

CHAPTER 11

In simple terms, it is the interaction of supply and demand factors for two currencies in the market that determines the rate at which they trade. But what factors influence the many thousands of decisions made each day to buy or sell a currency? How do changes in supply and demand conditions explain the path of an exchange rate over the course of a day, a month, or a year?

This complex issue has been extensively studied in economic literature and widely discussed among investors, officials, academicians, traders, and others. Still, there are no definitive answers. Views on exchange rate determination differ and have changed over time. No single approach provides a satisfactory explanation of exchange rate movements, particularly short- and medium-term movements, since the advent of

widespread floating in the early 1970s.

Three aspects of exchange rate determination are discussed below. First, there is a brief description of some of the broad approaches to exchange rate determination. Second, there are some comments on the problems of exchange rate forecasting in practice. Third, central bank intervention and its effects on exchange rates are discussed.

1. SOME APPROACHES TO EXCHANGE RATE DETERMINATION⁶

► The Purchasing Power Parity Approach

Purchasing Power Parity (PPP) theory holds that in the long run, exchange rates will adjust to equalize the relative purchasing power of currencies. This concept follows from the *law of one price*, which holds that in competitive markets, identical goods will sell for identical prices when valued in the same currency.

The law of one price relates to an individual product. A generalization of that law is the *absolute* version of PPP, the proposition that exchange rates will equate nations' overall price levels. More commonly used than absolute PPP is the concept of *relative* PPP, which focuses on

changes in prices and exchange rates, rather than on absolute price levels. Relative PPP holds that there will be a *change* in exchange rates proportional to the *change* in the ratio of the two nations' price levels, assuming no changes in structural relationships. Thus, if the U.S. price level rose 10 percent and the Japanese price level rose 5 percent, the U.S. dollar would depreciate 5 percent, offsetting the higher U.S. inflation and leaving the relative purchasing power of the two currencies unchanged.

PPP is based in part on some unrealistic assumptions: that goods are identical; that all goods are tradable; that there are no

transportation costs, information gaps, taxes, tariffs, or restrictions of trade; and —implicitly and importantly—that exchange rates are influenced only by relative inflation rates. But contrary to the implicit PPP assumption, exchange rates also can change for reasons other than differences in inflation rates. Real exchange rates can and do change significantly over time, because of such things as major shifts in productivity growth, advances in technology, shifts in factor supplies, changes in market structure, commodity shocks, shortages, and booms.

In addition, the relative version of PPP suffers from measurement problems: What is a good starting point, or base period? Which is the appropriate price index? How should we account for new products, or changes in tastes and technology?

PPP is intuitively plausible and a matter of common sense, and it undoubtedly has some validity—significantly different rates of inflation should certainly affect exchange rates. PPP is useful in assessing long-term exchange rate trends and can provide valuable information about long-run equilibrium. But it has not met with much success in predicting exchange rate movements over short- and medium-term horizons for widely traded currencies. In the short term, PPP seems to apply best to situations where a country is experiencing very high, or even hyperinflation, in which large and continuous price rises overwhelm other factors.

► The Balance of Payments and the Internal-External Balance Approach

PPP concentrates on one part of the balance of payments—tradable goods and services—and postulates that exchange rate changes are determined by international differences in prices, or changes in prices, of tradable items.

Other approaches have focused on the balance of payments on current account, or on the balance of payments on current account plus long-term capital, as a guide in the determination of the appropriate exchange rate. But in today's world, it is generally agreed that it is essential to look at the entire balance of payments—both current and capital account transactions—in assessing foreign exchange flows and their role in the determination of exchange rates.

John Williamson and others have developed the concept of the “fundamental equilibrium exchange rate,” or FEER, envisaged as the equilibrium exchange rate that would reconcile a nation's internal and external balance. In that system, each country would commit itself to a macroeconomic strategy designed to lead, in the medium term, to “internal balance”—defined as unemployment at the natural rate and minimal inflation—and to “external balance”—defined as achieving the targeted current account balance. Each country would be committed to holding its exchange rate within a band or target zone around the FEER, or the level needed to reconcile internal and external balance during the intervening adjustment period.

