THE DETERMINATION OF EXCHANGE RATES

Experience shows that neither a state nor a bank ever have had the unrestricted power of issuing paper money without abusing that power.

David Ricardo (1817)

Chapter Learning Objectives

● To explain the concept of an equilibrium exchange rate
● To identify the basic factors affecting exchange rates in a floating exchange rate system
● To calculate the amount of currency appreciation or depreciation associated with a given exchange rate change
● To describe the motives and different forms and consequences of central bank intervention in the foreign exchange market
● To explain how and why expectations affect exchange rates

Key Terms

appreciation
ask rate
asset market model
bid rate
central bank
currency board
depreciation
devaluation
dollarization
equilibrium exchange rate
exchange rate
fiat money
floating currency
foreign exchange market intervention
forward rate

freely floating exchange rate
liquidity
monetary base
monetize the deficit
moral hazard
nominal exchange rate
open-market operation
pegged currency
real (inflation-adjusted) exchange rate
reference currency
revaluation
seigniorage
spot rate
sterilization
unsterilized intervention
Economic activity is globally unified today to an unprecedented degree. Changes in one nation's economy are rapidly transmitted to that nation's trading partners. These fluctuations in economic activity are reflected, almost immediately, in fluctuations in currency values. Consequently, multinational corporations, with their integrated cross-border production and marketing operations, continually face devaluation or revaluation worries somewhere in the world. The purpose of this chapter and the next one is to provide an understanding of what an exchange rate is and why it might change. Such an understanding is basic to dealing with currency risk.

This chapter first describes what an exchange rate is and how it is determined in a freely floating exchange rate regime—that is, in the absence of government intervention. The chapter next discusses the role of expectations in exchange rate determination. It also examines the different forms and consequences of central bank intervention in the foreign exchange market. Chapter 3 describes the political aspects of currency determination under alternative exchange rate systems and presents a brief history of the international monetary system.

Before proceeding further, here are definitions of several terms commonly used to describe currency changes. Technically, a devaluation refers to a decrease in the stated par value of a pegged currency, one whose value is set by the government; an increase in par value is known as a revaluation. By contrast, a floating currency—one whose value is set primarily by market forces—is said to depreciate if it loses value and to appreciate if it gains value. However, discussions in this book will use the terms devaluation and depreciation, and revaluation and appreciation, interchangeably.

### 2.1 Setting the Equilibrium Spot Exchange Rate

An exchange rate, which can be for spot or forward delivery, is the price of one country's currency in terms of another currency. For example, the yen/dollar exchange rate is just the number of yen that one dollar will buy. If a dollar will buy 100 yen, the exchange rate would be expressed as ¥100/$ and the yen would be the reference currency. Equivalently, the dollar/yen exchange rate is the number of dollars one yen will buy. Continuing the previous example, the exchange rate would be $0.01/¥ (1/100) and the dollar would now be the reference currency.

Exchange rates can be for spot or forward delivery. A spot rate is the price at which currencies are traded for immediate delivery, or in two days in the interbank market. A forward rate is the price at which foreign exchange is quoted for delivery at a specified future date.

To understand how exchange rates are set, it helps to recognize that they are market-clearing prices that equilibrate supplies and demands in foreign exchange markets. The determinants of currency supplies and demands are first discussed with the aid of a two-currency model featuring the U.S. dollar and the euro, the official currency of the twelve countries that participate in the European Monetary Union (EMU). The members of EMU are often known collectively as Euroland, the term used here. Later, the various currency influences in a multicurrency world will be studied more closely.

#### Demand for a Currency

The demand for the euro in the foreign exchange market (which in this two-currency model is equivalent to the supply of dollars) derives from the American demand for Euroland goods and services and euro-denominated financial assets. Euroland prices are set in euros, so in order for Americans to pay for their Euroland purchases they must first exchange their dollars for euros. That is, they will demand euros.

An increase in the euro's dollar value is equivalent to an increase in the dollar price of Euroland products. This higher dollar price normally will reduce the U.S. demand for Euroland goods, services, and assets. Conversely, as the dollar value of the euro falls,
The demand for a foreign currency derives from the demand for that country's goods, services, and assets.

Americans will demand more euros to buy the less-expensive Euroland products, resulting in a downward-sloping demand curve for euros. As the dollar cost of the euro (the exchange rate) falls, Americans will tend to buy more Euroland goods and so will demand more euros.

**Supply of a Currency**

Similarly, the supply of euros (which for the model is equivalent to the demand for dollars) is based on Euroland demand for U.S. goods and services and dollar-denominated financial assets. In order for Euroland residents to pay for their U.S. purchases, they must first acquire dollars. As the dollar value of the euro increases, thereby lowering the euro cost of U.S. goods, the increased Euroland demand for U.S. goods will cause an increase in the Euroland demand for dollars and, hence, an increase in the amount of euros supplied.\(^1\)

In Exhibit 2.1, \(e\) is the spot exchange rate (dollar value of one euro, that is, \(\varepsilon 1 = \$e\)), and \(Q\) is the quantity of euros supplied and demanded. Since the euro is expressed in terms of dollars, the dollar is the reference currency. The euro supply \((S)\) and demand \((D)\) curves intersect at \(e_0\), the equilibrium exchange rate. The foreign exchange market is said to be in equilibrium at \(e_0\) because both the demand for euros and the supply of euros at this price is \(Q_0\).

Before continuing, it should be noted that the notion of a single exchange rate is a convenient fiction. In reality, exchange rates—both spot rates and forward rates—are quoted in pairs, with a dealer (usually a bank foreign exchange trader) standing willing to buy foreign exchange at the bid rate or to sell foreign exchange at the ask rate. As might be expected, the bid rate is always less than the ask rate, enabling dealers to profit from the spread between the bid and ask rates by buying low and selling high. Chapter 7 describes the mechanics of the foreign exchange market in great detail.

**Factors that Affect the Equilibrium Exchange Rate**

As the supply and demand schedules for a currency change over time, the equilibrium exchange will also change. Some of the factors that influence currency supply and demand are inflation rates, interest rates, economic growth, and political and economic risks. Section 2.2 shows how expectations about these factors also exert a powerful influence on currency supplies and demands and, hence, on exchange rates.

**Relative Inflation Rates** Suppose that the supply of dollars increases relative to its demand. This excess growth in the money supply will cause inflation in the United States,

---

\(^1\) This statement holds provided the price elasticity of Euroland demand, \(E\), is greater than 1. In general, \(E = -\frac{\Delta Q}{\Delta P}\), where \(Q\) is the quantity of goods demanded, \(P\) is the price, and \(\Delta Q\) is the change in quantity demanded for a change in price, \(\Delta P\) if \(E > 1\), then total spending goes up when price declines.
which means that U.S. prices will begin to rise relative to prices of goods and services in Euroland. Euroland consumers are likely to buy fewer U.S. products and begin switching to Euroland substitutes, leading to a decrease in the amount of euros supplied at every exchange rate. The result is a leftward shift in the euro supply curve to $S'$ as shown in Exhibit 2.2. Similarly, higher prices in the United States will lead American consumers to substitute Euroland imports for U.S. products, resulting in an increase in the demand for euros as depicted by $D'$. In effect, both Americans and residents of Euroland are searching for the best deals worldwide and will switch their purchases accordingly as the prices of U.S. goods change relative to prices in Euroland. Hence, a higher rate of inflation in the United States than in Euroland will simultaneously increase Euroland exports to the United States and reduce U.S. exports to Euroland.

A new equilibrium rate $e_1 > e_0$ results. In other words, a higher rate of inflation in the United States than in Europe will lead to a depreciation of the dollar relative to the euro or, equivalently, to an appreciation of the euro relative to the dollar. In general, a nation running a relatively high rate of inflation will find its currency declining in value relative to the currencies of countries with lower inflation rates. This relationship will be formalized in Chapter 4 as purchasing power parity (PPP).

**Relative Interest Rates** Interest rate differentials will also affect the equilibrium exchange rate. A rise in U.S. interest rates relative to Euroland rates, all else being equal, will cause investors in both nations to switch from euro- to dollar-denominated securities to take advantage of the higher dollar rates. The net result will be depreciation of the euro in the absence of government intervention.

It should be noted that the interest rates discussed here are real interest rates. The real interest rate equals the nominal or actual interest rate minus the rate of inflation. The distinction between nominal and real interest rates is critical in international finance and will be discussed at length in Chapter 4. If the increase in U.S. interest rates relative to Euroland rates just reflects higher U.S. inflation, the predicted result will be a weaker dollar. Only an increase in the real U.S. interest rate relative to the real Euroland rate will result in an appreciating dollar.

