Chapter 14

Doctrinal Views on Exchange Rate Determination: An Eclectic Approach

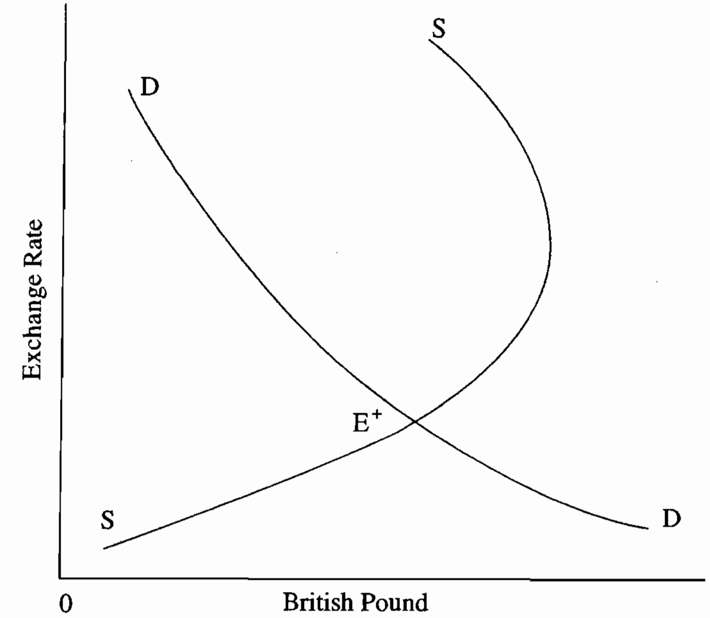
Dilip K. Ghosh, Abraham Mulugetta and Asrat Tessema

INTRODUCTION

Foreign exchange is the transmission fluid for international transactions in global markets. Since our world has become a truly global village, these transactions and the exchange rates that underlie them have assumed a significance of paramount proportion. How are foreign exchange rates determined? This question has been raised and answered for a long time, and the discussions have formed the basis for several doctrines. From the early 1920s onward, several theoretical paradigms have been posited in attempts to explain what factors determine exchange rates or how exchange rates are determined. It is therefore essential for anyone interested in this issue that we bring out the theoretical determinants of the exchange rate as presented in the existing literature. However, since it is neither possible, nor desirable perhaps, to bring every aspect or every argument advanced in the past, we will present only the major works that attempt to answer the question: what determines the rate of foreign exchange?

Although it is very difficult to pinpoint where the issue was first discussed, it is easy to identify Cassel's (1925) *purchasing power parity* and Keynes's (1930) subsequent comments on the British exchange rate policy in the 1920s as the definitive endeavors to define the determinants of the exchange rate. Later, however, Robinson (1949), Machlup (1949), and Haberler (1949), among others, identified the exchange rate as the balancer of the flows of foreign currency demanded by domestic residents for the purchase of foreign goods and assets and the flows of foreign currency supplied by foreigners by their purchase of goods and assets created by the domestic residents. Demand and supply schedules of foreign exchange are thus derived from the corresponding demand and supply schedules for imports and exports. The equilibrium exchange rate is the

Figure 14.1
Market for British Pound: Demand and Supply Conditions



price that equates the demand for, and supply of, foreign currency. This traditional view has become the textbook approach to the determination of the foreign exchange rate. Figure 14.1 exhibits the determinants of foreign exchange and shows how foreign exchange is determined. Here the horizontal axis measures foreign exchange (say, British pounds demanded and supplied in the marketplace), and the vertical axis represents the price of foreign exchange (British pounds, in this instance), measured in terms of U.S. dollars (which is assumed to be the domestic currency for our purpose). The curves DD and SS represent, respectively, the demand for, and supply of, British pounds at each rate of exchange. The DD curve is normally negatively sloped and the SS curve is mostly positively sloped, although a backward bouncing situation is a distinct possibility. The intersection of these two schedules defines the equilibrium price of British pounds in terms of U.S. dollars and identifies the equilibrium exchange rate. Here E^+ is the equilibrium exchange rate.