The concept of FEER, as an equilibrium exchange rate to reconcile internal and external balance, is a useful one. But there are practical problems in calculating FEERs. There is no unique answer to what constitutes the FEER; depending on the particular assumptions, models, and econometric methods used, different analysts could come to quite different results. The authors recognize this difficulty, and acknowledge that some allowance should be made by way of a target band around the FEER. Williamson has suggested that FEER calculations could not realistically justify exchange rate bands narrower than plus or minus 10 percent.

BOX 11-1

A METHODOLOGY FOR EXCHANGE RATE ASSESSMENTS

Oversight of members' exchange rate policies is at the core of the IMF's surveillance mandate. The methodology used for assessing the appropriateness of current account positions and exchange rates for major industrial countries embodies four steps:

- ▶ applying a trade-equation model to calculate the underlying current account positions that would emerge at prevailing market exchange rates if all countries were producing at their potential output levels;
- ▶ using a separate model to estimate a normal or equilibrium level of the saving-investment balance consistent with medium-run fundamentals, including the assumption that countries were operating at potential output;
- ▶ calculating the amount by which the exchange rate would have to change, other things being equal, to equilibrate the underlying current account position with the medium-term saving-investment norm; and
- ▶ assessing whether the estimates of exchange rates consistent with medium-term fundamentals suggest that any currencies are badly misaligned.

The IMF, while generally agreeing that it is not possible to identify precise "equilibrium" values for exchange rates and that point estimates of notional equilibrium rates should generally be avoided, does use a macroeconomic balance methodology to underpin its internal IMF multilateral surveillance. This methodology, which is used for assessing the "appropriateness" of current account positions and exchange rates for major industrial countries, is described in Box 11-1.⁷

▶ The Monetary Approach

The monetary approach to exchange rate determination is based on the proposition that exchange rates are established through the process of balancing the total supply of, and the total demand for, the national money in each nation. The premise is that the supply of money can be controlled by the nation's monetary

authorities, and that the demand for money has a stable and predictable linkage to a few key variables, including an inverse relationship to the interest rate—that is, the higher the interest rate, the smaller the demand for money.

In its simplest form, the monetary approach assumes that: prices and wages are completely flexible in both the short and long run, so that PPP holds continuously, that capital is fully mobile across national borders, and that domestic and foreign assets are perfect substitutes. Starting from equilibrium in the money and foreign exchange markets, if the U.S. money supply increased, say, 20 percent, while the Japanese money supply remained stable, the U.S. price level, in time, would rise 20 percent and the dollar would depreciate 20 percent in terms of the yen.

In this simplified version, the monetary approach combines the PPP theory with the quantity theory of money—increases or decreases in the money supply lead to proportionate increases or decreases in the price level over time, without any permanent effects on output or interest rates. More sophisticated versions relax some of the restrictive assumptions—for example, price flexibility and PPP may be assumed not to hold in the short run—but maintain the focus on the role of national monetary policies.

Empirical tests of the monetary approach—simple or sophisticated—have failed to provide an adequate explanation of exchange rate movements during the floating rate period. The approach offers only a partial view of the forces influencing exchange rates—it assumes away the role of non-monetary assets such as bonds, and it takes no explicit account of supply and demand conditions in goods and services markets.

Despite its limitations, the monetary approach offers very useful insights. It highlights the importance of monetary policy in influencing exchange rates, and correctly warns that excessive monetary expansion leads to currency depreciation.

The monetary approach also provides a basis for explaining exchange rate overshooting—a situation often observed in exchange markets in which a policy move can lead to an initial exchange rate move that exceeds the eventual change implied by the new long-term situation. In the context of monetary approach models that incorporate short-term stickiness in prices, exchange rate overshooting can occur because prices of financial assets—interest and exchange rates—respond more quickly to policy moves than does the price level of goods and services. Thus, for example, a money supply increase (or

decrease) in the United States can lead to a greater temporary dollar depreciation (appreciation) as domestic interest rates decline (rise) temporarily before the adjustment of the price level to the new long-run equilibrium is completed and interest rates return to their original levels.

