a high proportion of the total. However, it does not explain why total foreign exchange trading among banks is so large, relative to the foreign exchange sales and purchases required by customers for exports, imports, borrowing, and lending.

A major economic activity for banks is trading with other banks. Many banks and other financial institutions report profits from their foreign exchange business each year. This trading is extremely short term: Most traders are under instructions to close out their open positions—that is, to unwind any sales or purchases of foreign currency—by the end of the day. Longer-term positions are apparently considered too risky by banks.

Most purchases and sales of foreign exchange by traders, those trades not accounted for by the needs of customers, are made in effect as a gamble that the exchange rate will change in the trader's favor by the end of the day. Thus these transactions meet the definition of short-term speculation. (Chapters 27 and 28 will analyze speculation—the holding of assets in expectation of increases in their value.) What is not clear is whether the spot traders in the banks are able to outguess the general public, as many of them claim they can, so that their total profits exceed the transaction costs they charge their customers. The alternative possibility is that, although on any given transaction somebody must gain and somebody lose, the aggregate profits banks

[4]Paul Krugman, "The International Role of the Dollar: Theory and Prospect," in J. Bilson and R. Marston, eds., *Exchange Rate Theory and Practice* (Chicago: University of Chicago Press, 1984).

report from foreign exchange trading are nothing more than the normal payment they earn in return for providing foreign exchange services for customers.[5]

The remainder of this chapter discusses the successive waves of liberalization and innovation that over the last 30 years have increasingly broken down the barriers between the various financial markets around the world—not only the markets for money, but also the markets for stocks, bonds, and loans.

21.3 Liberalization

After the system of fixed exchange rates was abandoned in March 1973, the United States and several other major countries no longer needed the capital controls that had been put in place in the 1960s and the early 1970s, and so they removed them.

Liberalization by Countries Controlling Inflows

In Germany and some of its neighbors, the controls in place in the early 1970s were primarily designed to discourage the acquisition of assets in these countries by foreign residents—to discourage the inflow of capital rather than the outflow. The German government essentially prohibited the payment of interest to nonresidents on large bank deposits, taxed any new credits by nonresidents to German banks, and prohibited nonresidents from buying German bonds. A primary motive behind such controls was to limit the flow of capital from the United States to Germany, which was putting unwanted upward pressure on the mark at the same time as it put downward pressure on the dollar. Another, related, motive behind the barriers to capital inflow was concern over possible loss of control over the money supply: If a large volume of reserves flowed in through the balance of payments, the countries' central banks might not be able to sterilize the effects on the money supply, and inflation might result. Both motives were more or less eliminated after 1973, insofar as countries were no longer supposed to be concerned about preventing their exchange rates from fluctuating. Most of these controls were removed in 1974.

One way to determine the extent to which a country's capital controls are effective is to look at the differential between the domestic interest rate and interest rates outside the country. If a higher rate of return is being paid on assets inside the country than outside, this is a good indication that controls are preventing foreign residents from bringing in their capital; otherwise it would be difficult to explain why foreign residents would settle for a lower rate of return in their own countries.[6] Conversely, if the domestic rate of return always moves closely with foreign rates of return, this indicates that financial

[5]The view among banks that their spot trading operations make profits *above and beyond* the bid-ask spread is reported by Charles Goodhart, "The Foreign Exchange Market: A Random Walk with a Dragging Anchor," *Economica,* 55 (November 1988): 437–460.

[6]An exception to this rule of thumb, particularly relevant for long-term interest rates, arises if the country has a history of political instability, large budget and international deficits, or defaults on debt. In such cases, a higher rate of return on domestic assets than on foreign assets is probably a premium to compensate investors for risk.

markets are open and that arbitrage is keeping the rates in line with each other—by means of borrowing where interest rates are low and lending where they are high.

For such a test it is important that the two interest rates be expressed in terms of the same currency. The dollar interest rate in the United States is not directly comparable with the mark interest rate in Germany, for example. A differential that appeared in such interest rates would not truly be a difference in expected returns if it simply compensated investors for the likelihood that the dollar would depreciate against the mark during the period in question. Fortunately, the Euromarket allows observations of interest rates on currencies outside the home country.

During the period 1970 to 1974, the mark interest rate in Frankfurt exceeded the Euromark interest rate. In early 1973 the interest differential was as high as 10 percent per annum. We can view this differential as a measure of the magnitude of the barrier discouraging capital from flowing into Germany. The differential fell sharply thereafter, tangible evidence of the government's liberalization.

One country that maintained stringent controls on capital inflows in the period 1975 to 1979 was Japan. Foreign residents were prohibited from holding assets in Japan. The motive, again, was concern over monetary independence. Japan, like Germany and Switzerland, had a reputation for maintaining a strong currency, and potential demand for yen assets by international investors was growing. Sudden, large capital inflows would give the Bank of Japan an unpleasant choice. It could respond by allowing the yen to appreciate, or it could buy up the surplus dollars—in which case the increase in its reserve holdings would, it was feared, have inflationary implications for the money supply. During this period the Japanese were particularly worried that either a nominal appreciation of the yen or an increase in prices would erode their competitive price position on international export markets.

By 1979 the Japanese were more confident of their exporters' ability to compete on world markets, and the government did not consider a depreciation of the yen desirable. There was also political pressure from foreigners seeking to buy Japanese assets. For such reasons, the Ministry of Finance removed the prohibition against foreign investment.

The effect of the liberalization is visible in the differential between yen interest rates in Tokyo and overseas, shown in Figure 21.1. From January 1975 to April 1979, the differential between the three-month interest rate in Tokyo and the Euroyen interest rate in London averaged 2 percent, showing the efficacy of the controls on capital inflow. After 1979, the differential fell sharply. Since a 1984 agreement between the U.S. Treasury and the Japanese Ministry of Finance, the differential has been essentially zero, showing evidence of continued liberalization.[7]

Liberalization by Countries Controlling Outflows

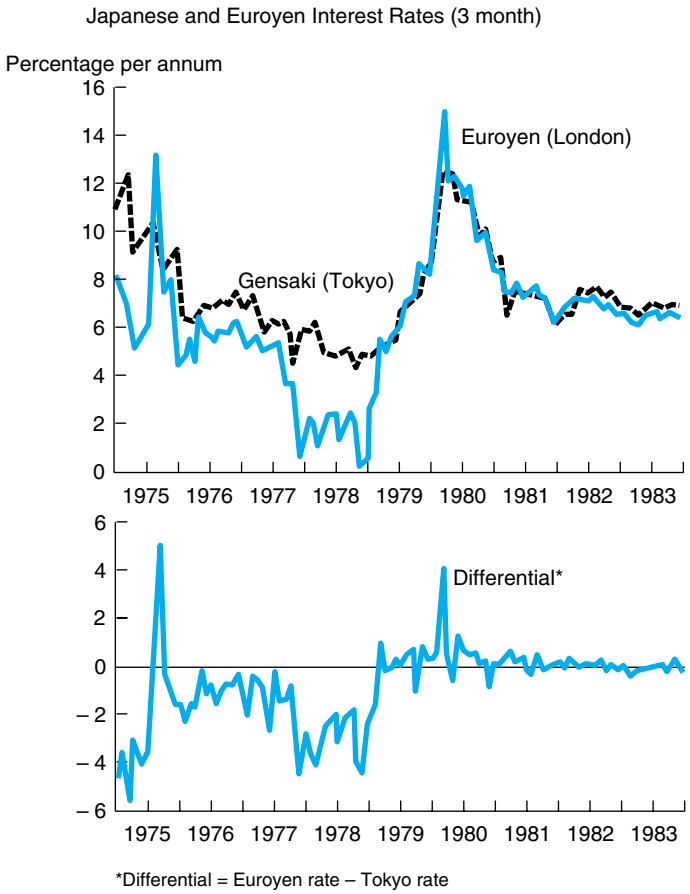
Countries often use capital controls to discourage outflows rather than to discourage inflows. These are usually countries that are concerned about a balance-of-payments deficit or a depreciating currency.

[7]Jeffrey Frankel, *The Yen/Dollar Agreement: Liberalizing Japanese Capital Markets* (Washington, DC: Institute for International Economics, 1984).

FIGURE 21.1

Financial Liberalization in Japan

In the 1970s capital controls in Japan prevented foreign residents from acquiring assets that were then paying a higher return than equivalent yen assets offshore. In 1979 these controls were removed, and arbitrage caused the interest differential to diminish.



