EXPLAINING EXCHANGE RATE BEHAVIOR: AN AUGMENTED VERSION OF THE MONETARY APPROACH

Thomas M. Humphrey

Prominent among competing theories of exchange rate determination in a regime of floating exchange rates is the monetary approach. This approach rests on the view that the exchange rate between two national currencies is determined by the respective national money supplies and demands in the two countries and the resulting effects on their general price levels.[1] To reach this conclusion the monetary approach combines the quantity theory of money with the purchasing power parity theory of exchange rates. The quantity theory says that the general price level is determined by the demand-adjusted money stock, i.e., by the nominal stock of money per unit of real money demand.[2] And the purchasing power parity doctrine holds that the exchange rate tends to equal the ratio of the price levels in the two countries concerned.[3] Taken together, the quantity theory and the purchasing power parity doctrine imply that the exchange rate is determined by relative demand-adjusted money stocks operating through relative national price levels.

The monetary approach has a long history dating back at least to the early 1800s when David Ricardo, John Wheatley, and other British bullionist writers used it to explain the fall of the paper pound on the foreign exchanges following Britain's switch from fixed to floating exchange rates during the Napoleonic wars. Later it was employed by the Swedish economist Gustav Cassel to explain the fall of the external value of the German mark during the famous hyperinflation episode of the early 1920s. Most recently, however, it has been employed, albeit with mixed results,[4] to explain the behavior of floating exchange rates in the post-1973 era of generalized floating.

The main shortcoming of the monetary approach is that it ignores the effect of real relative price changes on the exchange rate. In particular, it ignores the influence of changes in the *real terms of trade* (i.e., the relative price of imports and exports) and *internal relative prices* (i.e., the relative price of exports and domestic nontradeable goods), both of which function to clear national and international markets for real goods and services by equating commodity demand and supply. Determined by underlying shifts in consumer preferences, technology, and resource supplies, these real relative price changes necessitate equilibrium changes in exchange rates relative to the purchasing power parity ratio of nominal national price levels. Because the monetary approach assumes that purchasing power parity always holds, however, it cannot account for the influence of these real relative price changes on exchange rates. The result is that it ignores a key source of exchange rate

[1] For recent expositions of the monetary approach see Bilson [2], Frenkel [6], and Mussa [8].

[2] In other words, the price level equates money supply and demand by deflating the real value of the nominal money stock to the level people desire to hold.

[3] According to the purchasing power parity doctrine, this condition ensures that the common currency price of a standard basket of goods is everywhere the same so that there exists no arbitrage advantage to buying in one market over another. It also ensures that the real (exchange rate adjusted) purchasing power of both currencies is everywhere the same so that there exists no incentive to switch from one currency to the other and both moneys are therefore willingly held. The purchasing power parity doctrine argues that if these conditions were violated, goods would be cheaper in one country than another and one currency would be overvalued and the other undervalued on the foreign exchanges. The resulting rush to convert the former currency into the latter in order to purchase goods where they are relatively cheap would quickly bid the exchange rate back to the purchasing power parity at which no advantage exists to converting one money into the other.

[4] This is the conclusion reached by Kreinin and Officer [7; pp. 39-40] in their survey of empirical tests of the monetary approach. Of the 10 studies surveyed, at least 7 yield mixed or inconclusive results concerning the monetary approach. See also Stockman [10; pp. 675-6] who notes that the monetary approach has performed no better than simple purchasing power parity explanations and that "there remain substantial short-run variations in exchange rates unexplained by the monetary approach."

disturbance, namely real shocks impinging on the exchange rate through the channels of the terms of trade and internal relative prices.[5] Far from recognizing these real channels, the monetary approach asserts that all factors affecting exchange rates must do so through monetary channels alone, i.e., through money supplies and demands. While this assumption may be warranted during periods of hyperinflation when exchange rate disturbances are of a predominantly monetary origin, it is clearly invalid in turbulent periods, such as the 1970s, when real shocks abound.