THE BALANCE OF PAYMENTS APPROACH

If one looks back at this exposition, it is almost inescapable to accept the fact that the equilibrium exchange rate is the value of British pounds that brings about the balance of payments equilibrium (BP). The balance of payments equilibrium (BP = 0) of the United States is described as follows:

$$BP = 0 = X(EP^*/P, Y^*) - M(EP^*/P, Y) + K_I(r, r^*, s) - K_O(r, r^*, s) + UT + NFR + EO, \quad (1)$$

where X = export earnings, M = import expenditure, K_I = capital inflows, K_O = capital outflows, UT = unilateral transfers, NFR = net foreign reserves, and EO = errors and omissions, all expressed in U.S. dollar terms. The symbols inside the brackets are the arguments of these functions of export earnings (X), import expenditure (M), capital inflows (K_I) and capital outflows (K_O); E represents exchange rate ($/£), P stands for domestic price, P* is foreign price, Y is domestic national income, Y* is foreign income, r is domestic interest rate, r* is foreign interest rate, and s captures the speculative variable. EP*/P measures competitiveness in trade transactions. It is expected that the following conditions normally hold:

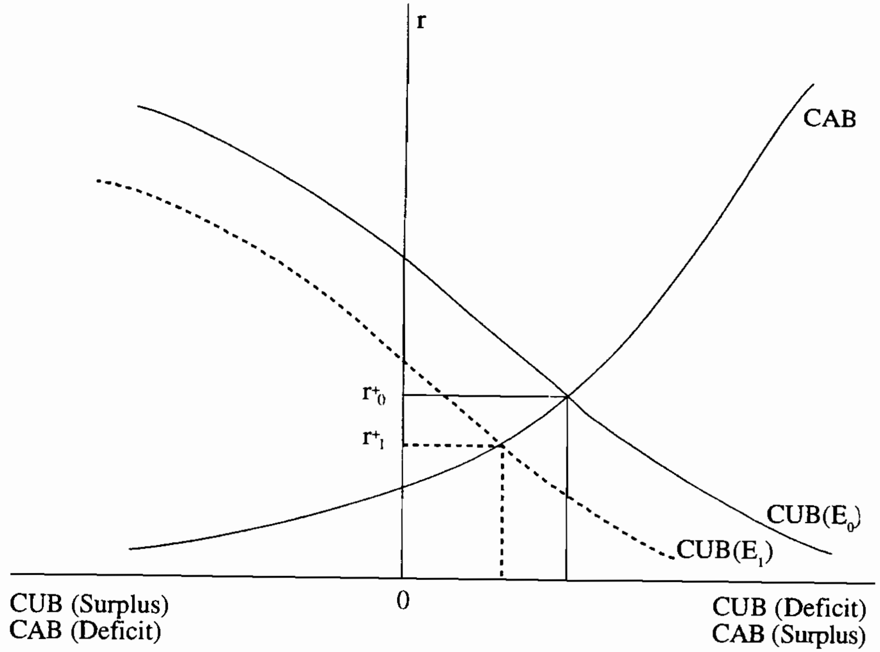
$$\frac{\partial X}{\partial [EP^*/P]} > 0, \frac{\partial M}{\partial (EP^*/P)} < 0, \frac{\partial X}{\partial Y^*} > 0, \frac{\partial M}{\partial Y} > 0, \frac{\partial K_I}{\partial r} > 0,$$
$$\frac{\partial K_I}{\partial r^*} < 0, \frac{\partial K_O}{\partial r} < 0, \frac{\partial K_O}{\partial r^*} > 0.$$

Taking exports and imports together, on the one hand, and capital inflows and outflows on the other, one can rewrite the balance of payments equilibrium as follows:

