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EXCHANGE-RATE FLEXIBILITY AND THE EFFICIENCY OF THE FOREIGN-EXCHANGE MARKETS

by

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Exchange-Rate Flexibility and the Efficiency of the Foreign-Exchange Markets

by Norman S. Fieleke*

Perhaps the major issue in the international monetary reform negotiations is how much market flexibility to allow in exchange rates between national currencies. Although there will surely be more flexibility in the future than under the Bretton Woods system, there has been much concern that a high degree of flexibility might somehow overburden the institutions of the foreign-exchange market, particularly the forward market, and thereby disrupt international commerce. While seldom clearly stated, the reasoning underlying this concern usually proceeds along the following lines.[1] Substantial exchange-rate flexibility leads business management to expect greater exchange-rate variations, with the result that businesses seek to cover much more of their foreign-exchange exposure (i.e., seek to "insure" against the greater exchange-rate risk) by purchasing or selling foreign currency forward. However, foreign-exchange traders either cannot accommodate this greatly increased demand for their services, or can accommodate it only at substantially higher cost. Consequently, business firms significantly reduce the volume of their international transactions.

This argument poses in an extreme form the interesting question of whether the foreign-exchange markets can function as efficiently with a high degree of flexibility as with the relatively fixed rates of the Bretton Woods system. There may not have been enough sustained experiences with highly flexible exchange rates to provide a definitive answer.[2] However, if we can ascertain the immediate determinants of the cost of executing foreign-exchange transactions, perhaps we can then infer the influence of increased flexibility on those determinants and thus on the transaction costs in which we are interested. Such inference, if supported by the scant direct evidence on transaction costs under sustained flexibility, should provide us with at least a tentative conclusion. This is the approach taken by this paper, which draws upon data generated by the 1971 experience with flexibility.

I. The Cost of Using the Foreign-Exchange Markets

In the absence of monopoly or market externalities, the social cost of the services of any class of middlemen, including foreign-exchange traders, is represented by the difference between their receipts for the things they market and their payments for the same things, a difference commonly known as the markup. Unfortunately, there are no published data on the markup which is actually paid to foreign-exchange traders by those who use their services. However, a fairly good approximation of at least the trend in the unit markup (or unit cost) can probably be derived from data on the markup (or "asked" minus "bid," or "spread") which is quoted on interbank foreign-exchange transactions in New York.[3]

Data on this markup, expressed as a percentage, are plotted in Figures 1 and 2 for nine different currencies for the year 1971. For most of these currencies, the markup rose perceptibly in May, when a new, higher dollar value was fixed for the Swiss franc, and when the Dutch guilder and the German mark were allowed to rise in value in free market trading. (The Canadian dollar had been floating since June 1, 1970.) Except for the yen and the Belgian franc, these hightened markups then subsided by July to approximately the levels of January-April. Then came President Nixon's pronouncements of August 15, and by the end of August all the currencies represented in the charts, except the French franc, were being allowed to float, with varying degrees of freedom, to higher values in terms of the dollar. In this month the markups on all the currencies except the Canadian dollar rose to levels that were very high by contrast with the more normal levels of January-April. Restrictions imposed by the Japanese Government at this time virtually terminated forward trading of the yen, but the abnormally high markups on other currencies fell considerably by November. Most markups, particularly the markup on the French franc, rose again in December when international meetings were held to establish new fixed rates of exchange.

These data suggest that the cost of using the foreign-exchange markets varied considerably during 1971. It is important to determine the reasons for such variation.

