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The Monetary Approach to Exchange Rates: What Now Remains?

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Summary

This paper examines the reasons for the failure of the monetary approach as an explanation for major-currency exchange rate movements. The monetary approach may be characterized by a model in which purchasing power parity, uncovered interest parity, a stable demand for money, a stable supply of money, and rational expectations all hold. Each of these hypotheses is discussed in the context of its contribution to the monetary approach; the paper then reviews the available empirical evidence.

Empirical testing of these hypotheses has been hampered by the difficulty of isolating each one from the others. Nonetheless, a number of conclusions may be drawn from this review. First, shifts in relative goods prices have been important enough that purchasing power parity has proved to be of very little relevance in explaining changes in exchange rates among the currencies of the major industrial countries. Second, uncovered interest parity probably does not hold in most cases, because securities denominated in different currencies are not perfect substitutes. Third, although the demand for and the supply of money may be determined by stable relationships, the simplified functional forms that are usually incorporated into empirical exchange rate models do not necessarily correspond to them. Fifth, the rationality of exchange rate expectations has not been established. Thus, difficulties with all of the underlying hypotheses appear to have contributed to the failure of the monetary approach.

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I. Introduction

The monetary approach to exchange rate determination has clearly failed to provide an adequate explanation of the movements in major currency values during the floating rate period that began in 1973. No monetary model has generated robust parameter estimates, and no monetary model has been shown to provide out-of-sample predictions that are consistently better than those of a simple random-walk process. The problem addressed in this paper is to isolate the causes of this failure.

The following discussion of the monetary approach differs from most surveys in that it is not concerned primarily with describing the monetary models that have been developed in the literature. Rather, it attempts to analyze the fundamental building blocks of the approach. It asks the question, What hypotheses must be valid if exchange market behavior is to be consistent with the view that exchange rates are determined principally by shifts in the demand for and the supply of money? Having specified a set of hypotheses, it then examines the empirical evidence relating to each one.

Section II of this paper examines the theoretical issues that are relevant for evaluating the monetary approach. It begins by contrasting the approach with alternative theories and then describes the specific monetary hypotheses in more detail. Section III discusses the empirical evidence pertaining to each hypothesis, and the conclusions of the exercise are presented in Section IV.

II. Theoretical Issues

Before examining the performance of models based on the monetary approach to exchange rates, it is necessary to define the approach by contrasting it with alternatives that have or have had a prominent place in the literature on exchange rate determination. On one general level, the monetary approach may be contrasted with a "flow" approach in which shocks such as shifts in monetary or fiscal policies alter trade flows through shifts in the terms of trade or in the relation between domestic absorption and output. 1/ The demand for and supply of foreign exchange in this approach is seen as a derived demand associated with the external current account balance, so the exchange rate will change so as to

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1/ The flow approach is frequently referred to as the "textbook" model of exchange rate determination. For descriptions, see Isard (1978), Mussa (1979), and Kenen (1984).

equilibrate those flows. In contrast, the monetary approach is one member of a class of "stock" or "asset" approaches in which changes in relative goods prices are assumed to play a relatively minor supporting role. The common feature of asset-market models is that the exchange rate is viewed as equilibrating the net stock demands for financial assets denominated in different currencies.

Because asset-market models have received by far the greatest attention in the literature during the floating-rate period since 1973, the more interesting contrast is between the monetary approach and other asset-market models. In fact, virtually every model developed since 1973 to explain movements in the values of floating currencies incorporates--implicitly or explicitly--an adjustment process that gives a prominent role to the equilibration of national money markets. Whatever may be wrong with the existing set of exchange rate models, no one is suggesting that better results would be attained by ignoring the financial aspects of the problem. Although real shifts have clearly been very important during this period, what is principally in dispute is the precise specification of asset models. Therefore, the remainder of this paper focuses principally on the features that distinguish a monetary exchange rate model from other asset models. For convenience, the latter may collectively be referred to as portfolio balance models. 1/

The empirical properties of the monetary approach to exchange rate determination can be summarized in the following five hypotheses. First, purchasing power parity (PPP) holds over some relevant time horizon. Second, uncovered interest parity (UIP) holds at all times. Third, the demand for real money balances is a stable function of a small set of real variables. Fourth, the supply of money is determined by a stable process. Fifth, expectations are in some sense rational.