The foregoing shortcoming can be remedied by incorporating a real exchange rate component into the analytical framework of the monetary approach. The result is an augmented monetary model that captures all factors, real and monetary, affecting exchange rates. This article constructs such a model, discusses its constituent components, and uses it to explain certain characteristic features and policy implications of observed exchange rate behavior in recent years.

The Model and Its Components The model itself assumes two hypothetical open national economies each with its own currency and each producing two goods, namely (1) a purely domestic (nontradeable) good and (2) a unique exportable good, part of which is consumed domestically and part of which is exported to the other country. The basic building blocks of the model include (1) a terms of trade identity that links the exchange rate with export prices, (2) a price structure identity that links export prices to general prices via a term containing the relative price of exportables and nontradeables, (3) a quantity theory equation that links general prices to money supply and demand, and finally (4) a money demand equation that links the demands for foreign and domestic currencies to the expected rate of change of the exchange rate. Taken together, these components imply that the exchange rate is determined by the multiplicative product of the terms of trade, relative price structures, relative nominal money stocks, and relative real money demands, respectively. Of these four determinants, the first two constitute the so-called real or price-deflated exchange rate that captures the effect of real disturbances operating through nonmonetary channels. By contrast, the last two determinants constitute the nominal or monetary element of the exchange rate. As such they capture the effect of monetary, real, and expectational disturbances operating through monetary channels, i.e., through money supply and demand.

The foregoing variables are denoted by the following symbols: let E be the observed market exchange rate (defined as the domestic currency price of a unit of foreign currency), R the real or price-deflated value of that exchange rate (i.e., the exchange rate divided by the purchasing power parity ratio of national price levels), and e the expected future rate of change of the exchange rate. Furthermore, let M be the nominal money stock (assumed to be exogenously determined by the central bank) and D the real demand for money, i.e., the stock of real (price-deflated) cash balances that the public desires to hold. Also let T be the real terms of trade (defined as the quantity of exports given up per unit of imports obtained) and S be the structure of prices in each country as represented by the relative price of exportable goods in terms of the general price level. Finally, let P_x be the price of exportable goods, P_n the price of nontradeable goods, and P the general price level defined as the weighted average of the prices of exportable goods and nontradeable goods, respectively (i.e., the aggregate price of gross domestic product). Asterisks distinguish foreign-country variables from home-country variables. The foregoing variables are linked together via the model's basic building blocks described below.

Terms of Trade The first building block of the model is the concept of the real terms of trade. Representing the quantity of exports that must be sacrificed to obtain a unit of imports, the terms of trade T is defined as the relative price of imports and exports (i.e., the ratio of import prices to export prices). Since the domestic currency price of goods imported from abroad is the same as their foreign currency export price multiplied by the market exchange rate between domestic and foreign currency, the terms of trade may be defined as

$$(1) \quad T = E\, P_x^*/P_x,$$

where T is the terms of trade, E the exchange rate, P_x^* the foreign currency price of foreign country exportables, and P_x the domestic currency price of domestic exportables. Via this identity the terms of trade variable links the exchange rate to export prices in both countries as can be seen by rewriting the identity as $E = T\, P_x/P_x^*$.

[5] Note, however, that the monetary approach does capture the effect of real shocks operating through the real income determinant of the demand for money. That is, the monetary approach captures the income effects but not the relative price effects of real disturbances.

Being a real relative price, the terms of trade is affected by real economic variables such as productivity, consumer preferences, resource supplies, and the structure of particular markets in both countries. For example, if productivity is increasing faster in A's export-producing sector than in B's, the consequent rise in A's export supply relative to B's means that A must give up more exports per unit of imports obtained from B. As a result, A's export price will fall relative to B's and the terms of trade will turn against A. Likewise a shift in world demand from A's exports to B's exports will raise the relative price of the latter and worsen A's terms of trade. Finally, suppose B's export sector becomes monopolized while A's remains competitive. B's exporters could exploit their newly acquired market power by restricting output and raising prices, thereby turning the terms of trade against A. In general, the greater the relative productivity and the lower the degree of market power in A's export sector compared with B's, and the lower the intensity of demand for A's exportables relative to B's, the worse the terms of trade for A and vice versa for B.

