V. K. BHALLA

EXCHANGE RATES VARIABILITY

Rates of exchange are the connecting links between national currencies, permitting international price and cost comparisons, which in turn are the proximate bases underlying international trade and investment. An exchange rate is the price, in domestic currency, per unit of a foreign currency. A rise in the rate of exchange means that more domestic currency is required to obtain a unit of foreign currency — hence the international value of the home currency is less, and we say it has depreciated. Conversely, a decline in exchange rates signifies an increase in the international value of the home, currency, or its appreciation.

During the period covered in this article, from mid-1970 to mid-1976, 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.

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 (a day, a month, or a quarter) for it is the short-term fluctuations that are most often attributed to destabilising speculative forces and are of greatest concern ro those engaged in international trade.

The daily exchange rates are used to measure the amount of exchange rate fluctuations 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. The results are presented in Table I.

The first set of results covers the period beginning 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 generalised float (March 1973-June 1976).

Evaluation of Measured Variability :

To measure the short-run ranges for exchange rate fluctuations, the fixed bands agreed upon in the Smithsonian accord is taken as a standard. 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 a 4.5 percent band vis-a-vis the U.S. dollar. 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 the 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 lands, the value of each would change by 9 percent relative to one another while changing only by 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[1].

The Smithsonian agreement, (i.e. the 4.5 percent band which is used here to evaluate the degree of the exchange rate fluctuations

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1. 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.

during the past few years) 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.

A review of Table I indicates that in no instance did the mean percentage change in 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.

Is the case of quarterly data for Belgium, France, Germany, Italy, Switzerland, and the Nerherlands, however, the standard deviation did exceed 4.5 percent during the period of the generalised float, in evaluating this last finding, we should keep in mind that the currencies of these countries (with the exception of Italy) were floating together under the European Economic Community's Snake agreement. As such, if the leading Snake currency (the German mark) were to fluctuate relatively to the dollar by a five percent over a given interval for any reason, all of the other Snake currencies would automatically fluctuate in a similar pattern. Table II shows the changes in the external value of the German mark in relation to the currencies of the countries participating in the joint float i.e. Snake, and the currencies of other member states of the EEC which are floating outside the Snake.

The important question which arises from these observed fluctuation in the exchange rates is that whether or not speculation in these markets is destabilising factor. With destabilising speculation. exchange rate expectations are said to be weakly held and, hence, traders are unwilling to take large position on the basis of these

expectations. The resulting exchange rate forth is then dominated by price runs and bandwagon effects and is, therefore unnecessarily erratic.

A set of test 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 behaviour is consistent with the hypothesis that speculation in these markets is destabilising—a prevalence of sustained runs (that is, bandwagons) up or down. In this test a run is defined as a sequence of changes of the other sign. If speculation is stabilising, the runs that do appear are due to changes in fundamental factors. Since one would expect that changes in these fundamental factor occur on a random basis, expectations are that they would cause neither more nor less runs than would any random process.[2]

Runs tests for randomness were performed for each of the exchange rate series. The results of these tests are presented in Table III. A positive value for the test statistic indicates that the number of runs in the sample exceed 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 non-random ordering is rejected with 95 percent confidence only, if the value of the test statistics lies within a range of $\pm$ 1 96 percent. The data presented in Table III indicates, 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 destabilising 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 pressures in one country relatively to another country's inflationary pressure. This theory can be well illustrated by a simple

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2.   Labo, Dick. A—"Basic Statistics", (1972), pp. 545 47.

two-country example.   Suppose there are only two countries in the world, country A and country B.   A high degree of inflationary pressures 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.   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 country growth.

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 managed exchange rates, necessary adjustments to changes in such fundamental factors are permitted to occur gradually.   However, when exchange rates are narrowly fixed (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 favour 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.