The basis for this list of essential hypotheses is not that they have characterized each and every model that has been called part of the monetary approach. It is rather that they define the basic properties of an economic system in which money plays the dominant role. For money to be a key variable, it is essential that money prices measure underlying

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1/ This term actually encompasses two rather different subclasses of models: those such as Hooper and Morton (1982) or Frankel (1983) that contain the Frenkel-Dornbusch monetary approach as a special case, and those such as Branson, Halttunen, and Masson (1977), Boughton (1984), and Dooley and Isard (1983) that do not. The latter derive more directly from the portfolio approach developed by Tobin in the context of domestic financial analysis; see Tobin (1969).

costs in the economy and be flexible over a reasonable time horizon, that the market for money balances be stable and in equilibrium over all but very short adjustment periods, and that asset markets be efficient. It may be shown that these underlying properties imply the five hypotheses outlined above. 1/

Before discussing the relationship between purchasing power parity and the monetary approach, it may be helpful to clarify what is meant empirically by PPP. At least three possibilities may be distinguished. First, as a relatively weak proposition, one may hypothesize that--ceteris paribus--the nominal exchange rate between two currencies will move in line with the expected inflation differential between the two countries. 2/ Some form of this first hypothesis is implicit in most asset-based exchange rate models, regardless of whether they would otherwise be classified as consistent with the monetary approach. As a second, and stronger, proposition, one may hypothesize that the real exchange rate will tend toward a time-invariant equilibrium level determined in some manner by the law of one price. 1/ Then, if expectations are rational, the expected rate of depreciation will be equal to the expected inflation differential plus a function of the gap (if any) between the current level of the nominal exchange rate and its equilibrium value. Third, and stronger still, one may hypothesize that the real exchange rate will always be at its equilibrium value (i.e., that the gap is always zero). The addition of this last requirement is what, in Frankel's (1983) taxonomy, constitutes a "monetarist" exchange rate model rather than a "monetary" model. But it is the second hypothesis that may be shown to be essential for the monetary approach.

1/ An economy at rest, with all markets in equilibrium, could be described by reference to any arbitrarily selected subset of relationships. The interesting issue is the importance of each market in determining the path of the economy when it is disturbed. That is the context in which these properties matter.

2/ A sufficient but not necessary condition for this proposition to hold is that the real exchange rate be in continuous time-invariant equilibrium. If it is out of equilibrium, even if expectations are rational, market participants may not have sufficient information to take the disequilibrium into account in forming expectations about the rate of currency depreciation. This point is discussed more fully in Boughton (1984).

3/ These two propositions are similar to the familiar "relative" and "absolute" versions of PPP, but each is somewhat weaker than those theoretical labels imply. Specifically, the propositions cited here are intended to be partial--i.e., ceteris paribus--conditions. As such, the first does not rule out substantial movements in real exchange rates, as would a strict interpretation of relative PPP. The second does not require that actual market prices be equal in the two currency areas, as would absolute PPP.

There is a close and obvious relationship between PPP and the flexibility of goods prices. If prices are not flexible, then changes in nominal exchange rates will not be fully reflected in offsetting movements in aggregate price levels; consequently, real exchange rates are likely to move in the same direction as nominal rates. Thus the conditions for PPP are essentially the same as the conditions for the natural rate of unemployment to hold, with an important addition: prices must be flexible not only within a country (or currency area) but internationally as well. The gradual realization during the past several years that PPP is an unrealistic hypothesis in the short or medium run has been a natural corollary to the dissatisfaction that has emerged with the natural rate of unemployment as anything other than a long-run hypothesis. However, in the case of PPP, there may be considerably more scope for doubt as to its importance even in the long run.

The hypothesis of uncovered interest parity is the source of the proposition that the exchange rate is the relative price of national moneys. 1/ A more general statement of the proposition that would not require UIP would be the following: the exchange rate is the relative price of outside assets that are denominated in different currencies and that are imperfect substitutes. Money, properly delimited, clearly satisfies at least the latter requirement, since national money stocks do not serve as wide a variety of functions outside the home country as they do within it. 2/ Money, however, might not be the only collection of assets that meets this requirement.

