CHAPTER 18

Exchange Rate Determination I: Prices and the Real Exchange Rate

Overview

The nominal exchange rate is the rate at which the currencies of two countries can be exchanged, while the real exchange rate is the ratio of what a specified amount of money can buy in one country compared with what it can buy in another. This chapter focuses on why the real exchange rate is so volatile. We first consider the law of one price, which says that in the absence of trade restrictions the same commodity should have the same price wherever it is sold. We then discuss purchasing power parity (PPP), which says that identical bundles of goods should cost the same in different countries. This implies that the real exchange rate should be constant and equal to one. Next we discuss why the real exchange rate changes and focus on the current and capital accounts of a country. The current account reflects trade in the goods and services of a country, and the capital account reflects the trade in assets of a country. Finally, we review the factors that influence the capital and current accounts, and their impact on the real exchange rate.

18.1 Definitions

BILATERAL AND EFFECTIVE ROLES

Exchange rates are confusing. Pick up any financial paper and you will see various exchange rates quoted. Part of the confusion is that there are many countries and different exchange rates, but there are also spot and forward rates, bilateral and effective exchange rates, and real and nominal rates. In this section we clarify these terms.

We start with **bilateral** exchange rates. Different countries often have different currencies. A bilateral exchange rate is the rate at which you can swap the money of one country for that of another. For instance, if one euro can be swapped for $1 U.S., then the exchange rate is 1:1 or simply 1. If the euro *appreciates*, then it rises in value—it becomes more expensive to buy euros if you are holding dollars. For instance, if it takes $1.10 to buy a euro, then the euro has appreciated by 10%; you need 10% more dollars to buy the same number of euros. By contrast, if the exchange rate falls to 0.90, then you only need 90 cents to buy a euro, which has *devalued* by 10%.

We now need to deal with yet another source of confusion about exchange rates—how should you express the exchange rate? For most currencies, including the U.S. dollar, the exchange rate is written as the amount of domestic currency that buys one unit of foreign currency. In other words, if $1 buys ¥100, the exchange rate is 0.01. However, for some currencies, notably the British pound sterling, the exchange rate is quoted as the amount of foreign currency you can buy with one unit of the domestic currency. In other words, if £1 buys $1.65, the exchange rate is 1.65 as opposed to 1/1.65 = 0.66 (it takes 66 pence to buy $1). To work out whether a currency is appreciating or depreciating, you have to know how the currency is expressed. If it is expressed in terms of how much domestic currency you need to buy one unit of foreign currency, then an appreciation means that the quoted exchange rate gets *smaller*—you need to spend less domestic currency to get one unit of foreign currency. However, expressed British style, if a currency appreciates, then the quoted exchange rate *rises*—you get more foreign currency for one unit of domestic currency.

Bilateral exchange rates are particularly important for foreign trade. For instance, if a German firm sells goods to Canada, then the bilateral euro—Canadian dollar rate is what matters. However, over any particular period, a currency will move in different directions against other currencies. For instance, the euro may rise against the U.S. dollar and the pound but depreciate against the Canadian dollar and the Japanese yen. Has the euro appreciated or depreciated? To answer this question, we need a measure of how the currency has done on average against *all* countries rather than just one other currency. The **effective exchange rate** is a measure of this average performance. However, certain currencies are more important than others. For instance, in assessing the performance of the euro, it is more important to know how the euro has done against the U.S. dollar rather than the Thai baht because Europe trades far more with the United States than with Thailand. We can measure a currency's performance by calculating the *effective exchange rate on a trade-weighted basis*. If a country's trade (the sum of imports and exports) with the United States is ten times more than with Thailand, the dollar will get a weight 10 times higher. Therefore, if the euro appreciates against the dollar by 1% but depreciates by 1% against the Thai baht, while remaining unchanged against all other currencies, the effective exchange rate will rise.

The weights reflect trade in a particular year, and as trading patterns change over time, these weights are revised. Because the effective exchange rate represents an average across a variety of currencies, it has no natural units (what do you get when you cross a dollar with a euro, a yen, and British sterling?). Therefore, we always express the effective exchange rate in an index form, so that in one particular year (usually the year that the trade weights refer to), it has a value of 100. Therefore, if the effective exchange rate appreciates on average by 10% from that date, the index will be 110, whereas if it depreciates, it will be 90.

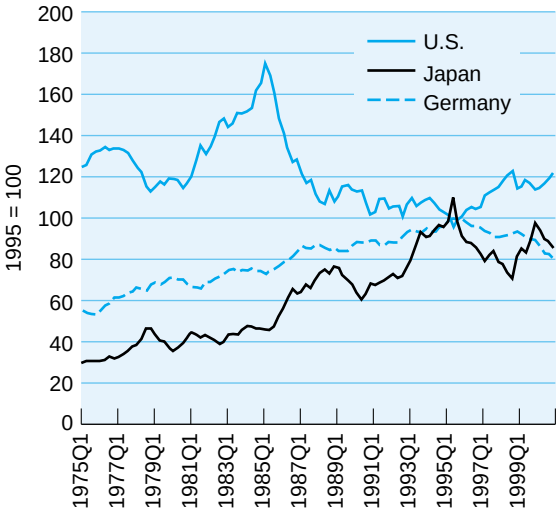

FIGURE 18.1 Effective exchange rates, 1975–2000. Nominal exchange rates are very volatile. *Source*: IMF, *International Financial Statistics* (September 2000).

Figure 18.1 plots the effective exchange rate since 1970 for the United States, Japan, and Germany. The main trend is a substantial appreciation of the yen, except for the last few years, when the Japanese recession has caused the yen to depreciate. The U.S. and German currencies have, on the whole, been less volatile. But between 1979 and 1986, the dollar appreciated by 50% before declining back to its original level.

REAL VERSUS NOMINAL EXCHANGE RATES

Throughout this book we have distinguished between *real* and *nominal* variables—real variables reflect quantities or volume measures, while nominal variables reflect money values. The **nominal exchange rate** is the rate at which you can swap two different currencies—this is the exchange rate we have just been discussing. If at an airport you wish to swap Australian for Canadian dollars, you can do so at the nominal exchange rate. The **real exchange rate** tells you how expensive commodities are in different countries and reflects the competitiveness of a country's exports.

Consider the following simple example. A cup of coffee costs 200 yen in Japan and $1 in the U.S., and the nominal exchange rate is ¥100 to $1. Imagine that you are about to leave New Orleans for a holiday in Tokyo and want to buy a cup of coffee. In New Orleans coffee costs $1, but how many cups of coffee could you buy if you converted your money into yen and went to Japan? The current nominal exchange rate means that $1 can be swapped for ¥100, but in Tokyo ¥100 only buys half a cup of coffee. The real exchange rate is therefore 0.5—one American cup of coffee costs the equivalent of 50% of a cup of coffee in Japan. While the nominal exchange rate tells you how much you can swap money for, the real exchange rate tells you what you can purchase for your money. A New Yorker returning from a vacation who says that Tokyo was expensive is essentially saying that the U.S. dollar–yen real exchange rate is low—goods in the United States are cheap by comparison.

However, the real exchange rate is not just about *one* commodity; it reflects all the goods you purchase in a foreign country. In other words, it is about the overall price

level in a country and not just the cost of a cup of coffee. The real exchange rate is the ratio of what you can buy in one country compared to what your money buys elsewhere. We define it as

real exchange rate = nominal exchange rate × overseas price level/domestic price level

Consider the case of the French–U.S. real exchange rate in which what costs $1 in the United States costs 5Fr in France and the nominal exchange rate is 0.2 (20 cents buys one franc). In this case we have

$$\text{real exchange rate} = \frac{0.2 \times 5}{1} = 1$$

which means that expressed in a common currency, goods cost the same in France as they do in the United States—the real exchange rate is 1, and you can buy exactly the same amount for your money in either country. If, instead, everything that costs $1 in the U.S. costs 10Fr in France, then we have

$$\text{real exchange rate} = \frac{0.2 \times 10}{1} = 2$$

so that you can buy twice as much with your money in the United States as in France.

As with the nominal exchange rate, we can express the real exchange rate either in a bilateral form or as an effective index. Figure 18.2 shows the behavior of the effective real exchange rate for the dollar, the DM (deutsch, or German mark), and the yen.

Comparing Figures 18.1 and 18.2, we can see how closely fluctuations in the real exchange rate track movements in the nominal exchange rate. Explaining this similarity in the behavior of real and nominal exchange rates is a substantial challenge for exchange rate economists. One argument says that real and nominal exchange rates behave so similarly because the real exchange rate is just the nominal exchange rate multiplied by the ratio of overseas to domestic prices. Every minute of the day, the nominal exchange

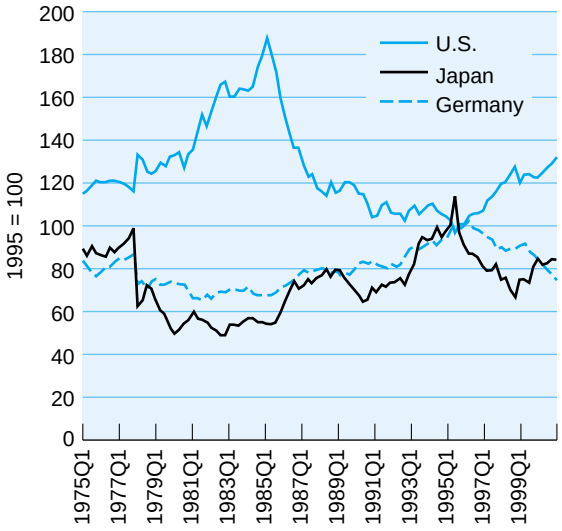

FIGURE 18.2 Real effective exchange rates, 1975–2000. Real exchange rates are also volatile and display a similar pattern to nominal exchange rates. *Source*: IMF, *International Financial Statistics* (September 2000).

rate changes, often substantially, because of currency transactions—quoted exchange rates are volatile. However, prices in a country change only slowly—as we showed in Chapter 15, prices are sticky. If prices hardly change, then movements in the nominal exchange rate will generate fluctuations in real exchange rates. A different argument is that because the factors that determine the real exchange rate are volatile, changes in the real exchange rate drive the substantial volatility in the nominal exchange rate. In the following sections we will try and outline both of these arguments.