**Relative Economic Growth Rates** Similarly, a nation with strong economic growth will attract investment capital seeking to acquire domestic assets. The demand for domestic assets, in turn, results in an increased demand for the domestic currency and a stronger currency, other things being equal. Empirical evidence supports the hypothesis that economic growth should lead to a stronger currency. Conversely, nations with poor growth prospects will see an exodus of capital and weaker currencies.

---

Inflation causes a nation's currency to depreciate.

Higher real interest rates cause a nation's currency to appreciate.

Strong economic growth and low political risk strengthen a nation's currency.
Political and Economic Risk  Other factors that can influence exchange rates include political and economic risks. Investors prefer to hold lesser amounts of riskier assets; thus, low-risk currencies—those associated with more politically and economically stable nations—are more highly valued than high-risk currencies.

Illustration  The Ruble Is Rubble

Exhibit 2.3  The Ruble Is Rubble

From the breakup of the former Soviet Union in 1991 on, the Russian government had difficulty managing its finances. By spending more than it was collecting in revenues, Russia faced persistent budget deficits financed by issuing short-term treasury bills and printing rubles. By late 1997, the combination of rapidly increasing debt issuance and falling commodity prices (a major source of Russia’s revenue and foreign exchange comes from exports of oil, timber, gold, and other commodities) increased investors’ doubts that Russia would be able to service its growing debt burden, including $160 billion in foreign debt. Sensing blood, speculators launched a series of attacks against the Russian ruble. The Russian government responded by repeatedly raising interest rates, which eventually reached 150 percent by the middle of May 1998. To help support the ruble, the International Monetary Fund (IMF) put together a $23 billion financial package, contingent on Russia implementing an adjustment program that stressed boosting tax revenues. When the Russian parliament balked at the tax collection measures, the IMF withheld its funds. Despite the high interest rates it was paying, the government had difficulty persuading investors to roll over their short-term government debt. The stock market sank to new lows, interest rates remained high, and investors began transferring money out of Russia.

Facing accelerating capital flight and mounting domestic problems, the Russian government announced a radical policy shift on August 17, 1998. The key measures
Calculating Exchange Rate Changes

Depending on the current value of the euro relative to the dollar, the amount of euro appreciation or depreciation is computed as the fractional increase or decrease in the dollar value of the euro. For example, if the €/$ exchange rate goes from €1 = $0.93 to €1 = $1.09, the euro is said to have appreciated by the change in its dollar value, which is 
\[
\frac{(1.09 - 0.93)}{0.93} = 17.20\%.
\]

The general formula by which we can calculate the euro's appreciation or depreciation against the dollar is as follows:

\[
\text{Amount of euro appreciation (depreciation)} = \frac{\text{New dollar value of euro} - \text{Old dollar value of euro}}{\text{Old dollar value of euro}} = \frac{e_1 - e_0}{e_0}
\]

Substituting in the numbers from the previous example (with \(e_0 = $0.93 \) and \(e_1 = $1.09\)) yields the 17.20 percent euro appreciation.

Alternatively, we can calculate the change in the euro value of the dollar. We can do this by recognizing that if \(e\) equals the dollar value of a euro (dollars per euro), then the euro value of a dollar (euros per dollar) must be the reciprocal, or \(1/e\). For example, if the euro is worth $0.93, then the dollar must be worth €1.08 (1/0.93). The change in the euro value of the dollar between time 0 and time 1 equals \(1/e_1 - 1/e_0\). In percentage terms, the dollar is said to have depreciated (appreciated) against the euro by the fractional decrease (increase) in the euro value of the dollar:

\[
\text{Amount of dollar depreciation (appreciation)} = \frac{\text{New euro value of dollar} - \text{Old euro value of dollar}}{\text{Old euro value of dollar}} = \frac{1/e_1 - 1/e_0}{1/e_0} = \frac{e_0 - e_1}{e_1}
\]

Employing Equation 2.2, we can find the increase in the euro exchange rate from $0.93 to $1.09 to be equivalent to a dollar depreciation of 14.68 percent \([(0.93 - 1.09) / 1.09 = -0.1468]\). (Why don't the two exchange rate changes equal each other?)

\[\text{2 The reason the euro appreciation is unequal to the amount of dollar depreciation depends on the fact that the value of one currency is the inverse of the value of the other one. Hence, the percentage change in currency value differs because the base off which the change is measured differs.}\]
Chapter 2 • The Determination of Exchange Rates

Illustration

Calculating Yen Appreciation against the Dollar

During 2002, the yen went from $0.0074074 to $0.0084746. By how much did the yen appreciate against the dollar?

Solution. Using Equation 2.1, the yen has appreciated against the dollar by an amount equal to \((0.0084746 - 0.0074074)/0.0074074 = 14.41\%\).

By how much has the dollar depreciated against the yen?

Solution. An exchange rate of ¥1 = $0.0074074 translates into an exchange rate of $1 = ¥135 (1/0.0074074 = 135). Similarly, the exchange rate of ¥1 = $0.0084746 is equivalent to an exchange rate of $1 = ¥118. Using Equation 2.2, the dollar has depreciated against the yen by an amount equal to \((118 - 135)/135 = -12.59\%\).

Illustration

Calculating Dollar Appreciation against the Thai Baht

On July 2, 1997, the Thai baht fell 17 percent against the U.S. dollar. By how much has the dollar appreciated against the baht?

Solution. If \(e_0\) is the initial dollar value of the baht and \(e_1\) is the post-devaluation exchange rate, then we know from Equation 2.1 that \((e_1 - e_0)/e_0 = -17\%\). Solving for \(e_1\) in terms of \(e_0\) yields \(e_1 = 0.83e_0\). From Equation 2.2, we know that the dollar's appreciation against the baht equals \((e_0 - e_1)/e_1 = (e_0 - 0.83e_0)/0.83e_0 = 0.17/0.83 = 20.48\%\).

Illustration

Calculating Yugoslav Dinar Devaluation against the Dollar

April 1, 1998, was an ill-fated date in Yugoslavia. On that day, the government devalued the Yugoslav dinar, setting its new rate at 10.92 dinar to the dollar, from 6.0 dinar previously. By how much has the dinar devalued against the dollar?

Solution. The devaluation lowered the dinar's dollar value from $0.1667 (1/6) to $0.0916 (1/10.92). According to Equation 2.1, the dinar has devalued by \((0.0916 - 0.1667)/0.1667 = -45\%\).

By how much has the dollar appreciated against the dinar?

Solution. Applying Equation 2.2, the dollar has appreciated against the dinar by an amount equal to \((10.92 - 6)/6 = 82\%\).

Illustration

Calculating Afghani Appreciation against the Pakistani Rupee

The afghani, Afghanistan's currency, has a perverse tendency to go up whenever sitting governments fall. So as soon as commentators labeled Osama bin Laden the prime suspect in the September 11 World Trade Center attack, currency traders figured the Taliban would become a target of the United States, bringing prospects of a new government and, perhaps, economic development—and a rise in the afghani's value. So it has. Under the Taliban, the exchange rate—quoted as the number of Pakistani rupees it takes to buy 100,000 afghanis—fell to around 85 rupees. September 11 galvanized the market. By mid-November 2001, military gains by the Northern Alliance opposition pushed the exchange rate up to 165. By how much has the afghani appreciated against the rupee?
2.2 Expectations and the Asset Market Model of Exchange Rates

Although currency values are affected by current events and current supply and demand flows in the foreign exchange market, they also depend on expectations—or forecasts—about future exchange rate movements. And exchange rate forecasts, as we will see in Chapter 4, are influenced by every conceivable economic, political, and social factor.

The role of expectations in determining exchange rates depends on the fact that currencies are financial assets and that an exchange rate is simply the relative price of two financial assets—one country's currency in terms of another's. Thus, currency prices are determined in the same manner that the prices of assets such as stocks, bonds, gold, or real estate are determined. Unlike the prices of services or products with short storage lives, asset prices are influenced comparatively little by current events. Rather, they are determined by people's willingness to hold the existing quantities of assets, which in turn depends on their expectations of the future worth of these assets. Thus, for example, frost in Florida can bump up the price of oranges, but it should have little impact on the price of the citrus groves producing the oranges; instead, longer-term expectations of the demand and supply of oranges govern the values of these groves.