$$BP = 0 = CUB(EP^*/P, Y, Y^*) + CAB(r, r^*, s), \quad (1')$$

treating errors and omissions as negligible. Here current account balance (CUB) is X − M + UT, and capital account balance (CAB) is $K_I - K_O + NFR$. In condition of equilibrium, BP = O, which implies that CUB + CAB = O. At a given exchange rate, say $E = E_0$ the CUB schedule is, as Ghosh (1987) noted, negatively sloped with respect to r (given r*), as shown in Figure 14.2, owing to the normal Keynesian open-economy multiplier. The logic is as follows: as the domestic interest rate drops, domestic investment expenditure, *ceteris paribus*, goes up, which in terms raises the domestic national income higher via the investment multiplier; moreover, increased income increases the import expenditure alone, without affecting domestic exports. This sequence of events tends to create a deterioration in the current account balance, which is portrayed in Figure 14.2. Capital account balance is obviously a positively sloped function of (domestic) interest rate (see Figure 14.2). The intersection of these schedules determines the equilibrium interest rate, r_0^+ for CUB(E_0). That is, the current account balance schedule (corresponding to exchange rate E_0), and the capital account balance schedule (denoted by CAB), yield the equilibrium interest rate, r_0^+. If the exchange rate were E_1 (where $E_1 > E_0$), the current account balance schedule would be defined by a further inward curve such as CUB(E_1) and the equilibrium interest rate would be lower (as with r_1^+ in Figure 14.2). What transpires is a trade-off between the interest rate and exchange rate to maintain balance of payments equilibrium (this relationship is exhibited in Figure 14.3). In a different fashion, Dornbusch (1979) presented the same relationship; he furthermore showed that the long-run trade-off schedule is steeper (see the dotted curve in Figure 14.3).

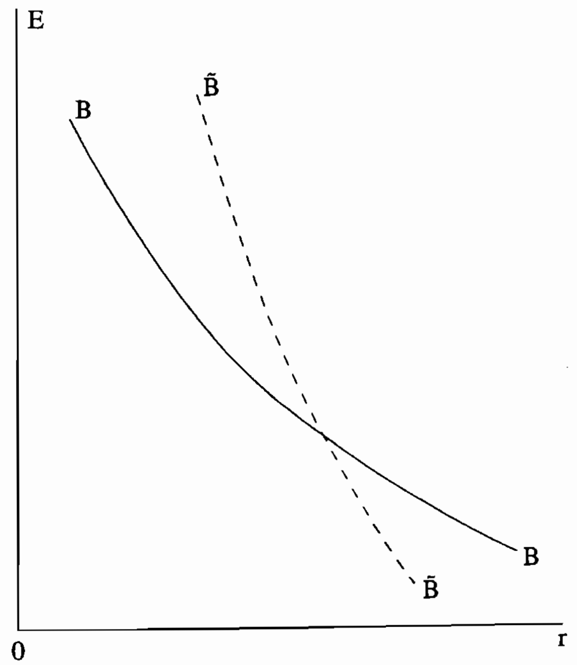
Figure 14.2
Current Account and Capital Account Balance and the Shift Thereof



THE FLEMING-MUNDELL APPROACH

Following further the Keynesian open-economy framework in terms of IS, LM, and BP (that is balance of payments equilibrium) within the quadrant with domestic interest rate and domestic income, Fleming (1962) and Mundell (1968) expositions under perfect capital mobility are described by Figure 14.4. As perfect mobility signifies a uniform interest rate across nations with the maintenance of balance of payments balance, the overall equilibrium is attained when the downward-sloping IS curve, upward-sloping LM curve, and horizontal BP curve intersect (at, say, point Z). If the interest rate had been lower, capital outflows would have occurred that would have tended to, as Dornbusch (1979) put it, "swamp any current account surplus," and in the opposite scenario, the opposite picture would appear. If, for some reasons, the interest rate happened to be lower to begin with, say, at r_1 (corresponding to the intersection of the IS_1 and LM

