The U.S. Dollar in International Markets: Mid-1970 to Mid-1976

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ONE of the most controversial issues in the area of international trade and finance has been that of the relative desirability of fixed versus floating exchange rates. Disagreement on this issue is widespread and has been, in the recent past, the major stumbling block to a general agreement within the International Monetary Fund (IMF) regarding the future form of the international payments mechanism.

This article addresses four issues related to the recent experience with generally floating exchange rates between the U.S. dollar and the currencies of nine of the United States' major trading partners.[1] The intervention activities of the Federal Reserve System in recent years are analyzed in order to get some idea of the extent to which exchange rates have been managed. Next, the question of measuring how much exchange rates have actually fluctuated in recent years is addressed. Some criteria are developed for and employed in evaluating whether the observed changes should be regarded as excessive. Finally, the issue of the likely causes of the observed exchange rate changes is explored.

Fixed Versus Floating Exchange Rates: The Issues

The theoretical arguments which surround the issue of fixed versus floating exchange rates are all well-known and will be discussed only briefly here.[2] On one side of this issue there are the fixed rate advocates who contend that exchange rate changes under a system of floating rates will be largely the result of speculation rather than the result of changes in fundamental economic factors.[3] This speculation, in turn, is presumed to be destabilizing. In other words, instead of dampening fluctuations in exchange rates, speculation will make the rates unnecessarily erratic. Furthermore, it is feared that these speculatively generated exchange rate changes will be so large and unpredictable as to disrupt international trade and investment.

On the other side of this issue are the floating rate advocates, who say that while exchange rates will change under a floating rate system, they will do so primarily in response to changes in fundamental economic factors. These individuals maintain that while speculation will undoubtedly occur in foreign exchange markets under a system of floating rates, such speculation will, on balance, not be destabilizing. In other words, speculation will have the effect of dampening fluctuations in exchange rates as they respond to changes in these fundamental factors.[4]

If the empirical evidence of the past few years shows that a significant portion of the fluctuation in exchange rates has been independent of changes in fundamental factors, then such fluctuations should be viewed with concern. On the other hand, if exchange rates have fluctuated in a pattern consistent with changes in fundamental factors, there is much less cause for concern. In such a case, the candidates for government stabilization actions are not the exchange rates themselves, but rather the underlying factors

[1]It is crucial from the outset that the reader recognize that the recent experience with floating exchange rates differs significantly from an experiment with the pure "freely floating" exchange rates dealt with in most of the theoretical literature. For one thing, some of the currencies analyzed in this article were officially pegged to others during all or part of the period covered by the study. For another, the rates have been "managed" through official market interventions rather than left alone to float completely free in response to nongovernmental market influences.

[2]For a discussion of the arguments for and against floating exchange rates, see M. O. Clement, Richard L. Pfister, and Kenneth J. Rothwell, *Theoretical Issues in International Economics*, ed. Jesse W. Markham (Boston: Houghton Mifflin Company, 1967), pp. 249-83; and Gottfried Haberler, Henry C. Wallich, Peter B. Kenen, Milton Friedman, and Fritz Machlup, "Round Table on Exchange Rate Policy," *The American Economic Review* (May 1969), pp. 357-69.

[3]The fundamental factors affecting exchange rates in the long run are relative rates of inflation and monetary expansion. These factors are considered fundamental in the sense that their impact on exchange rates can be justified on the basis of economic theory alone.

[4]For a theoretical discussion of the question of the stability of foreign exchange markets, see Kurt F. Hausafus, "Trade Finance, Capital Movements and the Stability of the Foreign Exchange Market," *International Economic Review* (June 1975), pp. 404-14. For an empirical evaluation of the stability issue, see Jerome L. Stein and Edward Tower, "The Short-Run Stability of the Foreign Exchange Market," *The Review of Economics and Statistics* (May 1967), pp. 173-85; and Michael P. Dooley and Jeffrey R. Shafer, "Analysis of Short-Run Exchange Rate Behavior, March 1973 to September 1975," *International Finance Discussion Papers*, International Finance Division, Board of Governors of the Federal Reserve System, No. 76 (February 1976).