Similarly, the value today of a given currency, say, the dollar, depends on whether or not—and how strongly—people still want the amount of dollars and dollar-denominated assets they held yesterday. According to this view—known as the asset market model of exchange rate determination—the exchange rate between two currencies represents the price that just balances the relative supplies of, and demands for, assets denominated in those currencies. Consequently, shifts in preferences can lead to massive shifts in currency values.

For example, during the 1990s, the Cold War ended and the United States became the sole global power. Following a brief recession, the U.S. economy innovated and grew rapidly while Japan and Europe largely stagnated. Capital was attracted to the United States by the strength of its economy, the high after-tax real rate of return, and the favorable political climate—conditions superior to those attainable elsewhere. Foreigners found the United States to be a safer and more rewarding place in which to invest than elsewhere, so they added many more U.S. assets to their portfolios. In response, the dollar soared in value against other currencies.

The desire to hold a currency today depends critically on expectations of the factors that can affect the currency's future value; therefore, what matters is not only what is happening today but what markets expect will happen in the future. Thus, currency values are forward looking; they are set by investor expectations of their issuing countries' future economic prospects rather than by contemporaneous events alone. Moreover, in a world of high capital mobility, the difference between having the right policies and the wrong ones has never been greater. This point is illustrated by the Asian currency crisis of 1997.

Solution. Applying Equation 2.1, the afghani has appreciated against the rupee by an amount equal to $(165 - 85)/85 = 94\%$.

Similarly, between September 11 and mid-November, the dollar went from 78,000 to 34,000. By how much did the dollar depreciate against the afghani during this two-month period?

Solution. According to Equation 2.2, the dollar depreciated during this period by an amount equal to $(34,000 - 78,000)/78,000 = -56\%$. Equivalently, the afghani appreciated against the dollar by 129 percent $\left( \frac{1}{34,000} - \frac{1}{78,000} \right) \left( \frac{1}{78,000} \right)$.
During the second half of 1997, and beginning in Thailand, currencies and stock markets plunged across East Asia, while hundreds of banks, builders, and manufacturers went bankrupt. The Thai baht, Indonesian rupiah, Malaysian ringgit, Philippine peso, and South Korean won depreciated by 40 percent to 80 percent apiece. All this happened despite the fact that Asia’s fundamentals looked good: low inflation, balanced budgets, well-run central banks, high domestic savings, strong export industries, a large and growing middle class, a vibrant entrepreneurial class, and industrious, well-trained, and often well-educated workforces paid relatively low wages. But investors were looking past these positives to signs of impending trouble. What they saw was that many East Asian economies were locked on a course that was unsustainable, characterized by large trade deficits, huge short-term foreign debts, overvalued currencies, and financial systems that were rotten at their core. Each of these ingredients played a role in the crisis and its spread from one country to another.

**Loss of Export Competitiveness**

To begin, most East Asian countries depend on exports as their engines of growth and development. Along with Japan, the United States is the most important market for these exports. Partly because of this, many of them had tied their currencies to the dollar. This tie served them well until 1995, promoting low inflation and currency stability. It also boosted exports at the expense of Japan as the dollar fell against the yen, forcing Japanese companies to shift production to East Asia to cope with the strong yen. Currency stability also led East Asian banks and companies to finance themselves with dollars, yen, and Deutsche marks—some $275 billion worth, much of it short term—because dollar and other foreign currency loans carried lower interest rates than did their domestic currencies. The party ended in 1995, when the dollar began recovering against the yen and other currencies. By mid-1997, the dollar had risen by over 50 percent against the yen and by 20 percent against the German mark. Dollar appreciation alone would have made East Asia’s exports less price competitive. But their competitiveness problem was greatly exacerbated by the fact that during this period, the Chinese yuan depreciated by about 25 percent against the dollar.\(^3\) China exported similar products, so the yuan devaluation raised China’s export competitiveness at East Asia’s expense. The loss of export competitiveness slowed down Asian growth and caused utilization rates—and profits—on huge investments in production capacity to plunge. It also gave the Asian central banks a mutual incentive to devalue their currencies. According to one theory, recognizing these altered incentives, speculators attacked the East Asian currencies almost simultaneously and forced a round of devaluations.\(^4\)

**Moral Hazard and Crony Capitalism**

Another theory suggests that moral hazard—the tendency to incur risks that one is protected against—lies at the heart of Asia’s financial problems. Specifically, most Asian banks and finance companies operated with implicit or explicit government guarantees. For example, the South Korean government directed the banking system to lend massively to

---


companies and industries that it viewed as economically strategic, with little regard for their profitability. When combined with poor regulation, these guarantees distorted investment decisions, encouraging financial institutions to fund risky projects in the expectation that the banks would enjoy any profits, while sticking the government with any losses. (These same perverse incentives underlie the savings and loan fiasco in the United States during the 1980s.) In Asia's case, the problem was compounded by the crony capitalism that is pervasive throughout the region, with lending decisions often dictated more by political and family ties than by economic reality. Billions of dollars in easy-money loans were made to family and friends of the well-connected. Without market discipline or risk-based bank lending, the result was overinvestment—financed by vast quantities of debt—and inflated prices of assets in short supply, such as land.5

This financial bubble persists as long as the government guarantee is maintained. The inevitable glut of real estate and excess production capacity leads to large amounts of nonperforming loans and widespread loan defaults. When reality strikes, and investors realize that the government doesn't have the resources to bail out everyone, asset values plummet and the bubble is burst. The decline in asset values triggers further loan defaults, causing a loss of the confidence on which economic activity depends. Investors also worry that the government will try to inflate its way out of its difficulty. The result is a self-reinforcing downward spiral and capital flight. As foreign investors refuse to renew loans and begin to sell off shares of overvalued local companies, capital flight accelerates and the local currency falls, increasing the cost of servicing foreign debts. Local firms and banks scramble to buy foreign exchange before the currency falls further, putting even more downward pressure on the exchange rate. This story explains why stock prices and currency values declined together and why Asian financial institutions were especially hard hit. Moreover, this process is likely to be contagious, as investors search for other countries with similar characteristics. When such a country is found, everyone rushes for the exit simultaneously and another bubble is burst, another currency is sunk.

The standard approach of staving off currency devaluation is to raise interest rates, thereby making it more attractive to hold the local currency and increasing capital inflows. However, this approach was problematic for Asian central banks. Raising interest rates boosted the cost of funds to banks and made it more difficult for borrowers to service their debts, thereby further crippling an already sick financial sector. Higher interest rates also lowered real estate values, which served as collateral for many of these loans, and pushed even more loans into default. Thus, Asian central banks found their hands were tied and investors recognized that.

THE BUBBLE BURSTS

These two stories—loss of export competitiveness and moral hazard in lending combined with crony capitalism—combine to explain the severity of the Asian crisis. Appreciation of the dollar and depreciation of the yen and yuan slowed down Asian economic growth and hurt corporate profits. These factors turned ill-conceived and overleveraged investments in property developments and industrial complexes into financial disasters. The Asian financial crisis then was touched off when local investors began dumping their own currencies for dollars and foreign lenders refused to renew their loans. It was aggravated by politicians, such as in Malaysia and South Korea, who preferred to blame foreigners for their problems rather than seek structural reforms of their economies. Both foreign and domestic investors, already spooked by the currency crisis, lost yet more confidence in these nations and dumped more of their currencies and stocks, driving them to record lows.

This synthesized story is consistent with the experience of Taiwan, which is a net exporter of capital and whose savings are largely invested by private capitalists without government direction or guarantees. Taiwanese businesses also are financed far less by debt than by equity. In contrast to its Asian competitors, Taiwan suffered minimally during 1997, with the Taiwan dollar (NT$) down by a modest 15 percent (to counteract its loss of export competitiveness to China and Japan) and its stock market actually up by 17 percent in NT$ terms.

“The way out,” said Confucius, “is through the door.” The clear exit strategy for East Asian countries was to restructure their ailing financial systems by shutting down or selling off failing banks (for example, to healthy foreign banks) and disposing of the collateral (real estate and industrial properties) underlying their bad loans. Although the restructuring has not gone as far as it needs to, the result so far is fewer but stronger and better-capitalized banks and restructured and consolidated industries and a continuation of East Asia’s strong historical growth record. However, progress has been slow in reforming bankruptcy laws, a critical element of reform. Simply put, governments must step aside and allow those who borrow too much or lend too foolishly to fail. Ending government guarantees and politically motivated lending will transform Asia’s financial sector and force cleaner and more transparent financial transactions. The result will be better investment decisions—decisions driven by market forces rather than personal connections or government whim—and healthier economies that attract capital for the right reasons.