Figure 14.3
Exchange-Rate–Interest-Rate Tradeoff



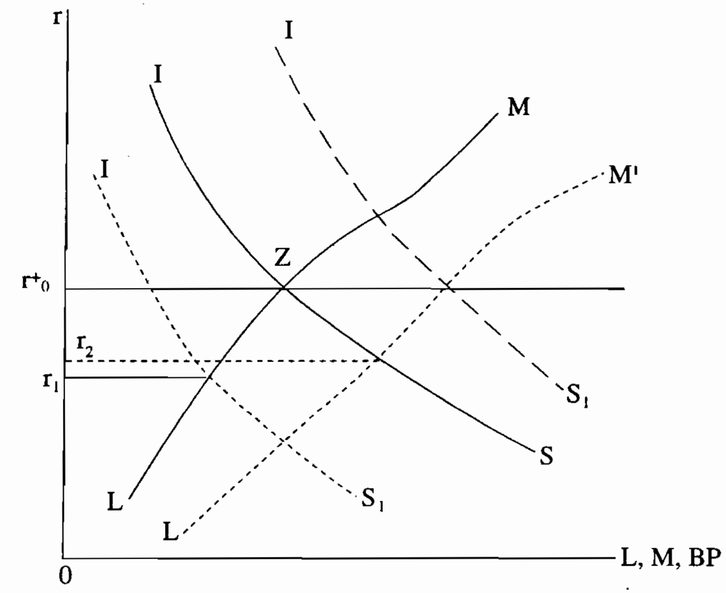
curves), the interest rate would have to go up to contain the demand for money to match the existing supply of money underlying the given LM schedule. Note here that since in this open economy, the IS_1 schedule is impacted by current account balance (which is influenced by income level and competitiveness), following an incipient currency depreciation, the IS_1 schedule will move upward to the right to the IS schedule, and thus the cycle of reactions and market adjustments will restore the equilibrium interest rate (consistent with Z).

Next, consider an exogenous increase in money supply in the economy. Obviously, as a consequence to such an increase, the LM curve will move to the right to, say, point LM^1, and the interest rate will move down to r_2. The drop in interest rate then will induce a depreciation, and thereby a shift to the top-right of the IS curve (to, say, IS^1), thus restoring the overall equilibrium interest rate, r^+_o.

THE PORTFOLIO BALANCE APPROACH

The Portfolio Balance Model, as enunciated and interpreted by Dornbusch (1979), Dornbusch and Fischer (1980), Boyer (1977), Kouri (1975, 1980), and others in the mid-1970s and later, is a step forward in modeling the exchange

Figure 14.4
Open Economy IS–LM Interaction



rate determination by postulating a limited substitution between domestic and foreign assets as opposed to a high degree of substitution between such assets as was envisioned in the Fleming-Mundell framework. In this portfolio balance model, the building blocks are as follows:

$$M = \alpha(r, r^*)W;\ \alpha_r < 0,\ \alpha_r^* < 0; \quad (2)$$
$$X = \beta(r, r^*)W;\ \beta_r > 0,\ \beta_r^* < 0; \quad (3)$$
$$W = M + EF + X \quad (4)$$

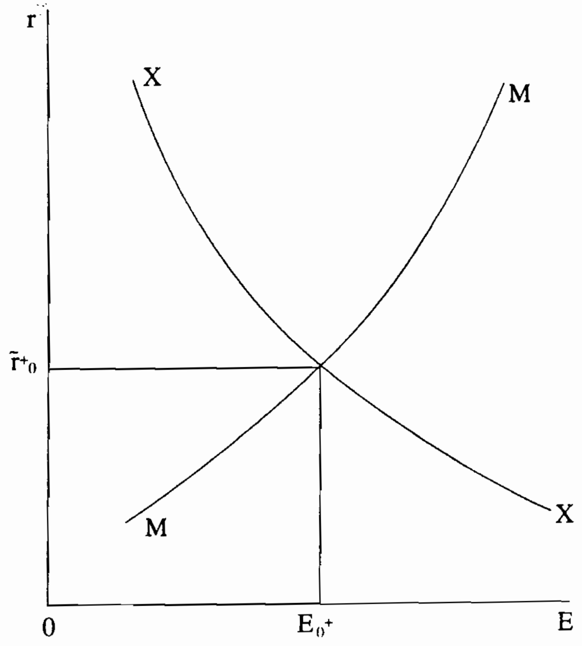
In other terms:

$$EF = (1 - \alpha - \beta)W \equiv \gamma(r, r^*)W;\ \gamma_r < 0,\ \gamma_r^* > 0 \quad (5)$$

Equation (2) defines the condition of monetary equilibrium that states that the demand for domestic money (M) equals the fraction ($\alpha([r, r^*])$ of total nominal wealth (W). Equation (3) states that equilibrium in the market for domestic assets occurs when the existing supply (X) equals the demand. The notation $\beta(r, r^*)$ denotes the desired ratio of domestic assets to wealth. Equation (4) is the wealth constraint, where F is the value of the net holdings of foreign assets, and equation (5) then defines the equilibrium condition in the market for foreign assets.