The United Kingdom maintained controls on capital outflows until 1979. Even though the largest Euromarket was physically located in London (in the old financial district known as "the City"), effective legal restrictions required that British banks keep their offshore accounts separate from their domestic accounts. Again, the effectiveness of these restrictions is shown by the interest differential. In 1978 the three-month Europound interest rate averaged 1.4 percent per annum higher than the U.K. Interbank interest rate. The controls were preventing British residents from getting at the higher-paying assets that were so close at hand. However, as is illustrated in Figure 21.2, the differential fell sharply in 1979 when Margaret Thatcher became prime minister and removed the controls.[8]

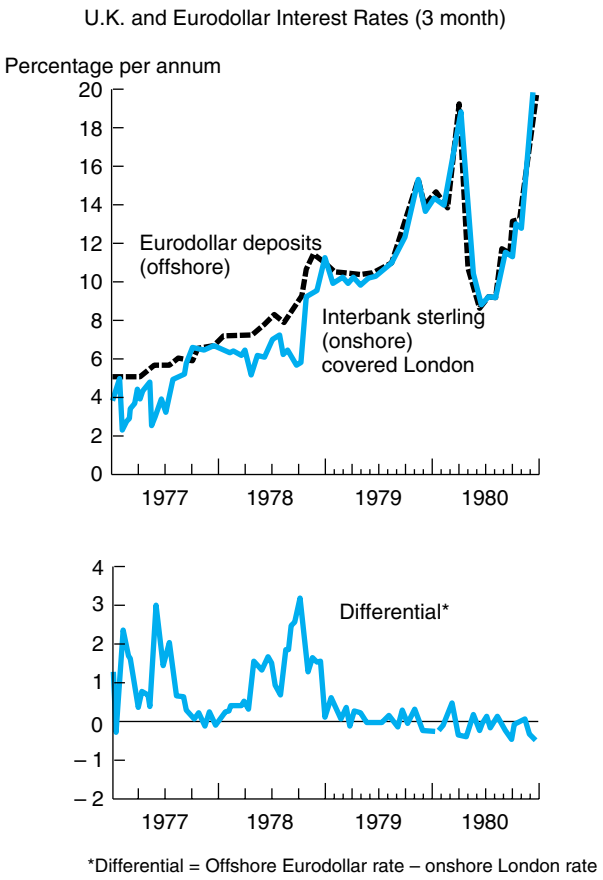
The two largest Western countries maintaining effective capital controls into the 1980s were France and Italy. Both France and Italy were members of the European

[8]Michael Artis and Mark Taylor, "Abolishing Exchange Control: The UK Experience," in A. Courakis and M. Taylor, eds., *Policy Issues for Interdependent Economies* (London: Macmillan, 1990).

FIGURE 21.2

Financial Liberalization in the United Kingdom

In the 1970s capital controls prevented British residents from acquiring offshore assets, which paid a higher return than equivalent assets in London. In 1979 these controls were removed, and arbitrage caused the interest differential to fall.



Monetary System (EMS) and were periodically threatened with capital outflows. Consequently, they had difficulty keeping their commitments to maintain their exchange rates within the bands of plus or minus 2.25 percent (6 percent in the case of Italy) against stronger member currencies such as the German mark. At such times, France and Italy had the option of raising domestic interest rates to keep capital inside the country. However, they too wanted to maintain some measure of independence in their monetary policies, which would not be possible if their interest rates were completely tied to foreign interest rates. This was their motive for maintaining controls on capital outflow. Indeed, France had to tighten its controls when socialist François Mitterrand was elected president in 1981 and many residents rushed to get their money out of the country.

The differential between the three-month Eurofranc interest rate in London and the most comparable domestic interest rate in Paris was highly variable. Most of the time it was only 1 to 2 percent per annum. Evidently, all along outflows in moderate quantity were possible. For example, there is the technique applicable in many coun-

tries with capital controls, of *leads and lags* in trade credit. Exporters request early payment from their foreign customers in foreign exchange, and importers try to delay payment of foreign exchange to their foreign suppliers. If an importer or exporter succeeds in shifting the timing of the payment from what it would normally be by, for example, six months, this is equivalent to a six-month capital outflow.

At times, however, the interest differential on Eurofrancs would shoot up sharply. These episodes occurred when investors suspected that the franc was about to be devalued within the Exchange Rate Mechanism of the EMS. If the capital markets had been free, then franc interest rates would have risen in Paris and London equally, to compensate holders of franc assets for the anticipated loss in value. Instead, a shortage of investors willing to hold Eurofrancs caused the interest rate to be bid up offshore, and most French citizens—because they could not get their money out of the country fast enough—were stuck with the lower domestic rate. These episodes ended as soon as the question of devaluation was resolved, usually when the suspected EMS realignment actually took place and investors decided it was safe to hold French assets again for another year. This same pattern was evident in Italy.

Subsequently, liberalization became more popular. After 1986 France and Italy dismantled their capital controls. By 1990 virtually all industrialized countries had opened their financial markets.

Many other countries still retained serious barriers to international capital movements. Nevertheless, financial liberalization around the world is the continuing trend. Many "emerging market" countries opened up their capital markets in the 1990s. Chapter 24 considers them at greater length.

Changes in Tax Laws

Tax reform can have important effects on international capital flows. Countries' income tax rates may have less of an effect on international investors' decisions concerning where to put their money than one would think, however. The mere fact that the citizens of one country are taxed at a higher rate than those of another does not necessarily create an incentive for portfolio capital flows, assuming that either group of citizens is taxed at the same rate on its foreign interest earnings as on its domestic earnings. Investors sometimes evade taxes by keeping their money in tax havens, however, in the Caribbean or elsewhere. Thus the existence of taxes does give rise to capital flows.

The United States, at times, serves as something of a haven for investors seeking to avoid taxation or the possibility of future controls, or even confiscation in their own countries. Comparisons of the current-account deficits of countries in Latin America and elsewhere with the debt incurred by those countries to foreign creditors suggests there have been at times large increases in unrecorded overseas claims by citizens of those countries, the well-known problem of *capital flight.* Many Latin Americans with wealth seek to hide it in Miami real estate. High corporate taxes, as opposed to personal income taxes, can induce capital outflows. This encourages countries to harmonize corporate tax rates.

Turnover taxes are an altogether different tax, one that affects the amount and location of trading in financial assets rather than the international flow of capital. Stock

market participants in Germany, Switzerland, and Japan have to pay a tax on every transaction. Authorities in these countries are under some pressure to remove these turnover taxes, so that Frankfurt, Zurich, and Tokyo do not lose business to other financial centers.

With respect to taxes, the apparent trend is again toward increased international capital mobility.

Liberalization of Domestic Financial Markets

When governments consider liberalizing controls on international capital movements, they often simultaneously consider other types of economic liberalization: those related to domestic capital markets and, perhaps, those related to distortions affecting trade in goods and services.

Domestic financial market liberalization involves the removal of ceilings on interest rates. Regulation Q in the United States, for example, was phased out long ago. The Japanese have also been phasing out their interest rate ceilings. Historically, the interest rates paid to small savers in Japan—through the enormous Postal Savings System, for example—were artificially kept quite low.

Domestic financial liberalization also involves the removal of other restrictions on the permissible activities of banks. Examples of restrictions in the United States are the prohibition against interstate banking, which ended in 1994, and the Glass-Steagall Act, which used to prohibit commercial banks from dealing in securities, as do investment banks.

In countries at an earlier stage of financial development, there may be little resembling a private banking system to deregulate. The government may have to begin by selling off banks it had previously owned (this process is known as privatization) and by abolishing existing prohibitions on private banking. One school of thought states that "repression" of the financial sector in many developing countries retards economic development by keeping the real rate of return low, thus discouraging people from saving, and by interfering with the efficient allocation of available saving among possible uses.[9]

Liberalization of Trade in Financial Services and Direct Investment

Trade liberalization is the removal of tariffs, subsidies, quotas, and other barriers to trade in goods. Its theoretical motivation stems from the argument in the first half of the text regarding the welfare gains from free trade. Firms' losses related to competition with imports are generally outweighed by the gains on the part of consumers, firms that export, and firms that use imported inputs. Nevertheless, for the liberalization arguments to succeed politically usually requires the promise of reciprocal reductions in import barriers by trading partners, as in successive rounds of multilateral negotiations.