The Nature of Money and Currency Values
To understand the factors that affect currency values, it helps to examine the special character of money. To begin, money has value because people are willing to accept it in exchange for goods and services. The value of money, therefore, depends on its purchasing power. Money also provides liquidity—that is, you can readily exchange it for goods or other assets, thereby facilitating economic transactions. Thus, money represents both a store of value and a store of liquidity. The demand for money, therefore, depends on money's ability to maintain its value and on the level of economic activity. Hence, the lower the expected inflation rate, the more money people will demand. Similarly, higher economic growth means more transactions and a greater demand for money to pay bills.

The demand for money is also affected by the demand for assets denominated in that currency. The higher the expected real return and the lower the riskiness of a country's assets, the greater is the demand for its currency to buy those assets. In addition, as people who prefer assets denominated in that currency (usually residents of the country) accumulate wealth, the value of the currency rises.

Because the exchange rate reflects the relative demands for two moneys, factors that increase the demand for the home currency should also increase the price of home currency on the foreign exchange market. In summary, the economic factors that affect a currency's foreign exchange value include its usefulness as a store of value, determined by its expected rate of inflation; the demand for liquidity, determined by the volume of transactions in that currency; and the demand for assets denominated in that currency, determined by the risk-return pattern on investment in that nation's economy and by the wealth of its residents. The first factor depends primarily on the country's future monetary policy, whereas the latter two factors depend largely on expected economic growth and political and economic stability. All three factors ultimately depend on the soundness of the nation's economic policies. The sounder these policies, the more valuable the nation's currency will be; conversely, the more uncertain a nation's future economic and political course, the riskier its assets will be, and the more depressed and volatile its currency's value.
On December 20, 1994, Mexico devalued its peso by 12.7 percent. Two days later, the government was forced to let the peso float freely, whereupon it quickly fell an additional 15 percent. By March 1995, the peso had fallen over 25 percent more, a total of over 50 percent altogether (see Exhibit 2.4). Even President Clinton’s dramatic rescue package involving $52 billion in loans and loan guarantees from the United States and various international financial institutions could only halt the freefall temporarily. The story of the peso’s travails illustrates the importance of credibility in establishing currency values. This credibility depends, in part, on the degree of consistency between the government’s exchange rate policy and its other macroeconomic objectives.

Until the devaluation, Mexico had a system under which the peso was allowed to fluctuate within a narrow band against the dollar. Pegging the peso to the dollar helped stabilize Mexico’s economy against hyperinflation. The credibility of this exchange rate regime depended on people believing that Banco de Mexico (Mexico’s central bank) would defend the currency to keep it within this band. As long as investors had confidence in the country’s economic future, this policy worked well. However, that confidence was shaken during 1994 by an armed uprising in the state of Chiapas, assassinations of leading Mexican politicians (including the front-running presidential candidate), and high-level political resignations. Another source of concern was the enormous trade deficit, which was about 8 percent of gross domestic product (GDP) for 1994.

The trade deficit jeopardized future growth because, to attract the dollars needed to finance this deficit, the government had to keep interest rates high, especially because interest rates were rising in the United States and around the world. Foreign investors began to bet that this situation was unsustainable, that in order to continue to finance the deficit Mexico would have to raise interest rates so much that it would damage its economy. Such a rise was unlikely given the political difficulties the government was already facing. At the same time, under pressure from an administration facing a tough election, the central bank permitted a monetary expansion of more than 20 percent during 1994, leading to fears of rising inflation. Sensing that something had to give, many investors ran for the exits, draining Banco de Mexico’s dollar reserves.

Here is where Mexico made a fundamental error. The central bank did not allow the supply of pesos to fall, even though the various political shocks—and the economic uncertainties they created—reduced the demand for pesos. As investors sold pesos to Banco de Mexico for dollars, reducing the supply of pesos to the level actually demanded,
Central Bank Reputations and Currency Values

As the example of Mexico indicates, another critical determinant of currency values is central bank behavior. A central bank is the nation’s official monetary authority; its job is to use the instruments of monetary policy, including the sole power to create money, to achieve one or more of the following objectives: price stability, low interest rates, or a target currency value. As such, the central bank affects the risk associated with holding money. This risk is inextricably linked to the nature of a fiat money, which is nonconvertible paper money. Until 1971, every major currency was linked to a commodity. Today no major currency is linked to a commodity—prices varied a great deal in the short term, but they eventually returned to where they had been. With a fiat money, there is no anchor to the price level—that is, there is no standard of value that investors can use to find out what the currency’s future value might be. Instead, a currency’s value is largely determined by the central bank through its control of the money supply. If the central bank creates too much money, inflation will occur and the value of money will fall. Expectations of central bank behavior also will affect exchange rates today; a currency will decline if people think the central bank will expand the money supply in the future.

Viewed this way, money becomes a brand-name product whose value is backed by the reputation of the central bank that issues it. And just as reputations among automobiles vary—from Mercedes-Benz to Yugo—so currencies come backed by a range of quality reputations—from the dollar, Swiss franc, and Japanese yen on the high side to the Mexican peso, Thai baht, and Russian ruble on the low side. Underlying these reputations is trust in the willingness of the central bank to maintain price stability.

The high-quality currencies are those expected to maintain their purchasing power because they are issued by reputable central banks. A reputable central bank is one that the markets trust to do the right thing, and not merely the politically expedient thing,
Inflation Dies Down Under

In Germany and Switzerland, long seen as bastions of sound money, inflation rose during the early 1990s. However, Australia and New Zealand, so often afflicted by high inflation, boasted the lowest rates among the nations comprising the Organization for Economic Cooperation and Development (OECD), which consists of all the industrialized nations in the world (see Exhibit 2.5).

**Price Stability and Central Bank Independence**

Because good reputations are slow to build and quick to disappear, many economists recommend that central banks adopt rules for price stability that are verifiable, unambiguous, and enforceable—along with the independence and accountability necessary to realize this goal. Focus is also important. A central bank whose responsibilities are limited to price stability is more likely to achieve this goal. For example, the Bundesbank—a model for many economists—managed to maintain such a low rate of German inflation because of its statutory commitment to price stability, a legacy of Germany’s bitter memories of hyperinflation in the 1920s, which peaked at 200 billion percent in 1923. Absent such rules, the natural accountability of central banks to government becomes an avenue for political influence. For example, even though the U.S. Federal Reserve is an independent central bank, its legal responsibility to pursue both full employment and price stability (aims that conflict in the short term) can hinder its effectiveness in fighting inflation. The greater scope for political influence in central banks that do not have a clear mandate to pursue price stability will, in turn, add to the perception of inflation risk.

This perception stems from the fact that government officials and other critics routinely exhort the central bank to follow “easier” monetary policies, by which they mean boosting the money supply to lower interest rates. These exhortations arise because many people believe (1) that the central bank can trade off a higher rate of inflation for more economic growth, and (2) that the central bank determines the rate of interest independently of the rate of inflation and other economic conditions. Despite the questionable merits of these beliefs, central banks—particularly those that are not independent—often respond to these demands by expanding the money supply.

Central banks that lack independence are also often forced to monetize the deficit, which means financing the public-sector deficit by buying government debt with newly created money. Whether monetary expansion stems from economic stimulus or deficit financing, it inevitably leads to higher inflation and a devalued currency.

The idea that central bank independence can help establish a credible monetary policy is being put into practice today, as countries that have been plagued with high inflation rates are enacting legislation to reshape their conduct of monetary policy. For example, New Zealand, England, Mexico, Canada, Chile, and Bolivia all have passed laws that mandate an explicit inflation goal or that give their central banks more independence.

---

The cure was simple: restrict the supply of Australian and New Zealand dollars. To increase the likelihood that it would stick to its guns, the Reserve Bank of New Zealand was made fully independent in 1990 and its governor, Donald Brash, was held accountable for cutting inflation to zero to 2 percent by December 1993. Failure carried a high personal cost: He would lose his job. Exhibit 2.5 shows why Mr. Brash kept his job; by 1993, inflation had fallen to 1.3 percent, and it has since then held at about 2 percent. At the same time, growth has averaged a rapid 4 percent a year.

The job of New Zealand’s central banker was made easier by the government’s decision to dismantle one of the OECD’s most taxed, regulated, protectionist, and comprehensive welfare states and transform it into one of the most free-market oriented. By slashing welfare programs and stimulating economic growth through its market reforms and tax and tariff cuts, the government converted its traditionally large budget deficit into a budget surplus and ended the need to print money to finance it. To ensure continued fiscal sobriety, in 1994 parliament passed the Fiscal Responsibility Act, which mandates budgetary balance over the business cycle.