Figure 14.5 portrays the equilibrium interest and exchange rates. The upward-

Figure 14.5
Internal and External Balances



sloping schedule MM shows the constellation of interest and exchange rate pairs (r, E) for which the domestic money market is in equilibrium, and the downward sloping schedule XX shows the constellation of interest and exchange rate pairs (r, E) for which the domestic asset market is in equilibrium. The notations r^+_0 and E^+_0 are, obviously, the equilibrium interest and exchange rates in the environment described in this diagram. Here one can go a step further and assert that if the foreign interest rate rises for any reason, there will be an excess supply of domestic money and securities. This will trigger a rightward shift of both the MM and XX schedules, which then will inevitably cause a depreciation of the exchange rate. Consider next the effect of an increase in domestic money supply on the exchange rate. From equations (2) through (4) taken together, one can easily obtain the following:

$$\frac{dE}{dM} = \frac{\beta_r\gamma + \beta(\beta_r + \alpha_r)}{F(\alpha\beta_r - \beta\alpha_r)} > 0 \qquad (6)$$

Thus, it can be shown that an increase in domestic money supply causes a deterioration in the exchange rate.

It ought to be noted that this model is couched in a partial equilibrium framework, and thus it fails to bring out the interaction of the goods market and the

financial markets. However, Dornbusch (1979) contends that "it extends the monetary model because we do not have to rely on shifts in money demand or supply as sole determinants of exchange rate movements" (p. 348). The question then is: what is the monetary model for exchange rate determination?

THE MONETARY APPROACH

Many works have surfaced in the decade of 1970s on the determination of exchange rates based on money as a major factor. Frenkel (1976), among others, provides a clear exposition of the doctrinal approach and empirical evidence on this issuee. The basic monetary model is the virtual extension of the Quantity Theory of Money in the open economic structure. The Fisherian Quantity Theory of Money states that MV = PQ, whence:

$$P = MV/Q, \qquad (7a)$$

$$P^* = M^*V^*/Q^* \qquad (7b)$$

where V and V* are the measures of the velocity of circulation of money in domestic and foreign economies, respectively. The variable Q represents the aggregate domestic product (real domestic income), and Q* is the aggregate foreign national product (real foreign income). Add to this structure the purchasing power parity, and the monetary model of exchange rate determination emerges. The purchasing power parity doctrine, brought out first by Cassel (1925), is one of the fundamental ingredients in the Monetary approach to exchange rate determination. Purchasing power parity means that in absolute terms, P = EP*, where P and P* denote the domestic and foreign price levels, respectively. In simple language, if £1 = $2 is the exchange rate between the British pound and the U.S. dollar, and if £20,000 buys a certain model of automobile, then $40,000 will buy the same model.

From P = EP*, one gets, following logarithmic differentiation, $\hat{E} = \hat{P} - \hat{P}^*$, where $\hat{P} \equiv dP/P$, and $\hat{P}^* \equiv dP^*/P^*$. That is, the exchange rate change (in percentage) equals the inflation rate differential between the domestic and foreign economies. However, Frenkel (1981) observed that "during the 1970s short-run changes in exchange rates bore little relationship to short-run diffentials in national inflation rates, and frequently, divergencies from purchasing power parities have been cumulative" (p. 227). Many economists share the same view.

Note that from the purchasing power parity relation, one can get:

$$E = P/P^* \qquad (8)$$

Substituting (7a) and (7b) into (8), we obtain the following expression:

$$E = \left(\frac{M}{M^*}\right)\left(\frac{Y^*}{Y}\right)\left(\frac{V}{V^*}\right) \tag{9}$$

The logarithmic differentiation of equation (9) yields the percentage change in the exchange rate as follows:

$$\hat{E} = (\hat{M} - \hat{M}^*) + (\hat{Y}^* - \hat{Y}) + (\hat{V} - \hat{V}^*) \tag{10}$$

where a "hat" (Λ) over a variable signifies the percentage change in that variable (that is, $\hat{E} \equiv \frac{dE}{E}$, etc.). Expression (10) then states that percentage change in the exchange rate is equal to the percentage change in the money supply of the domestic economy relative to that in the foreign economy $(\hat{M} - \hat{M}^*)$ plus percentage change in aggregate foreign national product relative to that in the domestic economy $(\hat{Y} - \hat{Y}^*)$ plus the relative percentage change in velocity of circulation in the home economy $(\hat{V} - \hat{V}^*)$. If one assumes that velocity depends on income level and the cost of holding money, or more specifically,

$$V = Q^{\varepsilon - 1}e^{\eta r}, \tag{11a}$$

$$V = Q^{*\varepsilon - 1}e^{\eta r^*} \tag{11b}$$

then expression (10) comes out as follows:

$$\hat{E} = (\hat{M} - \hat{M}^*) + \varepsilon(\hat{Y}^* - \hat{Y}) + \eta(r - r^*) \tag{12}$$