Internal Price Structure The second building block of the model is the concept of the internal price structure that links export prices to general prices via a term that summarizes the composition of relative prices in each country. Written as follows

$$(2) \quad P_x = SP \text{ and } P^* = S^*P_x^*$$

the internal price structure S is the ratio of export prices to general prices as can be seen by rewriting the identities as $S = P_x/P$ and $S^* = P_x^*/P^*$. Defined as the relative price of exportables in terms of the general price level, the internal price structure S is also the relative price of exports and nontradeable goods. To show this, write the general price level as a weighted geometrical average of the respective prices of the two goods, i.e.,

$$(3) \quad P = P_n^a P_x^{1-a}$$

where P denotes general prices, P_n nontraded goods prices, P_x exportable goods prices, and the weights a and 1—a denote the shares of the two goods in the gross domestic product. Dividing both sides of this expression by P_x and inverting the result yields

$$(4) \quad P_x/P = (P_x/P_n)^a = S$$

which says that the internal price structure S is equivalent to the relative price of exportable and nontradeable goods weighted by the latter's share in the gross domestic product.

Stated this way, the price structure variable measures the internal opportunity cost of producing exportables such that a rise in S means that a country will have to give up more nontradeables per additional unit of exportables produced. And, when combined with the terms of trade, it also measures the opportunity cost of transforming nontradeables into imports by way of exportables. Thus if Q_n/Q_x represents the quantity of nontradeables given up to produce a unit of exportables (the internal price structure) and Q_x/Q_m is the quantity of exportables sacrificed to obtain a unit of imports (the terms of trade), it follows that the product of these ratios $(Q_n/Q_x)\ (Q_x/Q_m) = Q_n/Q_m$ shows the domestic nontradeables cost of obtaining imports by means of exports. In this regard the price structure variable represents the *indirect* terms of trade just as the relative price of exports and imports represents the *direct* terms of trade.

Being a real relative price, the internal price structure is affected by real economic variables such as intersectoral differences in productivity, tastes, and the degree of market power. For example, if productivity (and hence output) is advancing faster in a country's export-producing sector than in the rest of the economy, the resulting rise in the relative supply of exportables will lower their internal relative price thereby altering the price structure. Likewise a reduction in the degree of market power in the export sector relative to the rest of the economy will result in a fall in the relative price of exportables and a corresponding change in the internal price structure. Similarly, a shift in demand away from a country's exportable good to its nontradeable good will lower the internal relative price of exportables and alter the structure of prices.

Before proceeding to the third building block of the model, it should be noted that substituting equation 2 into equation 1 and solving for the exchange rate yields

$$(5) \quad E = T\frac{S}{S^*}\frac{P}{P^*}$$

which expresses the exchange rate as the product of the terms of trade, relative price structures, and the purchasing power parity ratio of national price levels, respectively. Regarding this expression three points should be made. First, it recognizes that factors other than national price levels affect exchange rates. In particular, it says that the purchasing power parity ratio of national price levels is *a* determinant but not *the* sole determinant of exchange rates. In this respect it differs from the simple monetary approach, which identifies the exchange rate with the purchasing power parity determinant alone.

Second, equation 5 specifies the terms of trade and relative price structures as the constituent components of the real (price-deflated) exchange rate. That is, since the real exchange rate is by definition the observed exchange rate divided by the purchasing power parity ratio of national price levels, it follows that the real exchange rate R is the product of the terms of trade and relative internal price structures as can be seen by writing the equation as $E/(P/P^*) = R = TS/S^*$. This real exchange rate changes with shifts in the terms of trade and internal price structures. It also undergoes temporary changes when sluggish price adjustment prevents national price levels from responding as fast as exchange rates to changes in underlying economic conditions.