Uncovered interest parity holds if and only if securities that are similar except for currency of denomination are perfect substitutes, in which case their expected rates of return should be equal (up to an additive constant). It may be noted that this condition need apply only to government securities, since private securities are not net wealth to the private sector of the economy. 3/ Private securities are inside, rather than outside, assets; as such, a change in their stocks is not normally expected to lead to a change in relative prices or to have real

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1/ There is a trivial sense--that in which money is defined as a unit of account--in which this proposition holds by definition. UIP is defined more precisely below, in Section III.

2/ If some portion of the money stock consists of inside assets, then the general proposition will still hold, so long as those inside assets are perfect substitutes for the outside-asset portion.

3/ An exception arises if all securities, including government securities, are inside assets. Then UIP must hold regardless of the degree of substitutability.

effects on the economy. But if government securities with different currency denomination are imperfect substitutes, then an exogenous increase in the stock of (say) U.S. securities will reduce its price, raising U.S. interest rates without having a fully commensurate effect on the interest rates of other countries or on the expected rate of currency depreciation. 1/ Thus UIP will not hold.

The stability of the money demand function is an obvious requirement for a monetary model of exchange rates, as is the requirement that the demand for real balances be homogeneous of degree zero in the level of prices (i.e., that the demand for real balances be a function only of real variables). Without the latter condition, money will not necessarily be neutral in its economic effects. However, "stability" in this context has a somewhat different interpretation from that which is usually assigned to it in the empirical literature on the demand for money. It does not mean that occasional or even frequent shifts in estimated demand functions necessarily invalidate the monetary approach. To the extent that such shifts can be identified and quantified, they can readily be incorporated into an ex post explanation of exchange rate movements.

Stability in this context means that a shock to one of the arguments in the function will set in motion a transmission process that will cause one or more of the other arguments to respond in a predictable manner. An increase in the stock of money may generate a predictable rise in the price level; for a given stock of money, an increase in the level of real output may generate a predictable rise in interest rates. The exact nature of these transmission processes is a more general macroeconomic question, but the hypothesis that they can be adequately described by a relatively simple money demand function is a key element of the monetary approach. 2/

1/ This exposition assumes that each country denominates its securities in its own currency. It should also be noted that perfect substitutability is defined here so as not to rule out the possibility that one security might carry a higher risk premium than the other; it requires only that the risk premium be constant over time.

2/ In the sticky-price versions of monetary models, only the long-run demand for money appears directly in the solution for the exchange rate. Short-run changes are determined by real interest rate differentials. However, the latter are themselves determined by the excess demands for money balances. As Frankel (1983, p. 91) put it, "Intuitively, when a tight domestic monetary policy causes the nominal interest differential to rise above its equilibrium level, an incipient capital inflow causes the value of the currency to rise above its equilibrium level."

The role of the money supply process in the monetary approach is perhaps less well formulated in the theoretical literature than is the role of the demand function. In a model of floating exchange rates without official intervention, it is frequently assumed that the stock of money is an exogenous policy-controlled variable. It is, however, equally valid to posit the existence of a reaction function in which the monetary authorities respond systematically or with discretion to changes in one or more indicator variables. 1/ In a model of managed floating, a reaction function is always at least an implicit part of the model, because the authorities can manage the exchange rate only by reacting to observed changes in it. If the money supply is endogenous, it may also be specified in part as a function of commercial bank portfolio selection and liability management. The important point for the monetary approach is that an unstable supply process will negate the ability of the money market to equilibrate the economy, in much the same way as will an unstable demand.

The final building block of the monetary approach is rational expectations, without which one cannot assure the efficiency of foreign exchange markets. In this context, rational expectations may be defined as the full use of all available information; it does not necessarily imply perfect foresight over a finite period of time. 2/ The failure of this weak-form rationality would imply that market participants could exploit the unused information in order to make economic profits. If financial asset markets are inefficient processors of information, then there is no reason to expect these markets--rather than the flow markets for goods and services--to play the dominant role in the adjustment of exchange rates to an exogenous shock.

These considerations suggest that an appropriate expectations function for a monetary model (in which PPP holds) must begin with the expectation that the exchange rate will, ceteris paribus, respond pari passu to changes in the (rationally) expected inflation differential.

1/ For examples of monetary models incorporating reaction functions, see Frenkel and Aizenman (1981) and Papell (1984). For examples of portfolio-balance models with reaction functions, see Knight and Mathieson (1983) and Boughton (1984).