Table I

TREASURY AND FEDERAL RESERVE FOREIGN EXCHANGE OPERATIONS[1]
March 1971 — April 1976
(Millions of U.S. Dollars)

Time Period	Total Purchases	Total Sales	Net Purchases	Total Intervention
February 1976 — April 1976	$301.4	$ 270.4	$ 31.0	$ 571.8
August 1975 — January 1976	227.2	106.5	102.7	333.7
February 1975 — July 1975		1,045.0	–1,045.0	1,045.0
August 1974 — January 1975		742.3	– 742.3	742.3
February 1974 — July 1974	3.7	527.0	– 523.3	530.7
August 1973 — January 1974	584.2	247.5	336.7	831.7
March 1973 — July 1973		273.5	– 273.5	273.5
October 1972 — February 1973	215.0	339.0	– 144.4	554.0
April 1972 — September 1972	299.5	41.7	257.8	341.2
October 1971 — March 1972	55.0		55.0	55.0
March 1971 — September 1971		75.7	– 75.7	75.7

Time Period	Belgian Franc		French Franc		German Mark		Japanese Yen		Netherlands Guilder		Swiss Franc		U.K. Pound	
	P	S	P	S	P	S	P	S	P	S	P	S	P	S
Feb. 1976 — April 1976	$74.9	$	$	$	$173.7	$250.8	$	$	$19.6	$19.6	$ 33.2	$	$	$
Aug. 1975 — Jan. 1976	74.4				149.7	106.5					3.1			
Feb. 1975 — July 1975		29.8		45.6		740.6				96.3		132.8		
Aug. 1974 — Jan. 1975		16.2				619.2				43.3		63.6		
Feb. 1974 — July 1974		21.2		33.7	3.7	469.8				2.3				
Aug. 1973 — Jan. 1974	36.2		33.1		510.6	244.6	4.3			2.9				
March 1973 — July 1973		6.0		47.0		220.5								
Oct. 1972 — Feb. 1973	80.0					318.6				20.4	135.0			
April 1972 — Sept. 1972		10.2				21.4							299.5	
Oct. 1971 — March 1972	20.0												35.0	
March 1971 — Sept. 1971						75.7								

P — Purchases
S — Sales
[1]Canada and Italy are not listed separately in this table because no data relating specifically to these countries were available.

that contribute to the fluctuations. Indeed, if exchange rate changes reflect movements in macroeconomic conditions within countries, such changes in exchange rates have been beneficial in terms of dampening the international transmission of economic disturbances.[5]

Intervention Activities

During the period covered in this article, exchange rates were neither absolutely fixed at an officially specified level nor were they allowed to float completely free of official foreign exchange market intervention. Such an arrangement has come to be known as "managed floating". In fact, many advocates of a freely floating exchange rate system argue that the present exchange rate system has been so highly "managed" that its performance is not a fair measure of how a "freely floating" exchange rate system would work if fully adopted.

Because of the sparseness of information relating to the intervention activities of the United States and its major trading partners, it is difficult to assess the validity of the above argument. The only official source of information regarding foreign exchange market intervention activities is a quarterly report issued by the Federal Reserve Board of Governors.[6]

[5]This is a fundamental assertion of the advocates of flexible exchange rates. The supporting arguments can be found in Milton Friedman, "The Case for Flexible Exchange Rates," *Essays in Positive Economics* (Chicago: The University of Chicago Press, 1953), pp. 157-203; and Harry G. Johnson, "The Case for Flexible Exchange Rates, 1969," this *Review* (June 1969), pp. 12-24.

[6]This information can be found in a series of reports titled "Treasury and Federal Reserve Foreign Exchange Operations." These reports are usually published in the March, June, September, and December issues of the Federal Reserve *Bulletin*.

In addition to being highly aggregated with respect to U.S. activities, the figures given in these reports almost completely exclude the activities of other central banks. Since other central banks have, in total, intervened in foreign exchange markets with much greater frequency and in much larger dollar amounts than the United States, the numbers provided in these reports underestimate the total amount of intervention that has taken place. However, since it is reasonable to suppose that the United States and other countries take cooperative action and thus intervene on the same side of the markets, these numbers should at least give an indication of the general thrust of worldwide intervention activities during a given period. The data reported in Table I have been gleaned from the Federal Reserve reports.

Recognizing these caveats, there are still some interesting patterns which show up in Table I. First, the currencies in which the System has undertaken the greatest amount of intervention are those that have fluctuated the most (see Table II).[7] Secondly, the total amount of intervention undertaken by the Federal Reserve in the generalized float period (after March 1973) is actually greater than the amount undertaken prior to the generalized float. However, since this observation is based on data having significant shortcomings, firm conclusions should be drawn with care.