Here ε and η are the elasticity parameters of incomes and interest rates. This is the monetary model of exchange determination.

Moving further beyond the portfolio balance model, which has been characterized as an extension of the monetary model, Dornbusch (1979) introduced dynamics and expectations in the synthetic analytical structure behind exchange rate. In the open Fisher parity,

$$r - r^* = \left(\frac{\tilde{E}}{E} - 1\right) \tag{13}$$

where $(\frac{\tilde{E}}{E} - 1)$ is the expected depreciation of the domestic currency. From equation (13) one easily gets the following:

$$E = \frac{\tilde{E}}{1 + r - r^*} \tag{14}$$

It thus brings out the fact that movement of the current rate of exchange is predicated on either changes in expectations over the future course of exchange rates and/or changes in interest rate differentials, given expectations. Now, if we can assume that the foreign interest rate is given, and we can postulate the following functional relation for the domestic interest rate:

$$r = r(M/P, Q) \tag{15}$$

The expected (future) exchange rate $(\tilde{E})$ is a function of the terms of trade (σ) and of the long-run price relative $(\frac{\tilde{P}}{\tilde{P}^*})$:

$$\tilde{E} = \sigma(\ )\frac{\tilde{P}}{\tilde{P}^*} = \sigma(\ )\frac{\kappa\tilde{M}}{\kappa^*\tilde{M}^*} \tag{16}$$

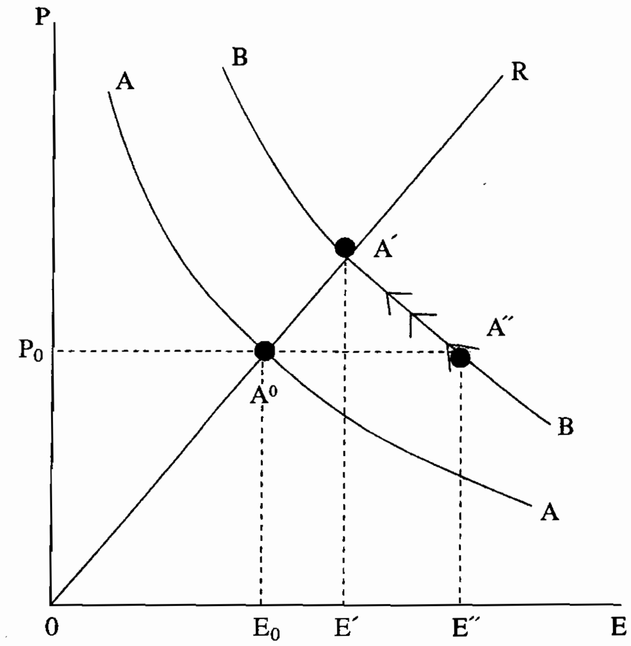
where $\tilde{M}$ and $\tilde{M}^*$ are the expected future stocks of money supply in home and foreign economies, and κ and κ* are the factors of proportionality, respectively. Plugging in these functional relations in equation (14), one gets expression (17):

$$E = \frac{\sigma(\ )\frac{\kappa\tilde{M}}{\kappa^*\tilde{M}^*}}{1 + r(\frac{M}{P}, Q) - r^*} \equiv E(\sigma, M/P, Q; \kappa, \kappa^*, \tilde{M}, \tilde{M}^*) \tag{17}$$

Figure 6 exhibits the equilibrium exchange rate, as defined by equation (16). Here the vertical axis measures P, and the horizontal axis measures E. The AA curve shows, *ceteris paribus*, the trade-off between domestic price level and exchange rate. Note that for every increase in P there will be a rise in r, and thus a differential in favor of the home economy. To offset this situation, E has to go down to the point where it equals r − r*. If money supply increases in the long run and all prices remain flexible, prices will increase, as will the exchange rate in the same proportion. This will then cause a shift of the AA curve to the BB curve, as shown in Figure 14.6, and the long-run equilibrium constellation of (P, E) will be at A', with all the real variables remaining unchanged.