[9]Ronald McKinnon, *Money and Capital in Economic Development* (Washington, DC: The Brookings Institution, 1973); and Edward S. Shaw, *Financial Deepening in Economic Development* (New York: Oxford University Press, 1973).

The United States formally proposed that trade in services, along with trade in goods, be included in trade liberalization in 1986 (at the meetings held in Uruguay, setting off a seven-year round of multilateral negotiations). The United States was primarily concerned with insurance, banking, and other financial and information services. Not until 1997, however, was a multilateral agreement to open markets to trade in financial services successfully negotiated under the World Trade Organization, which by then had succeeded the GATT. If, like the liberalization of capital controls, this trend becomes more widespread, it will further facilitate borrowing and lending between countries. This is still a U.S. priority area in negotiations such as the Doha Round.

Barriers to foreign direct investment in plant and equipment are common.[10] Some countries place performance requirements on any foreign direct investment (FDI), such as domestic-content legislation that prohibits such plants from importing a high proportion of the final product's value-added—for example, in the form of auto parts that are merely assembled in the host country. Such issues have also sometimes been important in the United States. Americans have begun to show the political sensitivity to inward foreign direct investment that had in the past been more common in other countries. A provision in the 1988 Omnibus Trade Bill empowered the president to investigate and block foreign investment for reasons of national security. U.S. politicians blocked attempts by a Chinese oil company to buy an American oil company in 2005, and by a Dubai company to buy U.S. port facilities in 2006. In truth, direct investment is less likely to be destabilizing than is portfolio investment, which can be cut off at any time. At the same time, Americans have begun to fear outward FDI as well. The concern, for example, in the debates over NAFTA or outsourcing to India, is that jobs are relocating to low-wage countries. In truth, more U.S. FDI goes to high-wage countries than low-wage countries. But multilateral attempts to negotiate reductions in international barriers to FDI have so far made little progress.[11]

The Optimal Order of Liberalization

An important practical question that arises for policy makers undertaking a program of liberalization along multiple fronts is the optimal order of liberalization. Should international capital liberalization proceed more rapidly or more slowly than domestic financial market liberalization? Than trade liberalization? In theory, the optimum (first best) is to remove all distortions immediately, but this strategy is seldom practical. The wrong order of liberalization can misallocate resources and give an unsatisfactory third-best outcome. What order is "second best"?

These questions were considered in the late 1970s when several countries in the southern cone of Latin America embarked on general liberalization plans. Subsequently, the optimal order of liberalization again became an urgent question in the context of plans for economic reform in Eastern Europe in the 1990s.[12] The consensus

[10]Refer back to Section 9.3 for a more complete discussion of foreign direct investment.
[11]All these restrictions are examples of so-called TRIMs (trade-related investment measures). The Uruguay Round included efforts to reduce TRIMs, for the first time in GATT negotiations.
[12]Ronald McKinnon, *The Order of Economic Liberalization: Financial Control in the Transition to a Market Economy* (Baltimore: Johns Hopkins University Press, 1991).

seems to be that international capital liberalization should come last. The argument is that if international controls are removed prematurely, massive capital flows might occur in response to distorted incentives. For example, liberalization in Chile resulted in a large trade deficit financed by a large increase in borrowing, leaving the country with a clearly excessive debt in the 1980s.[13] There is also an argument that the removal of capital controls should be postponed until after the reduction of a large existing government budget deficit, to prevent overborrowing while the government deficit is still stimulating demand, and until after the completion of any planned monetary stabilization program, again to prevent foreigners from rushing to buy domestic assets.

Indonesia is an example of a country that reversed the conventional wisdom, pursuing international financial liberalization more rapidly than domestic financial liberalization. One can imagine a possible justification for this reverse sequencing. In an environment where banks, brokers, and the rest of the financial sector are highly protected, regulated, and dependent on long-standing customer relationships, they may lack experience at competing in terms of the fees they charge for their services or at adapting to new ways of doing business. Like any vested interest group, they may be able to oppose liberalization politically. In such an environment, if international liberalization comes first, the "demonstration effect" of seeing foreign financial companies operating in their markets may teach them new ways of doing business. In any case, the argument goes, the political opposition will soon become irrelevant as banks are forced to offer competitively high interest rates to their depositors, and brokers are forced to charge competitively low fees to their clients, to avoid losing business to the foreign newcomers. The severe financial crisis experienced by Indonesia in 1997–1998, however, would seem to support the conventional wisdom of pursuing domestic financial liberalization, along with appropriate prudential banking regulation, *before* international liberalization.

The subject of increasingly competitive financial services markets leads to the next topic: innovation by the private financial sector.

21.4 Innovation

Innovation in domestic financial markets reduces the cost differential between the rate of return paid to the investor and the cost of capital paid by the ultimate borrower. Innovation in international financial markets works similarly and therefore, like liberalization, increases the degree of capital mobility across national borders. The original key innovation was the development of the Euromarkets, out of reach of regulation by national authorities. However, the innovation process accelerated in the 1980s and

[13]To be fair, the Chileans did in fact seek to keep liberalization of the international capital barriers for last. Other factors, such as the plummeting of the world price of a key export, copper, and the increase in world interest rates, were the proximate causes in the 1980s of the debt crises in Chile, as in other countries that had borrowed too heavily in the 1970s. See Sebastian Edwards, "Stabilization with Liberalization: An Evaluation of Ten Years of Chile's Experience with Free-Market Policies, 1973–1983," *Economic Development and Cultural Change* (December 1985): 223–254.

1990s. Financial centers in London, New York, Chicago, Tokyo, Singapore, and elsewhere are awhirl with new products and new ways of buying and selling them.

Innovation can be driven by exogenous technological developments, such as those in telecommunications and computers already mentioned. Often, however, innovation is an endogenous response to some new problem in the financial environment, such as uncertainty. Exchange rate variability and interest rate variability have been higher in the decades since 1973. Uncertainty in exchange rates and interest rates creates risk for international investors. In response, a variety of new ways to protect against risk in exchange rates and interest rates were developed.

The Forward Exchange Market

The most standard technique for dealing with exchange rate risk is by means of the *forward exchange market.* This market enables transactors, after they commit themselves to a transaction but before payment is made, to protect themselves against a change in the exchange rate. Saudi Arabian exporters invoicing exports to the United States in dollars run the risk that the value of the dollar in terms of the Saudi riyal will fall before the date comes when they are paid and can convert the dollars into their own currency, which may be three months later. The Swedish portfolio manager who acquires a sterling treasury bill in the United Kingdom runs the risk that the value of the pound in terms of the Swedish krona will fall by the time the treasury bill matures in three months. In each case, if the prospective recipients (Saudi and Swedish) of the foreign currency do not wish to bear this risk, they can protect themselves against it by *hedging,* or "selling the currency forward." This involves entering into a contract with a bank, under which they agree to sell the foreign currency for their own currency, with the exchange to take place in 90 days but with the price set at the time the contract is agreed on. The price received is the current stated forward exchange rate, as opposed to the uncertain spot exchange rate that will prevail in 90 days.

There are other market participants in addition to exporters and investors for whom hedging on the forward exchange market is often beneficial. The Argentine importing a German product invoiced in euros runs the risk that the peso price of the euro will go up by the time payment is required. Similarly, the Australian borrowing in U.S. dollars runs the risk that by the time the debt needs to be repaid, the cost of doing so in Australian currency will have gone up. In each case, the party obliged to pay foreign currency in the future (the Argentine or Australian) can avoid the risk of changes in the exchange rate by hedging, which in this case means *buying* the currency forward. In this way, the future cost of the obligations in terms of domestic currency is locked in today. The ability to hedge risk on the forward exchange market has meant that the high degree of volatility exhibited by exchange rates has not been as costly as it otherwise would have been to firms engaged in international business. Once hedged, they are immune.

The forward exchange market has developed since the advent of floating exchange rates in 1973, as Milton Friedman predicted it would,[14] in that more currencies are

[14]Milton Friedman, "The Case for Flexible Exchange Rates," in *Essays in Positive Economics* (Chicago: University of Chicago Press, 1953).

traded more widely around the world. Banks report that as of 2004, about 65 percent of their foreign exchange business consisted of forward transactions.[15] Although most trading is in the pound, euro, yen, and Swiss franc (all against the dollar), many other currencies are traded as well. In addition to the popular 90-day maturity, contracts are also traded at 30 days, 60 days, and one year.