Third, the equation shows that the strict purchasing power parity condition assumed by the monetary approach holds only if the real exchange rate R is unity. This can be seen by rewriting equation 5 as

$$(6) \quad E = R\frac{P}{P^*}$$

which says that the exchange rate will equal the purchasing power parity ratio of national price levels only when the real exchange rate is one. But the real exchange rate will be unity only in the special case in which both countries produce a single identical traded good (or standard basket of traded goods) such that commodity arbitrage will render the real price of this good everywhere the same. In all other cases the real exchange rate can be expected to possess a value other than unity. Hence we conclude that the strict purchasing power parity condition postulated by the monetary approach rests on the special assumption of a one-good world.[6]

Quantity Theory of Money The third building block of the model is the quantity theory of money which links general prices P to national nominal money supplies M and real money demands D. Written as follows

$$(7) \quad P = M/D \text{ and } P^* = M^*/D^*$$

the quantity theory says that the general price level in each country is determined by the demand-adjusted money stock, i.e., by the nominal stock of money per unit of real money demand. Written in the form $M/P = D$, the quantity theory also expresses the condition of money market equilibrium according to which the price level adjusts to equate the real (price-deflated) value of the nominal money stock with the public's real demand for it thereby clearing the market for real cash balances. Note that equation 7 implies that the purchasing power parity ratio of domestic to foreign national price levels is determined by relative national money supplies and demands. Here is the essence of the simple monetary approach to exchange rate determination, namely the extension of the quantity theory of money to the open economy under floating exchange rates.

Money Demand Functions The fourth component of the model consists of money demand functions linking the demands for foreign and domestic currency to the expected future rate of change of the exchange rate. Money demand is assumed to be a function of four variables, including (1) real income (a proxy for the transaction demand for money), (2) nominal interest rates (the opportunity cost of holding money rather than bonds), (3) expected future rate of inflation (the anticipated depreciation cost of holding money rather than goods), and (4) expected rate of change of the exchange rate (the anticipated rate of return from holding foreign money rather than domestic money). In what follows, however, all but the last of these money demand determinants are suppressed and real money demands D in both countries are treated as a function solely of the anticipated future rate of change e of the exchange rate, i.e.,

$$(8) \quad D = D(e) \text{ and } D^* = D^*(e).$$ [7]

Equation 8 emphasizes the crucial role of exchange rate expectations in the determination of current exchange rates. It implies that exchange rates behave as efficient asset prices, being extremely sensitive to expectations of future conditions and adjusting instantaneously to changes in those expectations. In particular, it states that money demand functions provide the channel through which expectations in-

[6] See Sakakibara [9; p. 204] for a discussion of this point.

[7] Equation 8 enters exchange rate expectations directly into the money demand function on the grounds that such expectations constitute the anticipated depreciation cost of holding one currency over the other. The same result can be derived indirectly by assuming (1) that the demand for each currency is determined by the nominal interest rate on securities denominated in that currency, (2) that international nominal interest rate differentials equal the forward premium on foreign exchange (the interest rate parity condition), and (3) that the forward premium equals the expected rate of depreciation of the exchange rate. This latter interpretation views the expected rate of change of the exchange rate not as the cost of holding one currency over the other but rather as the relative opportunity cost of holding either currency instead of securities. Both interpretations yield the same conclusion, namely that expectations of future exchange rates influence current exchange rates through real money demands.

fluence exchange rates, i.e., expectations determine relative demands for the two currencies and therefore also the exchange rate between them. Thus a rise (fall) in the expected future rate of change of the exchange rate will, by raising (lowering) the expected yield from holding foreign rather than domestic currency, shift demand to the former (latter) thereby depreciating (appreciating) the current exchange rate. In this way current exchange rates are determined by exchange rate expectations operating through the channel of relative national money demands.

Components of the Exchange Rate The foregoing elements can be combined into a single reduced form expression by substituting equations 2, 7, and 8 into equation 1 and solving for the exchange rate. The resulting expression is

$$(9) \quad E = T \frac{S}{S^*} \frac{M}{M^*} \frac{D^*(e)}{D(e)}$$

which says that the exchange rate is composed of the product of four groups of factors, namely the real terms of trade, relative internal price structures, relative nominal money supplies, and relative real money demands, respectively. Of these four components, the first two comprise the real exchange rate and the last two the underlying determinants of the nominal or purchasing power parity exchange rate. More precisely, the terms of trade and relative price structure variables account for real influences affecting the exchange rate through nonmonetary channels. By contrast, the relative nominal money stock variable accounts for purely monetary influences affecting the exchange rate through monetary channels (i.e., through money supplies). Finally, relative real money demands account for real and expectational influences affecting the exchange rate through monetary channels (i.e., through money demands).