**EXHIBIT 2.5 • INFLATION DIES DOWN UNDER**

Sources: International Financial Statistics and OECD, various years. Data for 2001 are through September 30 annualized.

**Currency Boards** Some countries, like Argentina, have gone even further and established what is in effect a currency board. Under a **currency board** system, there is no central bank. Instead, the currency board issues notes and coins that are convertible on demand and at a fixed rate into a foreign reserve currency. As reserves, the currency board holds high-quality, interest-bearing securities denominated in the reserve currency. Its reserves are equal to 100 percent, or slightly more, of its notes and coins in circulation. The board has no discretionary monetary policy. Instead, market forces alone determine the money supply.

Over the past 150 years, more than 70 countries (mainly former British colonies) have had currency boards. As long as they kept their boards, all of those countries had the same rate of inflation as the country issuing the reserve currency and successfully maintained convertibility at a fixed exchange rate into the reserve currency; no board has ever devalued its currency against its anchor currency. Currency boards are successfully operating today in Estonia, Hong Kong, and Lithuania. Argentina dropped its currency board in January 2002.

In addition to promoting price stability, a currency board also compels government to follow a responsible fiscal (spending and tax) policy. If the budget is not balanced, the government must persuade the private sector to lend to it; it no longer has the option of forcing the central bank to monetize the deficit. By establishing a monetary authority that is independent
of the government and is committed to a conservative monetary policy, currency boards are likely to promote confidence in a country’s currency. Such confidence is especially valuable for emerging economies with a past history of profligate monetary and fiscal policy.

Argentina, once the world’s seventh-largest economy, has long been considered one of Latin America’s worst basket cases. Starting with Juan Peron, who was first elected president in 1946, and for decades after, profligate government spending financed by a compliant central bank that printed money to cover the chronic budget deficits had triggered a vicious cycle of inflation and devaluation. High taxes and excessive controls compounded Argentina’s woes and led to an overregulated, arthritic economy. However, in 1991, after the country had suffered nearly fifty years of economic mismanagement, President Carlos Menem and his fourth Minister of Economy, Domingo Cavallo, launched the Convertibility Act. (The first Minister of Economy, Miguel Roig, took one look at the economy and died of a heart attack six days into the job.) This act made the austral (the Argentine currency) fully convertible at a fixed rate of 10,000 australs to the dollar, and by law the monetary supply had to be 100 percent backed by gold and foreign currency reserves, mostly dollars. This link to gold and the dollar imposed a straitjacket on monetary policy. If, for example, the central bank had to sell dollars to support the currency, the money supply automatically shrank. Better still, the government could no longer print money to finance a budget deficit. In January 1992, the government knocked four zeros off the austral and renamed it the peso, worth exactly $1.

By effectively locking Argentina into the U.S. monetary system, the Convertibility Act had remarkable success in restoring confidence in the peso and providing an anchor for inflation expectations. Inflation fell from more than 2,300 percent in 1990 to 170 percent in 1991 and 4 percent in 1994 (see Exhibit 2.6). By 1997, the inflation rate was 0.4 percent, among the lowest in the world. Argentine capital transferred overseas to escape Argentina’s hyperinflation began to come home. It spurred rapid economic growth and led to a rock-solid currency. In response to the good economic news, stock prices quintupled, in dollar terms, during the first year of the plan. And the price of Argentina’s foreign debt rose from 13 percent of its face value in 1990 to 45 percent in 1992.

EXHIBIT 2.6 • ARGENTINA ENDS HYPERINFLATION

The likelihood that the Convertibility Act marked a permanent change in Argentina and would not be revoked at a later date—an important consideration for investors—was increased by the other economic actions the Argentine government took to reinforce its commitment to price stability and economic growth: it deregulated its economy, sold off money-losing state-owned businesses to the private sector, cut taxes and red tape, opened its capital markets, and lowered barriers to trade. In September 1994, the Argentine government announced a sweeping privatization plan designed to sell off all remaining state-owned enterprises—including the national mint, the postal service, and the country’s main airports.

Since then, however, the Argentine economy suffered from a series of external shocks and internal problems. External shocks included falling prices for its agricultural commodities, the Mexican peso crisis in late 1994, the Asian currency crisis of 1997, and the Russian and Brazilian financial crises of 1998–1999. The financial shocks led investors to reassess the risk of emerging markets and to withdraw their capital from Argentina as well as the countries in crisis. The devaluation of the Brazilian real in early 1999—which increased the cost of Argentine goods in Brazil and reduced the cost of Brazilian goods to Argentines—hurt Argentina because of the strong trade ties between the two countries. Similarly, the strong appreciation of the dollar in the late 1990s made Argentina’s products less competitive, both at home and abroad, against those of its trading partners whose currencies were not tied to the dollar.

Internal problems revolved around rigid labor laws that make it costly to lay off Argentine workers and excessive spending by the Argentine government. In a decade that saw GDP rise 50 percent, public spending rose 90 percent. Initially, the growth in government spending was funded by privatization proceeds. When privatization proceeds ran out, the government turned to tax increases and heavy borrowing. The result was massive fiscal deficits, a rising debt burden, high unemployment, economic stagnation, and a restive population.

On June 14, 2001, Domingo Cavallo, the treasury secretary for a new Argentine president, announced a dramatic change in policy to stimulate Argentina’s slumping economy, then in its fourth year of recession. Henceforth, the peso exchange rate for exporters and importers would be an average of a dollar and a euro, that is, P1 = $0.50 + €0.50. With the euro then trading at about $0.85, exporters would now receive around 8 percent more pesos for the dollars they exchanged and importers would have to pay around 8 percent more for the dollars they bought. Financial markets panicked, fearing that this change was but a prelude to abandonment of the currency board. In response, Mr. Cavallo said that his new policy just amounted to a subsidy for exporters and a surcharge on imports and not an attempt to devalue the peso.

Over the next six months, Argentina’s bold currency experiment unraveled amidst political and economic chaos brought about by the failure of Argentine politicians to rein in spending and to reform the country’s labor laws. During the two-week period ending January 1, 2002, Argentina had five different presidents and suspended payments on its $132 billion in public debt, the largest sovereign debt default in history. On January 6, 2002, President Eduardo Duhalde announced that he would end Argentina’s decade-long currency board system. The collapse of the currency board had devastating consequences. Over the next week, the Argentine peso plunged by 50 percent against the dollar. By year’s end, the peso had depreciated 70 percent, the government had imposed a draconian banking freeze that sparked violent rioting, and a severe economic contraction took the Argentine economy back to 1993 levels. In effect, forced to choose between the economic liberalization and fiscal discipline that was necessary to save its currency board and the failed economic policies of Peronism, Argentina ultimately chose the latter and wound up with a disaster.
The downside of a currency board is that a run on the currency forces a sharp contraction in the money supply and a jump in interest rates. High interest rates slow economic activity, increase bankruptcies, and batter real estate and financial markets. For example, Hong Kong’s currency board weathered the Asian storm and delivered a stable currency but at the expense of high interest rates (300 percent at one point in October 1997), plummeting stock and real estate markets, and deflation. Short of breaking the Hong Kong dollar’s peg to the U.S. dollar, the government can nothing about deflation. Instead of being able to ease monetary policy and cut interest rates during a downturn, Hong Kong must allow wages and prices to decline and wait for the global economy to recover and boost demand for the city’s goods and services. Argentina, on the other hand, abandoned its currency board in an attempt to deal with its recession.

One lesson from Argentina’s failed currency board experiment is that exchange rate arrangements are no substitute for good macroeconomic policy. The latter takes discipline and a willingness to say no to special interests. The peso and its currency board collapsed once domestic and foreign investors determined that Argentina’s fiscal policies were unsound, unlikely to improve, and incompatible with the maintenance of a fixed exchange rate. Another lesson is that a nation cannot be forced to maintain a currency arrangement that has outlived its usefulness. As such, no fixed exchange rate system, no matter how strong it appears, is completely sound and credible.