How Much Have Exchange Rates Actually Fluctuated?

In investigating the extent to which exchange rates have actually fluctuated in recent years, the concern is not with the net change in exchange rates over long intervals of time, but rather with how much they have fluctuated over short intervals. The reason for concentrating on short intervals (a day, a month, or a quarter) is that it is the short-term fluctuations that are most often attributed to destabilizing speculative forces and are of greatest concern to those engaged in international commerce.

The daily exchange rates between the U.S. dollar and the currencies of the United States' largest trading partners are used to measure the amount of exchange rate fluctuation that has actually been experienced during the past few years. Monthly averages of these daily exchange rate levels were computed for the time period covering June 1970 through June 1976, and quarterly averages of these monthly levels were computed from the second quarter of 1970 through the second quarter of 1976. The statistical distributions of the percentage changes in these daily, monthly, and quarterly series were then analyzed.[8] The results are presented in Table II.[9]

The first set of results covers the period beginning approximately with the floating of the Canadian dollar in June 1970 and ending in June 1976. The second set of results covers the period June 1970 through February 1973, just prior to the beginning of the current generalized float. The last set of results covers the period of the generalized float (March 1973 - June 1976).

Evaluation of Measured Variability

Unfortunately, there exists no consensus regarding what constitutes excessive exchange rate fluctuations. Hence, there is no standard against which the fluctuations of the past few years can be compared. The approach adopted here is to assume that the fixed bands agreed upon in the Smithsonian accord represent at least a loose consensus on acceptable short-run ranges for exchange rate fluctuations. The performance of exchange rates over the past few years is then compared with these bands.

At the Smithsonian meetings of December 1971, the members of the Group of Ten agreed to permit their currencies to fluctuate within a 2.25 percent range on each side of mutually acceptable central values. In other words, it was agreed that the value of each of the currencies of the United States' major trading partners would be allowed to fluctuate within

[7]The interpretation of this observation is a matter of dispute. Many floating rate advocates maintain the possibility that the intervention itself was a source of confusion in foreign exchange markets and, therefore, exacerbated exchange rate movements. On the other hand, many analysts contend that the rates would have fluctuated much more had the intervention not taken place.

[8]The distributions of the *absolute values* of percentage changes were also analyzed. However, there was no significant difference between these results and those of the *actual* exchange rate changes analyzed in this article.

[9]It is usually assumed that data on daily exchange rate changes are normally distributed. Furthermore, upon invoking the Central Limit Theorem, the same assumption is usually made about the distribution of the changes in the monthly and quarterly averages of daily exchange rates. However, the assumption of normality of daily exchange rate changes has been questioned recently by Janice M. Westerfield, "Empirical Properties Of Foreign Exchange Rates Under Fixed and Floating Rate Regimes," *Philadelphia Fed Research Papers* (December 1975).

An analysis of the third and fourth moments about the mean of the data employed in this study leads to no firm conclusions regarding the validity of the normality assumption. However, as expected, the assumption seems to have greater justification in the case of monthly and quarterly averages than in the case of daily levels. Thus, the normal model may not be the most accurate description of the distribution of exchange rate changes. If it is not, then the usefulness of the means and variances reported in Table II is diminished.

Table II

Distribution of Percentage Changes in Exchange Rates Between the U.S. Dollar and the Currencies of Its Major Trading Partners