Regarding the effect of these four determinants on the exchange rate, the equation predicts that a rise in each will tend to depreciate the exchange rate and a fall to appreciate it. That is, the equation predicts that a country's currency will depreciate upon:

(1) a worsening of the terms of trade (i.e., a rise in the export cost of obtaining imports),

(2) a rise in the relative price structure reflecting an increase in the nontradeables cost of producing exportables,

(3) a rise in the relative money stock due to a faster rate of monetary expansion at home than abroad, and

(4) a rise in the demand for foreign relative to domestic money due, say, to a rise in the expected future rate of depreciation of the exchange rate.

Conversely, the equation indicates that the exchange rate will appreciate given (1) an improvement in the real terms of trade, (2) a fall in the nontradeables cost of producing exportables, (3) a reduction in domestic relative to foreign money growth, and (4) a rise in domestic relative to foreign money demand reflecting improved prospects for the value of the domestic currency.

Application of the Model Having outlined the augmented monetary model, the next step is to use it to answer certain questions arising from exchange rate experience in the post-1973 era of floating exchange rates. The first question is: What has caused the large exchange rate fluctuations observed in recent years?[8]

The model outlined above identifies three sources of exchange rate disturbance, namely

- real shocks operating through the terms of trade and relative internal price structures,
- monetary and real shocks operating through money supplies and demands, and
- changes in exchange rate expectations operating through relative money demands.

All three types of shocks were prevalent in the turbulent 1970s and all three contributed to exchange rate movements. Real shocks occurred in the form of oil embargoes, changes in international demands, commodity shortages, tax and regulatory burdens, shifts in commercial policy, productivity growth differentials and the like. Monetary shocks occurred in the form of divergent money growth rates and frequent sharp shifts in short-term policy targets. Also, during this period uncertainty about future developments became more intense. The policy surprises and the associated increased uncertainty about the future induced large and frequent changes in exchange rate expectations. Channeled through real money demands, these expectational changes were immediately embodied in the price of foreign exchange which jumped to its new equilibrium level consistent with the altered expectations. In short, the events of the 1970s indicate the extent to which disturbances can affect exchange rates. Given the abundance of shocks, surprises, and uncertainties in the post-Bretton

[8] See Artus and Young [1; pp. 25-33] for a discussion of these fluctuations.

Woods period it is small wonder that exchange rates moved as much as they did.

Exchange Rate Volatility The second question refers to the high degree of short-run (daily, weekly, monthly) volatility exhibited by exchange rates. With respect to volatility, Frenkel [5; p. 23] and Flood [3; pp. 10-13] note that since the adoption of floating exchange rates in early 1973 exchange rates have displayed a degree of variability far exceeding that of national price levels and sometimes approaching that of stock prices quoted on the securities exchanges. And Artus and Young [1; p. 26] argue that exchange rates have been much more volatile than their underlying economic and financial determinants (e.g., money growth rate differentials, real relative prices, inflation differentials and the like). Why are exchange rates so volatile?

Exchange rates are more volatile than their basic economic determinants because they depend not only upon the current value of those determinants themselves but also upon expectations of the entire future paths of those determinants. This expectational factor magnifies the impact of unanticipated changes in economic conditions on the exchange rate. Those changes affect the exchange rate directly and also indirectly through their effect on expectations. In particular, by inducing shifts in exchange rate expectations, disturbances to underlying economic conditions may engender large and frequent movements in exchange rates. For example, unforeseen changes in monetary growth rates may, by altering expectations of future monetary conditions, produce disproportionally large changes in current exchange rates. Viewed this way, exchange rate volatility is seen to stem from large and frequent shifts in exchange rate expectations operating through relative money demands.