► The Portfolio Balance Approach

The portfolio balance approach takes a shorter-term view of exchange rates and broadens the focus from the demand and supply conditions for money to take account of the demand and supply conditions for other financial assets as well. Unlike the monetary approach, the portfolio balance approach assumes that domestic and foreign bonds are not perfect substitutes. According to the portfolio balance theory in its simplest form, firms and individuals balance their portfolios among domestic money, domestic bonds, and foreign currency bonds, and they modify their portfolios as conditions change. It is the process of equilibrating the total demand for, and supply of, financial assets in each country that determines the exchange rate.

Each individual and firm chooses a portfolio to suit its needs, based on a variety of considerations—the holder's wealth and tastes, the level of domestic and foreign interest rates, expectations of future inflation, interest rates, and so on. Any significant change in the underlying factors will cause the holder to adjust his portfolio and seek a new equilibrium. These actions to balance portfolios will influence exchange rates.

Accordingly, a nation with a sudden increase in money supply would immediately purchase both domestic and foreign bonds, resulting in a decline in both countries' interest rates, and, to the extent of the shift to foreign bonds, a depreciation in the nation's home currency. Over time, the depreciation in the home currency would lead to

growth in the nation's exports and a decline in its imports, and thus, to an improved trade balance and reversal of part of the original depreciation.

As yet, there is no unified theory of exchange rate determination based on the portfolio balance approach that has proved

reliable in forecasting. In fact, results of empirical tests of the portfolio balance approach do not compare favorably with those from simpler models. These results reflect both conceptual problems and the lack of adequate data on the size and currency composition of private sector portfolios.

BOX 11-2

MEASURING THE DOLLAR'S EQUILIBRIUM VALUE:

► A Look at Some Alternatives

As the discussion above indicates, there are various ways of estimating the dollar's "equilibrium" value, and they can yield a wide range of possible results.

In its 1998 annual report, the Bank for International Settlements (BIS) looks at three calculations of the dollar's long-run equilibrium rate, which can be compared with the dollar's market rates.

The three calculated rates considered by the BIS are (1) Purchasing Power Parity (PPP), (2) PPP adjusted for productivity, and (3) Fundamental Equilibrium Exchange Rates (FEER).⁸

As of mid-May 1998, on the basis of a straight calculation of PPP, the dollar appeared to be undervalued in the market (see table below). On May 11, 1998 the dollar was trading at 1.77 DEM and 132 yen. But to reach parity in PPP terms, the dollar would have had to command about 15 percent more DEM and about 30 percent more yen, using end-1996 measures of PPP.

The calculations for PPP adjusted for productivity show a different picture. Some analysts contend that differences in productivity across countries distort international comparisons of broad consumption baskets used in PPP calculations. The argument is made that countries such as Japan with higher productivity in the traded goods sector than in the non-traded goods sector tend to have real exchange rate appreciation, which makes their PPP appear to be higher than it really is; and that there should be an adjustment for this "productivity bias." One such adjustment calculated by Goldman Sachs suggests that the dollar was not undervalued in "adjusted-PPP" terms, but was overvalued by some 5-15 percent.

The third approach has been calculated by Swiss Bank Corporation, using FEER, or fundamental equilibrium exchange rate concepts. This calculation also suggests that the dollar was overvalued in the market in early 1998 by as much as 20-30 percent against the DEM and the yen. As noted above, both PPP calculations and FEER calculations can vary on the basis of the assumptions, models, and techniques used.

In recent years, the United States has run substantial current account deficits—a deficit of more than \$200 billion is expected in 1998—which might suggest an overvalued dollar. But the fact that those current account deficits have been so easily financed by capital inflows may indicate that the dollar is still considered a bargain at present levels.

(continued on page 112)

(continued from page 111)

Estimates of the U.S. Dollar's Purchasing Power and Fundamental Equilibrium Value

	Market Rate ^a Against the Dollar	PPP Purchasing Power Parity (PPP)		PPP Adjusted for Productivity Goldman Sachs ^d	Equilibrium Exchange Rate	
		OECD ^b	Penn ^c		IIE	SBC ^d
Deutsche mark	1.77	2.02	2.12	1.51	1.45-1.50	1.40
Japanese yen	132	169	188	124	100	95

^aOn May 11, 1998.^b1997 average.^c1992.^dEarly 1998.

