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ABSTRACT

Since the move to generalized floating in 1973, exchange rates between major currencies have displayed large fluctuations. This turbulence of exchange rates is an important concern of government policy and its explanation is a challenge for theories of foreign exchange market behavior. This paper documents the extent of turbulence by examining (i) the magnitude of short run variations of exchange rates; (ii) the degree of divergence between actual and expected changes in exchange rates; and (iii) the degree of deviations from purchasing power parities. The empirical findings are being interpreted in terms of the modern "asset market theory" to exchange rate determination. The paper concludes with an analysis of the question of whether turbulence in the foreign exchange market has been "excessive" and what policy measures can (or should) be taken to reduce it.

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Since the move to generalized floating in 1973, exchange rates between major currencies have displayed large fluctuations. This turbulence of foreign exchange rates is an important concern of government policy and its explanation is a challenge for theories of foreign exchange market behavior. In section I of this paper, we document the extent of turbulence in foreign exchange markets by examining (i) the magnitude of short run variations in exchange rates relative to other measures of economic variability; (ii) the degree of divergence between actual and expected changes in exchange rates; and (iii) the extent to which exchange rate movements have diverged from movements of relative national price levels. In section II, we provide a general explanation of this turbulence in terms of the modern "asset market theory" to exchange rate determination. This theory emphasizes that exchange rates, like the prices of other assets determined in organized markets, are strongly influenced by the market's expectation of future events. In this context, we also discuss the narrower technical question of "foreign exchange market efficiency." Finally, in section III, we address the question of whether turbulence in the foreign exchange markets has been "excessive" and what policy measures can (or should) be taken to reduce it.

I. Measures of Turbulence

Perhaps the simplest measure of turbulence in foreign exchange markets is the average percentage changes in exchange rates over some interval of time. For example, Table 1 reports the average absolute monthly percentage change for three major exchange rates (the Dollar/Pound, the Dollar/French Franc and the Dollar/DM) for the period June 1973 to February 1979. In all cases, the average absolute change exceeded two percent per month. In comparison the average absolute monthly percentage change for wholesale and consumer price

indices and for ratios of national price levels were only about half that of the exchange rates, and the differences are even more striking for the detrended series.

Another important dimension of exchange rate turbulence, is the predictability of exchange rate changes. If exchange rate changes were largely predictable, they would give rise to little risk. The facts indicate, however, that exchange rate changes are largely unpredictable. If we regard the forward premium on foreign exchange as a measure of the market's prediction of the change in the exchange rate, then predicted changes in the exchange rate account for a very small fraction of actual changes. This general phenomenon is illustrated for the case of the Dollar/DM exchange rate in Figure 1.

If exchange rates moved in accord with relative national price levels, as suggested by a simple version of the purchasing power parity theory, the turbulence of exchange rates would be regarded as a manifestation of the forces underlying the turbulence of national inflation rates. Moreover, in this circumstance, turbulence of exchange rates would probably not be regarded as an additional source of social cost. However, as illustrated in Figure 1, short run changes in exchange rates bear little relationship to short run differentials in national inflation rates, particularly as measured by consumer price indices. Further, as illustrated in Figure 2 for the case of Germany and the United States, changes in exchange rates over longer periods of time have frequently been associated with large cumulative divergences from relative purchasing power parities.[1]

In summary, turbulence of exchange rates is indicated by the large and unpredictable fluctuations that do not conform closely to movements in relative national price levels. The question remains--what is the social