Two observations can be made on the basis of above analysis. Firstly, exchange rate variability even in the short run, is not, solely, the result of the destabiliting speculative movement of capital. Secondly, the long run exchange raters have changed in a pattern consistent with changes in fundamental economic factors.   An implication which can be derieved from these observations is that prospects for a return to a viable fixed exchange rate regime are remote for there remains as wide a specturm of economic policies among countries as has been the cases for the past few years.

TABLE I

DISTRIBUTION OF PERCENTAGE CHANGE IN EXCHANGE RATES BETWEEN THE U.S. DOLLAR AND THE CURRENCIES OF OTHER MAJOR COUNTRIES

Time period & Time interval	Statistic	Belgium	France	Germany	Italy	Netherlands	U.K.	Canada	Japan	Switzerland
Daily changes from June 1, 1970 o June 30, 1976 (1494 Observations)	Mean	0.016%	0.012%	0.025%	−0.018%	0.020%	0.019%	0.007%	0.013%	0.039%
	Standard Deviation	0.526	0.540	0.552	0.446	0.476	0.389	0.177	0.446	0.588
Monthly changes from June 1970 to June 1976 (73 Observations)	Mean	0.335	0.239	0.507	−0.387	0.415	−0.408	0.136	0.268	0.798
	Standard Deviation	2.336	2.399	2.720	2.120	2.403	1.751	0.715	1.961	2.576
Quarterly changes from 11/70 to 11/76 (25 Observations)	Mean	1.034	0.760	1.588	−1.164	1.259	−1.068	0.376	0.773	2.299
	Standard Direction	4.316	4.481	5.090	4.090	4.174	3.742	1.369	3.409	4.418
Daily changes from June 1, 1970 to February 28, 1973 (669 Observations)	Mean	0.035	0.030	0.038	0.016	0.037	0.006	0.012	0.046	0.049
	Standard Deviation	0.301	0.342	0.373	0.195	0.295	0.245	0.208	0.208	0.488
Monthly changes from June 1970 to Feb. 1973 (33 Observations)	Mean	0.538	0.458	0.584	0.279	0.566	0.038	0.230	0.799	0.728
	Standard Deviation	1.255	1.447	1.286	0.601	1.335	1.296	0.766	1.844	1.798
Quarterly changes from 11/70 to 1/73 (12 Observations)	Mean	1.506	1.284	1.756	0.747	1.357	0.083	0.620	2.123	1.931
	Standard Direction	2.475	2 577	2.309	1.096	2.415	2.592	1.256	3.109	2.889
Daily changes from March 2, 1973, to June 30, 1976 (824 Observations)	Mean	0.001	−0.004	0.013	−0.048	0.007	−0.004	0.003	−0.013	0.032
	Standard Deviation	0.654	0 658	0.662	0.597	0.583	0.474	0.148	0.408	0.744
Monthly changes from March 1973 to June 1976 (40 Observations)	Mean	0.168	0.058	0.444	−0.937	0.290	−0.775	0.058	−0.170	−0.856
	Standard Directions	2.952	2.969	3.506	2.705	3.027	1.994	0.670	1.968	3.096
Quarterly changes from 11/73 to 11/76 (13 Observations)	Mean	0.598	0.276	1.433	−2.928	0.984	−2.131	0.151	−0.473	2.639
	Standard Deviation	5.587	5.792	6.846	5 033	5.415	4.393	1.479	3.298	5.580

TABLE II

CHANGES IN EXTERNAL VALUE OF THE DEUTSCHE MARK

(in relation to the Central rates of end 1972)