18.2. Law of One Price

The **law of one price** states that identical commodities should sell at the same price wherever they are sold. In other words, a television set should cost the same whether it is sold in Madrid or Barcelona. The basis of the law of one price is arbitrage. If the television is cheaper in Barcelona, a firm can buy televisions in Barcelona, sell them in Madrid, and pocket the difference. This would increase the demand for television sets in Barcelona and their supply in Madrid. It would thus push up the price of televisions in Barcelona and lower them in Madrid, and so reduce the price discrepancy between the two cities. Arbitrage will continue until the price of the television is exactly the same in each city—one price prevails. Note that this result of only one price depends on there being no travel costs. If it costs 1000 pesetas to shift a television from Barcelona to Madrid, arbitrage will stop when the price differential is 1000 peseta.

The law of one price refers not just to similar commodities in the same country but also across different economies. Ignoring transportation costs, once prices are expressed in a common currency, identical commodities should sell in different economies at the same price. Let the U.S. dollar be worth 150 pesetas and imagine that the television set retails in Barcelona for 15,000 pesetas. Arbitrage should ensure that in America the television set costs $100 (15,000/150 = 100). In other words, the law of one price says

> dollar price of television in United States = dollar/peseta exchange rate × peseta price of television in Barcelona

Does the law of one price hold? The answer is basically no—except for a few commodities, little evidence supports the law of one price. The exceptions tend to be goods that are similar or homogenous. For instance, Table 18.1 shows the price of gold in vari-

TABLE 18.1 Price of Gold

Country	$ Price One Troy Ounce
Hong Kong (late)	270.65
London (late)	270.10
Paris (afternoon)	270.23
Zurich (late afternoon)	269.95
New York	270.20

Source: December 18, 2000, www.msnbc.com/news/

ous international markets. The gold market is international—you can call the markets in many countries and buy gold for much the same price—the law of one price seems to hold for gold. However, even for gold the law of one price is less convincing than it first appears. The prices in Table 18.1 for the purchase of gold do not include delivery charges. If you live in the Netherlands and wish to receive gold from either the London or New York market you will end up paying different amounts. In other words, gold in New York is a different commodity from gold in London. This rather obvious point is important. The law of one price says that identical commodities should sell for identical prices. But if transport costs matter, then location is an important feature of a commodity. If transport costs are high and the distance between markets is great, the same commodity will sell for different prices in different locations.

HOW BIG ARE TRANSPORT COSTS?

How large are these transport costs and can they account for much of the deviations from the law of one price that we observe? We can measure transport costs by comparing the prices of goods when they leave a country as exports to their cost when they arrive as imports. Customs authorities collect vast amounts of trade data, including two sets of prices: exports f.o.b. (free on board) and imports c.i.f.. (cost of insurance and freight). Exports f.o.b. refers to the value of commodities when they are loaded on board the ship. Imports c.i.f. refers to the value of imports when they arrive, including the cost of insurance and freight. To see the magnitude of these costs, we need only take the case of one commodity, say, aircraft engines traded between two countries, e.g., Japan and Germany. If we compare the value of the aircraft engines exported f.o.b. from Germany to Japan with the value of the aircraft engines imported c.i.f. into Japan from Germany, we can estimate these transport costs. Figure 18.3 shows that the estimated transport costs using this method vary from around 2% for tobacco and transport equipment to around 9% for oil and stone. While Figure 18.3 focuses on a few highly aggregated industries covering all global trade, Figure 18.4 shows the distribution

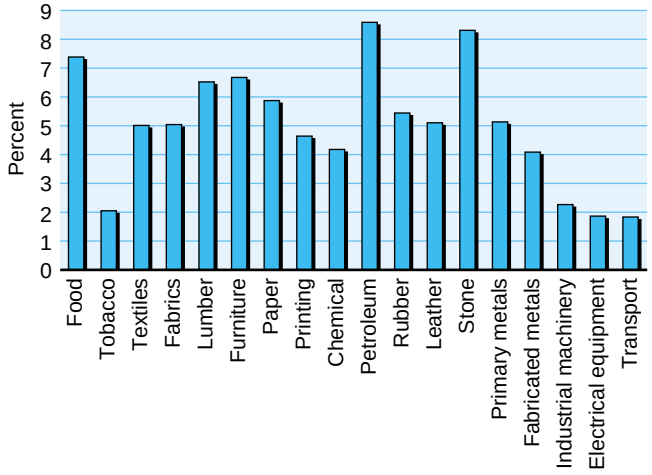

FIGURE 18.3 Estimated transport costs for global trade. The transport costs of tradeable commodities are significant. *Source*: Ravn and Mazzenga, "Frictions in International Trade and Relative Price Movements," London Business School Working Paper (1999).

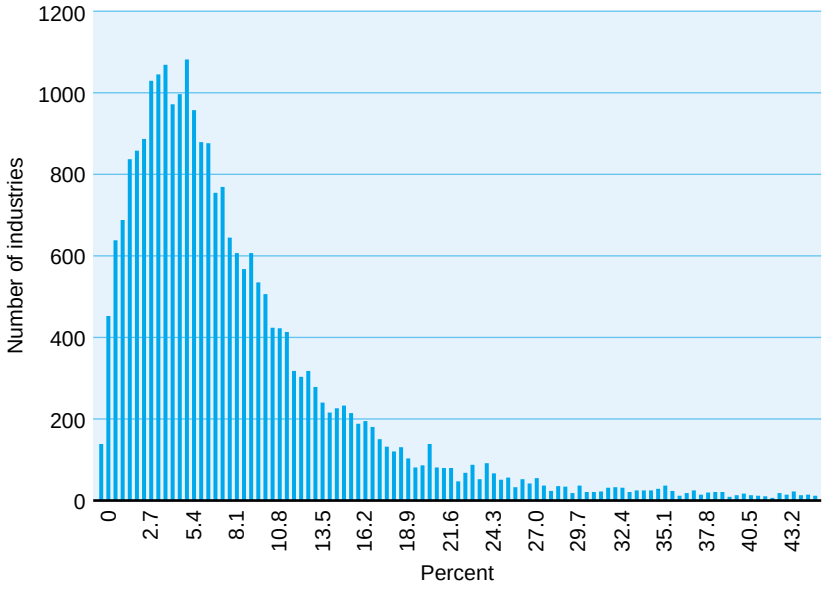

FIGURE 18.4 Estimated transport costs for U.S. manufacturing imports. Some industries have very large transport costs, which partly explains why the law of one price does not hold. *Source*: Ravn and Mazzenga, "Frictions in International Trade and Relative Price Movements, "London Business School Working Paper (1999).

of transport costs for imports to the United States from over 25,000 manufacturing industries.

For most industries transport costs are under 10%. However, for a minority of industries, transport costs are over 25% of value. With transport costs of this magnitude, identical commodities sell for very different prices in different locations.

THE BORDER EFFECT

But transportation costs matter both between and within countries. San Francisco is a long way from Portland, Oregon, so we can expect that the prices of televisions will be different in these cities just as they are between New York and Barcelona. However, close examination suggests that differences in prices between cities in the *same* country for the same commodity are tiny compared to the huge differences in price for the same commodity in *different* countries. This suggests that border effects are another reason why the law of one price fails to hold. The difference in prices for the same commodity increases not just with distance and transport costs but also when the commodity crosses a national border.

To see how important this border effect is, consider Figure 18.5, which measures the volatility or dispersion of prices across cities in the United States and Canada between 1978 and 1994. If prices were exactly the same in each city, volatility would be zero. The higher the measure, the greater the discrepancy between prices in different

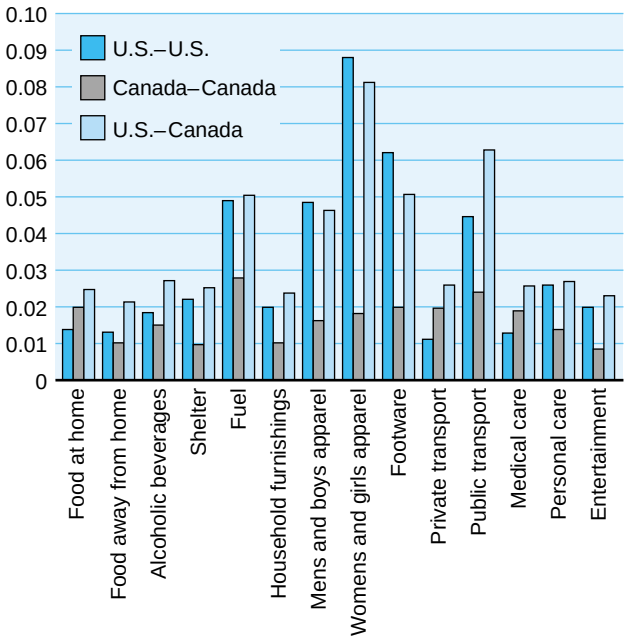

FIGURE 18.5 Price differences between U.S. and Canadian cities. Price differences between cities cannot be explain just by transport costs— differences in prices between U.S. and Canadian cities are greater than differences within countries regardless of distance apart. *Source*: Engel and Rogers , "How Wide Is the Border?" *American Economic Review* (1996) vol. 86, pp. 1112–1125.

cities. Figure 18.5 shows that except for clothing and footwear, the discrepancies between prices in Canadian and U.S. cities are larger than those between U.S. cities or Canadian cities. The data in Figure 18.5 show that crossing a national border substantially increases price differences—it is equivalent to adding an additional 1800 miles of transport costs over and above the actual distance between a U.S. and Canadian city.

Why does the border matter so much? One reason is the tariffs. Table 18.2 shows the average tariffs for several countries. Tariffs prevent arbitrage and are one reason why the law of one price fails to hold. There are other reasons—technical requirements (U.S. and Spanish television sets work on different electrical voltages, cars in the UK and Japan need to be right-hand drive but are left-hand drive in the United States and Continental Europe) or attempts by firms to obtain regional monopoly power (if a European buys a camera in the United States, for example, warranties are only valid in the United States). These factors reduce the role of arbitrage in establishing the law of one price.

More fundamental is that not all commodities are tradeable. If you live in Sydney, how can you take advantage of the cheaper haircuts in Delhi? Most goods have a substantial nontraded component. For instance, consider a pineapple on sale in a supermarket. Its cost contains substantial amounts of nontraded input—the real estate cost of the supermarket, marketing and advertising, transport from wholesale to retailer, and so forth. All of these factors explain why the law of one price does not hold and why prices in different countries can be so different.