Sources: Bank for International Settlements Annual Report, 1998. OECD, Penn World Tables 5.6, Goldman Sachs, John Williamson's 1996 informal update of estimates in estimating equilibrium exchange rates, Institute for International Economics (IIE), Washington, D.C. (September 1994) and Swiss Bank Corporation (SBC).

Nevertheless, the portfolio balance approach offers a useful framework for studying exchange rate determination. With its focus on a broad menu of assets, this approach provides richer insights than the monetary approach into the forces influencing exchange rates. It also enables foreign exchange rates to be seen like asset prices in other markets, such as the stock market or bond market, where rates are influenced, not only by current conditions, but to a great extent by market *expectations* of future events. As with other financial assets, exchange rates change continuously as the market receives new information—information about current conditions and information that affects expectations of the future. The random character of these asset price movements does not rule out rational pricing. Indeed, it is persuasively argued that this is the result to be expected in a well-functioning financial market. But in such an environment, exchange rate changes can be large and very difficult to predict, as market participants try to judge the expected real rates of

return on their domestic assets in comparison with alternatives in other currencies.

► How Good Are the Various Approaches?

The approaches noted above are some of the most general and most familiar ones, but there are many others, focusing on differentials in real interest rates, on fiscal policies, and on other elements. The research on this topic has been of great value in enhancing our understanding of long-run exchange rate trends and the issues involved in estimating “equilibrium” rates. It has helped us understand various aspects of exchange rate behavior and particular exchange rate episodes.

Yet none of the available empirical models has proved adequate for making reliable predictions of the course of exchange rates over a period of time. Research thus far has not been able to find stable and significant relationships between exchange rates and any economic fundamentals capable of consistently predicting or explaining short-term rate movements.

2. FOREIGN EXCHANGE FORECASTING IN PRACTICE

Most of the approaches to exchange rate determination tell only part of the story—like the several blindfolded men touching different parts of the elephant’s body—and other, more comprehensive explanations cannot, in practice, be used for precise forecasting. We do not yet have a way of bringing together all of the factors that help determine the exchange rate in a single comprehensive approach that will provide reliable short- to medium-term predictions.

The exchange rate is a pervasive and complex mechanism, influencing and being influenced by many different forces, with the effects and the relative importance of the different influences continuously changing as conditions change. To the extent that trade flows are a force in the market, competitiveness is obviously important to the exchange rate, and the many factors affecting competitiveness must be considered. To the extent that the money market is a factor, the focus should be on short-term interest rates, and on monetary policy and other factors influencing those short-term interest rates. To the extent that portfolio capital flows matter, the focus should be broadened to include bond market conditions and long-term interest rates. Particularly at times of great international tension, all other factors affecting the dollar exchange rate may be overwhelmed by considerations of “safe haven.” Indeed, countless forces influence the exchange rate, and they are subject to continuous and unpredictable changes over time, by a market that is broad and heterogenous in terms of the participants, their interests, and their time frames.

With conditions always changing, the impact of particular events and the response to particular policy actions can vary greatly with the circumstances at the time. Higher interest rates might strengthen a currency or weaken it,

by a small amount or by a lot—much depends on *why* the interest rates went up, whether a move was anticipated, what subsequent moves are expected, and the implications for other financial markets, decisions, or government policy moves. Similarly, the results of exchange rate changes are not always predictable: Importers might expect to pay more if their domestic currency depreciates, but not if foreign producers are “pricing to market” in order to establish a beachhead or maintain a market share, or if the importers or exporters had anticipated the rate move and had acted in advance to protect themselves from it.

Nonetheless, those participating in the market must make their forecasts, implicitly and explicitly, day after day, all of the time. Every piece of information that becomes available can be the basis for an adjustment of each participant’s viewpoint, or expectations—in other words, a forecast, informal or otherwise. When the screen flashes with an unexpected announcement that, say, Germany has reduced interest rates by a quarter of one percent, that is not just news, it is the basis for countless assessments of the significance of that event, and countless forecasts of its impact in number of basis points.