Time Period and Time Interval	Statistic	Belgium	Canada	France	Germany	Italy	Japan	Nether-lands	Switzer-land	U.K.
Daily Changes from June 1, 1970 to June 30, 1976 (1494 Observations)	Mean	0.016%	0.007%	0.012%	0.025%	-0.018%	0.013%	0.020%	0.039%	-0.019%
	Std. Dev.	0.526	0.177	0.540	0.552	0.465	0.446	0.476	0.588	0.389
Monthly Changes from June 1970 to June 1976 (73 Observations)	Mean	0.335	0.136	0.239	0.507	-0.387	0.268	0.415	0.798	-0.408
	Std. Dev.	2.336	0.715	2.397	2.720	2.120	1.961	2.403	2.576	1.751
Quarterly Changes from II/70 to II/76 (25 Observations)	Mean	1.034	0.376	0.760	1.588	-1.164	0.773	1.259	2.299	-1.068
	Std. Dev.	4.316	1.369	4.481	5.090	4.090	3.409	4.174	4.418	3.742
Daily Changes from June 1, 1970 to February 28, 1973 (669 Observations)	Mean	0.035	0.012	0.030	0.038	0.016	0.046	0.037	0.049	0.006
	Std. Dev.	0.301	0.208	0.342	0.373	0.195	0.488	0.295	0.301	0.245
Monthly Changes from June 1970 to February 1973 (33 Observations)	Mean	0.538	0.230	0.458	0.584	0.279	0.799	0.566	0.728	0.038
	Std. Dev.	1.255	0.766	1.447	1.286	0.601	1.844	1.335	1.798	1.296
Quarterly Changes from II/70 to I/73 (12 Observations)	Mean	1.506	0.620	1.284	1.756	0.747	2.123	1.557	1.931	0.083
	Std. Dev.	2.475	1.256	2.577	2.309	1.096	3.109	2.415	2.889	2.592
Daily Changes from March 2, 1973 to June 30, 1976 (824 Observations)	Mean	0.001	0.003	-0.004	0.013	-0.048	-0.013	0.007	0.032	-0.040
	Std. Dev.	0.654	0.148	0.658	0.662	0.597	0.408	0.583	0.744	0.474
Monthly Changes from March 1973 to June 1976 (40 Observations)	Mean	0.168	0.058	0.058	0.444	-0.937	-0.170	0.290	0.856	-0.775
	Std. Dev.	2.952	0.670	2.969	3.506	2.705	1.968	3.027	3.096	1.994
Quarterly Changes from II/73 to II/76 (13 Observations)	Mean	0.598	0.151	0.276	1.433	-2.928	-0.473	0.984	2.639	-2.131
	Std. Dev.	5.587	1.479	5.792	6.846	5.033	3.298	5.415	5.580	4.393

a 4.5 percent band vis-a-vis the U.S. dollar.[10] Therefore the 4.5 percent band is used here as a standard for evaluating the degree of the exchange rate fluctuation during the past few years.[11]

A review of Table II indicates that in no instance did the mean of the percentage change in the exchange rate of the U.S. dollar vis-a-vis each of the other nine currencies exceed 4.5 percent over either daily, monthly, or quarterly intervals. In addition, in no instance did the standard deviation of the percentage exchange rate changes exceed 4.5 percent for either the daily or monthly data.

In the case of quarterly data for Belgium, France, Germany, Italy, Switzerland, and the Netherlands, however, the standard deviation did exceed 4.5

[10]While each currency was restricted to a 4.5 percent band vis-a-vis the U.S. dollar, each could fluctuate by up to 9 percent vis-a-vis a third currency. For example, suppose currency A was at the top of its 4.5 percent band and currency B was at the bottom of its 4.5 percent band vis-a-vis the dollar. If these two currencies were to switch positions within their respective bands, the value of each would change by 9 percent relative to one another while changing by only 4.5 percent relative to the U.S. dollar. For these same reasons, any two currencies of the European Snake can fluctuate by up to 4.5 percent vis-a-vis one another under current Snake rules. This point is discussed at greater length in "The European System of Narrower Exchange Rate Margins," *Monthly Report of the Deutsche Bundesbank* (January 1976), pp. 22-29.

[11]The Smithsonian agreement did not specify the appropriate time interval over which the 4.5 percent constraint was to apply. It merely stated that the constraint would be binding until a "fundamental disequilibrium" arose. Therefore, in comparing recent exchange rate movements over *specific* time intervals (days, months, and quarters) with the 4.5 percent Smithsonian band, the 4.5 percent figure must be taken merely as a *guideline* to what may have been considered acceptable variation over these intervals. One should also keep in mind that the considerations which led to the Smithsonian agreement were formed against a backdrop of inflation that was relatively mild in terms of both levels and inter-country differences compared to the experience which has followed this agreement. Hence, considerably greater fluctuations might have been considered acceptable in these latter years. Thus, given the economic environment of the past few years, the 4.5 percent constraint may represent an unduly restrictive standard of comparison.

percent during the period of the generalized float. In evaluating this last finding, one should keep in mind that the currencies of these countries (with the exception of Italy) were joined together in a currency block for much of the generalized float period. As such, if the major block currency (the German mark) were to fluctuate relative to the dollar by a given percent over a given interval for any reason, all of the other block currencies would automatically fluctuate in a similar pattern.[12]

Causes of the Observed Fluctuations in Exchange Rates

Much of the discussion about the relative desirability of fixed versus floating exchange rates relates to questions about the stability of the foreign exchange markets. This issue is tied to the question of whether or not speculation in these markets is destabilizing. With destabilizing speculation, exchange rate expectations based on fundamental factors are said to be weakly held and, hence, traders are unwilling to take large positions on the basis of these expectations. The resulting exchange rate path is then dominated by price runs and bandwagon effects and is, therefore, unnecessarily erratic.