But we have not discussed the most important reason why prices differ so much between countries: prices in Spain are quoted in pesetas and prices in the United States in

TABLE 18.2 Average Tariffs

Region	Average Tariff (%)
Developed Countries	3.9
Canada	4.8
European Union	3.6
Japan	1.7
United States	3
Developing Countries	12.3
Economies in Transition	6

Source: Schott, *The Uruguay Round—An Assessment* (Institute for International Economics, 1994)

TABLE 18.3 Relative Price Volatility between and across European Cities

	Variance of Change In Relative Prices		
	1 Month	1 Year	4 Years
Intranational	0.17	0.96	2.83
International	2.76	52.3	159.8
	Variance of Change In Exchange Rates		
International	2.62	53.1	159

Source: Engel and Rogers, "Deviations from the Law of One Price: Sources and Welfare Costs" University of Washington mimeo 2000.

dollars. The peseta–dollar exchange rate changes daily, but the price of television sets in Barcelona and New York changes only occasionally. Therefore, the same commodity is not consistently sold for the same price (expressed in one currency) around the world. This combination of sticky retail prices and volatile nominal exchange rates not only helps explain why prices differ across countries, but also why the relative price of a commodity in different countries is so volatile.

Table 18.3, which focuses on 65 European cities between 1981 and 1997, shows evidence for this volatility for particular commodities (e.g., the ratio of Munich car prices to Paris car prices) both for cities within a country (*intranational*) and for cities in different countries (*international*) for one month, one year, and four years.

Table 18.3 shows that relative prices *between different* countries are far more volatile (by around 20 to 50 times) than relative prices *within* a country. The last row of the table shows why—the volatility in relative prices between countries is almost exactly the same as the volatility in exchange rates. What does this mean?

The law of one price says that an identical commodity should be priced the same in the United States and Spain. But this implies that *any* changes in the dollar–peseta exchange rate should also change U.S. dollar or Spanish peseta prices. Consider a television set that costs 15,000 pesetas in Spain and assume that there are 150 pesetas to the dollar. The law of one price says that the television should retail for $100 in the United States. If instead the exchange rate is 100 pesetas to the dollar, the U.S. price should be $150. But what happens when the currency changes, but the U.S. price remains $100? At the new exchange rate of 100 pesetas to the dollar, the cost of the television in the United States translates into 10,000 pesetas—much cheaper than the price in Spain. The law of one price fails to hold. In this case, the fall of a third in the exchange rate brings about a fall of a third in the relative price of the U.S. television set. The volatility in the exchange rate directly affects the volatility of relative prices across countries. Therefore, the main reason that the law of one price fails to hold is that while prices tend to be sticky in each country, nominal exchange rates tend to be volatile.

PRICING TO MARKET

Let's consider this result in more detail. Consider the case of a Spanish television manufacturer who sells to the United States. When the exchange rate is 150 pesetas to the dollar, its television set retails at $100. However, when the exchange rate goes to 100 pesetas, the firm should charge $150 to preserve the same peseta price. But this is a huge increase in price, which will undermine the competitiveness of Spanish products. Therefore, the Spanish producer may keep the U.S. retail price at $100 and sell the product for the equivalent of 10000 pesetas in the United States but 15,000 in Spain. The Spanish producer is **pricing to market**—the price is set in dollars, taking into consideration U.S. circumstances rather than the domestic costs of production and the domestic selling price of the Spanish producer. Transport costs and tariffs mean that the Spanish firm can charge a different price for its product in New York and Barcelona, although if the exchange rate changes too much, the gap between the U.S. and Spanish price may get so wide that arbitrage occurs.

With pricing to market, the Spanish producer incurs production costs in pesetas but sets the price in dollars. Fluctuations in the exchange rate therefore do not change the dollar price at which Spanish televisions are sold. However, they do affect the peseta equivalent value that these sales raise. Therefore, with pricing to market, the Spanish firm's profit margin varies with changes in the exchange rate. This is why exchange rate fluctuations matter to exporters—a low exchange rate and a pricing to market strategy mean high profit margins, but when the exchange rate is high, the firm may even lose money if it keeps its foreign currency–denominated export prices fixed.

Pricing to market also opens up another issue—exchange rate pass through. When the exchange rate depreciates, imports become more expensive when converted into domestic prices. The 15,000 peseta television rises in retail value from $100 to $150 if the law of one price holds. Therefore, a depreciating exchange rate may lead to higher import prices and thus put upward pressure on wages and inflation. Central banks are always concerned about this "pass-through" effect on inflation. However, if pricing to market occurs, then exchange rate changes need not lead to higher inflation—if the Spanish producer is pricing to the U.S. market, it charges $100 no matter what happens to the exchange rate.

The precise amount of pass-through obviously depends on different countries and different industries. If no U.S. television producers rival the Spanish firm, then pass-through of exchange rate changes will be higher, and dollar prices will rise. But more competitive industries may have no pass through. Studies suggest that pass-through is never complete. For instance, one study finds that only around 50% of exchange rate volatility is passed through in changed prices of imports in the U.S.[1] For Germany, the estimate is 60% pass-through; for Japan, 70%. For Canada and Belgium, smaller economies and smaller markets, the pass-through is about 90%.

[1]Kreinin, "The Effect of Exchange Rate Changes on the Prices and Volume of Foreign Trade," *International Monetary Fund Staff Papers* (July 1977) vol.24 no. 2., pp. 297–329.

18.3. Purchasing Power Parity

The law of one price is a crucial part of our first theory of real exchange rate determination: **purchasing power parity** (PPP). The law of one price refers to particular commodities. PPP applies the law of one price to *all* commodities—whether they are tradeables or not. Imagine going shopping in Germany and buying commodities that cost DM100. If in Japan the same purchases cost ¥5000, then according to PPP, the yen–DM exchange rate should be 5000/100 = 50. At this exchange rate, the yen price of the shopping equals the deutsche mark cost in Germany. Therefore PPP says

PPP nominal exchange rate = Japanese price / German price

If the German price increases to DM110 and the Japanese cost to ¥6000, then PPP implies that the exchange rate should adjust to 54.54 (=6000/110). It is worth going back to our definition of the real exchange rate to grasp the implications of PPP. We have

real ¥-DM exchange rate = nominal ¥-DM exchange rate × German prices / Japanese prices

But according to PPP, the nominal ¥-DM exchange rate equals Japanese prices divided by German prices, and putting this into our definition of the real exchange rate results in the value 1—things cost the same in each country. In other words, PPP implies that all countries are equally competitive, that commodity baskets cost the same the world over, and that the real exchange rate is forever equal to 1.

PPP further implies that because

PPP nominal exchange rate = Japanese price / German price

then

changes in ¥-DM exchange rate = Japanese inflation—German inflation

In other words, PPP implies that currencies depreciate if they have higher inflation and appreciate if they have lower inflation. We showed above that when the shopping cost is DM100 in Germany and ¥5000 in Japan, PPP implies an exchange rate of 50. If German inflation is 10%, so that costs increase to DM110, but Japanese inflation is 20%, so the price rises to ¥6000, PPP implies an exchange rate of 54.54.[2] This is an appreciation in the deutsche mark of around 10%—or the difference between German and Japanese inflation.

How well does PPP agree with historical evidence? We have already shown evidence that suggests that PPP will perform poorly—we saw that the real exchange rate is volatile and that the law of one price (the basis for PPP) holds for few commodities. However, PPP does have some successes—in particular, PPP appears to be a useful model for explaining long-run data.

[2]Although Japanese inflation is 10% higher than German inflation, the exchange rate does not depreicate by exactly 10% but by the factor (1.10/1.20)—this is approximately 10%.

We can see the relative successes and failures of PPP in Figure 18.6, which compares several countries' exchange rates and inflation relative to the United States over various time horizons. If PPP holds, the relationship should be one for one—for every 1% higher inflation a country has compared to the United States, its exchange rate should devalue by 1% against the dollar. In Figure 18.6*a*, which shows inflation and exchange rate depreciations for the last quarter of 2000, we see no evidence in favor of PPP. Over this period exchange rate fluctuations appeared to have nothing to do with inflation differences. Figure 18.6*b*, which looks at data for the whole of 2000, tells a similar story. In Figure 18.6*c*, which shows changes in the exchange rate over 1995–2000, the negative correlation of Figures 18.6*a* and 18.6*b* disappears, but no strong relationship between inflation and changes in the exchange rate emerges. However, Figure 18.6*d*, which shows averages over the last 20 years, finally supports PPP. Over long periods the currency of high inflation countries does seem to depreciate.

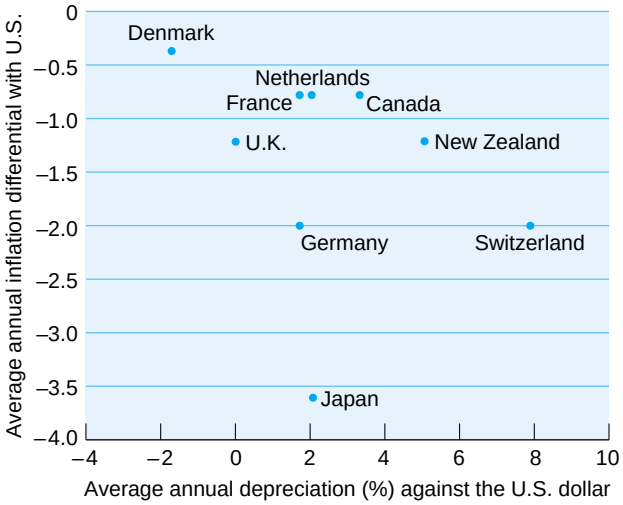

FIGURE 18.6a Quarterly change in exchange rates and inflation, 2000q4. *Source*: IMF, *International Financial Statistics* (2000).

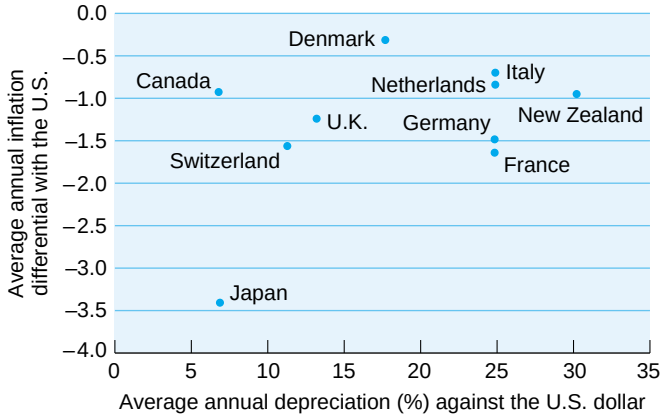

FIGURE 18.6b Annual change in exchange rates and inflation, 1999q4–2000q4. *Source*: IMF, *International Financial Statistics* (2000).