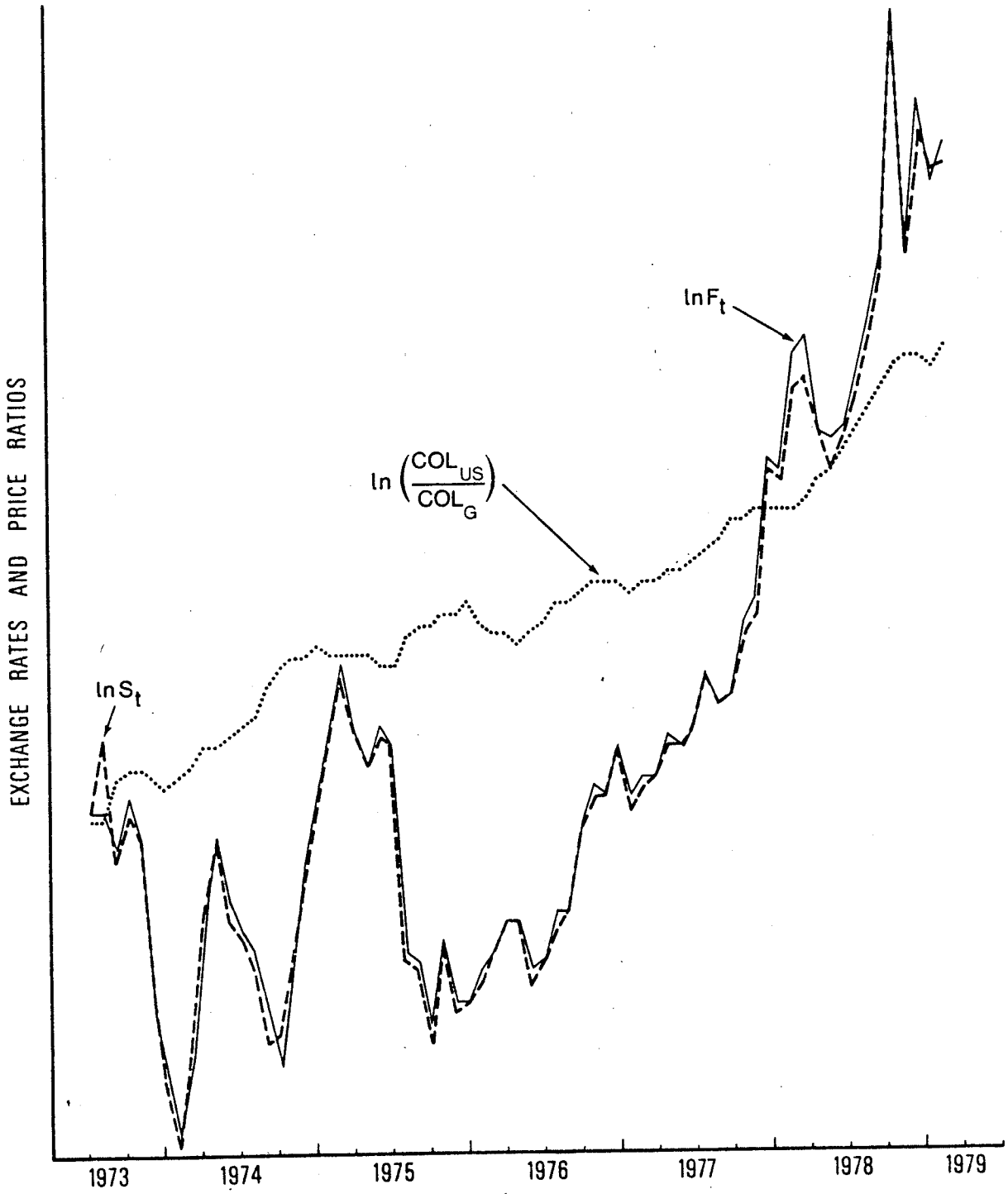

Figure 2: Monthly observations of the Dollar/DM Spot and Forward Exchange Rates and the Ratio of the U.S./German Cost of Living Indices (scaled to equal the spot exchange rate at the initial month): June 1973 - February 1979.

supplies, incomes, output levels, and the like).[3] Assuming that expectations are "rational" in that equation (1) applies to expectations of future exchange rates, it follows, by forward iteration, that[4]

$$(2) \qquad E(s(t+j);t) = (1/(1+b)) \cdot \sum_{k=0}^{\infty} (b/(1+b))^{k} \cdot E(z(t+j+k);t).$$

Thus, the current exchange rate (j = 0) and current expectations of future exchange rates (j > 0) are linked because both depend on expectations concerning the future z's. The presumption is that this linkage should be quite strong at least for the exchange rates expected in the near future. The reasoning is straightforward. If the expected change in the exchange rate over a single day is one percent, the expected rate of return from shifting wealth from one currency of denomination to another is extremely high. The flow of funds induced by such a high expected rate of return should swamp the ordinary factors of supply and demand represented by z(t). Hence, the current exchange rate, s(t) = E(s(t);t), should be closely linked to the current expectation of tomorrow's exchange rate, E(s(t+1);t), which in turn should be closely linked to the exchange rate expected for the following day, E(s(t+2);t); and so on.[5] Further, using equation (2) we may determine the expected change in the exchange rate, conditional on information available at time t. The actual change is this expected change plus the (necessarily unpredictable) unexpected change due to "new information" that alters expectations concerning the z's.

The evidence from the behavior of spot and forward rates, illustrated in figure 1, indicates that the bulk of exchange rate changes appear to be due to "new information." The close correlation between movements of spot and forward rates illustrated in figure 2 indicates that this "new information" appears to alter views concerning current and expected future exchange rates by approximately the same amount. This close correlation between spot and

rules. Different tests applied to different exchange rates in different time periods have not reached a unanimous concensus concerning the hypothesis of foreign exchange market efficiency.[7]

Whatever the outcome of the debate on the technical question of market efficiency, the general view of exchange rates as asset prices is vital in explaining the turbulence of exchange rates documented in section I. This perspective implies that exchange rates will not adjust slowly and smoothly, but like other asset prices, will display random fluctuations in response to "new information" that is continually being received by the market. While it is exceedingly difficult to determine the precise "new information" which caused particular changes in individual exchange rates, the turbulent events since 1973 is consistent with substantial volatility of exchange rates. During this period, many countries experienced the widest variations of output, employment and inflation rates of the post-World War II era. In virtually all countries, there have been wide swings in government policy. The world economy has had to adjust to the real and financial consequences of the increase in the price of oil. Exchange rates, like other asset prices, have responded not only to events but also to their effect on expectations concerning future events. In short, there is no great mystery why exchange rates have shown a high degree of turbulence during recent years.