A set of tests were performed to determine how prevalent such runs and bandwagon effects have been in foreign exchange markets since June 1970. These tests examine whether the number of runs observed in foreign exchange markets can be distinguished from the number that would be generated by a completely random process. Such so-called "runs tests" are useful in determining whether the behavior of exchange rates has been consistent with the hypothesis that speculation in these markets is destabilizing — a prevalence of sustained runs (that is, bandwagons) up or down.[13]

Runs tests for randomness were performed for each of the exchange rate series discussed in the preceding sections of this article. The results of these tests are presented in Table III. A positive value for the test statistic indicates that the number of runs

Table III

Runs Test for Randomness of Exchange Rate Fluctuations

	TIME PERIODS		
	I	II	III
Belgium			
Daily	-0.010	0.029	-0.035
Monthly	-0.058	-0.070	-0.042
Quarterly	-0.114	0.392	-0.212
Canada			
Daily	-0.085	-0.060	-0.103
Monthly	-0.282	-0.191	-0.362
Quarterly	-0.381	-0.163	-0.603
France			
Daily	-0.004	0.012	-0.018
Monthly	-0.210	-0.151	-0.258
Quarterly	-0.233	0.392	-0.603
Germany			
Daily	-0.027	-0.001	-0.044
Monthly	-0.197	-0.121	-0.242
Quarterly	-0.141	-0.131	-0.080
Italy			
Daily	-0.019	0.071	-0.060
Monthly	-0.128	0.164	-0.304
Quarterly	-0.218	0.174	0.095
Japan			
Daily	0.0	0.088	-0.031
Monthly	-0.339	-0.129	-0.336
Quarterly	-0.353	-0.696	-0.080
Netherlands			
Daily	-0.047	-0.052	-0.039
Monthly	-0.010	0.050	-0.042
Quarterly	-0.459	-0.654	-0.212
Switzerland			
Daily	-0.031	-0.049	-0.020
Monthly	-0.307	-0.222	-0.374
Quarterly	0.012	0.131	-0.028
U.K.			
Daily	-0.029	0.057	-0.098
Monthly	-0.395	-0.302	-0.430
Quarterly	-0.355	-0.554	0.097

Daily I = June 1, 1970 — June 30, 1976
II = June 1, 1970 — February 28, 1973
III = March 2, 1973 — June 30, 1976

Monthly I = June 1970 — June 1976
II = June 1970 — February 1973
III = March 1973 — June 1976

Quarterly I = II/1970 - II/1976
II = II/1970 - I/1973
III = II/1973 - II/1976

[12]While this observation says nothing about the cause of the comparatively large fluctuations experienced by the block currencies as a group, it does call attention to the possibility that the source of fluctuations of any one of these currencies may lie more in the fact that the currency was a member of the block, rather than in any other factor.

[13]In this test a run is defined as a sequence of changes of the same sign that is preceded and followed by a sequence of changes of the other sign. If speculation is stabilizing, the runs that do appear are due to *changes* in fundamental factors. Since one would expect that *changes* in these fundamental factors occur on a random basis, expectations are that they would cause neither more nor less runs than would any random process. For a discussion of the runs test utilized in this article, see Dick A. Leabo, *Basic Statistics*, 4th ed. (Homewood, Illinois: Richard D. Irwin, Inc., 1972), pp. 545-47.

in the sample exceeds the expected number for a random ordering. A negative value for the test statistic indicates fewer than the expected number of runs. The hypothesis of nonrandom ordering is rejected with 95 percent confidence only if the value of the test statistic lies within a range of $\pm$ 1.96. The data presented in Table III indicate that the hypothesis that exchange rate changes were generated by a nonrandom process should be rejected on the basis of this test and these data. As such, these results permit conditional rejection of the view that observed exchange rate fluctuations have been the result of destabilizing speculation.

What are the Relevant Fundamental Factors?

The data presented in the preceding section cast doubt on the view that exchange rate changes have been the result of destabilizing speculation. However, the alternative hypothesis, that exchange rates change primarily in response to changes in fundamental factors, has not been explicitly developed or considered.