Others participate in the forward exchange market in addition to those importers, exporters, investors, and borrowers seeking to hedge against currency risk. A second group is made up of "speculators," that is, anyone who takes an "exposed" (open or risky) position in the foreign exchange market in hope of gains when the exchange rate changes. Speculators expecting the currency in question to appreciate to a value higher than the going forward rate will buy a forward contract in that currency. A profit will result if the currency does appreciate as expected, but a loss will result if it does not. If the speculator expects the currency to depreciate to a value lower than the going forward rate, then he or she sells a forward contract in that currency. Now profits result only if the currency depreciates in the expected way. Speculators are thus the ones who accept the risk that the hedgers shun.[16]

Covered Interest Arbitrage

The third set of participants in the forward exchange market, after hedgers and speculators, are called *covered interest arbitragers.* Covered interest arbitrage is a powerful force in forward exchange market equilibrium under modern conditions, that is, in well-developed financial markets without barriers to international transactions. Indeed, covered interest arbitrage is sufficiently powerful that it can be considered the sole determinant of the forward exchange rate, provided the spot rate and the interest rate are taken as given.[17] We will now see how it works.

Consider an asset holder facing the choice between putting money into a one-year certificate of deposit (CD) denominated in dollars at a U.S. bank or a one-year CD denominated in pounds at a U.K. bank. If there is a difference between the interest rates on the two assets of 1 percent per annum in favor of the U.K. asset, it might appear that the U.K. asset is the better investment. However, there is the risk that the pound/dollar exchange rate will change during the course of the year. To eliminate this risk, the investor must use the forward exchange market.

Assume that the investor has $1 million to invest. By putting it into the U.S. CD, at the end of the year the investor will get back $(1 + i_{US}) million, where i_{US} is the U.S. interest rate. Here is the alternative:

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[15]Counting not only forward transactions but also foreign exchange swap contracts, which constitute the simultaneous execution of a spot and forward transaction (in opposite directions).

[16]The minimum contracts in the forward market are too large for individuals. If you feel the urge to speculate, you should—after considering the large risks involved!—investigate the closely related futures market or the options market, both of which are discussed later in this chapter.

[17]For a country that still has some barriers to international capital movements, it takes all three groups—hedgers, speculators, and covered interest arbitragers—to determine together the equilibrium value for the forward exchange rate (again taking the spot rate and interest rates as given).

1. Take the $1 million and buy pounds on the spot exchange market, getting £$(1/S)$ million, where S is the spot exchange rate in dollars per pound;[18]
2. Then take the £$(1/S)$ million and put it into a British CD, which in one year's time will pay off £$(1/S)(1 + i_{UK})$ million, where i_{UK} is the U.K. interest rate; and finally
3. Sell the £$(1/S)(1 + i_{UK})$ million on the current forward exchange market, where it will fetch $\$F(1/S)(1 + i_{UK})$ million, F being the current forward exchange rate in dollars per pound. Because the forward rate is known at the time the initial investment is made, the complete investment strategy is riskless in terms of dollars. The investor has "covered" the holdings of foreign securities, just as a home owner is "covered" when buying fire insurance.

Which should the investor buy, the U.S. asset or the U.K. asset covered (hedged) on the forward exchange market? In both cases, the investor would be putting $1 million in today, and getting back a certain amount of dollars in one year. Assuming that the two investments are the same with respect to taxes, risk of default, and so on, the investor should clearly buy whichever one pays the higher return. If $(1 + i_{US}) < (F/S)(1 + i_{UK})$, then the investor should buy the U.K. asset and cover it. When many investors do this, they will add to the supply of pounds on the forward market, thus driving down the forward price of pounds, F, and reducing the inequality. (If the investors also drive up the spot price of pounds, S, by their purchases of pounds in the spot market, or drive down the British interest rate, i_{UK}, by their purchases of pound CDs, this too will tend to reduce the inequality.) This is covered interest arbitrage at work.

To engage in covered interest arbitrage, it is not necessary to be a wealth-holder with a stock of dollars to allocate. If the U.K. interest rate exceeds the U.S. interest rate on a covered basis, as in the preceding inequality, it is possible to make a profit even without initial capital. Begin by borrowing the $1 million at the relatively low U.S. interest rate, i_{US}, and then proceed as before: Exchange the dollars for pounds on the spot market, invest the proceeds in a U.K. CD, and finally, sell the pounds forward. The dollars received in one year as a result of the forward transaction will be enough to settle the dollar debt incurred at the beginning, with some left over as a profit; the inequality tells us so. Anyone engaging in this form of arbitrage will be adding downward pressure on the forward rate.[19]

If transaction costs are low, such arbitrage will continue until the inequality is eliminated. The result is a condition called *covered interest parity.*

$$(1 + i_{US}) = (F/S)(1 + i_{UK}) \tag{21.1}$$

[18]Previous chapters have designated the exchange rate as E, but now the spot exchange rate, S, must be distinguished from the forward exchange rate, F.

[19]Even though anyone could engage in this sort of arbitrage if the inequality held (i.e., it is not the sort of thing where "it takes money to make money"), one has to incur four transaction costs to do so: borrowing, spot, investing, and forward. In practice, those who already have money and are investing it all the time anyway (or hedgers who are already engaging in forward transactions) have an advantage in covered interest arbitrage because they have fewer additional transaction costs to incur.

If the inequality goes the opposite way, with the right-hand side of the expression being less than the left-hand side, then arbitrage will run in the opposite direction. Investors will convert pounds (which they may have borrowed at the relatively low interest rate, i_{UK}) into dollars (at the relatively favorable spot exchange rate, S), invest them in a U.S. CD (at the relatively high interest rate, i_{US}), and sell the dollar proceeds forward for pounds (at the relatively favorable rate of $1/F$), thereby locking in a riskless profit. Such arbitrage, again, will put upward pressure on F, pushing it back into line with Equation 21.1, until covered interest parity is restored.

Let us define the forward discount: $fd \equiv (F - S)/S$. If F is greater than S, the foreign currency is more expensive—or the domestic currency is less expensive—on the forward market than on the spot market. The forward discount on the domestic currency is the percentage rate at which "the forward market thinks the currency will depreciate." If the current spot rate is $2 per pound, and the one-year forward rate is $2.02 per pound, then the forward discount on the dollar is 1 percent.[20] Thus, in Equation 21.1, F/S can be thought of as "1 plus the forward discount."

$$(1 + i_{US}) = (1 + fd)(1 + i_{UK})$$

Multiplying out,

$$(1 + i_{US}) = (1 + fd + i_{UK} + fdi_{UK})$$

The forward discount and the interest rate are both normally fractions, relatively small numbers such as 0.01 and 0.06. Thus, the last term, the product of these two small numbers, is likely to be very small—for example, 0.0006—and can be omitted, with the approximation remaining relatively accurate.[21] Canceling out the two "1"s that appear as well, the equation becomes an alternate statement of covered interest parity, which may be more intuitive than Equation 21.1.

$$i_{US} \approx fd + i_{UK} \tag{21.2}$$

This equation implies that when the U.S. interest rate is higher than the U.K. interest rate, U.S. assets are not necessarily a better investment. If there are no barriers to capital mobility, then the dollar will be selling at a discount in the forward exchange market at a rate fd that precisely cancels out the interest differential.[22]

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[20] If the forward rate, F, is less than the spot rate, S, then there is a forward *premium* on the dollar. (Check that you understand the arithmetic of covered interest parity, including the case where the maturity is less than one year, by doing Problem 2 at the end of the chapter.)

[21] The approximation is fairly safe when dealing with stable industrialized countries, where the inflation rate, interest rate, and forward discount are usually in single digits. But when dealing with some developing countries, where these rates can go to 100 percent per annum or higher, one must be very careful how the rates are expressed; one cannot go back and forth readily between equations like Equation 21.1 and Equation 21.2.

[22] There is another way of getting to the approximation of covered interest parity, Equation 21.2, if you know enough about logarithms to apply them to Equation 21.1.

$$\log (1 + i_{US}) = \log F - \log S + \log (1 + i_{UK})$$

Because the log of $1 + i_{US}$ is approximately equal to i_{US}, and the same for i_{UK}, this equation is simply Equation 21.2 with the forward discount expressed in logarithmic terms.

Ever since the 1980s, for example, dollar interest rates have usually been higher than yen interest rates by three or four percentage points per annum. As a result, the dollar has sold at a forward discount of the same magnitude. The dollar often sells at a forward premium against the Mexican peso, reflecting Mexican interest rates that are higher than U.S. interest rates.