2/ This distinction is discussed in Friedman (1979). The weak form of rational expectations may be referred to as Friedman-rational, as opposed to Muth-rational. If the latter holds in a monetary model, then only unanticipated changes in the rate of growth of money will have real effects. For a discussion of the relationship between rational expectations and efficiency, see Mussa (1979).

The exact specification of the latter term, as well as of other possible determinants of the expected change in the exchange rate, is open to interpretation.

III. Empirical Issues

Tests of the monetary approach may be classified broadly as of two types: tests of the validity of an exchange rate model and tests of the validity of specific hypotheses. The first type of test, as noted in the introduction to this paper, has clearly indicated the failure of the monetary approach to explain movements in the exchange rates of major major currencies during the post-1973 floating rate period. Not only have virtually all such tests of specific models revealed substantial problems with parameter estimates; in addition, studies of the post-sample predictive ability of these models have been uniformly negative. 1/ Unfortunately, although there is evidence that some portfolio-balance models may outperform those of the monetary approach, most of these studies have given relatively little indication of the direction in which research should turn in order to develop better models. 2/ It is thus necessary to examine more closely the performance of specific hypotheses.

The testing of the hypothesis of purchasing power parity has been widely discussed in the literature. Many of the issues that arise are largely technical, involving choices related to (a) the time period over which data are to be examined (whether PPP is hypothesized to hold

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1/ Examples of the former include Bilson (1978), Dornbusch (1980), Hacche and Townend (1981), and Frankel (1983, 1984). For the latter, see Meese and Rogoff (1983a, 1983b, 1985), Backus (1984), and Boughton (1985).

2/ Evidence that the portfolio-balance models of Artus (1976, 1981, 1984) and Boughton (1984) perform better than the monetary models is presented in Boughton (1985). Rogoff (1983) also notes a number of studies that have provided evidence in favor of a portfolio-balance effect in the form of a risk premium, although he questions the appropriateness of the measures used in those studies (typically some variant of the cumulated external balance). Frankel (1983) concludes that his estimates for the monetary approach are enough better than the "disaster" that he finds for the "synthetic" monetary-portfolio-balance model "tentatively to justify a return of attention to the monetary approach." In contrast, Isard (1983) suggests revamping the portfolio-balance models by incorporating more microeconomic structual hypotheses.

in the short run or only over long periods, and what base period is appropriate); (b) the currencies to be covered (relatively few currencies float freely; some models apply only to small countries, and those few small countries with floating rates may not have the other data required for testing the model); and (c) the definition of the price index (eg., consumer or wholesale prices, traded goods prices, value added deflators, or cost indexes in manufacturing industries).

In the final analysis, although each of these technical issues is important in its own right, none of them has proved to matter greatly in the determination of the empirical importance of PPP. Regardless of how the question is defined, the massive movements that have taken place in real exchange rates during the past ten years lead inexorably to the conclusion that PPP (as defined in the preceding section) plays a very limited role in exchange rate determination. 1/ It is thus difficult to escape the conclusion that shifts in relative goods prices are an important--though so far relatively unexplored--determinant of exchange rate movements. 2/

Tests of the hypothesis of uncovered interest parity have yielded mixed results. The UIP hypothesis states that interest rates in the home country should (in the absence of capital controls) be equal to comparable interest rates in a second country plus the rate of depreciation against the currency of that country that is expected to occur during the remaining life of the assets in question. Direct tests of this hypothesis have been impossible to conduct until recently, because of the absence of observable data on exchange rate expectations. Tests of UIP therefore have involved one of the following two types of joint hypotheses.

One standard procedure for testing UIP has been as follows. First, assume that asset markets are efficient, so that covered interest parity

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1/ Levich (1984) has surveyed a variety of empirical tests of PPP, including regressions in level and first-difference form, simple base-period comparisons, and microeconomic comparisons of individual prices across countries. Except possibly in periods of hyperinflation, all of these tests reveal substantial departures from PPP. These tests, however, do not test whether PPP holds ceteris paribus in the context of a fully specified model. In that context, it is quite difficult and usually impossible to sort out the validity of PPP from the other assuptions of the model.