Exchange rate theory indicates that the predominant factor determining exchange rate changes in the long run is the degree of inflationary pressure in one country relative to inflationary pressure in another country.[14] This theory can be well illustrated by a simple two-country example. Suppose there are only two countries in the world, country A and country B. A high degree of inflationary pressure in country A relative to that existing in country B implies an increase in country A's demand for all products, including those produced in country B. This increased demand for country B's products results in an increase in the demand for country B's currency in country A and causes the price of currency B to rise (in terms of the currency of country A). In other words, currency A will depreciate and currency B will appreciate.[15] In addition, if the rate of growth of a country's money stock plays a dominant role in the determination of inflationary pressures, a strong relationship will be expected to exist between exchange rate changes and relative rates of monetary growth.[16]

The longer the time horizon, the more pronounced these relationships will be. Inflationary pressures become established only in the long run and the full impact of differing inflationary pressures on exchange rates could be resisted by governments in the short and intermediate runs. Under a system of freely floating or loosely managed exchange rates, necessary adjustments to changes in such fundamental factors are permitted to occur gradually. However, when exchange rates are narrowly fixed or tightly managed (as within the European Snake, for example) exchange market pressures are not relieved in a slow and orderly fashion. However, once market participants sense the presence of pent-up market forces which favor realignment, taking into account changes in fundamental factors, exchange market pressures surge and result in "currency crises" and sudden large jolts in exchange rates. Thus, while the relationship between exchange rates and relative inflationary pressures (as measured by changes in price indices) may not be strong in the short run, the longer the time frame, the stronger this relationship becomes.

In order to perform a test of the relative inflationary pressure hypothesis of exchange rate determination, the following series were constructed. The simple percentage change in the value of the U.S. dollar vis-a-vis each of the other nine currencies reviewed was calculated over the same three time periods analyzed in the preceding tests. The same computations were then performed for the simple percentage changes in two proxies for inflationary pressure (the consumer price index, CPI, and the wholesale price index, WPI), and for the money stock in each of the respective countries relative to the simple percentage

[14]The future can be divided into three different time frames — the long run, the intermediate run, and the short run — during which different factors are the dominant influence on exchange rate movements. Just where one of these time frames begins and ends cannot be precisely specified. This analysis concentrates on the long run only, which is defined here as any period extending for more than a quarter.

[15]Inflationary pressures are empirically approximated by observed changes in some very broad and imperfect index of *all* prices. These indices attempt to capture increases in the prices of foreign as well as domestically supplied products. However, the majority of the items included in these indices are domestically supplied.

Any increase in inflationary pressures will be reflected in an increase in the demand for foreign as well as domestically supplied products. The increased demand for domestically supplied products will result in an increase in the price of those products. An increase in the demand for products produced in foreign countries will result in a rise in the price of the foreign exchange needed to purchase those products (depreciation of the domestic currency). It is reasonable to expect that the increase in the price of foreign exchange (which immediately increases the domestic price of foreign produced products) will occur faster than the increase in the prices of *all* of the other products covered by some overall price index. As such, it is entirely possible that inflationary pressures will be reflected in exchange rates before they are reflected in changes in overall price indices. For this reason, exchange rate changes may precede the relative movement in price indices in the short run, but this does not indicate that exchange rate changes have *caused* the movement in price indices.

[16]See Donald S. Kemp, "A Monetary View of the Balance of Payments," this *Review* (April 1975), pp. 20-21.

changes in their U.S. counterparts. In other words, for each time period the simple percentage change in the CPI, WPI, and money stock for the United States was substracted from the simple percentage change in the foreign counterparts of these measures.

A correlation test was then performed to determine the degree of relationship between the simple percentage change in exchange rate series and each of the other series described above.[17] If it is true that exchange rate movements reflect relative inflationary pressures and relative rates of money growth among countries, then the exchange rate series would be negatively correlated with each of the other three series. That is, those countries whose currencies appreciated the most relative to the U.S. dollar should be those countries whose inflation and money growth rates were smallest relative to the inflation and money growth rates in the United States.