The theory of covered interest parity is clear. Does it hold precisely in practice? This depends on where interest rates are observed. If the dollar interest rate, the yen interest rate, and the dollar-yen forward discount are all observed in the same location, such as London, then covered interest parity holds extremely well—to within the very small margins of interbank transaction costs. Indeed, banks in the Euromarket determine the forward rate they offer their customers by calculating it from the spot and Euromarket interest rates using the covered interest parity equation. It is more interesting, however, to see whether the condition holds across national boundaries—for example, with the dollar interest rate observed in New York and the yen interest rate observed in Tokyo. Section 21.3 pointed out that, even for some of the G-7 industrialized countries, nonzero differentials in interest rates remained in the 1970s (the U.K. and Japan as late as 1979, and France and Italy as late as 1986), and they remain today for developing countries. The reason is default risk, capital controls, tax differences, and the other barriers to the movement of capital across national boundaries that have been discussed.

The covered interest differential, the deviation from Equation 21.1 (which Figure 21.2 illustrated for the case of the U.K. liberalization of 1979), is essentially the same as the Eurocurrency onshore interest differential (which Figure 21.1 illustrated for the case of the Japanese liberalization).[23] Statistics on covered interest differentials confirm that only eight industrialized countries (plus Hong Kong and Singapore) began the 1980s with relatively open financial markets, but other countries liberalized significantly thereafter.[24]

Other Ways of Managing Risk in Exchange Rates and Interest Rates

In addition to the market in forward exchange, there is also an active market in foreign exchange *futures.* Like a forward contract, a futures contract is a commitment to buy foreign exchange in the future. One difference is that a deposit must be put down to buy a futures contract. Then, each day, the contract is "marked to market." This means that if the market rate moves the wrong way, the investor receives a margin call requiring payment for any losses. A forward contract, by contrast, does not have to be settled until maturity.

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[23]This is because covered interest parity holds so perfectly *within* the Euromarket. Consider the yen example illustrated in Figure 21.1. Within the Euromarket we have $i_E^{¥} = i_E^{\$} - fd$, where $i_E^{¥}$ is the Euroyen interest rate, $i_E^{\$}$ is the Eurodollar interest rate, and fd is the forward discount on the dollar. The interesting question is whether there is a covered interest differential across national boundaries. The covered interest differential is $i_T^{¥} - (i_E^{\$} - fd)$, where $i_T^{¥}$ refers to the Tokyo rate. Given covered interest parity in the Euromarket this is the same differential as the one discussed earlier: $i_T^{¥} - i_E^{¥}$.

[24]Jeffrey Frankel, "Measuring International Capital Mobility: A Review," *American Economic Review,* 82, no. 2 (May 1992): 197–202.

Another difference is that futures contracts mature on specific dates: the third Wednesday of March, June, September, and December. Forward contracts, by contrast, are tailored to the customer seeking foreign currency, for example, 90 days into the future, regardless of the starting date. Another difference is that futures contracts are traded on centralized exchanges, like the Chicago Mercantile Exchange, whereas forward contracts are arranged through the banking system. A large investor or importer who wants to lock in the rate on foreign currency needed in the future may use the forward market. A small speculator buying or selling foreign exchange on a short-term basis in anticipation of exchange rate changes is more likely to use the futures market.[25]

Foreign currency *options* were introduced in the United States in 1982 and grew rapidly in popularity. When buying an option on pound sterling, an investor acquires the right, but not the obligation, to buy pound sterling in the future at a price agreed on at the time the option is purchased. The buyer has the right to buy the pounds at what is called the *strike price.* It will not be in the buyer's interest to exercise that right until such time as the market price of pounds rises above the strike price. The option gives the investor protection against possible future increases in the spot price of pounds (the exchange rate), protection that could be useful if the investor is planning on buying British goods or securities in the future and will need to pay in pounds. Alternatively, an individual may buy an option because of a desire to speculate in pounds, betting on an increase in the pound's value. Finally, an option is a way for a trader to take a position on the volatility of a currency. The higher the volatility of the currency, the more valuable the option, because the probability is higher that the exchange rate will reach the strike price in the time allotted. The famous Black-Scholes formula relates the options price to volatility.

Whether the motive for buying the option is hedging or speculation, a similar goal could be accomplished by buying pounds in the futures market. In a futures contract, however, the agent would be committed to complete the transaction regardless of whether the spot rate goes up or down. Of course, in buying the option the individual must give up some return for the advantage of not having to buy the pounds if the price goes down in the future. Options are often used for speculation, and as with other derivatives, it is sometimes charged that they add to volatility. (*Derivatives* is the name applied to the general class of instruments or contracts that are written so as to depend on an underlying spot price.) However, they are an effective way for the individual international investor to manage risk arising from exchange rate or interest rate volatility.[26]

Forward exchange contracts (along with futures and options) are widely available only for horizons up to one year at the longest. An investor considering the purchase of a long-term bond in a foreign currency, or a borrower considering issuing a long-term

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[25]For more on futures, see Norman Fieleke, "The Rise of the Foreign Currency Futures Markets," *New England Economic Review* (March/April 1985): 38–47.

[26]The right to *buy* pounds in the future is a *call* option. The right to *sell* pounds is a *put.* Here the investor is speculating that the value of the pound might fall in the future. An accessible reference on options is Ian Giddy, "The Foreign Exchange Option as a Hedging Tool," in J. Stern and D. Chew, eds., *New Developments in International Finance* (Cambridge, MA: Basil Blackwell, 1988).

bond abroad in a foreign currency, will be exposed to exchange rate risk that cannot be readily hedged on the forward exchange market. Another important innovation is the *currency swap,* although the transactions involved sound somewhat complicated.

To take an example, assume that the Coca-Cola Corporation is sufficiently well known in Switzerland that it can borrow at a slightly lower cost there than it can at home (where investors already have all the Coca-Cola bonds they want)—provided that the debt is denominated in Swiss francs, which is the currency Swiss investors prefer to hold. Coca-Cola, however, may wish to avoid the uncertainty of not knowing what the exchange rate will be in the future, and thus not knowing the cost of debt service in terms of dollars. At the same time, Nestlé Corporation, a Swiss company, may wish to know its debt service ahead of time in terms of Swiss francs. Coca-Cola, or its bank, goes to Nestlé and proposes that each corporation issue bonds denominated in the other's currency and that they then swap the obligations to service each other's debt—Nestlé paying interest in Swiss francs to the investors who bought the Coca-Cola bond, and Coca-Cola paying interest in dollars to the investors who bought the Nestlé bond.[27] This technique has allowed hundreds of corporations to go beyond their own countries' capital markets and borrow internationally when it otherwise might not have been convenient for them to do so.

Securitization

In the 1960s and 1970s, bankers led the assault on international financial barriers. In the 1990s, however, new waves of exotic financial weaponry succeeded the now-mundane bank loan.

International banking was dealt a major blow by the international debt crisis, which first surfaced in August 1982 when Mexico informed its creditor banks that it was unable to service its debts on the original schedule. The crisis spread rapidly to other debtors, and banks became much less willing to put new money into developing countries. Bank lending to developing countries fell from $51 billion in 1982 to $8 billion in 1985 and then turned negative. In the second half of the 1980s, repayment of previous loans exceeded new loans.

At the same time, public concerns regarding the stability of the banking system arose, fueled by reports of problems at financial institutions. The Federal Reserve and other regulatory agencies put pressure on banks to raise the ratio of their capital to their outstanding loans. One consequence of these developments was that banks sought to earn more of their fees through "off balance sheet" activities, like swaps, which do not involve recording a loan on their books. In the Basel Agreement of 1987, central banks of the Group of 10 set common "harmonized" rules (which took effect in 1993) for the minimal capital requirements they impose on their countries' banks, and they also set some reserve requirements to cover off balance sheet items. The East

[27] In practice, the corporations do not necessarily have to deal with each other directly. Rather, the bank may swap a dollar obligation for the corporation's foreign currency debt, and it is then up to the bank to match up with another corporate borrower (and to guarantee the other side of the transaction against default).

Asian financial crisis of 1997–1998 prompted efforts to extend such standards to banking in emerging markets, under "Basel II."