2/ For a suggestion on how shifts in relative goods prices might be incorporated into exchange rate models, see Dooley and Isard (1985).

holds. 1/ Second, hypothesize that securities denominated in different currencies are not perfect substitutes, so that a risk premium will be associated with holding foreign-currency assets, and that this premium may be explained by one or more variables; UIP then is the hypothesis that this risk premium is zero. Third, embody this hypothesis in a portfolio-balance model and estimate the reduced form; if the variables that are introduced into the model in order to explain the risk premium have a statistically insignificant effect, then reject the hypothesis that a risk premium exists in favor of the null hypothesis that UIP holds. Such tests are joint tests of UIP, model specification, and measurement of relevant variables. 2/

In most tests of this type, the risk premium has been specified as a function of some measure of the relative stocks of outside securities denominated in each currency. 3/ This relative stock enters the model in the absence of UIP because the uncovered interest differential is an argument in the demand function for securities in each country; this relationship is then inverted in the reduced form. Other variables, however, have sometimes been included as well. 4/ Regardless of the formulation, all such tests indicate that changes in the risk premium account at best for a small portion of actual changes in exchange rates.

A second type of test focuses more directly on the strong rational expectations assumption, under which the actual exchange rate is used as a proxy for the rate that was expected in the previous period to prevail in the current period. Given this assumption, one may ask simply whether ex post returns are equalized across countries except for a white-noise error term. In general, they are not, so this test leads to the rejection of UIP. 5/ This type of test, however, is unable to

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1/ That is, the home-country interest rate equals the foreign interest rate plus the forward discount on the exchange rate. There may also be a premium associated with differences in default risk, tax treatment, or other differences in the properties of the securities; empirical tests of covered interest parity generally attempt to select securities with very similar properties.

2/ The hypothesis of covered interest parity, which is also embedded in this type of test, may be verified independently. For a discussion and survey, see Levich (1984).

3/ Frequently the cumulated external balance on the current or the private capital account serves as a proxy for the relative stock of securities.

4/ See, for example, Dooley and Isard (1983).

5/ See Cumby and Obstfeld (1981).

distinguish whether the estimated departure from UIP is attributable to the existence of a risk premium or to systematic differences between expected exchange rate changes and actual outcomes. The evidence that the bulk of observed changes in exchange rates are unexpected (i.e., are responses to "news") may imply that the power of this type of test is quite low. 1/

A third type of test that has been conducted recently is based on survey data of exchange rate expectations. Such data have been assembled by Frankel and Froot (1985) and have been used by Froot (1985) to test for the validity of UIP. These tests indicate the presence of a large gap between interest differentials and the expected rate of change in the exchange rate; thus, unless the survey data are shown to be very far from accurate, this test--which is much more direct than the others just outlined--will lead to the rejection of UIP.

The hypothesis of a stable demand for money has fared somewhat better in the literature than have the two hypotheses just examined, although even here there have been some important reservations. The instabilities in the demands for M1 in the United States and Canada and for sterling M3 in the United Kingdom that emerged in the 1970s may have given rise to a more general impression of instability, but there is very little evidence for that view. Boughton (1981) argued that for other definitions of money in those countries and for both narrow and broad definitions of money in other major industrial countries, money demand functions were broadly stable. Similarly, Atkinson et al. (1984) concluded that "while there is evidence for money demand instability in the case of some aggregates, a reasonably stable equation can be identified for all of the major seven OECD countries" (p. 17).

Perhaps a more serious problem with the way the demand for money enters most tests of exchange rate determination is that there is a gap between the way demand functions are specified in such tests and the way they are written in studies focusing on money demand itself. A typical demand function in an exchange rate model specifies the demand for real money balances (or for money balances as a portion of wealth) as a function only of the current levels of real income and a rate of interest. In contrast, functions estimated directly virtually always incorporate a lengthy lag process, and they frequently add variables such as the expected rate of inflation or additional rates of return (longer-term interest rates or Tobin's q). Furthermore, parameters

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1/ See Frenkel (1981) for a test of the role of unexpected events; for a general discussion, see Mussa (1979).

such as income elasticities that are generally assumed to be equal across countries in exchange-rate studies often have rather different values in comparative studies. Thus the possibility exists that the money demand functions that are implicitly estimated in reduced-form exchange rate equations are unstable, even if the actual demand functions are not. 1/