Dollarization

Dollarization is the ultimate commitment to monetary credibility and a currency good as the dollar is **dollarization**—the complete replacement of the local currency with the U.S. dollar. The desirability of dollarization depends on whether monetary discipline is easier to maintain by abandoning the local currency altogether than under a system in which the local currency circulates but is backed by the dollar. The experience of Panama with dollarization is instructive. Dollarization began in Panama 100 years ago, in 1904. Annual inflation has averaged 1.7 percent for the past thirty years, lower than in the United States; there is no local currency risk; and thirty-year mortgages are readily available. These are unusual conditions for a developing country, and they stem from dollarization. The downside of dollarization is the loss of **seigniorage**, the central bank’s profit on the currency it prints. However, this loss is acceptable if the alternative is monetary chaos.

That is what Ecuador decided recently. Ecuador’s new government—faced with a plunging currency, accelerating capital flight, a bankrupt banking system, huge budget deficits, in default to foreign creditors, and with its economy in a nosedive—unveiled an economic reform package on January 9, 2000. The centerpiece of that program was the planned replacement of the currency it had used for the past 116 years, the sucre, with the U.S. dollar. As Exhibit 2.7 demonstrates, the announcement of dollarization was enough, by itself, to stabilize the foreign exchange market. The next day, the sucre traded at the new official level of 25,000 per dollar. It remained there, despite nationwide strikes and two changes of government, until September 9, 2000, when Ecuador officially replaced the sucre with the dollar. During the period leading up to that date, some capital returned to Ecuador and the economy began to grow again.

Dollarization by itself, of course, is no guarantee of economic success. It can provide price stability, but like a currency board it is not a substitute for sound economic policies. Even the United States, which by definition is dollarized, has its economic ups and downs. To achieve stable economic growth, what is needed are the types of political and economic reforms discussed in Chapter 6. But what dollarization can do is to provide the macroeconomic stability that will enhance the impact of these reforms.
2.3 The Fundamentals of Central Bank Intervention

The exchange rate is one of the most important prices in a country because it links the domestic economy and the rest-of-world economy. As such, it affects relative national competitiveness.

How Real Exchange Rates Affect Relative Competitiveness

We already have seen the link between exchange rate changes and relative inflation rates. The important point for now is that an appreciation of the exchange rate beyond that necessary to offset the inflation differential between two countries raises the price of domestic goods relative to the price of foreign goods. This rise in the real or inflation-adjusted exchange rate—measured as the nominal (or actual) exchange rate adjusted for changes in relative price levels—proves to be a mixed blessing. For example, the rise in the value of the U.S. dollar from 1980 to 1985 translated directly into a reduction in the dollar prices of imported goods and raw materials. As a result, the prices of imports and of products that compete with imports began to ease. This development contributed significantly to the slowing of U.S. inflation in the early 1980s.

However, the rising dollar had some distinctly negative consequences for the U.S. economy as well. Declining dollar prices of imports had their counterpart in the increasing foreign currency prices of U.S. products sold abroad. As a result, American exports became less competitive in world markets, and American-made import substitutes became less competitive in the United States. Domestic sales of traded goods declined, generating unemployment in the traded-goods sector and inducing a shift in resources from the traded- to the nontraded-goods sector of the economy.

Alternatively, home currency depreciation results in a more competitive traded-goods sector, stimulating domestic employment and inducing a shift in resources from
A strong dollar hurts U.S. exports, while giving consumers access to cheaper foreign products; a weak dollar helps U.S. exports but hurts American consumers.

From its peak in mid-1985, the U.S. dollar fell by more than 50 percent during the next few years, enabling Americans to experience the joys and sorrows of both a strong and a weak currency in less than a decade. The weak dollar made U.S. companies more competitive worldwide; at the same time, it lowered the living standards of Americans who enjoyed consuming foreign goods and services. The dollar hit a low point in 1995 and then began to strengthen, largely based on the substantial success that the United States had in taming inflation and the budget deficit and in generating strong economic growth. Exhibit 2.8 charts the value of the U.S. dollar from 1970 to 2001. Despite its substantial rise in the late 1990s, and more recent decline, the dollar is still below its level achieved back in 1970.

**Foreign Exchange Market Intervention**

Depending on their economic goals, some governments will prefer an overvalued domestic currency, whereas others will prefer an undervalued currency. Still others just want a correctly valued currency, but economic policy makers may feel that the rate set by the market is irrational; that is, they feel they can better judge the correct exchange rate than the marketplace can. The tradeoffs faced by governments in terms of their exchange rate objectives are illustrated by the example of China's yuan.

---

**EXHIBIT 2.8 ● TRACKING THE VALUE OF THE DOLLAR: 1970–2001**

[J.P. Morgan narrow effective exchange rate index. Data are monthly averages, through October 2001. Source: J.P. Morgan, www2.jpmorgan.com/MarketDataInd/Forex/currIndex.html.]
On September 2, 2003, U.S. Treasury Secretary John Snow traveled to Beijing to lobby his Chinese counterparts to revalue what is widely regarded as an undervalued yuan. In the eyes of U.S. manufacturers and labor unions, a cheap yuan gives China’s exports an unfair price advantage and is accelerating the movement of manufacturing jobs to China. One evidence of this problem is the widening U.S. trade deficit with China, which reached $130 billion in 2002. Similarly, Japan, South Korea, and many European and other nations are pushing for China to abandon its fixed exchange rate because a weak U.S. dollar, which automatically lowered the yuan against other currencies, was making already inexpensive Chinese goods unfairly cheap on global markets, hurting their own exports.

China rejected calls for it to revalue its currency and said it would maintain the stability of the yuan. Since 1996, China has fixed its exchange rate at 8.28 yuan to the dollar. In the past year, the dollar has depreciated significantly against the euro, giving Chinese companies a competitive advantage against European manufacturers. A massive rise in China’s foreign exchange reserves in recent years (reserves rose 21 percent in the first half of 2003 to reach $346.5 billion as of June 30, 2003) is evidence that the Chinese government has been holding its currency down artificially. Politicians and business people in the United States and elsewhere have been calling for the yuan to be revalued, which it almost certainly would in a free market. (Economists estimate that the yuan is currently undervalued by 20 percent to 30 percent against the dollar.)

The Chinese government is resisting the clamor for yuan revaluation because of the serious problems it faces. China is often referred to as a “bicycle economy,” meaning that it needs to keep moving forward just to avoid falling down. As the country becomes more market-oriented, its money-losing state-owned enterprises must lay off millions of workers. Only flourishing businesses can absorb this surplus labor. The Chinese government is concerned that allowing the yuan to appreciate would stifle the competitiveness of its exports and result in millions of unemployed and disgruntled Chinese wandering the countryside, threatening the stability of its regime. It also justified a weak yuan as a means of fighting the threat of deflation.

Nonetheless, keeping China’s currency peg is not risk free. Foreign currency inflows are rising as investors, many of whom are ordinary Chinese bringing overseas capital back home, bet that China will be forced to revalue its yuan. They are betting on the yuan by purchasing Chinese stocks, real estate, and treasury bonds. To maintain its fixed exchange rate, the Bank of China must sell yuan to buy up all these foreign currency inflows. This intervention boosts China’s foreign exchange reserves, but at the expense of a surging yuan money supply, which rose 21 percent in the first half of 2003 alone. For a time, a rising domestic money supply seemed an appropriate response to an economy that appeared to be on the verge of deflation. More recently, however, rapid money supply growth threatens inflation, and has led to roaring asset prices, including fears of a speculative bubble in real estate, and excessive bank lending. The latter is particularly problematic as Chinese banks are estimated to already have at least $500 billion in nonperforming loans to bankrupt state companies and unprofitable property developers.

Another risk in pursuing a cheap currency policy is the possibility of stirring protectionist measures in its trading partners. For example, ailing U.S. textile makers are lobbying the Bush administration for emergency quotas on Chinese textiles imports, while other manufacturers are seeking trade sanctions if Beijing won’t allow the yuan to rise. Similarly, European government officials have spoken of retaliatory trade measures to force a revalued yuan.
No matter what category they fall in, most governments will be tempted to intervene in the foreign exchange market to move the exchange rate to the level consistent with their goals or beliefs. Foreign exchange market intervention refers to official purchases and sales of foreign exchange that nations undertake through their central banks to influence their currencies.

For example, review Section 2.1 and suppose the United States and Euroland decide to maintain the old exchange rate $e_0$ in the face of the new equilibrium rate $e_1$. According to Exhibit 2.2, the result will be an excess demand for euros equal to $Q_3 - Q_2$; this euro shortage is the same as an excess supply of $(Q_3 - Q_2)e_0$ dollars. Either the Federal Reserve (the American central bank), or the European Central Bank (the central bank for Euroland), or both will then have to intervene in the market to supply this additional quantity of euros (to buy up the excess supply of dollars). Absent some change, the United States will face a perpetual balance-of-payments deficit equal to $(Q_3 - Q_2)e_0$ dollars, which is the dollar value of the Euroland balance-of-payments surplus of $(Q_3 - Q_2)$ euros.