Borrowers and lenders have begun to rely less on banks for intermediating between them, and more on the direct selling of bonds and other securities. This is the process of international disintermediation, or *securitization*.[28] We have already covered a number of the innovations, such as swaps, that facilitate issuing international bonds. The new methods of selling bonds have helped them to become increasingly important relative to bank loans.

The majority of international bond issues are by industrialized countries. Nevertheless, in light of disenchantment with bank loans as a vehicle for developing countries borrowing, there has been a trend toward securitization in this area as well. When foreign capital began flooding back into Mexico in the early 1990s, it largely took the form of bond purchases rather than bank flows. Bonds have been tried before as an alternative to bank loans for lending to developing countries. In the nineteenth century and in the 1920s, capital flowed from industrialized countries to colonies and developing countries via this route. Defaults occurred periodically, however, culminating in the widespread defaults of the 1930s.

Capital also reaches developing countries through foreign direct investment. Recipients of FDI are apparently less vulnerable to financial crises than are recipients of loans. China has allowed in large flows of FDI, as a successful industrialization strategy that circumvents deficient domestic systems of finance (too many bad loans by banks) and corporate governance (too big a role of government). However, developing countries value their political independence, and some are reluctant to have foreigners owning controlling shares of their natural resources, land, or plant and equipment. Thus there is interest in devising some new mode of capital flow, other than bonds, direct investment, or bank lending.

An obvious candidate is equity investment. Unlike bonds or bank loans, the cost of such an obligation does not stay fixed in dollar terms when the ability of the country to earn export revenue falls because of a world recession or a collapse in commodity prices. Unlike direct investment, securities do not give the foreigner a controlling interest in investment projects. Another idea is the possibility of tying the repayment terms on bonds to export prices or export revenues, which would give them "risk-sharing" characteristics more like equity: The cost of the obligation automatically falls when the ability to pay falls, thus reducing the risk to the borrower.

Equity markets are, of course, far more developed in the United States and other industrialized countries. The United States (and the United Kingdom) have historically had the largest stock markets. But international equity trading has grown rapidly. One reason for this trend (and for securitization in general) is that in wealthy countries, savings have shifted out of banks and other financial intermediaries, and into securities

[28]Disintermediation describes the phenomenon of borrowers (e.g., firms) and lenders (e.g., individual investors) starting to do business directly, rather than via financial intermediaries (e.g., banks). This normally means the borrower sells securities to the lender. (The term *securitization* is sometimes reserved for the transformation of a given bank loan into a security, e.g., debt-equity swaps. Here we are using it more broadly to denote any increased use of securities in international capital markets at the expense of bank lending.)

markets, especially via diversified mutual funds, where they can in turn find their way overseas. Although it will take time for investors everywhere to hold similar, widely diversified portfolios, movement is clearly in that direction. The strengthening links among countries' stock markets are reflected in the increasing tendency for market indices to rise or fall together. The stock market crash of October 1987, for example, was transmitted within hours from the United States to markets in Asia and Europe. Ten years later, in October 1997, Asia was the origin of a sharp decline in securities markets that was again felt around the world. Chapter 24 will discuss the integration of emerging markets into the global financial system.

21.5 Advantages of Financial Integration

Financial integration has both pros and cons. It is important to consider both, in order to make the trade-off. Advantages of financial opening include the following:

- For a rapidly growing country, with a high return to domestic capital, investment can be financed more cheaply by borrowing from abroad than out of domestic saving alone. Most of the remainder of this chapter develops the model to illustrate this advantage.
- Investors in wealthier countries can earn a higher rate of return on their saving by investing in emerging markets than they could domestically.
- Everyone benefits from the opportunity to diversify away risks and smooth disturbances.
- Letting foreign financial institutions into a country with an underdeveloped financial system improves the efficiency of domestic financial markets. Overregulated and potentially inefficient domestic institutions are subject to the harsh discipline of competition and the demonstration effect of having examples to emulate.
- Governments face the discipline of the international capital markets in the event they make policy mistakes.

Some Disadvantages in Practice

Financial integration has disadvantages as well, unfortunately, because financial markets do not always work as well as the perfect textbook theory suggests. In theory, private capital markets should be *countercyclical:* flowing in to countries suffering temporary setbacks, so as to cushion the adverse impact, and flowing out from countries that are expanding. In practice, especially for developing countries, it is more nearly the reverse: In boom times the whole world wants to lend to you, but in recessions it cuts you off. In other words, capital flows are observed empirically to be *procyclical.* Particularly salient are the recurrent disruptions, the busts that follow the booms, such as the 1982 international debt crises, 1992–1993 crisis in the European ERM, 1994 Mexican peso crisis, and 1997–1998 Asian financial crisis, followed by Russia (1998), Brazil (1999), Turkey (2001), and Argentina (2002). Chapter 25 examines the crisis phenomenon in detail. For now, let us note that it has gotten more difficult to

argue that investors punish countries when and only when the governments are following bad policies, for three reasons:

- Large inflows often give way suddenly to large outflows, with little news appearing in between that might explain the change in sentiment.
- Second, contagion sometimes spreads to countries that are unrelated, or where fundamentals appear strong.
- Recessions that have hit emerging market countries in such crises have been so big that it is difficult to argue the system is working well.

The Theory of International Capital Flows as Intertemporal Optimization

This section serves three purposes. First, it formalizes the first advantage of financial integration that was listed earlier, showing how the freedom to borrow and lend internationally can leave people better off. Second, it constitutes an important theory of the current account, the intertemporal approach. (Recall that the current account is just the flip side of the capital account.) Third, it leaves us with the prediction that capital flows from the low-interest-rate country to the high-interest-rate country, a proposition that will be a central building block of Chapters 22 and 23. It is nice to have such a key proposition rooted in the economic theory of individual agents who optimize.

The procedure here will be the same as that used to introduce the theory of international trade in Chapters 2 and 3: first taking supply as given and looking at trade that arises from differences in demand, and then introducing supply differences. Rather than discussing the supply and demand for goods, however, the discussion here will be concerned with the supply and demand for *bonds*.

This analysis is necessarily *intertemporal,* meaning that it concerns different periods in time. The purchase of a bond in the present period is the purchase of a claim to consumption in the future, when the bond comes due. Assume two periods: the present, period 0, and the future, period 1.

First consider an economy in which output in the two periods is fixed. Imagine, for example, a country where coconuts fall off the trees with no effort on the part of the population. Figure 21.3 shows the number of coconuts in period 0 on the horizontal axis and the number of coconuts in period 1 on the vertical axis. Point A indicates the number of coconuts that fall off the trees in the two periods.

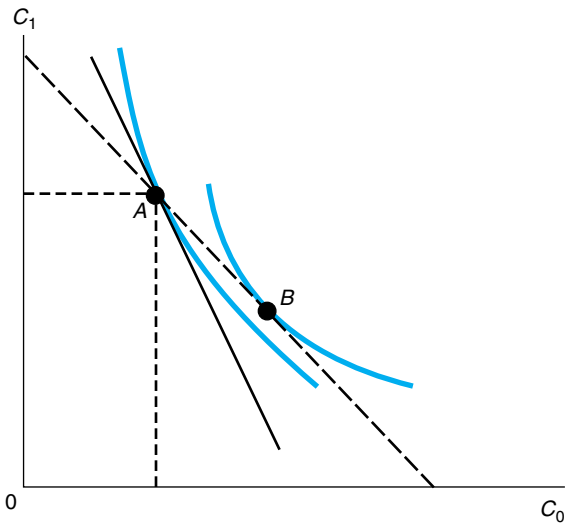
We draw community indifference curves along which consumers ("representative agents") are indifferent between different combinations of the two kinds of consumption, in this case present and future consumption, C_0 and C_1. The slope of the indifference curve is called the *intertemporal rate of substitution*. It tells how many future coconuts the agent is willing to give up to get one more coconut this period. Thus it reflects how impatient the agent is.

In autarky, where there is no possibility of trade between periods, the point of output A must also be the point of consumption. Point A is located on the graph in such a way that $C_1 > C_0$. There are more coconuts in the second period than in the first. (This is the usual case: Output, like the size of coconut trees, tends to grow over time.) The

FIGURE 21.3

Borrowing from Abroad, with Fixed Output in Both Periods

The horizontal axis represents the current period; the vertical axis the future period. *A* represents given levels of output in the two periods. If the country is relatively impatient to consume, at *B* it can borrow to finance a relatively greater level of current consumption C_0 at the expense of lower consumption C_1 next period.



market price of C_0 in terms of C_1 is (the absolute value of) the slope of the indifference curve that passes through *A*. A solid line is drawn through *A* tangent to the indifference curve. As drawn, the slope is greater than 1 (in absolute value): Present consumption must be more expensive than future consumption to induce agents to wait for the next period, when more coconuts will be available.