A related issue concerns the proper definition of money. In a number of countries, the demand for narrowly defined money stocks is less stable than is the demand for broader aggregates. 2/ However, broadly defined stocks are inappropriate measures of money in a monetary exchange rate model, for two reasons. First, broadly defined aggregates generally include deposits that bear a market rate of interest. As such, they are properly regarded as securities; if UIP holds, then these assets should also be perfect substitutes. 3/ Second, as a consequence of the payment of market rates of interest, broad aggregates are less likely to have a significant negative interest elasticity. Without that relationship, the monetary equation for the exchange rate must be truncated in an odd way. In its most general form, the monetary equation states that the level of the nominal exchange rate is a function of relative money stocks, relative income flows, real interest rate differentials, and expected inflation differentials. 4/ This last term arises solely from the existence of an interest elasticity in the demand for money. Therefore, a finding that money demand does not respond to the rate of interest in either country would imply as well that the nominal exchange rate is unaffected by a change in the expected rate of inflation. 5/

1/ In sticky-price monetary models, as noted above, only the long-run demand for money appears in the solution for the exchange rate. However, the real interest rate differential is usually treated as endogenous, with instrumental variables used for estimation. The question then is whether the money demand equations that are implicit in the formulation of these instrumental variables are stable. In most cases, published articles do not provide sufficient information about the specification of the instrumental variables to enable an evaluation of that question.

2/ Both Boughton (1981) and Atkinson et al. (1984) found that the broader aggregates were relatively more stable in the United States, Germany, and France. Boughton also found the broad aggregates to be relativley stable in Canada and Japan. Only in the United Kingdom did both studies find M1 to be more stable than the broader aggregate (sterling M3).

3/ See Girton and Roper (1981) for an elaboration of the money/bond distinction in this context.

4/ See Frankel (1983) for a straightforward derivation of this equation.

5/ This problem is alleviated if the demand for money is a function of the expected rate of inflation.

The stability of the money supply process is a difficult issue to assess in general terms. Many exchange rate models assume that the stock of money is an exogenous policy-controlled variable that follows a steady growth path. The number of countries for which this assumption is applicable would appear to be quite small. Most of the large industrial countries follow eclectic strategies in determining the appropriate stance of monetary policy, with the result that the stock of money is an endogenous variable in the sense that its movements are--at least in principle--explained by the variables in which the monetary authorities have a more fundamental interest. The close control of the stock of central bank money in Germany and of M2 plus CDs in Japan in recent years are exceptions, but they do not confute this general pattern.

An alternative procedure is to specify a reaction function for the monetary authorities, which may include the exchange rate as one target variable. There is a substantial literature in which reaction functions have been estimated successfully for a number of countries, but the temporal stability of these functions remains to be established. 1/ In any event, the possible empirical role of reaction functions in monetary models of the exchange rate has not been very well explored in the literature. 2/

The final empirical issue concerns the rationality of exchange rate expectations. As noted above, the evidence is quite clear that only a very small portion of actual exchange rate changes is expected; that is, only a small portion can be predicted by standard models. Furthermore, it is well known that forward discount rates are essentially uncorrelated with actual changes in spot rates. 3/ Hence tests that employ either the actual realized change or the forward rate as a measure of the rationally expected change in the spot exchange rate are not likely to be very powerful tests against a null hypothesis of rationality.

Expectations functions that are based on the notion that market participants have a view as to the PPP level of the exchange rate (and, implicitly, that they are willing to act on that view) also have some difficulty being reconciled with the empirical realities of the floating-rate period. The most notable example of this type of function is the

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1/ See Black (1983) and several of the papers in Hodgman (1983). The latter volume includes discussion by a number of contributors of the stability problems with reaction functions, especially in view of the political effects on policy formulation.

2/ See footnote 1 on p. 7.

3/ For a discussion of the failure of forward rates to predict future spot rates, see Hansen and Hodrick (1980, 1983) and Levich (1984).