Those who forecast foreign exchange rates often are divided into those who use “technical” analysis, and those who rely on analysis of “fundamentals,” such as GDP, investment, saving, productivity, inflation, balance of payments position, and the like. Technical analysis assumes certain short-term and longer-term patterns in exchange rate movements. It differs from the “random walk” philosophy—the belief that all presently available information has been absorbed into the present exchange rate, and that the next

BOX 11-3**ASSESSING FACTORS THAT MAY INFLUENCE EXCHANGE RATES**

In the end, it is up to each market participant to decide, in each particular situation, which factors are likely or not likely to move an exchange rate, and what the impact on market expectations will be. It is a matter of judgment; market participants must read the market, decide which data are important, how much weight to give them, and whether and in what way to react—and often these assessments must be made very quickly. Among the considerations to keep in mind in assessing a new piece of information:

1. The Institutional Setting

- ▶ Does the currency float, or is it managed—and if so, is it pegged to another currency, basket, or other standard?
- ▶ What are its intervention practices? Are they credible, sustainable?

2. Fundamental Analysis

- ▶ Does the currency appear overvalued or undervalued in terms of PPP, balance of payments, FEER?
- ▶ What is the cyclical situation, in terms of employment, growth, savings, investment, and inflation?
- ▶ What are the prospects for government monetary, fiscal, and debt policy?

3. Confidence Factors

- ▶ What are market views and expectations with respect to the political environment, and the credibility of the government and central bank?

4. Events

- ▶ Are there national or international incidents in the news; possibility of crises or emergencies; governmental or other important meetings coming up?

5. Technical Analysis

- ▶ What trends do the charts show? Are there signs of trend reversals?
- ▶ At what rates do there appear to be important buy and sell orders? Are they balanced? Is the market over-bought, over-sold?
- ▶ What are the thinking and expectations of other market players and analysts?

piece of information as well as the direction of the next rate move is random, with a 50 percent chance the rate will rise, and 50 percent chance it will decline.

Nearly all traders acknowledge their use of technical analysis and charts. According to surveys, a majority say they employ technical analysis to a greater extent than “fundamental”

analysis, and that they regard it as more useful than fundamental analysis—a contrast to twenty years ago when most said they relied many more heavily on fundamental analysis. Perhaps traders use technical analysis in part because, at least superficially, it seems simpler, or because the data are more current and timely. Perhaps they use it because traders often have a very short-term time frame and are interested in very short-term moves. They might agree that “fundamentals” determine the course of prices in the long run, but they may not regard that as relevant to their immediate task, particularly since many “fundamental” data become available only with long lags and are often subject to major revisions. Perhaps traders think technical analysis will be effective in part because they know many other market participants are relying on it.

Still, spotting trends is of real importance to traders—“a trend is a friend” is a comment

often heard—and technical analysis can add some discipline and sophistication to the process of discovering and following a trend. Technical analysis may add more objectivity to making the difficult decision on when to give up on a position—enabling one to see that a trend has changed or run its course, and it is now time for reconsideration.

Most market participants probably use a combination of both fundamental and technical analysis, with the emphasis on each shifting as conditions change—that is, they form a general view about whether a particular currency is overvalued or undervalued in a structural or longer-term sense, and within that longer-term framework, assess the order flow and all current economic forecasts, news events, political developments, statistical releases, rumors, and changes in sentiment, while also carefully studying the charts and technical analysis.

3. OFFICIAL ACTIONS TO INFLUENCE EXCHANGE RATES

As in some other major industrial nations with floating exchange rate regimes, in the United States there is considerable scope for the play of market forces in determining the dollar exchange rate. But also, as in other countries, U.S. authorities do take steps at times to influence the exchange rate, via policy measures and direct intervention in the foreign exchange market to buy or sell foreign currencies. As noted above, in practice, all foreign exchange market intervention of the U.S. authorities is routinely sterilized—that is, the initial effect on U.S. bank reserves is offset by monetary policy action.

No one questions that monetary policy measures can influence the exchange rate by

affecting the relative attractiveness of a currency and expectations of its prospects, although it is difficult to find a stable and significant relationship that would yield a predictable, precise response. But the question of the effectiveness of *sterilized* intervention, which has been extensively studied and debated, is much more controversial. Some economists contend that sterilized intervention can have, at best, a modest and temporary effect. Others say it can have a more significant effect by changing expectations about policy and helping to guide the market. Still others believe that the effect depends on the particular market conditions and the intervention strategy of each situation.