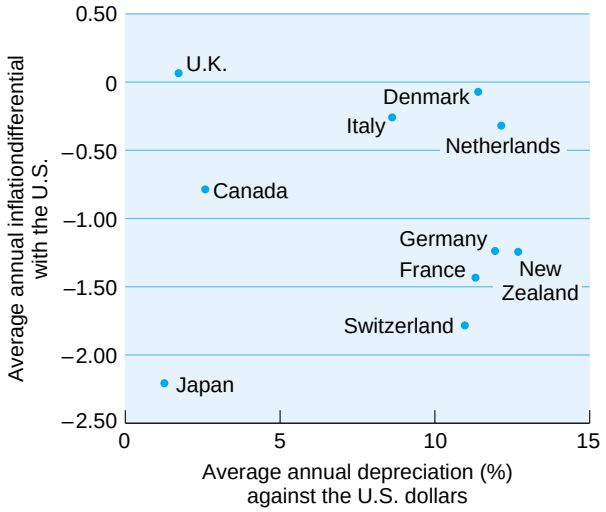

FIGURE 18.6c Average inflation differential and depreciation, 1995q4–2000q4. *Source*: IMF, *International Financial Statistics* (2000).

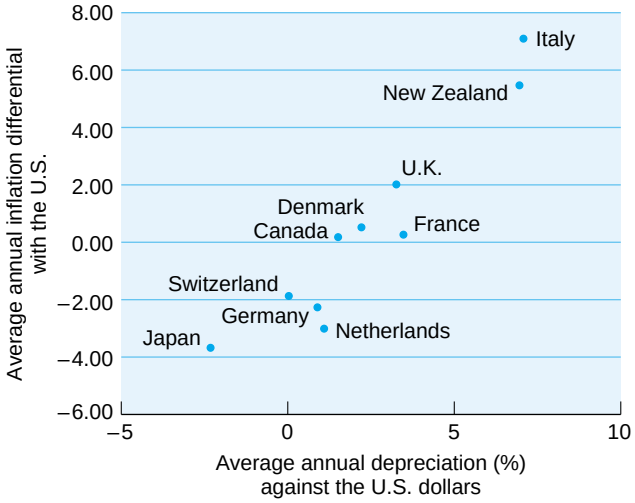

FIGURE 18.6d Average inflation differential and depreciation, 1980q4–2000q4. Over short periods of time PPP is a poor explanation of exchange rates, but over 20-year periods it performs extremely well. *Source*: IMF, *International Financial Statistics* (2000).

Figures 18.7*a* and 18.7*b*, which plot the real exchange rate between the UK and the United States from 1791 and for the UK and France since 1805 offer further support for the long-run validity of PPP. Figure 18.7 supports the weakest implications of PPP—there is some average value to which the real exchange rate eventually returns (the zero line). The exchange rate may not return to this long-run average value for decades, but eventually it does—a country does not stay forever overpriced. However, the correction in the real exchange rate overvaluation is not immediate, and before the real exchange rate declines, it may rise further, making the country seem even more expensive. The forces that bring about equality of prices are weak and take a long time to work.

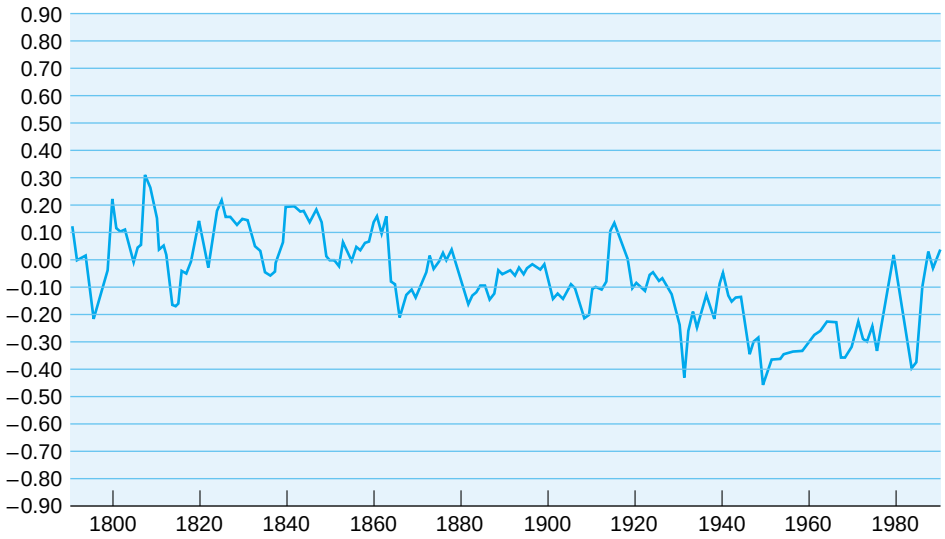

FIGURE 18.7a Sterling/dollar real exchange rate, 1791–1990. *Source*: Lothian and Taylor, "Real Exchange Rate Behavior: The Recent Float from the Perspective of the Past Two Centuries," *Journal of Political Economy* (1996) vol. 104, pp. 488–509.

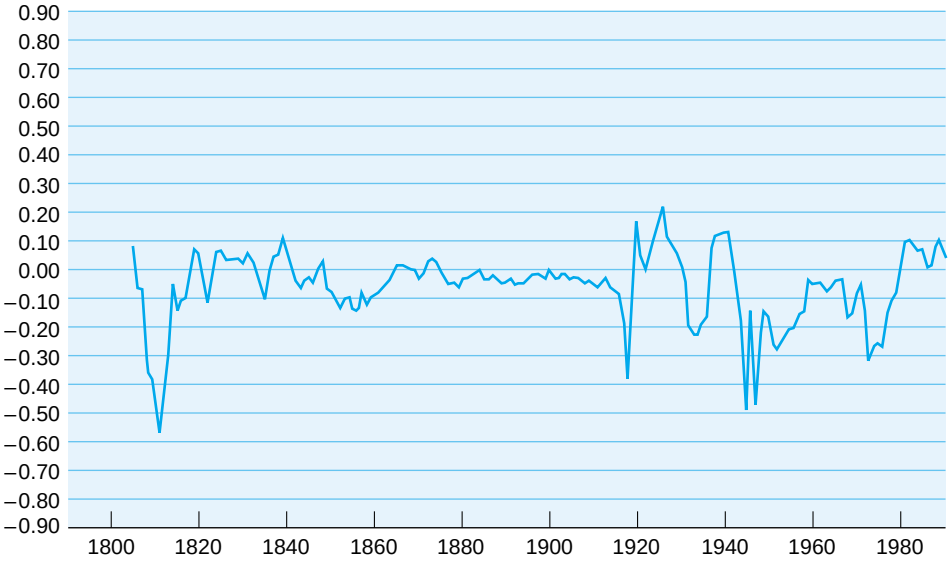

FIGURE 18.7b Sterling-franc real exchange rate, 1805–1990. PPP holds in the very long run, but real exchange rates return to their PPP values very slowly. *Source*: Lothian and Taylor, "Real Exchange Rate Behavior: The Recent Float from the Perspective of the Past Two Centuries," *Journal of Political Economy* vol. 104, pp. 488–509.

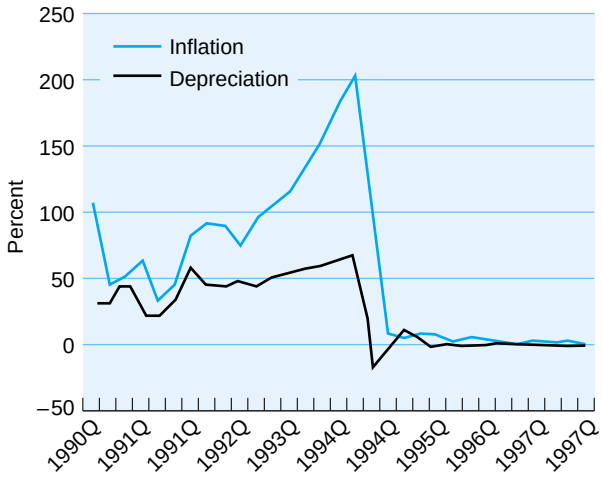

FIGURE 18.8 Quarterly inflation and depreciation in Brazil, 1990–97. PPP is a better short-run explanation of exchange rates for high inflation countries. *Source*: IMF, *International Financial Statistics* (September 2000).

Therefore, we should not discard PPP completely—over decades depreciations of nominal currencies are related to inflation differentials. However, PPP does not offer a reliable guide to the short-run volatility of real and nominal exchange rates.

PPP is a more reliable guide to short-term exchange rate fluctuations for countries that have very high inflation rates. Figure 18.8, where we plot the quarterly percentage Brazilian inflation rate and the quarterly depreciation of the currency against the U.S. dollar, shows this. Although the link is not exact, inflation and depreciation are much more closely connected in the short run for hyperinflation countries than for the OECD countries in Figure 18.6.

THE BIG MAC INDEX

The *Economist* magazine popularizes a version of PPP with its Big Mac index. PPP posits that identical commodities should sell for the same price wherever they are sold. The *Economist* therefore uses the domestic price of Big Macs to estimate PPP exchange rates. The Big Mac PPP estimate is the ratio of the price of Big Macs in each country. For instance, if a Big Mac costs $1 in the U.S. and 10Fr in France, the implied Big Mac exchange rate is 10Fr:$1. If the actual exchange rate is 7Fr:$1, then the French currency is overvalued—French Big Macs are more expensive than American ones.