**Mechanics of Intervention** Although the mechanics of central bank intervention vary, the general purpose of each variant is basically the same: to increase the market demand for one currency by increasing the market supply of another. To see how this purpose can be accomplished, suppose in the previous example that the European Central Bank (ECB) wants to reduce the value of the euro from $e_1$ to its previous equilibrium value of $e_0$. To do so, the ECB must sell an additional $(Q_3 - Q_2)$ euros in the foreign exchange market, thereby eliminating the shortage of euros that would otherwise exist at $e_0$. This sale of euros (which involves the purchase of an equivalent amount of dollars) will also eliminate the excess supply of $(Q_3 - Q_2)e_0$ dollars that now exists at $e_0$. The simultaneous sale of euros and purchase of dollars will balance the supply and demand for euros (and dollars) at $e_0$.

If the Fed also wants to raise the value of the dollar, it will buy dollars with euros. Regardless of whether the Fed or the ECB initiates this foreign exchange operation, the net result is the same: The U.S. money supply will fall, and Euroland’s money supply will rise.

**Questions**

1. Why is China trying to hold down the value of the yuan? What evidence suggests that China is indeed pursuing a weak currency policy?
2. What benefits does China expect to realize from a weak currency policy?
3. What policy tool is China using to maintain the yuan at an artificially low level? Are there any potential problems with using this policy tool? What might China do to counter these problems?
4. Does an undervalued yuan impose any costs on the Chinese economy? If so, what are they?
5. Suppose the Chinese government were to cease its foreign exchange market intervention and the yuan climbed to five to the dollar. What would be the percentage gain to a dollar investor?
6. Currently, the yuan is not a convertible currency, meaning that Chinese individuals are not permitted to exchange their yuan for dollars to invest abroad. Moreover, companies operating in China must convert all their foreign exchange earnings into yuan. Suppose China were to relax these currency controls and restraints on capital outflows. What would happen to the pressure on the yuan to revalue? Explain.
Sterilized versus Unsterilized Intervention  The two examples just discussed are instances of unsterilized intervention; that is, the monetary authorities have not insulated their domestic money supplies from the foreign exchange transactions. In both cases, the U.S. money supply will fall, and the Euroland money supply will rise. As noted earlier, an increase (decrease) in the supply of money, all other things held constant, will result in more (less) inflation. Thus, the foreign exchange market intervention will not only change the exchange rate, it will also increase Euroland inflation, while reducing U.S. inflation. Recall that it was the jump in the U.S. money supply that caused this inflation. These money supply changes will also affect interest rates in both countries.

To neutralize these effects, the Fed and/or the ECB can sterilize the impact of their foreign exchange market intervention on the domestic money supply through an open-market operation, which is just the sale or purchase of Treasury securities. For example, the purchase of U.S. Treasury bills by the Fed supplies reserves to the banking system and increases the U.S. money supply. After the open-market operation, therefore, the public will hold more cash and bank deposits and fewer Treasury securities. If the Fed buys enough T-bills, the U.S. money supply will return to its preintervention
level. Similarly, the ECB could neutralize the impact of intervention on the Euroland money supply by subtracting reserves from its banking system through sales of euro-denominated securities.

For example, during a three-month period in 2003 alone, the Bank of China issued 250 billion yuan in short-term notes to commercial banks to sterilize the yuan created by its foreign exchange market intervention. The Bank of China also sought to mop up excess liquidity by raising its reserve requirements for financial institutions, forcing banks to keep more money on deposit with it and make fewer loans.

The net result of sterilization should be a rise or fall in the country’s foreign exchange reserves but no change in the domestic money supply. These effects are shown in Exhibit 2.10a, which displays a steep decline in Mexico’s international reserves during 1994 while its money supply, measured by its monetary base (currency in circulation plus bank reserves), followed its usual growth path with its usual seasonal variations. As mentioned earlier, Banco de Mexico sterilized its purchases of pesos by buying back government securities. Conversely, Argentina’s currency board precluded its ability to sterilize changes in foreign exchange reserves, forcing changes in Argentina’s monetary base to closely match changes in its dollar reserves, as can be seen in Exhibit 2.10b.

The Effects of Foreign Exchange Market Intervention

The basic problem with central bank intervention is that it is likely to be either ineffectual or irresponsible. Because sterilized intervention entails a substitution of foreign currency–denominated securities for domestic currency securities, the exchange rate will be permanently affected only if investors view domestic and foreign securities as being imperfect substitutes. If this is the case, then the exchange rate and relative interest rates must change to induce investors to hold the new portfolio of securities.

If investors consider these securities to be perfect substitutes, however, then no change in the exchange rate or interest rates will be necessary to convince investors to hold this portfolio. In this case, sterilized intervention is ineffectual. This conclusion is

---

EXHIBIT 2.10 • MEXICO AND ARGENTINA FOLLOW DIFFERENT MONETARY POLICIES

<table>
<thead>
<tr>
<th></th>
<th>1991</th>
<th>92</th>
<th>93</th>
<th>94</th>
<th>95</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>International reserves</strong> (dollars)</td>
<td>20,000</td>
<td>17,500</td>
<td>15,000</td>
<td>12,000</td>
<td>10,000</td>
</tr>
<tr>
<td><strong>Monetary base (total monetary liabilities, pesos)</strong></td>
<td>5,000</td>
<td>2,500</td>
<td>7,500</td>
<td>10,000</td>
<td>12,000</td>
</tr>
</tbody>
</table>

**NOTE:** End-of-month figures, except latest value plotted April 12, 1995

(a) International Reserves and Monetary Base in Mexico

<table>
<thead>
<tr>
<th></th>
<th>1991</th>
<th>92</th>
<th>93</th>
<th>94</th>
<th>95</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>International reserves</strong> (dollars)</td>
<td>30,000</td>
<td>25,000</td>
<td>20,000</td>
<td>15,000</td>
<td>10,000</td>
</tr>
<tr>
<td><strong>Monetary base (total monetary liabilities, pesos or dollars)</strong></td>
<td>30,000</td>
<td>25,000</td>
<td>20,000</td>
<td>15,000</td>
<td>10,000</td>
</tr>
</tbody>
</table>

**NOTE:** End-of-month figures, except latest value plotted April 11, 1995

(b) International Reserves and Monetary Base in Argentina


---

7 Central banks typically hold their foreign exchange reserves in the form of foreign currency bonds. Sterilized intervention, therefore, involves selling off some of the central bank’s foreign currency bonds and replacing them with domestic currency ones. Following the intervention, the public will hold more foreign currency bonds and fewer domestic currency bonds.
consistent with the experiences of Mexico as well as those of the United States and other industrial nations in their intervention policies. For example, Exhibit 2.11 shows that a sequence of eight large currency interventions by the Clinton administration between 1993 and 2000 had little effect on the value of the dollar or its direction; exchange rates appear to have been moved largely by basic market forces. Similarly, Mexico ran through about $25 billion in reserves in 1994, and Asian nations ran through more than $100 billion in reserves in 1997 to no avail.

Sterilized intervention could affect exchange rates by conveying information or by altering market expectations. It does this by signaling a change in monetary policy to the market, not by changing market fundamentals, so its influence is transitory.

On the other hand, unsterilized intervention can have a lasting effect on exchange rates, but insidiously—by creating inflation in some nations and deflation in others. In the example presented above, Euroland would wind up with a permanent (and inflationary) increase in its money supply, and the United States would end up with a deflationary decrease in its money supply. If the resulting increase in Euroland inflation and decrease in U.S. inflation were sufficiently large, the exchange rate would remain at $e_0$ without the need for further government intervention. But it is the money supply changes, and not the intervention by itself, that affect the exchange rate. Moreover, moving the nominal exchange rate from $e_1$ to $e_0$ should not affect the real exchange rate because the change in inflation rates offsets the nominal exchange rate change.

If forcing a currency below its equilibrium level causes inflation, it follows that devaluation cannot be much use as a means of restoring competitiveness. A devaluation improves competitiveness only to the extent that it does not cause higher inflation. If the devaluation causes domestic wages and prices to rise, any gain in competitiveness is quickly eroded. For example, Mexico’s 1994 peso devaluation led to a burst of inflation, driving the peso still lower and evoking fears of a continuing inflation-devaluation cycle.