Given the present size of U.S. monetary aggregates, balance of payments flows, and the levels of activity in the foreign exchange market and other financial markets, it is widely accepted that any effects of sterilized intervention are likely to be through indirect channels rather than through direct impact on these large aggregates. Empirical tests of sterilized intervention have focused on two main channels through which such intervention might indirectly influence the exchange rate: *the portfolio balance channel and the expectations, or signaling, channel.*

The *portfolio balance channel* postulates that the exchange rate is determined by the balance of supply and demand for available stocks of financial assets held by the private sector. It holds that sterilized intervention will alter the currency composition of assets available to the global private sector, and that if dollar and foreign currency-denominated assets are viewed by investors as imperfect substitutes, sterilized intervention will cause movements in the exchange rate to re-equilibrate supply and demand for dollar assets. The size of this portfolio balance effect would depend on the degree of substitutability between assets denominated in different currencies and on the size of the intervention operation.

The *expectations, or signaling, channel* holds that sterilized intervention may cause private agents to change their expectations of the future path of the exchange rate. Thus, intervention could signal information about the future course of monetary or other economic policies, signal information about, or analysis of, economic fundamentals or market trends, or influence expectations by affecting technical conditions such as bubbles and bandwagons.

A considerable number of studies have found no quantitatively important effects of sterilized intervention through the portfolio balance channel. Some studies have found expectations or signaling effects of varying degrees of significance. Others conclude that the effectiveness depends very much on market conditions and intervention strategy.

There are serious data and econometric problems in studying this question. To assess success, the researcher needs to know the objective of the intervention and other specific details—was the aim to ameliorate a trend, stop a trend, reverse a trend, show a presence, calm a market, discourage speculation, or buy a little time? The researcher also needs to know the counterfactual—what would have happened if the intervention had not taken place. Also, research on this issue must be placed in the broader context of research on exchange rate determination, which, as noted above, indicates that it has not been possible to find stable and significant relationships between exchange rates and any economic fundamentals.

As a practical matter, it is difficult to make sweeping assessments about the success or failure of official intervention operations. Some intervention operations have proven resoundingly successful, while others have been dismal failures. The success or failure of intervention is not so much a matter of statistical probability as it is a matter of how it is used and whether conditions are appropriate. Is the objective reasonable? Does the market look technically responsive? Is intervention anticipated? Will an operation look credible? What is the likely effect on expectations?

In 1983, the Working Group on Foreign Exchange Market Intervention established at the Versailles summit of the Group of Seven warned against expecting too much from official intervention, but concluded that such

intervention can be a useful and effective tool in influencing exchange rates in the short run, especially when such operations are consistent with fundamental economic policies. Unquestionably, intervention operations are more likely to succeed when there is a consistency with fundamental economic policies, but it may not always be possible to know whether that consistency exists.

Although attitudes differ, monetary authorities in all of the major countries intervene in the foreign exchange markets at times when they consider it useful or appropriate, and they are likely to continue to do so. The current attitude toward foreign exchange market intervention is summarized in the following excerpt from the June 1996 report of the finance ministers of the Group of Seven nations:

BOX 11-4

CONTINUING CLOSE G7 COOPERATION IN EXCHANGE MARKETS

Exchange rate misalignments can heighten uncertainty in the global economy and can be detrimental to growth and trade. When exchange rates appear to move out of line with underlying fundamentals, close monitoring is necessary and coordinated responses may be required.

We should continue our close cooperation in exchange markets in this foundation, taking into account the fact that:

- ▶ A clear and consistent articulation of a common G7 view can have a stabilizing influence and help reinforce the credibility of our commitment to cooperate in the exchange market when circumstances warrant;
- ▶ interventions can be effective in certain circumstances, especially when they reinforce changes in policies and/or underlying fundamentals that lead to changes in market expectations about future exchange rates;
- ▶ the instrument of intervention must be used judiciously, given its implications for monetary policy and the amount that the authorities can mobilize relative to the size of international capital markets. Nevertheless, these factors do not impede our joint ability to send a clear message to the markets, if and when appropriate;
- ▶ interventions are more likely to be effective when they are concerted and reflect a common assessment;
- ▶ an important condition for success is the appropriate timing of intervention.