Table 18.4 shows actual exchange rates and the Big Mac PPP exchange rates in April 2000 and the implied over- or undervaluation. If we use the Big Mac rates as a guide to PPP, the currencies in China, Indonesia, and Hungary are undervalued. The Danish krona and the British pound were overvalued and restoration of PPP would involve their depreciation. Unfortunately a trading strategy based on the Big Mac index is unlikely to make you rich. As we have stressed, PPP is a long-run influence on exchange rates, and PPP rates exert only a weak attraction for exchange rates. In the short term, an undervalued currency can become even more undervalued according to PPP measures, and it may take decades to return to its PPP level. While the

TABLE 18.4 Big Mac Exchange Rates

	BigMac Exchange Rate	Actual Exchange Rate	Over(+)/Under(−) Valuation
Argentina	1.00	1.00	0
Australia	1.03	1.68	−38
Brazil	1.18	1.79	−34
Canada	1.14	1.47	−23
Chile	502	514	−2
China	3.87	8.28	−53
Czech Republic	21.7	39.1	−45
Denmark	9.28	7.62	32
France	7.37	7.07	4
Germany	1.99	2.11	−6
Hong Kong	4.06	7.79	−48
Hungary	135	279	−52
Indonesia	5777	7945	−27
Japan	117	106	11
Malaysia	1.80	3.80	−53
Russia	15.7	28.5	−45
Sweden	9.56	8.84	8
United Kingdom	1.32	1.58	20

Source: *The Economist* (April 27, 2000)

currency becomes more undervalued, the Big Mac inspired trade will be losing money.

The Big Mac index has other problems over and above failures of PPP. First, the Big Mac has more to do with the law of one price than with PPP—it refers to one commodity rather than a basket of goods. Second, the Big Mac may be identical across countries, but it is not tradeable—a freshly cooked Big Mac in London is a different commodity from a reheated one imported from China. Third, Big Macs are not identical—a Big Mac consumed in Tokyo reflects the cost of rent for a retail outlet in Tokyo plus various local labor and indirect taxes. This makes it a different commodity from a Big Mac sold in Manila. Finally, transport costs are high relative to the price of a Big Mac. For this reason the Russian price of a Big Mac may always be lower than that of one in Copenhagen without affecting the rouble–krona exchange rate.

WHY DO RICH COUNTRIES HAVE HIGHER PRICES?

One systematic deviation from PPP is that prices tend to be higher in industrial economies than in emerging nations—as Figure 18.9 shows. This is known as the **Balassa-Samuelson effect**. The Balassa-Samuelson explanation assumes that productivity

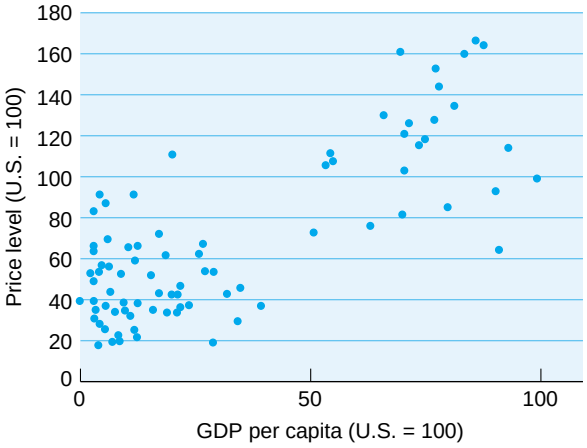

FIGURE 18.9 Wealthy countries have high prices. Prices in OECD countries are higher than in the developing world. *Source*: Summers and Heston dataset, *http://cansim.chass.utoronto.ca:5680/pwt/*

growth in the service sector (which is substantially nontradeable) is less high than in the tradeable sector. In other words, it is harder to boost the productivity of hairdressers than manufacturing firms. How does this explain price differences across countries? With rising productivity in the tradeable sector, producer real wages (wages divided by output prices) will be increasing in these industries (see Chapter 8). If the nontradeable sector is to continue to hire workers, then wages in the nontradeable sector will also have to rise in line with those in the tradeable sector. However, the nontradeable sector does not have the productivity improvements that boost wages in the tradeable sector, so the only way to finance higher wages is to charge a higher price for services. This can be done because there is no threat of foreign competition. The result is higher prices (originating from the nontradeable sector) in countries with high levels of productivity in the tradeable sector.

Figure 18.9, which shows, for a selection of OECD countries, the relationship between nontradeable inflation and the gap between productivity in the tradeable and nontradeable sector, offers further support for the Balassa-Samuelson effect. According to the Balassa-Samuelson theory, countries with higher productivity in tradeable sectors will have to have higher nontradeable wages and thus higher nontradeable inflation—this is exactly what Figure 18.10 shows.

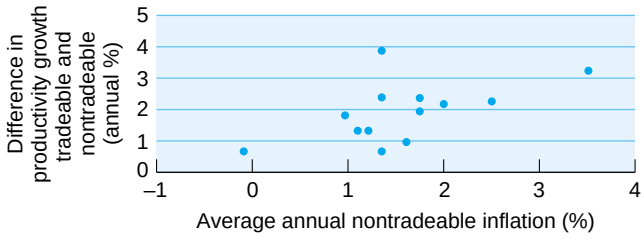

FIGURE 18.10 The Balassa-Samuelson effect, OECD, 1960–1998. High productivity in the tradeable sector leads to high inflation in the nontradeable sector as wages rise across the economy. *Source*: Authors' calculations from OECD data.

18.4. Current and Capital Accounts

The previous sections have shown that real exchange rates are too volatile for PPP to explain. In the rest of this chapter, we examine factors that lead the real exchange rate to change. Before we can do that, we have to introduce important concepts. In particular we have to discuss the concepts of *capital* and *current* accounts. The capital and current accounts are part of a country's balance of payments. The *balance of payments* is a statistical record, covering a particular time, of a country's economic transactions with the rest of the world. The **current account** records the net transactions in goods and services, while the **capital account** records transactions in assets between countries. While the accounting definitions can be confusing, one thing should be made clear: the current and capital accounts should sum to zero. In other words, if the current account is in surplus (deficit), the capital account should be in deficit (surplus) by an equivalent amount. Why? If a country is running a current account surplus, it is selling more goods and services overseas than it is purchasing and thus has a surplus of foreign currency. This foreign currency has to go somewhere, and the financial system will recycle it to buy overseas assets. Buying overseas assets leads to a capital account deficit because foreign currency is used to finance the purchases. That is why the current and capital accounts must sum to zero.

THE CURRENT ACCOUNT

The current account measures the net flow of goods and services between a country and the rest of the world. It consists of records of four main types of trade: in goods, services, income, and transfers. Let's start with trade in goods. Countries both export

TABLE 18.5 Capital and Current Account Flows, 1997 ($bn)

	United States	United Kingdom	Thailand
Balance Goods, Services, and Income	−115.53	17.85	−3.5
Net Current Transfers	−39.85	−7.81	0.48
Current Account	−155.35	10.04	−3.02
Capital Account	0.16	1.37	–
Net Direct Investment	−28.39	−26.5	3.35
Net Portfolio Investment	295.53	−38.5	4.3
Net Other Investment	−11.2	50.4	−23.5
Financial Account	255.94	−14.6	−15.8
Net Errors and Omissions	−99.71	−0.74	0.58
Overall Balance	1.01	−3.9	−18.25
Reserve Assets	−1.01	3.9	18.25

Source: IMF, *International Financial Statistics*, (March 1999).

and import goods (automobiles, wheat, oil, etc). For instance, in 1997 (see Table 18.5) the UK exported to the rest of the world $281.3 billion worth of goods and imported $300.8 billion. Therefore, its net exports of goods were −$19.5 billion—what economists term a *balance of trade* deficit. However, trade in services is also important. Services account for a broad collection of activities—such as transport services, telecommunications, legal and financial services, royalties—and in 1997, UK exports of services were $93.8 billion against imports of $74.3 billion providing a surplus on services of $19.5 billion. Therefore, the surplus on services offset the deficit on goods, so that the UK had a balance on its trade in goods and services of zero (subject to rounding error).

There are two other aspects of the current account: income and transfers. As we shall see when we study the capital account, the UK own assets overseas, and foreign companies own assets in the UK. For instance, UK pension funds and insurance companies have invested in the United States and Japanese stock markets, and firms such as Nissan and Merrill Lynch own factories and offices in the UK. The UK funds invested overseas earn interest and dividends that are paid to UK investors. Similarly, Nissan, UK sends profits and dividends back to Nissan, Japan. The current account records these income flows (but *not* the investment flows). We can think of the money invested in Nissan, UK as Nissan lending machinery to the UK—in other words, providing productive services. In return for these services, a dividend is paid, but it represents payment for an economic service provided (the provision of machinery). The current account represents a measure of all the transactions in goods and services between a country and the rest of the world and so should contain this income measure. However, as we shall see below, when Nissan makes its investment in the UK, it is acquiring an asset and not providing a productive service. So that investment will appear in the capital account; any future income flows arising from the transaction will feature in the current account. In 1997 the UK received $176.6 billion in income on its current account and paid out $158.7 billion leaving a credit of $17.9 billion. Therefore, the UK's balance of payments on goods, services, and income was $17.9 billion.

The current account has one final component, which reflects transfer payments. Transfer payments occur when no asset or good is provided in return for money paid. For instance, if the UK donates resources to Venezuela for flood relief, this is a transfer payment because either goods or money flows in one direction only. In 1997 the UK paid out $7.8 billion in net transfers. If we add this to the balance on goods, services, and income, we have the current account—for the UK in 1997, a $10 billion surplus. The UK earned $10 billion more from its exports of goods and services, and from income received, than it paid out on total imports, income on foreign assets based in the UK, and transfers.

current account = balance of trade (exports goods—imports goods)
+ balance on services (exports services—imports services)
+ investment income and dividends
+ Net Transfers

CAPITAL ACCOUNT

The current account records transactions in goods and services between a country and the rest of the world. The capital account records transactions in assets—both financial and nonfinancial. Strictly speaking, we should refer to the *capital and financial account*, where the *capital account* refers to capital transfers (such as debt forgiveness) as well as the acquisition or disposal of nonproduced, nonfinancial assets (like copyright ownership and patents), and the *financial account* refers to the acquisition and disposal of financial assets.[3] However, this distinction is rare, and we normally refer to the whole of the capital and financial account as just the *capital account*. We shall follow this practice throughout this chapter, except in the next few paragraphs, where we distinguish between the capital and financial accounts.