**EXHIBIT 2.11 • THE VISIBLE HAND**

The Clinton administration’s currency-market interventions, shown with J.P. Morgan’s index of the U.S. dollar against eighteen major currencies.

Note: Episodes typically involved more than one sale or purchase of dollars over days or weeks.

Questions

1. Describe how these three typical transactions should affect present and future exchange rates:
   a. Joseph E. Seagram & Sons imports a year’s supply of French champagne. Payment in French francs is due immediately.
   b. MCI sells a new stock issue to Alcatel, the French telecommunications company. Payment in dollars is due immediately.
   c. Korean Airlines buys five Boeing 747s. As part of the deal, Boeing arranges a loan to KAL for the
purchase amount from the U.S. Export–Import Bank. The loan is to be paid back over the next seven years with a two-year grace period.

2. The maintenance of money’s value is said to depend on the monetary authorities. What might the monetary authorities do to a currency that would cause its value to drop?

3. For each of the following six scenarios, state whether the value of the dollar will appreciate, depreciate, or remain the same relative to the Japanese yen. Explain each answer. Assume that exchange rates are free to vary and that other factors are held constant.
   a. The growth rate of national income is higher in the United States than in Japan.
   b. Inflation is higher in the United States than in Japan.
   c. Prices in Japan and the United States are rising at the same rate.
   d. Real interest rates in the United States rise relative to real rates in Japan.
   e. The United States imposes new restrictions on the ability of foreigners to buy American companies and real estate.
   f. U.S. wages rise relative to Japanese wages, while American productivity falls behind Japanese productivity.

4. The Fed adopts an easier monetary policy. How is this likely to affect the value of the dollar and U.S. interest rates?

5. Comment on the following headline from the New York Times. “Germany Raises Interest Rate, and Value of Dollar Declines” (October 10, 1997).

6. In the 1995 election for the French presidency, the Socialist candidate, Lionel Jospin, vowed to halt all privatizations, raise taxes on business, spend heavily on job creation, and cut the workweek without a matching pay cut. At the time Mr. Jospin made this vow, he was running neck-and-neck with the conservative Prime Minister Jacques Chirac, who espoused free-market policies.
   a. How do you think the French franc responded to Mr. Jospin’s remarks?
   b. Mr. Chirac won the election. What was the franc’s likely reaction?

7. On November 28, 1990, Federal Reserve Chairman Alan Greenspan told the House Banking Committee that despite possible benefits to the U.S. trade balance, “a weaker dollar also is a cause for concern.” This statement departed from what appeared to be an attitude of benign neglect by U.S. monetary officials toward the dollar’s depreciation. He also rejected the notion that the Fed should aggressively ease monetary policy, as some Treasury officials had been urging. At the same time, Mr. Greenspan did not mention foreign exchange market intervention to support the dollar’s value.
   a. What was the likely reaction of the foreign exchange market to Mr. Greenspan’s statements? Explain.
   b. Can Mr. Greenspan support the value of the U.S. dollar without intervening in the foreign exchange market? If so, how?

8. Many Asian governments have attempted to promote their export competitiveness by holding down the values of their currencies through foreign exchange market intervention.
   b. Some Asian countries have attempted to sterilize their foreign exchange market intervention by selling bonds. What are the likely consequences of sterilization on interest rates? On exchange rates in the longer term? On export competitiveness?

9. As mentioned in the chapter, Hong Kong has a currency board that fixes the exchange rate between the U.S. and H.K. dollars.
   a. What is the likely consequence of a large capital inflow for the rate of inflation in Hong Kong? For the competitiveness of Hong Kong business? Explain.
   b. Given a large capital inflow, what would happen to the value of the Hong Kong dollar if it were allowed to freely float? What would be the effect on the competitiveness of Hong Kong business? Explain.
   c. Given a large capital inflow, will Hong Kong business be more or less competitive under a currency board or with a freely floating currency? Explain.

10. In 1994, an influx of drug money to Colombia coincided with a sharp increase in its export earnings from coffee and oil.
   a. What was the likely impact of these factors on the value of the Colombian peso and the competitiveness of Colombia’s legal exports? Explain.
   b. In 1996, Colombia’s president, facing charges of involvement in his country’s drug cartel, sought to boost his domestic popularity by pursuing more expansionary monetary policies. Standing in the way was Colombia’s independent central bank—Banco de la Republica. In response, the president and his supporters discussed the possibility of returning central bank control to the executive branch. Describe the likely economic consequences of ending Banco de la Republica’s independence.
Problems

   a. What was the original U.S. dollar value of the Zim dollar? What is the new U.S. dollar value of the Zim dollar?
   b. By what percent has the Zim dollar devalued (revalued) relative to the U.S. dollar?
   c. By what percent has the U.S. dollar appreciated (depreciated) relative to the Zim dollar?

   a. What was the dollar value of the yen in 1995? What was the yen's dollar value in 2000?
   b. By what percent has the yen fallen in value between 1995 and 2000?
   c. By what percent has the dollar risen in value between 1995 and 2000?

3. On February 1, the euro is worth $0.8984. By May 1, it has moved to $0.9457.
   a. By what percent has the euro appreciated or depreciated against the dollar during this three-month period?
   b. By what percent has the dollar appreciated or depreciated against the euro during this period?

4. In early August 2002 (the exact date is a state secret), North Korea reduced the official value of the won from $0.465 to $0.0067. The black market value of the won at that time was $0.005.
   a. By what percent did the won devalue?
   b. Following the initial devaluation, what further percentage devaluation would be necessary for the won to equal its black market value?

5. On Friday, September 13, 1992, the lira was worth DM 0.0013065. Over the weekend, the lira devalued against the DM to DM 0.0012613.
   a. By how much had the lira devalued against the DM?
   b. By how much had the DM appreciated against the lira?
   c. Suppose Italy borrowed DM 4 billion, which it sold to prop up the lira. What were the Bank of Italy's lira losses on this currency intervention?
   d. Suppose Germany spent DM 24 billion in an attempt to defend the lira. What were the Bundesbank's DM losses on this currency intervention?

6. At the time Argentina launched its new exchange rate scheme, the euro was trading at $0.85. Exporters and importers would be able to convert between dollars and pesos at an exchange rate that was an average of the dollar and the euro exchange rates, that is, $P = \$0.50 + \€0.50$.
   a. How many pesos would an exporter receive for one dollar under the new system?
   b. How many dollars would an importer receive for one peso under the new system?

Bibliography


Internet Resources

pacific.commerce.ubc.ca/xr/plot.html Contains current and historical foreign exchange rate data for all currencies that you can download into preformatted time series charts.


www.bis.org/cbanks.htm Web site of the Bank for International Settlements (BIS) that takes you directly to links with the various central banks of the world.

www.bis.org/review/index.htm Contains a collection of articles and speeches by senior central bankers.

www2.jpmorgan.com/MarketDataInd/Forex/currIndex.html Web site of J.P. Morgan that contains historical data on real and nominal foreign exchange rate indexes going back to 1970.
Chapter 2  The Determination of Exchange Rates  63

research.stlouisfed.org/fred2/  Web site of the Federal Reserve Bank of St. Louis that takes you directly to current and historical foreign exchange rate data that you can download into spreadsheets.

www.federalreserve.gov/releases/H10/hist/  Web site of the Federal Reserve Bank that takes you directly to historical foreign exchange rate data that you can download into spreadsheets.

patriot.net/~bernkopf/  Contains links to central banks and ministries of finance and economics worldwide and to multilateral financial institutions such as the IMF, BIS, World Bank, and OECD. It also contains histories of central banks.

Internet Exercises

1. Plot the nominal and real values of the dollar over the past ten years using the J.P. Morgan data.
2. How closely correlated are changes in the real and nominal values of the dollar over this period? That is, do the real and nominal exchange rates tend to move together?
3. By how much has the dollar changed in real terms over this period?
4. By how much has the dollar changed in nominal terms over this period?
5. Plot the following exchange rates over the past five years: dollar/yen, dollar/euro, and dollar/pound. Are these exchange rates closely correlated with each other? You can use foreign exchange data from the Federal Reserve for this assignment.
6. Based on your review of several recent currency interventions, what reasons were given by the monetary authorities for these interventions? How much money was expended during these interventions? You can find stories of these interventions by searching the Web site of the Federal Reserve Bank of New York and the Web sites of other central banks linked through the BIS Web site.
7. Based on your review of the Economist, the Wall Street Journal, and Financial Times, which countries are having currency problems? What are the causes of those currency problems?