Another way of expressing the slope is $1 + i$, where i is the market interest rate. Why is $1 + i$ the price of C_0 in terms of C_1? Because an individual saver can take \$1 worth of coconuts, buy a one-period bond, receive back the principal plus interest next period, and then consume $\$(1 + i)$ worth of coconuts. The proposition that the marginal rate of substitution is greater than 1 is thus the same as the proposition that the interest rate i is greater than 0.

Now assume that the country is opened up to international financial markets, that it can borrow or lend at the going world interest rate. Suppose that the world interest rate, i^*, corresponds to the slope of the dotted line in Figure 21.3. It has been drawn less steep than the solid line, meaning that the world interest rate, i^*, is less than the domestic autarkic interest rate, i. The relative price of current consumption, although still greater than 1, is lower in the rest of the world. (Or the relative price of *future* consumption is *greater* in the rest of the world.) Foreign agents are less impatient than domestic agents, less anxious to consume today.

Domestic agents will take advantage of a lower interest rate abroad by borrowing. In terms of the figure, they will slide down the new relative price line to point *B*, where the line is tangent to a new indifference curve that represents a higher level of welfare. At point *B*, domestic agents are giving up some consumption in period 1 in exchange for more consumption in period 0. They gain from this arrangement because it assuages some of the impatience they feel at point *A*. The horizontal distance between points *A* and *B* is the current account deficit, financed by a capital inflow.

To illustrate with a key feature of the world economy, Japan is the perfect example of a country where people have a low rate of impatience: The Japanese have had a high saving rate during the postwar period because they were willing to postpone consumption to the future even for a relatively low interest rate. The United States is a good example of a country with a high rate of impatience: Americans have a low national saving rate because they are reluctant to postpone spending, even for a relatively high interest rate. In autarky, Japan would have a low interest rate and the United States a high one.[29] When nations remove barriers to the international flow of capital, as the Japanese government did in the early 1980s, the Japanese lend and the Americans borrow.

We now consider the possibility that the quantities of coconuts produced in the two periods are not determined exogenously but are the outcome of an economic decision. In the illustration, the coconuts do not fall off the tree but have to be picked. The decision as to how many to leave on the tree (or the decision as to how many trees to plant) is an *investment* decision, of the sort firms make when planning additions to factory capacity. Figure 21.4 draws a production possibility frontier, showing the trade-off between coconuts harvested for sale this period and coconuts available next period.

The point A again represents autarky, determined where the indifference curve is tangent to the production possibility frontier. Again, the graph is drawn so the slope is relatively high at A. Again, the interest rate, i, in autarky exceeds the world interest rate, i^*, and the domestic country will borrow from abroad when it is opened up to international capital movements. Now, however, the international borrowing has two effects. The new one is that the country responds to the lower interest rate by increasing investment (planting more coconuts): Output takes place at point B, with a greater harvest in period 1 in exchange for a smaller harvest in period 0. The second effect is that, as before, the international borrowing allows the home country to reallocate some of its consumption from period 1 to period 0: Consumption takes place at point C, where consumption is higher than output in period 0 and lower than output in period 1.

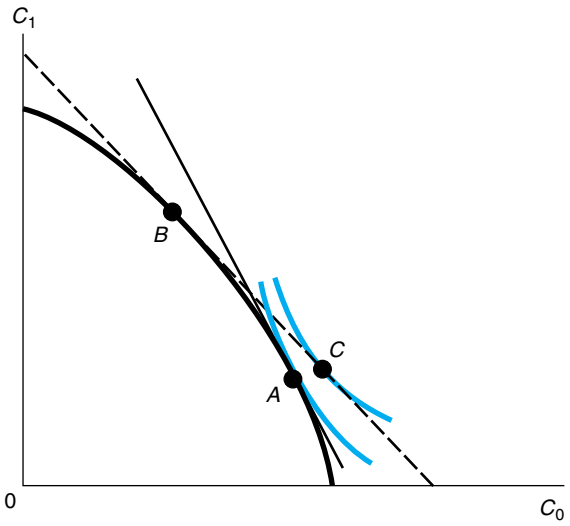
To return to the example of the United States: the net capital inflow, ever since it began in 1982, has kept interest rates lower than they otherwise would be. The capital inflow thereby has both prevented U.S. investment from being crowded out as much as it would have otherwise been and allowed U.S. consumption to be higher than it would have otherwise been.

[29] If the rate of intertemporal substitution for a country like the United States is higher than for other countries, as at point A in the figure, this can be for either of two reasons. First, the high degree of impatience may be inherent in Americans' preferences: Their indifference curves might be steeper than the indifference curves of Japanese would be at the corresponding point in the graph. Second, even if the pattern of indifference curves is the same for all nationalities, if the U.S. economy is growing more rapidly than the Japanese economy, then the autarky point A will be located higher and farther to the left than it would be for the Japanese economy. Because all indifference curves are curved, it would then follow that the indifference curve at A would be steeper in the U.S. case. Either way, the slope of the solid line comes out higher (in absolute value) than the slope of the dotted line that represents the rest of the world.

FIGURE 21.4

Borrowing from Abroad, with Investment

The possibility of physical investment means there is a transformation frontier between output in the two periods. The country can divert resources to future production at *B* and borrow more to finance current consumption at *C*, thereby realizing further welfare gains.



21.6 Summary

This chapter showed how governments' removal of capital controls, the development of new financial instruments, and other forms of liberalization and innovation have all worked to reduce barriers to the international flow of capital. This increase in the degree of international capital mobility makes an enormous difference, not just for those who operate in these markets, but for the entire macroeconomy as well, as the following chapters will show.

CHAPTER PROBLEMS

1. You have acquired an option to buy Swiss francs at a strike price of $.70 per Swiss franc. (At the time you bought the contract, the spot exchange rate was only $.50 per Swiss franc.) In each of the following three cases, would you choose to exercise the option? Answer either "definitely yes," "definitely no," or "maybe yes; maybe no, to wait to see if the spot exchange value of the Swiss franc goes higher."
   - **a.** The current spot exchange rate is $.60 per Swiss franc.
   - **b.** The current spot exchange rate is $.80 per Swiss franc, and the contract is about to expire.
   - **c.** The current spot exchange rate is $.80 per Swiss franc, and the contract still has two months to run.
   - **d.** Would the option be more or less valuable if the Swiss franc is thought to be highly volatile this year?

2. Suppose you are a U.S. exporter expecting to receive a payment of € 100 in 12 months. The one-year interest rate on € deposits is 4 percent per annum. The one-year interest rate on dollar deposits is 6 percent per annum. The present spot exchange rate is $1.20 per €.
   - **a.** What is the one-year forward exchange rate?
   - **b.** Assuming you ultimately need dollars, you have two ways to cover yourself from the exchange rate risk. Describe them and show their equivalence computationally.
   - **c.** Now suppose your claim on € 100 is due in six months. The interest rate on six-month € deposits is 2 percent per annum. The interest rate on six-month dollar deposits is 6 percent per annum. What is the six-month forward exchange rate? (*Hint:* You can't do this one in per annum terms.)
   - **d.** What do a and c imply about "the market's expectations" regarding the future path of the exchange rate?
   - **e.** The Swedish krona (SK) faces a spot exchange rate of 10 SK/€, and obeys the covered interest parity condition as in a. Suppose, however, that investors today discover (with certainty) that the krona will devalue sometime over the next year, to 11 SK/€. Suppose that the U.S. and euro interest rates remain unchanged (because their home countries are large). To what level will investors drive the one-year forward exchange rate? What will that imply for the interest rate on one-year deposits in SK?

SUGGESTIONS FOR FURTHER READING

Bank for International Settlements. *75th Annual Report* (Basel: BIS, June 2005). Yearly review of the global economy, financial markets, and foreign exchange markets.

Edwards, Sebastian. "The Order of Liberalization of the External Sector in Developing Countries," *Essays in International Finance,* 156 (Princeton: Princeton University Press, 1984). An analysis of whether international trade should be liberalized before or after capital markets, and related issues.