Table 18.5 shows that in 1997 the United States had a small surplus on its capital account of $0.16 billion. A surplus means that the United States was a net recipient of funds, which could have arisen either from a government transfer or more likely the United States selling a nonproduced, nonfinancial asset, i.e., royalty rights on a record label or movie or the sale of a chemical patent. However, the size of the financial account dominates asset flows. The following gives the financial account:

> financial account = net direct investment + net portfolio flows + net other investment + change in reserve assets

Each of the four terms on the right-hand side reflects how the United States is transacting with the rest of the world over various asset classes. *Direct investment* is when an individual or firm in one country acquires a lasting interest in an enterprise resident in another economy. Direct investment implies a long-term relationship between the investor and the recipient firm in which the investor has significant influence over the enterprise.[4] For instance, if Coca-Cola, U.S. opens a bottling factory in the Philippines, it would count as U.S. foreign direct investment abroad. If Toshiba opens a production factory in California, it would count as Japanese foreign direct investment abroad. Here we need to be careful about what signs we use when we measure the financial account. When Coca-Cola opens its Philippines bottling plant, it is in effect purchasing an overseas asset. Therefore, U.S. investment overseas counts as a negative for the U.S. financial account. Just as the United States purchasing cars made in the Philippines would count as a current account import, so the U.S. purchase of a bottling factory in the Philippines counts as a capital account import. Table 18.5 shows that in 1997, the United States had a deficit of $28.4 billion on direct investment (consisting of $121.84 billion of foreign investment compared to investment in the United States by foreign firms of $93.45 billion).

The portfolio assets section of the financial account refers to various assets, but mainly equities and bonds. In 1997 for the United States, this part of the financial ac-

[3]For those of you who wish to speak strictly on balance of payments accounting issues there is no better place to learn than the IMF's *Balance of Payments Textbook*, which is updated occasionally. This offers a complete overview of the structure of balance of payments accounting as well as detailed definitions of various terms.

[4]The investor does not, however, have to have majority control—a 10% stake or more is normally enough. See IMF, *Balance of Payments Textbook*, p.107.

count saw a surplus of $295.5 billion—the United States sold this many more equities and bonds than it bought from overseas. This is an unusually high financial inflow and reflects the extraordinary events of 1997 (we discuss the Asian crisis in detail in Chapter 19). As Table 18.5 shows, this large inflow of money into U.S. bonds and equities occurred at the same time as outflows from the Russian and Thai markets, as U.S. investors fled from volatile emerging market funds, and Thai and Russian investors sought to invest in dollar assets before their own currencies depreciated.

Another part of the financial account is investment in other assets. As its name suggests, it reflects a range of different transactions (such as trade credit), but its most important category is bank deposits and bank loans. When a U.S. investor places funds on deposit in a London account, the funds will appear in the "other investment" category (with a negative sign for the United States—the United States is acquiring an asset in the UK). When a Korean firm borrows from a New York–based bank, the loan will also show up in this category (as a positive term—the Korean economy has increased its liabilities to the rest of the world). In 1997 the United States had a deficit of $11.2 billion on this other investment category.

The final part of the financial account is the *reserve asset* category. This reflects mainly the government's financial interactions with the rest of the world, and in particular, with other governments. More specifically, reserve assets are the means governments use to avoid financing problems and balance of payments problems. But what do we mean by balance of payments problems?

Consider the case of Thailand in 1997 (see Table 18.5), which had a current account deficit of $3.02 billion. This means that considering trade in goods and services, and allowing for income and transfers, the Thai economy purchased $3.02 billion more commodities from abroad than it sold to foreign countries. Somehow it had to finance this $3 billion deficit (find $3 billion of foreign currency) and this is reflected in the capital and financial account (remember that the capital and current accounts have to sum to zero). However, the financial account shows a deficit of $15.8 billion—in 1997 domestic and foreign investors withdrew their money from Thai banks and financial markets and sent it to the United States and elsewhere. Far from providing the necessary foreign currency to settle current account flows, the financial account created the need for an additional $15.8 billion of foreign currency. The Thai economy had to find $18.25 billion of foreign currency to fund the financial account.[5] This is what we call a **balance of payments problem**—the capital and financial account are not providing the foreign currency needed to fund the current account deficit.

Governments have various means to try to solve such a balance of payments problem. The central bank can sell any foreign currency reserves it possesses. In 1997 Thailand had a desperate shortage of foreign currency, and as a result, the domestic currency was falling. If the Thai central bank had stocks of dollars and yen, it could intervene in the market and sell them (thus providing the desired foreign currency) and buy baht to try to increase the value of the baht. However, if the central bank has sold all its reserves, then it has to finance the balance of payments crisis in other ways. This

[5]Note that the current account and financial account deficit do not add to the total financing number we quote. This is because of a term called "Errors and omissions"—more of which later.

is where the International Monetary Fund (IMF) and other international institutions play a role. By transferring funds to Thailand and arranging exceptional financing (i.e., Thailand can borrow foreign currency from other central banks), they can use reserve assets to finance the balance of payments crisis. In fact in 1997, the official financing of $18.25 billion in Thailand was made up in part by $9.9 billion of reserve sales by the Thai central bank, a $2.4 billion loan from the IMF, and exceptional financing of $5.9 billion (mainly loans from other central banks).

The financial account is the sum of all these four categories (direct investment, portfolio investment, other investment, and reserve changes in assets). For the United States in 1997 the financial account was

$28.4bn (net direct investment) + $295.5 bn (net portfolio investment)

− $11.2bn (net other investment)

− $1.01bn (change in reserve assets)

= a surplus of $254.9bn

Add to this the capital account surplus of $0.16 billion and the United States was the net recipient of just over $255 billion in 1997 through its capital and financial transactions.

However, in 1997 the U.S. current account deficit was $155.4 billion. In other words, the U.S. economy only required an inflow of this much to finance its current account deficit but instead took in $255 billion—around $100 billion too much. This brings us to the last term in our exhaustive discussion of capital and current accounts: *errors and omissions*. Logging all the financial transactions between a country and the rest of the world is a Herculean task. First, some transactions just do not want to be registered—money laundering— so these transactions will be excluded from the balance of payments. Second, even legitimate transactions will not always come to the attention of statisticians. For these reasons, the capital and financial account will not always exactly offset the current accounts, and the size of the discrepancy is a measure of the magnitude of the errors and omissions made in the calculations. Thus for the United States in 1997, the errors and omissions are calculated as an enormous $99.7 billion—around two-thirds of the current account itself. By definition these errors and omissions are unmeasured—they are recorded as $99.7 billion only because that is the value that ensures that the current and capital accounts offset each other.

18.5 Who is Rich and Who is Poor?

The capital account records disposals and acquisitions of assets within a particular period, it is therefore a flow concept. If a country is running a capital account deficit (buying overseas assets every year), then its *stock* of overseas assets is rising. Further, if this stock of wealth is invested in assets that earn a positive rate of return, then the wealth is increasing *even if there is no further capital account deficits/overseas investment.* The net *international investment position* (IIP) measures this stock of external wealth. If this is a positive number, then a country has more foreign assets than it does liabilities; if it is negative, then the country owes the rest of the world money.

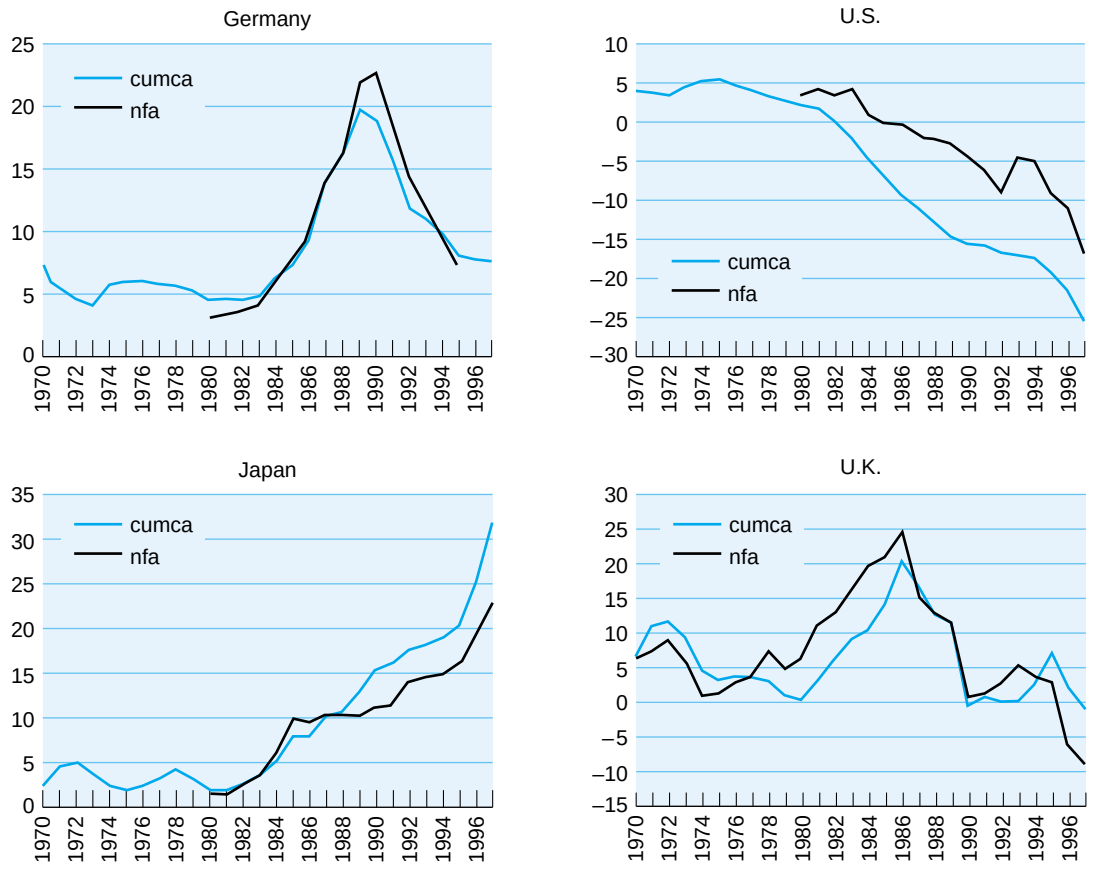

FIGURE 18.11 Net foreign assets (% GDP). Germany and Japan are important global creditors; the United States is a debtor. *Source*: Lane and Milessi-Ferretti, "The External Wealth of Nations", *CEPR* Discussion Paper (2000).