Dornbusch-Frankel expectations mechanism, which has been incorporated in a number of recent monetary models. Dornbusch (1976) and Frankel (1979) argue that--in the presence of price rigidity--the real exchange rate will rationally be expected to return to its PPP level at a steady rate. However, the massive swings in real exchange rates that have been observed during the past several years have made it increasingly difficult to accept this idea. What would account for the rise in the value of the U.S. dollar during 1983 and 1984 (a period when real interest differentials did not shift in favor of the dollar)? There may have been an expectation that the long-run sustainable level of the dollar had risen, perhaps because of confidence or "safe haven" factors. However, unless one is willing to argue that such a shift accounted for a very large long-run effect, it remains nonetheless likely that market participants were unwilling to act on their expectations that the dollar was *overvalued or that the implicit rate of adjustment was extremely slow.* In any case, the Dornbusch-Frankel expectations mechanism would be of limited value as an explanator of actual developments.

A number of other rational expectations mechanisms have been employed in monetary models. The simplest form is that of Frenkel (1976), in which the expected rate of depreciation is hypothesized to be equal to the expected inflation differential. 1/ This function is undoubtedly overly simplified as a representation of actual expectations, but it has substantial theoretical appeal as a characterization of the central tendency of those expectations. 2/ Frankel and Froot (1985) present several tests of this type of function. In most cases, they are unable to reject the hypothesis that the coefficient on the expected inflation differential is equal to one; however, they also estimate constant terms that are significantly different both from zero and from the process generating actual changes in exchange rates. They thus are able to reject the hypothesis of rational expectations.

1/ The same function is employed in Boughton (1984), but the latter is a non-monetary model in which the rationale is somewhat different. Whereas Frenkel assumes that the real exchange rate is always in equilibrium and is expected to remain so, Boughton assumes that market participants lack information about whether the exchange rate is in equilibrium or not and therefore act as if it were.

2/ Artus (1984) develops an expectations function of this more general type in the context of a portfolio balance model. In his function, the expected rate of depreciation is a function of the expected inflation differential plus differences between other relevant variables and their equilibrium values. Boughton (1985) provides evidence that the less restricted function may improve the performance of portfolio balance models.

Hartley (1983) estimates a simple monetarist model similar to Frenkel's, with the expected rate of depreciation measured by the forward discount on foreign exchange. 1/ Hartley's tests fail to reject the hypothesis of rationality; however, the sample variances of the parameter estimates are large enough that the model itself appears to be inconsistent with the data. Because it is not possible to separate the hypothesis of model structure from that of the rationality of the expectations function, this test sheds little light on the latter issue.

IV. Conclusions

This paper has examined several hypotheses that are essential elements in the monetary approach to exchange rate determination. It has been shown that each of them has some claim to validity, but that the relevance of each for the empirical explanation of exchange rate movements is open to question. Purchasing power parity (in level form) is at best a long-run hypothesis that has little or no bearing on short- or medium-term developments. Uncovered interest parity appears to be a viable approximation under some indirect tests, but not at all when subjected to other tests, including direct tests using survey data on expectations. The money demand functions and supply mechanisms that are usually specified in exchange rate models are too simplified to be likely to be stable in practice. And the expectations mechanisms do not appear to be well founded.

As this brief summary indicates, some of the empirical problems associated with the monetary approach may be solvable by recourse to more careful specification of the empirical relationships, and they do not call into question the underlying monetary theory. The specification of demand functions and supply processes for money and of expectations functions are in this category. Others, however, are more fundamental: neither purchasing power parity nor uncovered interest parity may be a very good approximation to reality, raising the possibility that the monetary approach may be too restricted a view to be applicable in practice.

The weaknesses in these two hypotheses--purchasing power parity and uncovered interest parity--have quite different implications for the direction in which research on exchange rate determination should

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1/ Recall that the model assumes that the forward discount is equal to the nominal interest differential. With perfect asset substitutability plus PPP, the nominal interest differential will also equal the expected inflation differential.

be directed. The former problem implies that shifts in relative goods prices may be important and that such shifts should be explained if we are to have a more complete theory of exchange rate movements. Unfortunately, little progress has so far been achieved in this direction. On the other hand, the failure of uncovered interest parity implies that shifts in relative asset supplies via current account imbalances may be important and that exchange rate models should include an explanation of shifts affecting securities markets. There is some evidence that less restricted portfolio balance models perform somewhat better than monetary models, at least in estimates of equations for major currencies. Nonetheless, although the general asset market approach certainly has become and is likely to continue to be the standard for any analysis of exchange market behavior, a great deal of research remains to be done before we will have anything more than a fragmentary understanding of this important issue.

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