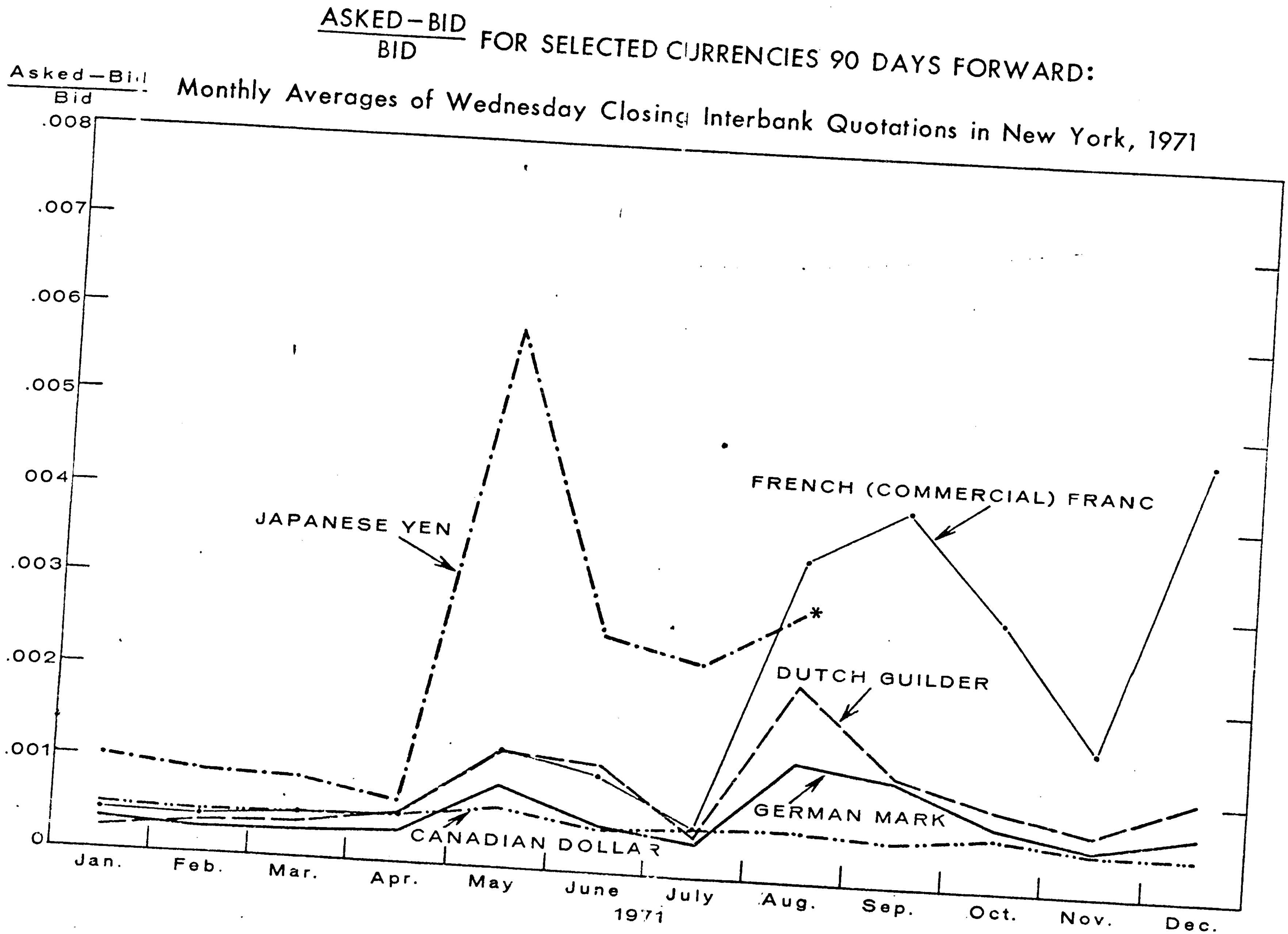

Figure 1.

*No forward yen quotations available after August 15.

Source: Computed from data provided by the First National Bank of Boston. For a few currencies quotations were not available for some Wednesdays ... were then used ...