Figure 18.11 shows the net IIP (expressed as a percentage of GDP) for the United States, Japan, Germany, and the UK between 1970 and 1997. Throughout this period Germany and Japan had net overseas assets, while the United States and the UK have switched from being creditor to debtor nations. The slow deterioration of the U.S. position from a positive stock of around 10% of GDP to a net debt of 15% reflects the years of persistent current account deficits. Capital account surpluses have to offset current account deficits, which means selling U.S. assets or overseas investors gaining claims over U.S. assets, hence the deterioration in the U.S. IIP. By contrast, the Japanese graph shows a continual increase in overseas assets from a stock of around 3% of GDP in 1970 to over 30% by 1997. The ability of the Japanese economy to generate current account surpluses means that Japan continually had capital account deficits. Capital account deficits mean that a country is buying more assets overseas than it is selling domestic assets to foreign investors. As a result, its stock of foreign wealth rises. Until 1989 Germany experienced a similar pattern of rising foreign assets caused by several

years of current account surpluses. However, German unification transformed the German current account, and Germany began to sell its overseas assets to finance its reunification program. As a result the current account moved into deficit, and net foreign assets declined.

Does it matter if a country is a net creditor or debtor? As so often in economics, the answer is that it depends on the circumstances. For instance, if a country is starting from a low level of capital, then our analysis in Chapters 4 though 6 suggests that investors could earn a high return from investing in that country. As a result, the country will borrow from overseas, and as long as the money is invested appropriately, the country's economy will grow fast, which will allow the loans to be repaid. Therefore, sustained periods of negative net foreign assets may be optimal when there are exceptional domestic investment opportunities. However, if a country is running a current account deficit because of high consumption (rather than high investment), then selling off its foreign assets is a cause of more concern because eventually foreign assets cannot fall further, and consumption will have to be curtailed. Moreover, because by then the

TABLE 18.6 Net Foreign Asset Position (% GDP), 1997

Creditors	Debtors (0–20%)	Debtors (20–40%)	Debtors (40–60%)	Debtors (over 60%)
Botswana (120)	China (−8)	Argentina (−33)	Algeria (−49)	Cote d'Ivoire (−139.1)
Oman (15)	Egypt (−19)	Brazil (−30)	Bolivia (−52)	Jamaica (−79)
Singapore (210)	El Salvador (−9)	Costa Rica (−37)	Chile (−48)	Jordan (−70)
South Africa (16)	India (−17)	Colombia (−32)	Ecuador (−57)	Trinidad (−80)
Taiwan (49)	Israel (−12)	Dominican Republic (−36)	Indonesia (−54)	
Uruguay (11)	Korea (−5)	Guatemala (−28)	Malaysia (−45)	
Venezuela (16)	Austria (−10)	Mauritius (−33)	Mexico (−43)	
Netherlands (27)	Belgium (−9)	Paraguay (−21)	Morocco (−41)	
Norway (19)	Spain (−18)	Philippines (−32)	Pakistan (−50)	
Switzerland (48)		Sri Lanka (−38)	Peru (−47)	
France (3)		Syria (−22)	Thailand (−47)	
		Turkey (−30)	Tunisia(−43)	
		Finland (−21)	Zimbabwe (−55)	
		Greece (−40)	Australia (−55)	
		Canada (−24)		

Source: Lane and Milesi-Ferretti, "The External Wealth of Nations: Measures of Foreign Assets and Liabilities for Industrial and Developing Countries," CEPR Discussion Paper 2231(1999).

country has fewer foreign assets, it will be earning less overseas interest and so will have to lower consumption even more. In the next chapter, we shall consider currency crashes and see that an undue reliance on foreign loans (negative foreign assets), particularly short-term foreign currency loans, can be particularly problematic for a country.

Note also that a stock of overseas assets enables a country to potentially run a continual current account deficit. A country can always maintain a current account deficit if it also has a capital account surplus. A capital account surplus means that a country is selling its assets to overseas investors. If the Netherlands has a stock of overseas assets, then these will be increasing every year either through interest and dividends or because of capital gains. If the Netherlands every year sells foreign assets equal to these gains, then it will create a capital account surplus (it is selling Dutch assets) while maintaining a constant level of foreign assets (it only sells the gains it realizes from the assets, not the capital itself). It can thus maintain a continuous current account deficit if desired. Table 18.6 shows the debtor and creditor status of several countries in 1997.

18.6. A BIG Equation

One reason for outlining in such detail the current and capital accounts was that these concepts help us understand why the real exchange rate is volatile. To grasp this, we need to consider the following crucial equation:

net savings (savings–investment) = net exports (exports–imports)

We have already come across this formula—it says that the capital account deficit (surplus) must equal the current account surplus (deficit). Net exports are total exports less total imports, which is the current account surplus. But why does net savings—or the surplus of savings over investment—equal the capital account deficit? Consider the case in which net savings is positive—savings within a country exceed investment. The banking system can therefore finance all the domestic investment needs of a country and still have surplus deposit funds left over. But banks want to make a profit and will not simply sit on these surplus funds. Instead they will lend them overseas and earn profit on them. But lending money overseas means that a country gains a claim over another—this is the same as running a capital account deficit. If the surplus savings are invested in overseas equity markets, then the portfolio asset part of the financial account will show a deficit. If instead the bank lends the money to an overseas firm, then the other investment category of the capital account will show a deficit. Either way the level of net savings is equal to the capital account deficit; that net savings equals net exports is just another way of saying that the capital and the current accounts sum to zero.

But why does net savings equal net exports? To show this, we need to return to the national accounts—the way of recording how output is used that we studied in Chapter 2. There we showed that GDP (Y) is used in one of four ways—as consumption (C), investment in physical machinery or buildings (I), as government expenditure on goods and services (G), or as net exports (X−M). Therefore,

$$Y = C + I + G + (X - M)$$

Or alternatively, if we subtract from GDP the amount of consumption, we are left with the sum of investment, government expenditure, and net exports

$$(X - M) + I + G = Y - C \quad (1)$$

However, as we also discussed in Chapter 2, GDP is a measure of income, not just of output. The income that the economy earns is used in one of three ways: it is spent as consumption (C); it is used to pay taxes (T); or it is saved in the financial system (S). Therefore

$$Y = C + T + S$$

Or if we take away from income the amount of consumption, what is left is the amount of savings and taxes the economy pays

$$T + S = Y - C \quad (2)$$

Comparing (1) and (2) we can see that they both equal the same amount: Y −C. Therefore I + G + (X − M) must have the same value as T + S. Therefore

$$I + G + (X - M) = T + S$$

We can rewrite this as

$$X - M = T - G + S - I$$

The term X − M is just net exports—the current account surplus. The other side of the equation refers to savings in the economy. The term T − G is the government's fiscal surplus and is the amount of savings by the government. The term S − I is the private sector's net savings—their total savings less their total investment. Thus T − G + S − I denotes total savings in the economy; this equals the capital account deficit.

We can use the fact that net savings equals net exports to consider some of the factors that alter the current account. Consider the case of an economy that starts to run a large fiscal deficit. If net savings by the private sector do not increase, the larger fiscal deficit means a lower level of net national savings. This in turn means that the capital account deficit will fall and may even become a surplus as the government's needs mean that less funds are available for overseas investment. A falling capital account deficit means a deteriorating current account deficit, so that a fiscal expansion leading to a larger public sector deficit will worsen the current account. Figure 18.12 shows this is

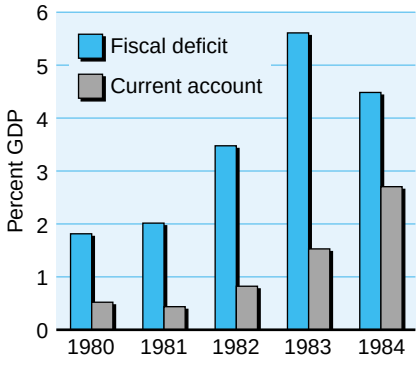

FIGURE 18.12 U.S. fiscal expansion leads to current account deficit. Fiscal deficits lead to worsening of the current account. *Source*: IMF, *International Financial Statistics* (September 2000).

what happened in the United States in the early 1980s. In the early years of the Reagan administration the fiscal deficit widened because of tax cuts and increased military expenditure and the current account simultaneously deteriorated.

Variations in national savings will also cause the current account to fluctuate—because of a rising fiscal deficit, falling personal savings, or rising domestic investment.

THE ROLE OF THE REAL EXCHANGE RATE

What mechanism assures that net savings equals net investment? After all, the people who are deciding whether to save and invest are different from those considering whether to export or import, so the two need not be equal. We will now outline a model that gives a key role for the real exchange rate in achieving balance between net savings and net investment and use this to explain the volatility of the real exchange rate.

Our key assumption is that the real exchange rate does not influence the level of net savings but does affect net exports. As outlined at the beginning of this chapter, the real exchange rate reflects a country's competitiveness—the higher its real exchange rate, the more expensive its commodities are to overseas residents. With a high real exchange rate, a country's exports will be low and imports high because foreign goods are cheap. Therefore, the higher the real exchange rate, the lower the level of net exports and the higher the current account deficit. Figure 18.13 shows this negative relationship between the real exchange rate and net exports.

Figure 18.13 suggests that when countries experience a real depreciation their current account should ultimately improve. We stress two features of this statement. First, it is the *real* exchange rate that matters. If the nominal exchange rate falls but is offset by higher domestic inflation, so that the real exchange rate is unaltered, then there is no effect on net exports. Second, the beneficial effect of the depreciation may not be immediately felt. In fact in the short term, the current account may worsen. When the real exchange rate depreciates, the cost of imports rises in domestic currency terms. Eventually this higher cost of imports will lead to a lower demand for them, and net exports will improve. However, in the short run, firms and individuals may be contracted to purchase, at specified *foreign currency* prices, goods from overseas. While these contracts are in force, the costs of imports will rise without offsetting benefits from reduced demand. Of course, as contracts come up for renewal, the extra cost means that many will be cancelled, and net exports will improve. Therefore the depreciation of the real exchange rate may lead the current account to deteriorate at first before an improve-

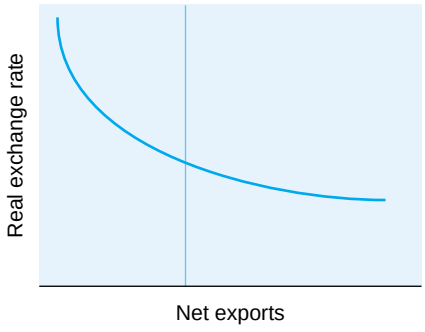

FIGURE 18.13 Real exchange rate and net exports. Net exports improve when the real exchange rate falls.