The results, reported in Table IV, indicate that for all time periods there exists a statistically significant negative correlation between the WPI series and the exchange rate series. In addition, with the exception of the June 1970 through February 1973 period, the correlation between both the CPI and the money stock series and the exchange rate series is also negative and statistically significant. These results are noteworthy in two respects. First, the results which cover the entire time period since June 1970 indicate that there does in fact exist a statistically significant negative correlation between the exchange rate series and each of the other series. Second, there is a striking dissimilarity between the results for the pre-generalized float period and those for the generalized float period. This indicates that when the exchange rates had the greatest amount of freedom to respond to changes in fundamental factors, their observed movements paralleled relative inflation and money growth rates most closely. The results reported in Table IV thus lend support to the hypothesis that movements in exchange rates, particularly in the long run, are determined by relative inflationary pressures and relative rates of money growth.[18] In addition to these results, graphic illustrations of the relationships between exchange rate changes and the relative inflation and money growth series during the generalized float are presented in Chart I.

Table IV

CORRELATION TEST

Percent Changes in Exchange Rates Correlated with:	Time Period	Correlation Coefficient	Number of Observations[1]
Relative Percent Changes in CPI[2]	June 1970-March 1976	−0.789[3]	9
	June 1970-Feb. 1973	0.002	9
	March 1973-March 1976	−0.922[3]	9
Relative Percent Changes in WPI[2]	June 1970-March 1976	−0.945[3]	8[4]
	June 1970-Feb. 1973	−0.858[3]	9
	March 1973-March 1976	−0.946[3]	8
Relative Percent Changes in Money Supply[2]	June 1970-Jan. 1976	−0.667[5]	7[6]
	June 1970-Feb. 1973	0.199	8
	March 1973-Jan. 1976	−0.829[3]	8

[1]The countries covered in this test are Belgium, Canada, France, Germany, Italy, the Netherlands, Japan, Switzerland, and the United Kingdom.

[2]The derivation of these series is explained in detail in the text.

[3]Significantly different from zero at the 99 percent level.

[4]The Netherlands was excluded from this test, as well as from the test covering March 1973-March 1976, because monthly WPI data are not currently available beyond December 1975.

[5]Significantly different from zero at the 90 percent level.

[6]The United Kingdom was excluded from this test, as well as from the test covering June 1970-February 1973, because monthly money supply figures are not available for the United Kingdom until October 1971. Italy was also excluded from this test, as well as from the test covering March 1973-January 1976, because monthly money supply figures for Italy are not available beyond September 1975.

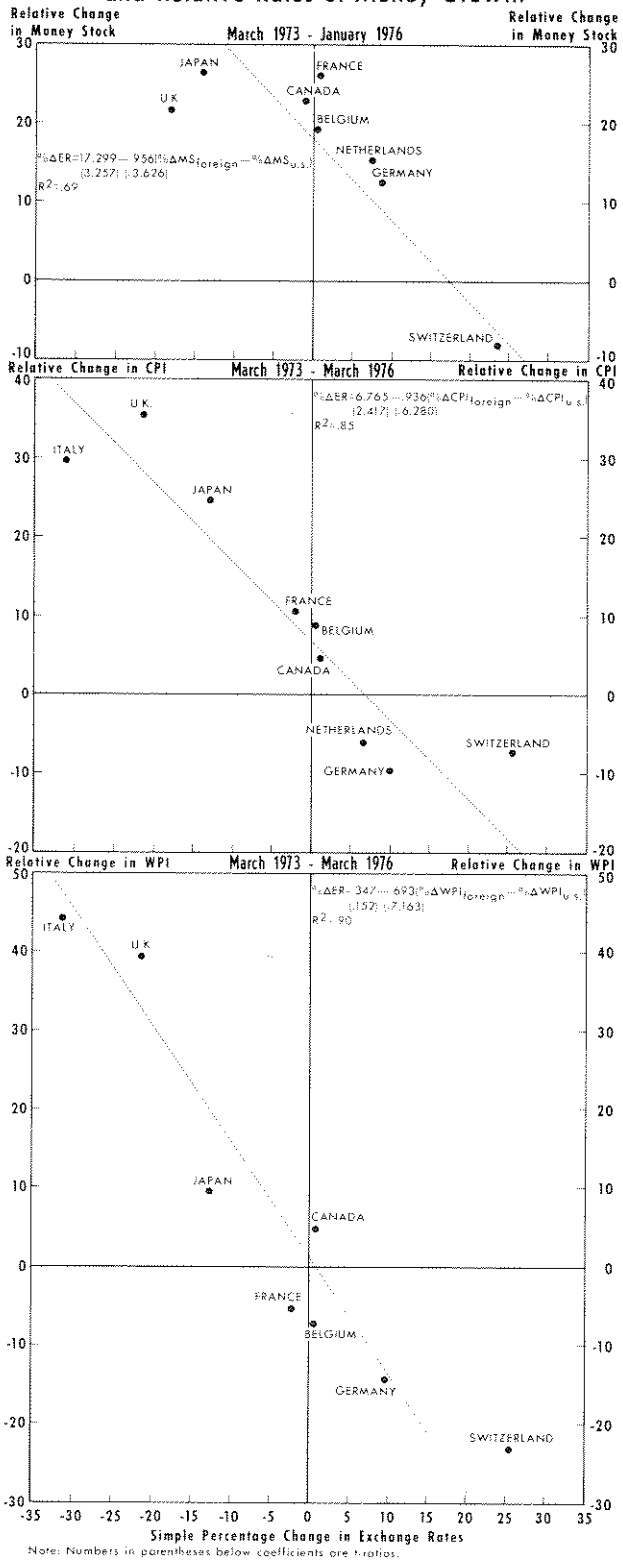
The observed negative correlation between relative rates of inflation and exchange rate changes says nothing about the direction of causality which underlies this relationship. Some analysts claim, for example, that changes in exchange rates "cause" changes in relative rates of inflation. However, evidence in favor of the alternative argument, that exchange rate changes were "caused" by the differences in inflation rates, is given by the last set of results in Table IV. One body of economic thought holds that relative rates of monetary expansion are the predominant factor in explaining relative rates of inflation in the long run. Applied to the argument advanced in this article, this view implies a strong negative correlation between exchange rate movements and relative rates of money growth, as shown in Table IV. On the other hand, the argument that changes in ex-