In this connection, the model stresses that exchange rates are efficient asset prices dominated by expectations of the future and extremely sensitive to new information (announcements, rumors, unforeseen events, policy surprises and the like) that alters those expectations. Consequently, when new information appears it is immediately discounted into the market price of foreign exchange which jumps to its new equilibrium level consistent with the changed expectations. Since new information abounds by definition in periods of turbulence and uncertainty, it follows that exchange rates will exhibit a large degree of volatility in such periods. The 1970s constitute a prime example of such a period. Given the economic shocks, political upheavals, policy surprises, and uncertainty that dominated that period, the observed volatility of exchange rates is no mystery. That volatility reflected the large and frequent shifts in expectations induced by the shocks, surprises, and news of that period.

Sources of Departure From Purchasing Power Parity The third question is: Why have exchange rates since 1973 failed to conform to the predictions of the purchasing power parity theory? That theory predicts that exchange rates will move over time as the ratio of nominal national price levels so as to leave the real value of money and its counterpart, the real price competitiveness of goods, everywhere the same. These predictions have not held up well in recent years. On the contrary, as Jacob Frenkel convincingly demonstrates in his paper "The Collapse of Purchasing Power Parities During the 1970s" [4], exchange rates have frequently deviated sharply from purchasing power parities and in many cases these deviations have persisted with the passage of time. What caused these deviations that have produced such large discrepancies between the external and internal values of currencies?

The model suggests that deviations from purchasing power parity occur for two reasons. One is nonsynchronous movements of exchange rates and price levels due to sluggish price adjustment; exchange rates adjust much faster than national price levels to changes in underlying economic conditions. Being efficient asset prices, exchange rates are extremely sensitive to unforeseen changes that alter expectations of the future. By contrast, national general prices are composed largely of commodity prices reflecting past and present conditions as embodied in existing contracts and are therefore relatively unresponsive to unforeseen changes in economic conditions. Consequently, when changes occur, sensitive exchange rates adjust immediately whereas sluggish national price levels lag behind. The resulting differential speed of price response causes a temporary divergence from purchasing power parity. It follows that in turbulent periods like the 1970s, when shocks and surprises occur frequently, exchange rates will deviate from purchasing power parity much of the time.

Sluggish price adjustment is not the only source of deviation from purchasing power parity, however. The model suggests that real structural changes in tastes, technology, and market structure also play a role. Operating through real relative prices, these structural changes necessitate real equilibrium changes in the exchange rate and thereby produce systematic divergences from purchasing power parity. In terms of the exchange rate equation $E = RP/P^*$, real structural changes generate movements in the real exchange rate R, thereby necessitating equilibrium shifts in the market exchange rate E relative to the purchasing power parity ratio of national price levels.

To illustrate how real structural changes produce systematic deviations from purchasing power parity, consider a hypothetical case in which the United States exports wheat to OPEC in exchange for oil. For convenience, assume that the monetary authorities are stabilizing general prices in both countries so that no exchange rate disturbances arise from that source. That is, all shifts in money demand (due, for example, to productivity-induced increases in income) are accompanied by corresponding changes in the money supply so as to leave general prices and purchasing power parity unchanged. Now suppose that OPEC forms a cartel and quadruples the price of oil. The rise in the price of oil relative to the price of wheat means that the United States now has to export more wheat than before to obtain a barrel of imported oil. The resulting worsening of the U. S. terms of trade and the consequent rise in the real exchange rate causes the dollar to depreciate relative to OPEC currencies despite no underlying change in purchasing power parity. In short, a real shock in the form of increased market power induces a real exchange rate depreciation relative to the unchanged purchasing power parity.

As another example, suppose that U. S. demand shifts away from fuel-inefficient Cadillacs to fuel-efficient Toyotas, thereby raising the price of the latter relative to the price of the former such that more Cadillacs have to be given up in trade to obtain a Toyota. As before, general price levels are assumed constant. The resulting worsening of the U. S. terms of trade with Japan causes a real depreciation of the dollar relative to the yen necessitating an equilibrium shift in the exchange rate relative to the unchanged purchasing power parity.