Finally, divergences of exchange rates from relative purchasing power parities are not necessarily indicative of any peculiarity in the behavior of exchange rates. Time series analysis reveals that monthly changes in exchange rates, like changes in many other asset prices, show little or no serial correlation. Measured national price levels, however, do <u>not</u> behave like exchange rates, but instead exhibit a degree of serial-correlation. Recent macroeconomic theorizing has rationalized this "stickyness" in terms of nominal contracts, costs of price adjustments, as well as confusion between relative and absolute

dealing with the strains created by the oil crisis. It is doubtful that the system of pegged rates could have survived in that environment without severe limits on trade and capital movements being imposed by many countries.

Third, changes in real economic conditions requiring adjustments in the relative prices of different national outputs occur continuously. Under the system of pegged rates, relative price adjustments are achieved through the slow changes of national price levels and through occasional changes of parity. Under floating rates, adjustments in the relative price of different national outputs occur rapidly and in anticipation of changes in economic conditions rather than after the need for adjustment has become apparent. In the absence of an explicit specification of relative costs, there is no general presumption that slow adjustment of relative prices is preferable to rapid adjustment, or that price adjustments should not occur in anticipation of events requiring such adjustments. Indeed, since prices play an important role in communicating the appropriate manner to deploy resources, rapid and anticipatory adjustment of relative prices may contribute to the efficiency of the economic system. Given the apparent "stickyness" of national price levels, the flexibility of relative prices of national outputs provided by floating exchange rates may contribute to the efficient functioning of the economic system.

Fourth, part of the variability of exchange rates and associated variability of relative prices of national outputs may represent an "overshooting" response to purely monetary disturbances. This suggests that exchange rate changes induced by purely monetary disturbances could be a source of costly real disturbances. However, since "overshooting" can only be defined with respect to the equilibrium exchange rate, it is essential to have a well-defined measure of the equilibrium exchange rate in order to judge the empirical relevance of "overshooting." At present, there is no reliable evidence that exchange rate changes are dominated by overshooting, rather than by adjustments to new information about equilibrium exchange rates. Moreover, even if overshooting were empirically important, it would not automatically follow that policies should be directed

supply shifts, thereby eliminating the need for costly adjustments of exchange rates and national price levels. The difficulty with implementing this policy is in identifying when a shift in money demand has occurred and in adjusting the asset side of the balance sheets of national banking systems.

Fourth, another way in which government policy can make a positive contribution to reducing costly and unnecessary turbulence of foreign exchange rates is by reducing high and variable rates of monetary expansion which, for example, result from misguided attempts to stabilize nominal interest rates. This is especially important because, from the asset market theory, it follows that exchange rates are affected not only by current policy actions, but also by current expectations of future policy. If expectations of future policy are highly sensitive to current policy, then instability of policy can have a magnified effect on exchange rates and on the relative prices of different national outputs, thereby generating significant social costs. If, as we believe, the instability and unpredictability of policy, particularly monetary policy, has contributed significantly to the turbulence of exchange rates since 1973, then the turbulence and its associated cost, can be reduced by adopting more stable and predictable patterns of government policy. This is particularly important for the United States in view of its size and in view of the special role of the dollar in the international monetary system. The U.S. dollar has performed the role of "world money" in serving the functions of invoice currency, unit of account, intervention currency, store of value, international reserve asset, and the like. The principal contribution that U.S. economic policy can make in reducing exchange rate turbulence and achieving greater economic stability, is by reducing the level and variability of U.S. inflation and simultaneously reducing uncertainty about U.S. economic policy. This should increase the efficiency and enhance the role of the dollar as "world money."

5. If the time period is literally a day, then for any reasonable model the coefficient b should be numerically very large. Hence, the weight given to all expected future z's in determining the current exchange rate, b/(1+b), will also be relatively large.

6. The hypothesis that the predominant cause of exchange rate movements are "news" which could not have been anticipated has been put forward by Mussa (1976b, 1977b, 1979) and Dornbusch (1978). For an empirical test of the hypothesis see Frenkel (1980a).

7. Tests of efficiency of interest arbitrage are reported by Frenkel and Richard M. Levich (1977). Tests of efficiency of the foreign exchange market for various periods are reported by Frenkel (1977, 1978, 1980, 1980b), Frenkel and Kenneth W. Clements (1980), Paul Krugman (1977), Maurice Obstfeld (1978), Craig S. Hakkio (1979), and by Lars Hansen and Robert J. Hodrick (1980). For surveys see Levich (1979) and Steven W. Kolhagen (1978).

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