Period		I					II		
		Currencies of the countries participating in the Joint Float					Currencies of other Members States of the E.E.C.		
		Belgian & France	Denish Krove	Netherlands Guilder	Nolwegian Krone	Swedish Krona	French Frence	Italian Lira	Pound Sterling
		A V E R A G E D U R I N G M O N T H							
1973	March	0.9	0.7	1.9	1.2	6.1	0.8	12.1	7.9
	April	1.7	1.1	4.2	1.1	6.5	1.1	14.9	7.3
	May	1.5	1.6	3.0	0.9	6.3	1.0	16.9	7.0
	June	4.4	4.3	5.1	3.2	9.2	3.9	27.8	13.8
	July	8.9	9.3	9.6	0.4	15.7	09.4	37.7	27.4
	August	9.6	8.6	.88	10.1	14.6	10.4	30.9	25.9
	September	9.5	8.8	6.4	10.8	16.0	10.7	29.0	28.9
	October	9.0	8.0	2.8	9.6	15.8	10.0	29.9	29.0
	November	7.5	6.7	3.2	5.4	12.6	7.6	26.8	22.6
1974	January	9.4	2.0	3.6	2.9	14.1	12.4	27.1	20.9
	February	8.6	9.4	3.4	3.1	15.4	15.0	33.5	22.4
	March	9.5	9.9	4.3	4.5	16.7	15.9	34.6	23.3

	April	10.0	10.7	5.1	5 5	15.6	21.2	39.4	25.3
	May	10.0	10.3	4.6	5.0	15.3	24.5	42.3	27.3
	June	8.0	9.2	4.1	4.2	14.6	17.5	39.5	23.9
	July	6.7	7.1	2.4	2.4	14 6	14.9	38.6	23.1
	August	6.3	6.5	1.3	1.5	13.1	14.9	38.6	23.1
	September	6.5	7.5	1.2	1.2	12.6	13.6	37.8	22.6
	October	6.9	7.2	1.7	2.9	13,4	14.9	42.4	24.9
	November	7.8	7.9	2.8	4.8	14.9	17.0	46.7	29.0
	December	7.9	8.5	2.8	4 8	14.3	16.2	48.7	32.1
1975	January	7.8	9.5	3.1	4.7	14.3	18.3	51.0	35.3
	February	7.4	9.6	2.7	4.2	14.3	15.8	51.8	35.6
	March	6.6	8.2	1.6	2.7	13.3	15 8	50.9	34.9
	April	6.4	7.2	1.3	1.8	12.0	14.1	50.9	34.9
	May	6.8	7.2	1.6	2.0	12.0	8.5	47.9	38.7
	June	7.4	7.2	2.2	1.5	12.0	7.8	48.1	41.6
	July	7.3	6.9	2.7	2.0	11.9	7.8	45.8	40.4
	August	6.9	6.8	1.9	2.9	12.2	7.0	43.7	38.8
	September	7.7	7.1	1.9	3.8	13.6	7.6	43.5	38.6
	October	8.5	7.6	2.2	3.7	13.9	7.5	45.6	42.4
	November	8.4	7.6	1.9	3.4	13.5	7.2	45 4	42.5
	December	8.3	8.2	1.7	2.7	12.5	7.1	44.3	42.5
1976	January	8.5	9.2	1,9	3 5	12.6	8.3	49.1	43.2
	February	9,9	10.7	3.3	4.6	14.4	10.0	65.9	45.7
	March	10.2	10.8	4.4	5.0	15.2	13.7	78.4	51.8
	April	10.4	9.9	5.2	5.0	16.2	16.0	91.8	61.4
	May	10.0	9.2	5.3	4.0	15.3	15.6	85.1	63.2
	June	10.6	9.6	6.5	4.4	15.6	15.8	82.4	66.2

TABLE III

RUN TEST FOR RANDOWNESS OF EXCHANGE RATE FLUCTUATIONS

Time Periods.

	I	II	III
UNITED KINGDOM			
Daily	—0.029	—0.057	—0.098
Monthly	—0.395	—0.302	—0.430
Quarterly	—0.355	—0.554	0.097
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	0.174	—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

Daily	:	I	— June 1, 1970	—	June 30, 1976
		II	June 1, 1970	—	Feb. 28, 1973
		III	— March 2, 1973	—	June 30, 1976
Monthly	:	I	June 1970		June 1976
		II	June 1970		Feb. 1973
		III	March 1973		June 1976
Quarterly	;	I	11/1970	—	11/1976
		II	11/1970		11/1973
		III	11/1973		11/1976