[17]The particular measure of correlation utilized here is the Pearsonian Correlation Coefficient.

[18]The same test which led to the results presented in Table IV was conducted using data for all OECD member countries for which data are currently available. This same test was also performed using data for all of the 46 IMF member countries which account for about 90 percent of total U.S. trade and for which data are currently available. The results of both tests were virtually identical in their implications, if not in their exact numerical value, with those presented in Table IV. Thus, the conclusions drawn from Table IV do not appear to be sensitive to the sample of countries chosen for analysis.

Chart I

Relationship Between Exchange Rate Changes, Relative Rates of Inflation, and Relative Rates of Money Growth



Note: Numbers in parentheses below coefficients are t-ratios.

change rates "cause" inflation offers no explanation of these results.[19]

Conclusion

The thrust of this article has been an empirical review of the recent experience with generally floating exchange rates between the U.S. dollar and the currencies of the United States' major trading partners. The evidence presented herein casts doubt on the view that exchange rate changes are the result of destabilizing speculation, even in the short run. It is also demonstrated that in the long run exchange rates have changed in a pattern consistent with changes in fundamental economic factors.

An implication of these findings is that the prospects for a return to a viable fixed exchange rate regime are remote as long as there remains as wide a spectrum of economic policies among countries as has been the case for the past few years. The unacceptability of such a regime has been amply demonstrated recently by the futile efforts to hold together the European Currency Snake and the virtual abandonment by the Common Market of any plans for a closer Economic and Monetary Union. It is no coincidence that all but one *large* country departed from the Snake and that the dream of an economically united Europe vanished simultaneously. The reason is that the Common Market countries have recognized that no country that believes it has an option will be willing to subjugate its own economic policies to the monetary discipline practiced in another country (in the current situation the other country is West Germany). These experiences amply demonstrate that the time has not yet arrived for the kind of economic policy coordination that a fixed exchange rate system requires. While such coordination may or may not be a laudable goal to strive for, the world should accept the facts as they currently are and admit that, as of now, such an arrangement is nowhere in sight.

[19]For some samples of other recent studies which arrive at the same conclusion regarding the relative inflation and money growth rate hypothesis of exchange rate determination, see David Kern, "Inflation Implications in Foreign Exchange Rate Forecasting," *Euromoney* (April 1976), pp. 62-69; and D. King, "The Performance of Exchange Rates in the Recent Period of Floating: Exchange Rates and Relative Rates of Inflation," unpublished memorandum (New York: Foreign Research Division, Federal Reserve Bank of New York, March 15, 1976). King's work also provides some evidence favoring the inflation to depreciation direction of causality. For an analysis of an earlier period of floating rates, see John S. Hodgson, "An Analysis of Floating Exchange Rates: The Dollar — Sterling Rate, 1919-1925," *The Southern Economic Journal* (October 1972), pp. 249-57.