In the short run, however, price level may not respond to the change in the money supply, and hence, the nominal and real stocks of money will be virtually identical in size. Under this situation, an increase in nominal money supply will induce a drop in interest rate, which then will trigger a net capital outflow to the point where the exchange rate depreciates enough to create the expectation of appreciation to match the interest rate differential. In this scenario, the economy moves to the point A", which defines the true long-run exchange rate. This overshooting of exchange rate is the result of a permanent monetary expansion

Figure 14.6
Domestic Price and Exchange-Rate Tradeoffs over Time



in a situation of price rigidity and capital mobility. If the short-run sticky price condition disappears over time, the equilibrium will move to A' (along BB schedule in Figure 14.6).

Exchange rate determination is a continuous search. Understanding what determines the exchange rate depends on all the theories and factors we have just enunciated. The relative strength of each factor or theory will vary in different situations, and speculation on such movement continually adds new forces to the dynamics driving its path over time.

REFERENCES

Boyer, R. "Devaluation and Portfolio Balance." *American Economic Review*, 67, no. 2 (March 1977): 54–63.

Cassel, G. "Rates of Exchange and Purchasing Power Parity." *Skandinaviska Kerditaktieholaget Quarterly Report*, 98 (1925): 325–336.

Dornbusch, R. "Monetary Policy under Exchange Rate Flexibility." Conference Series no. 20. Federal Reserve Bank of Boston, 1979, pp. 1–27.

Dornbusch, R., and S. Fisher. "Exchange Rate and the Current Account." *American Economic Review*, 70, no. 5 (1980): 960–971.

Fleming, J. M. "Domestic Financial Policies under Fixed and Floating Exchange Rates." *International Monetary Fund Staff Papers*, 9 (1962): 369–379.

Frenkel, J. A. "A Monetary Approach to the Exchange Rate: Doctrinal Aspects and Empirical Evidence." *Scandinavian Journal of Economics* (May 1976): 200–224.

Frenkel, J. A. "The Collapse of Purchasing Power Parities during the 1970s." NBER Working Paper no. 569. *European Economic Review*, 16, no. 1 (May 1981): 145–165.

Ghosh, D. K. "Some Comments on the Economics of Exchange Rate." In *Asia-Pacific Economies: Promises and Challenges: Research in International Business and Finance*, ed. M. Dutta. Greenwich, Conn.: JAI Press, 1987, pp. 303–307.

Haberler, G. "The Market for Foreign Exchange and the Stability of the Balance of Payments: A Theoretical Analysis." *Kyklos*, 115 (1949): 781–789.

Keynes, J. M. *A Treatise on Money*. Vol. 1. London, 1930.

Kouri, P. "The Theory of Exchange Rates." Ph.D. dissertation, Massachusetts Institute of Technology, 1975.

Kouri, P. "Monetary Policy, the Balance of Payments, and the Exchange Rate." In *The Functioning of Floating Exchange Rates: Theory, Evidence, and Policy Implications*, ed. D. Bigman and T. Taya. Cambridge, Mass.: Ballinger Publishing Company, 1980, pp. 168–181.

Machlup, F. "The Theory of Foreign Exchanges." In *Readings in the Theory of International Trade*, ed. H. S. Ellis and L. A. Metzler. Philadelphia: Blakiston, 1949, pp. 334–349.

Mundell, R. A. *International Economics*. New York, Macmillan, 1968.

Murphy, R. G., and C. Van Duyne. "Asset Market Approaches to Exchange Rate Determination: A Comparative Analysis." *Weltwirtschaftliches Archive*, 116, no. 4 (1980): 627–656.

Robinson, J. "The Foreign Exchanges." In *Essays in the Theory of Employment*. 2nd ed. Oxford, U.K.: Blackwell, 1947. Reprinted in *Readings in the Theory of International Trade*, ed. H. S. Ellis and L. A. Metzler. Philadelphia: Blakiston, 1949, pp. 129–143.