Finally, suppose that Canada's export productivity doubles relative to U. S. export productivity, thereby rendering Canadian exports half as expensive as before in terms of U. S. exports. The resulting improvement in the U. S. real terms of trade causes the U. S. dollar to appreciate against the Canadian dollar despite no change in the purchasing power parity. The same thing would happen if productivity were advancing faster in the U. S. export sector than in the domestic nontradeables sector, thereby rendering exportables cheaper in terms of nontradeables. The resulting reduction in the real cost of transforming nontradeables into exportables and thereby into imports would strengthen the external value of the U. S. dollar on the foreign exchanges. In both cases the U. S. would experience a real exchange rate appreciation and a corresponding departure from purchasing power parity.

These examples illustrate how real shocks such as productivity growth differentials and international shifts in demand can induce systematic departures from purchasing power parity. In this perspective there is nothing mysterious about the failure of exchange rates to move in conformity with national price levels in the post-Bretton Woods era of floating exchange rates. Given the abundance of real shocks in that period (e.g., oil embargoes, commodity shortages, diverging productivity growth rates, shifts in international demands, changes in commercial policy and the like), persistent departures from purchasing power parity were to be expected.

Residual Validity of the Purchasing Power Parity Doctrine The last question raised by recent exchange rate experience refers to the residual validity of the purchasing power parity doctrine. What remains of the doctrine given the departures from purchasing power parity? Is it still a useful guide to exchange rate behavior? Does it still have something to teach us?

Regarding the validity of the doctrine the model presented above yields the following conclusions. First, the purchasing power parity doctrine can be expected to hold in the long run when the source of exchange rate disturbance is predominantly of a monetary origin. Such nominal disturbances have no lasting impact on the real exchange rate and therefore leave the purchasing power parity price-exchange rate relationship intact. Second, the doctrine is unlikely to hold in the short run since exchange rates tend to adjust to changes in underlying monetary conditions more quickly that national price levels thereby causing temporary divergences from purchasing power parity. Third, nor will purchasing power parity hold exactly in the long run when the source of exchange rate disturbance is of a predominately real origin. Such real shocks alter real relative prices and thereby loosen the linkage between price levels and exchange rates postulated by the doctrine. What this means is that although the purchasing power parity doctrine is a reliable guide to long run exchange rate movements originating in the monetary sector, its forecasting accuracy diminishes when real shocks affect exchange rates.

Note, however, that the purchasing power parity doctrine remains a useful tool even when real structural changes produce systematic disparities between exchange rate movements and changes in national price levels. It continues to be useful because it identifies divergent rates of price inflation as an important source of exchange rate movements and points out that this source could be eliminated if countries would pursue stable noninflationary monetary policies. That is, it specifies unstable monetary policies as a prime cause of exchange rate movements and stresses that this cause could be removed if countries would practice monetary stability. It also serves as a reminder that policies that strengthen the internal value of a currency will also strengthen its external value on the foreign exchanges. And, in stressing that exchange rates are endogenous variables determined by underlying monetary conditions, the doctrine yields the important insight that exchange rate depreciation per se cannot be inflationary because it merely reflects rather than creates underlying inflationary pressures. For these reasons the purchasing power parity doctrine remains a useful analytical tool.

Policy Implications Having employed the augmented monetary model to interpret recent exchange rate behavior, it remains to outline the policy implications of the model. At least three policy implications stem from the augmented monetary model. The first is that it is impossible for countries to peg both the external and internal value of their currencies in an inflationary world subject to real economic shocks. As a result, floating exchange rates may be necessary for countries desiring to stabilize general prices.

To see this, recall the real/nominal exchange rate equation $E = RP/P^*$. It is obvious from this expression that it is impossible to peg both the exchange rate E and domestic prices P if the real exchange rate R and/or foreign prices P* are changing. Given foreign prices, a rising real exchange rate means that a country that wishes to stabilize its domestic price level must be prepared to abandon fixed rates and let its currency depreciate on the foreign exchanges. Similarly, given the real exchange rate, rising foreign prices mean that a country that wishes to pursue domestic price stability must let its currency appreciate on the foreign exchanges. Under these conditions only floating exchange rates are compatible with domestic price stability. For this reason, floating exchange rates may be necessary for countries wishing to achieve price stability in an inflationary world also subject to real economic shocks. Given price stability as the overriding policy goal, pegged exchange rates would be inferior to floating rates.