Frankel, Jeffrey. "Still the Lingua Franca: The Exaggerated Death of the Dollar," *Foreign Affairs,* 74, 4 (August 1995): 9–16. Is the dollar losing its role as premier international currency?

Mussa, Michael, and Morris Goldstein. "The Integration of World Capital Markets," in *Changing Capital Markets: Implications for Monetary Policy* (Federal Reserve Bank of Kansas City, 1993). Good comprehensive survey of measures and implications of the internationalization of financial markets.

Prasad, Eswar, Kenneth Rogoff, Shang-Jin Wei, and M. Ayhan Kose. "Effects of Financial Globalization on Developing Countries: Some Empirical Evidence," *Occasional Paper No. 220*, Research Department, International Monetary Fund, 2003. The IMF has become less confident of the virtues of high financial integration in emerging markets.

APPENDIX

The Effect of a Budget Deficit Under Intertemporal Optimization

The notion of the twin deficits suggests that an increase in the budget deficit translates into an increase in the current account deficit. But this need not necessarily always be the case, especially if household behavior is derived from intertemporal optimization as in Section 21.5. In the first place, a budget deficit could as a theoretical matter be offset by private saving. In the second place, even if a budget deficit reduces national saving, it is an open empirical question whether it crowds out domestic investment or whether it is instead offset by borrowing from abroad, financing a current account deficit. We consider each of these two questions in turn, under the names "debt neutrality proposition" and "Feldstein-Horioka finding."

The Debt-Neutrality Proposition

This is the place to acknowledge a school of thought associated with the economist Robert Barro. The key proposition, known as Ricardian equivalence, or *debt neutrality,* states that changes in the government budget deficit have no macroeconomic effect on the economy. (This refers to changes in the deficit with government spending held constant, that is, to tax cuts.) The argument runs as follows: A budget deficit implies that the government is accumulating debt. At some point in the future the government will have to raise taxes to service or pay off that debt. If people can see far into the future, and if they intertemporally plan in an optimizing way like the consumers in Figures 21.3 and 21.4, then they will save more today, so that they or their children will have the money to pay the taxes in the future. Their current spending will fall by the same amount as the budget deficit. On net, total national saving will be unchanged. The fiscal expansion will have no effect on total spending. It will not shift the *IS* curve out and thus will have none of the effects on income, the interest rate, the exchange rate, and the current account to be studied throughout Chapter 22.

Many economists, and most other observers as well, find it difficult to believe that households in reality look that far into the future when planning their consumption. A great many theoretical and econometric points have been scored on both sides of this debate. One compelling argument against the debt-neutrality proposition is precisely the massive U.S. experiments of the administrations of Ronald Reagan and George W. Bush. Many of those who supported their tax cuts and countered concerns that it would result in budget deficits predicted that private saving would rise to offset the decline in public saving. What happened, however, was quite the reverse.

The federal budget deficit averaged 2 percent of GDP in the 1970s. It then rose sharply in the 1980s as shown in Table 17.1. Private saving as a share of GDP, far from rising to help finance the budget deficit, actually fell. As a result, the total level of net domestic saving, private plus public together, available to finance additions to the

capital stock was down to about 5 percent of GDP by the late 1980s, compared to about 9 percent, on average, in the 1970s. If it had not been for the large-scale borrowing from abroad, investment would have fallen sharply as a percentage of GDP. Events of the 1980s did not seem to have borne out the predictions of Ricardian equivalence. These events have been repeated in the years since 2001. A large swing in the budget, from record surplus to record deficit, was not offset by an increase in private saving. To the contrary, private saving declined further, thereby exacerbating the decline in national saving.

Feldstein-Horioka and Measures of International Capital Mobility

If we take as an established event a fall in national saving, it is interesting to examine how the shortfall is divided between a net capital inflow—that is, a current-account deficit—and a decline in investment. Alternatively, there is the more positive experiment of an increase in national saving as the result of a cut in government spending, an increase in taxes, or a rise in private saving. To what extent are the funds that are generated retained at home to finance additions to the capital stock, and to what extent do they instead go to reduce the capital inflow from abroad?

This question has been examined in a series of papers by Martin Feldstein and others inspired by him.[30] The name *saving-retention coefficient* will be used to describe the effect that an exogenous change in national saving (whether public, i.e., the budget deficit, or private) equal to 1 percent of GDP has on the country's investment, again as a percentage of GDP. The initial finding was that the coefficient for a cross-section of countries was about 0.9. Changes in national saving were reflected almost one-for-one as changes in investment. Feldstein considered this result surprising, in light of the existing consensus that the degree of international capital mobility was close to perfect. According to his logic, perfect capital mobility implies that arbitrage ensures that the domestic interest rate is tied to the foreign interest rate. Thus a fiscal expansion or other shortfall in national saving should be easily financed by borrowing from abroad, with no increase in the domestic interest rate and consequently no crowding-out of investment. According to this logic, the saving-retention coefficient should have been zero![31]

The direct way to test statistically for capital mobility is to examine international differentials in interest rates to see if arbitrage is able to drive them to zero. How should interest differentials be measured? We will continue to define international capital mobility as the absence of transaction costs, default risk, capital controls, risk of future capital controls, or other barriers to financial integration across political boundaries. Chapter 21 showed that interest rate differentials covered on the forward exchange

[30]Martin Feldstein and Charles Horioka, "Domestic Saving and International Capital Flows," *Economic Journal,* 90 (1980): 314–329.

[31]To compute the statistics correctly, the changes examined in national saving should be exogenous. The estimate of the saving-retention coefficient will not be accurate if national saving and investment rates are highly correlated because both are responding to some common factor. However, the coefficient appears to be high also for exogenous changes in government budgets or in private saving.

market can be used to test for perfect capital mobility in this sense. The covered differential is expressed as

$$i - i^* - fd \tag{21.A.1}$$

where i is the domestic interest rate, i^* is the foreign interest rate, and fd is the forward discount on domestic currency. As we saw in Chapter 21, this measure of the interest differential is indeed very small for most major industrialized countries. For developing countries, which may lack active forward markets, we can test these factors by looking at the sovereign spread that global investors require to lend to the country in dollars. This spread, or country premium, is not very small.

A somewhat broader measure of the international differential is the difference in expected returns on the two countries' bonds, expressed in terms of a common currency but *not* covered for exchange rate risk on the forward exchange market. This is the *uncovered* interest differential,

$$i - i^* - \Delta s^e \tag{21.A.2}$$

where Δs^e is the rate at which investors expect the domestic currency to depreciate against the foreign currency in the future. The uncovered differential (Equation 21.A.2) is equal to the covered differential (Equation 21.A.1) *plus* the exchange risk premium, defined as

$$rp = fd - \Delta s^e. \tag{21.A.3}$$

The risk premium is the extra expected return that investors demand in compensation for holding a currency that they perceive as riskier than others. It can be small if risk is not important (if uncertainty regarding the future exchange rate is not very large or if investors are not very risk averse). In general, however, even if the covered differential, Expression 21.A.1, is zero, the uncovered differential, 21.A.2, will not be zero because of the existence of the risk premium, Expression 21.A.3.[32]

A still broader measure of the international differential in rates of return is the *real* interest differential. The real interest rate, defined as the nominal interest rate adjusted for expected inflation, is the cost of funds on which investment in each country depends. The real interest differential is

$$(i - \Delta p^e) - (i^* - \Delta p^{*e}) \tag{21.A.4}$$

where Δp^e and Δp^{*e} are defined as the domestic and foreign expected inflation rates, respectively. It is equal to the uncovered differential, Expression 21.A.2, *plus* expected real depreciation of the currency, defined as

$$\Delta s^e - (\Delta p^e - \Delta p^{*e}). \tag{21.A.5}$$

If purchasing power parity held, then expected real depreciation would be zero and there would be no difference between Expressions 21.A.4 and 21.A.2. However, as seen in Chapter 19, purchasing power parity does not in reality hold, and expected real

[32]Chapter 28 examines the exchange risk premium at greater length.

depreciation is not always zero. It follows that arbitrage could equalize interest rates across countries when they are expressed in a common currency, not only on a covered basis but even on an uncovered basis, and yet real interest rates will not be equalized.

Even though covered interest differentials have become very small, reflecting low political barriers to the movement of capital across national boundaries, currency variability remains high. Perhaps this is the reason why real interest parity continues to fail, and the saving-retention coefficient, although it seems to have fallen to roughly half, is still well above zero, even for developed countries.