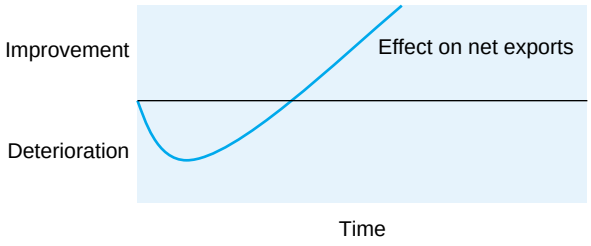

FIGURE 18.14 J curve. The current account initially worsens before improving after real depreciation.

ment occurs. It may take six months or more before the improvement manifests itself. Economists call this delayed beneficial effect on the current account the J-curve effect for reasons that should be obvious from Figure 18.14.

We can now complete our model and show how the real exchange rate will alter in response to changes in the economy. Consider again the case of the Reagan fiscal expansion, which through a larger fiscal deficit produced a lower level of net savings (larger capital account surplus), which in turn required a lower level of net exports (larger capital account deficit). To produce this larger current account deficit, the real exchange rate has to rise. A higher real exchange rate makes U.S. goods more expensive and overseas goods cheaper, which leads the current account to deteriorate. Therefore, the real exchange rate has to change to equate net savings and net exports; clearly this is not in line with the implications of purchasing power parity.[6] Figure 18.15 models the effect of this fiscal expansion on the real exchange rate.

This helps explain what happened in the United States in the early 1980s—a large fiscal deficit leading to a substantial real appreciation (Figure 18.16). Figure 18.17 shows that the same phenomenon occurred in Germany during the early 1990s after the large fiscal deficit that unification caused.

However, it is not just changes in net savings (driven by changes in fiscal policy, private sector savings, or investment) that cause the real exchange rate to fluctuate. Anything that shifts the net export schedule will also change the real exchange rate. Consider what happens when Mediterranean goods suddenly become fashionable. At

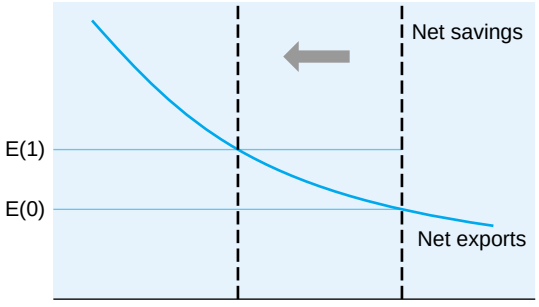

FIGURE 18.15 Real exchange rate appreciation from fiscal expansion. A large fiscal deficit reduces net savings and leads to real exchange rate appreciation.

[6]In fact PPP is a special cases of our model in which net exports are so sensitive to changes in relative prices that the net export schedule in Figure 18.15 is a horizontal line.

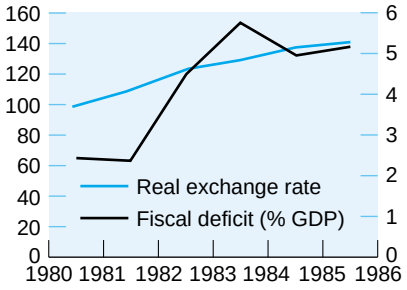

FIGURE 18.16 U.S. fiscal expansion and dollar appreciation. Reagan-era deficits led to the dollar rising. *Source*: IMF, *International Financial Statistics* (September 2000).

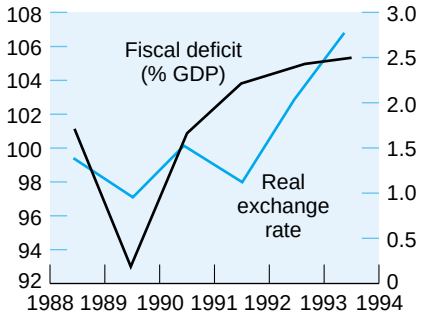

FIGURE 18.17 Real appreciation after German unification. The deutsche mark appreciated in the wake of large deficits caused by unification. *Source*: IMF, *International Financial Statistics* (September 2000).

any particular real exchange rate, exports from Italy and Spain will be higher than before—the net export schedule shifts to the right, as in Figure 18.18. However, net savings have not altered, so as a result neither can net exports—the capital and current accounts must sum to zero. But, at the existing exchange rate, Italian net exports have increased and will be greater than net savings. Because this cannot happen, the real exchange rate will have to increase to choke off the demand for Italian goods. Figure 18.18 shows this case—in which the increased demand for Italian goods leads to an appreciation of the exchange rate from E(0) to E(1).

Note that we can use the same diagram to examine import controls. If a government introduces import controls, then for a given real exchange rate, the level of imports is reduced, but exports are unchanged, so that net exports increase *for a particular exchange rate*. But import controls can only influence the current account if they also affect net savings or the capital account. In our analysis the introduction of import controls does not affect the level of net savings and thus cannot affect the current account deficit. As a result, the real exchange rate has to rise to reduce exports in line with the reduction in imports that import controls caused.

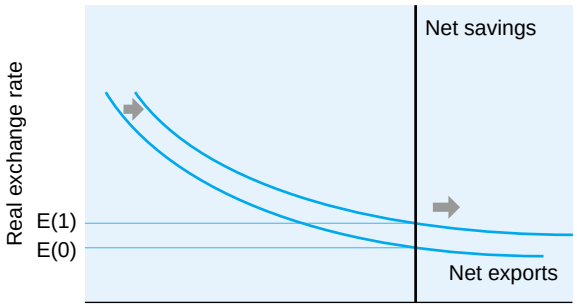

FIGURE 18.18 Shift in export demand and real appreciation. An increase in demand for countries' net exports leads to appreciation.

This simple model suggests that there are good reasons (shifting net export and net savings curves) for expecting fluctuations in the real exchange rate. However, the key question here is one we posed earlier. Examination of the nominal and real exchange rate (e.g., Figures 18.1 and 18.2) shows them both to be volatile and to roughly move together. These facts have two potential explanations. First as we suggested in this section, the real exchange rate changes, and the factors that lead it to change are volatile. According to this account volatile economic fundamentals lead to a volatile real exchange rate, which in turn produces a volatile nominal exchange rate. The alternative explanation is that because prices in a country are relatively sticky, then changes in the nominal exchange rate feed through into changes in the real exchange rate. According to that analysis, we need to focus on the nominal exchange rate, and in particular monetary models, to understand the volatility of the real exchange rate.

Which of these two explanations is correct? While opinions differ, the general consensus is that real exchange rates are far too volatile to be explained by changes in the macroeconomic fundamentals that underpin the net exports and net savings curve. As our analysis of the Reagan years and German unification show, we can use changes in macroeconomic fundamentals to explain some of the fluctuations in the real exchange rate. However, the real exchange rate is too volatile to explain all its fluctuations this way. For that reason, in Chapter 19 we will discuss changes in the nominal exchange rate.

SUMMARY

The nominal exchange rate reflects the rate at which you can swap different currencies, whereas the real exchange rate represents the relative cheapness of one country compared to another.

The law of one price implies that the same good should sell for the same price, making allowance for different currencies, wherever it is sold. However, transport costs, tariffs, monopoly practices, and transaction costs mean that similar commodities sold in different places are effectively different commodities and can sell for different prices. Differences in prices are far more marked than trade restrictions and transport costs alone would merit.

Purchasing power parity says that the cost of living (adjusted for different currencies) should be the same in all countries, so that the real exchange rate should equal 1. Long-run evidence supports PPP, but over shorter horizons, PPP has little to recommend it. The real exchange rate is far too volatile to be consistent with the constancy implications of PPP.

A current account surplus means that a country exports more goods and services than it imports. A capital account surplus means that a country is selling more of its domestic assets than it is purchasing assets overseas.

Fluctuations in either net exports or net savings can, in principle, account for volatility in the real exchange rate. But the real exchange rate is so variable that macroeconomic

fundamentals cannot explain it. Instead, the consensus view is that fluctuations in the real exchange rate reflect variations in the nominal exchange rate.

CONCEPTUAL QUESTIONS

1. Did the last foreign country you visited seem expensive to you? What does this imply about the real exchange rate?
2. If you can swap one Eurasian dollar for four Oceanean dollars or six Kingdom dollars, what does this imply about the relative cost of goods in Eurasia, Oceania, and Kingdom?
3. Examine the different foreign currency prices of an issue of the *Economist* and see whether the law of one price holds. Which would be a better guide to the law of one price—the price of Big Macs or the price of an issue of the *Economist*?
4. What does the Internet imply about purchasing power parity?
5. A multinational has asked you for a 30-year forecast of various African exchange rates against the U.S. dollar. The firm will give you any macroeconomic forecasts you need. What data would you ask for?
6. Microsoft takes a stake in a software firm in Bombay. How does that affect the U.S. capital account?
7. A German investor places some funds with an emerging economy stock market fund and intends to leave them there for five years and have all dividends paid into a Munich bank account. How will this affect the German current and capital account over the next five years?
8. The Hong Kong dollar depreciates by 5% against the United States dollar, but Hong Kong inflation also rises by 5%. What will happen to the Hong Kong current account? How would your answer differ if the authorities managed to prevent inflation from increasing?

ANALYTICAL QUESTIONS

1. The United States of Albion does 30% of its total trade with the Republic of Oz, 25% with the Federation of Tropical States (FTS),and 45% with the Banana Republic. Over the last three years the exchange rate changes against the United States dollar have been

	Republic of Oz	FTS	Banana Republic
Year 0	−4%	−3%	+8%
Year 1	+2%	−1%	+4%
Year2	+2%	−1%	+5%

Calculate the effective exchange rate for the United States dollar.

2. Calculate the purchasing power parity exchange rate between the following countries

Commodity	United States of Albion	Republic of Oz
Gasoline	120	180
Meat	80	140
Books	20	33
Fruit Juice	40	40
Coffee	15	10
Clothes	70	160

3. Use the model of real exchange rate determination in Section 18.6
   a) to analyze the impact on the euro of a surge in European investment
   b) to analyze the impact of import controls where the net savings line depends positively on the real exchange rate

4. What slope does the net export schedule in Question 3(a) have to be in order to account for purchasing power parity? What is the economic justification of assuming this slope?