A second policy implication of the model is that proposed purchasing power parity policy intervention rules should be rejected. Such rules would require the authorities to intervene in the market for foreign exchange to insure that exchange rates conform to the purchasing power parity path of national price levels.

Such intervention rules are singularly ill-advised. They wrongly assume that policymakers can and should eliminate all real exchange rate changes. To be sure, real exchange rate changes stemming from erratic macroeconomic policies can and should be eliminated by pursuing stable, predictable policies. But real exchange rate changes stemming from fundamental structural changes in national economies should be accepted. For, as noted above, such changes generate changes in real relative prices that require equilibrium shifts in exchange rates relative to purchasing power parity. An intervention rule that ties exchange rates rigidly to national price levels in accordance with purchasing power parity ignores the need for such real exchange rate changes. It also fails to recognize that, because of sluggish national price levels, real exchange rate changes may be necessary to accomplish adjustments that would otherwise be achieved by movements in national price levels. For example, real exchange rate changes may serve the useful role of providing a temporary outlet for monetary shocks not accommodated by price level movements.

The model's third policy implication is that, short of obtaining a coordinated international program to equalize inflation rates in the trading world, the best way to reduce exchange rate fluctuations is to pursue a stable and predictable domestic noninflationary monetary policy. Not only would such a policy strengthen both the internal and external value of the currency, but it would also contribute to exchange rate stability in at least two ways. First, it would eliminate the unstable monetary growth that is a direct cause of exchange rate fluctuations. Second, it would exert a stabilizing effect on exchange rates via the expectations channel. This is so because market exchange rates are dominated by expectations of future monetary policies and these expectations themselves are influenced by current monetary policies. It follows that stable monetary policies will induce expectations of future policy stability and thereby exert a stabilizing influence on current exchange rates.

Note, however, that a stable domestic monetary policy alone would not eliminate all sources of exchange rate fluctuations. On the contrary, fluctuations could still result from unstable policies abroad as well as from unavoidable real disturbances. But stable monetary policy would eliminate one source of exchange rate variability, namely that produced by erratic and unstable domestic monetary policies. In short, while domestic monetary policy can do little to stop exchange rate disturbances originating from the real sector or from unstable policies abroad, it can stop one source of disturbance, namely that emanating from the domestic monetary sector.

Concluding Comments This article has presented an augmented monetary model of exchange rate determination and has used it to address certain questions raised by recent experience with floating exchange rates. The article's main conclusion is that real as well as monetary factors affect exchange rates and that they do so through nonmonetary channels, i.e., through real relative prices. The simplest version of the monetary approach ignores this, however, and for that reason must be augmented with a real exchange rate component if it is to account for all factors affecting exchange rates. Without this modification, the simple monetary approach is capable of accounting only for nominal movements in the exchange rate.

Even so, however, the simple version of the monetary approach remains a useful analytical tool. It provides a reliable guide to long-run exchange rate behavior when the source of exchange rate disturbance is of a predominantly monetary origin. It reminds us that excessive monetary growth is a primary source of exchange rate depreciation and that one can eliminate this source by adhering to stable noninflationary monetary policies. It also reminds us that exchange rates and price levels cannot be treated as independent, unrelated variables since policies that affect one tend to affect the other in the same way. It notes that since exchange rates themselves are determined by monetary policy they cannot be treated as independent policy instruments. And, in stressing that exchange rates are endogenous variables determined by underlying monetary conditions, it makes the important point that floating exchange rates cannot be inflationary since they reflect rather than generate inflationary pressures. In so doing, it effectively refutes the popular argument that floating rates cause inflation. These propositions remain valid even when real exchange rate changes occur. For this reason the monetary approach remains a useful analytical tool.

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