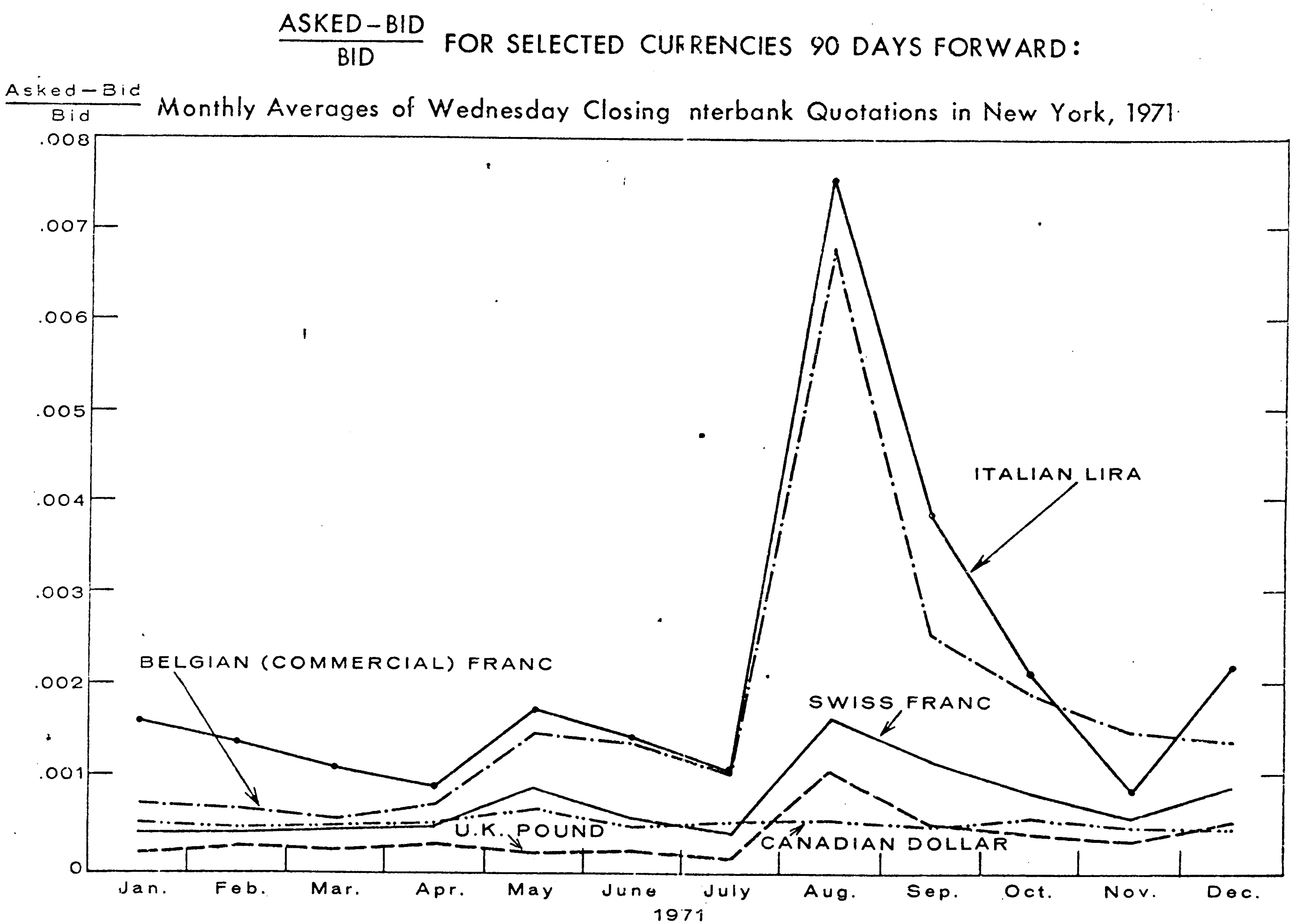

Figure 2.

Source: Computed from data provided by the First National Bank of Boston. For a few currencies, quotations were not available for some Wednesdays, and Tuesday or Thursday quotations were then used if available.

II. Hypotheses Regarding Variation in Markups

The markup collected by foreign-exchange traders is a function of the demand for and supply of their services. Among the factors which determine the supply price of these services, four would seem to be particularly important. First, the cost of exchanging one currency for another probably decreases in the long run if the normal daily volume of trading increases, because in a large market with well-developed communications it is easier for foreign-exchange traders to match up specific bids with specific offers, or to buy and sell without influencing the price. In addition, the cost will be lower, the stronger the competition among the banks which serve the market. By contrast, foreign-exchange restrictions generally raise the cost of executing foreign-exchange transactions, as they tax or prohibit these transactions, snarl them in red tape, or arouse doubts about whether the parties to foreign-exchange contracts will be allowed to meet their obligations. Finally, because of the way business is done in the market, the cost of handling transactions is also enlarged by increases in uncertainty about the future level of exchange rates, or, more precisely, about the future rate of change in exchange rates.

The manner in which exchange-rate uncertainty works its effects may not be immediately obvious, but can easily be illustrated. Assume that a foreign-exchange trader in one of the large banks is telephoned by an important customer who wants to know the rates at which he could buy or sell pounds sterling in exchange for U.S. dollars; also assume that the trader neither owns nor owes any sterling, that the customer does not reveal whether he wishes to buy or sell, and that the dollar price of sterling has been falling rapidly. The trader knows the interbank bid and asked rates around which he might have sold or bought sterling for his customer just a minute ago, but he also knows that these rates are probably changing even as he talks with the customer. Because sterling has been falling rapidly in value, the trader will probably quote the customer a bid that is distinctly lower than the bid he last observed in the interbank market, in order to reduce the risk of buying sterling from his customer at a price higher than that at which he will be able to resell it. Yet the trader cannot be certain that sterling will continue to decline in value, and he may well quote the customer an asking price that is little different from the last "asked" in the interbank market. Thus the spread between the bid and the asked tends to widen when rates are changing rapidly.[4]

Of course, there is no published measure of the extent to which foreign-exchange traders in fact realize such uncertainty-induced increases in quoted spreads. At least a portion of the quoted increase is probably realized, and this portion can be interpreted as a reward for the greater risk and effort associated with foreign-exchange trading at such times.[5]

The theory advanced here, then, is that the supply price (in the form of a percentage markup) of foreign-exchange trading tends to be lower, the greater is the normal volume of trading and the greater is the competition among the banks, but that the markup tends to be higher, the greater is the intensity of foreign-exchange restrictions and the more uncertain is the rate of change in exchange rates. In the regression analysis which follows, we shall be interested in explaining variations in percentage markups over a period of only a few months, and we shall assume that there was no variation in the degree of bank competition during this short period. Consequently, this variable is dropped from further explicit consideration. Also, it happens that we cannot include the volume of foreign-exchange transactions as a distinct explanatory variable, because there are no data on this variable and no reasonable proxies come to mind; this omission, while unfortunate, may not be serious, since percentage markups may be fairly impervious to fluctuations in volume *per se* in the short run.

Probably much more important than volume *per se*, at least in the period under examination, are the remaining two determinants of supply price: foreign-exchange restrictions and uncertainty over the rate of change in exchange rates.[6] It is reasonable to assume that both are uninfluenced by the *level* of the percentage markup, or, more generally, that both are determined exogenously, outside of a model which purports to explain the percentage markup earned by foreign-exchange traders. Therefore, the supply function is a reduced form which it is appropriate to estimate directly.[7]

Finally, it is assumed that realized markups show the same general variations, although probably not so extreme, as the quoted markups. Indeed, if this assumption did not hold true in 1971, it would follow that the cost of using the foreign-exchange markets was not increased in that year either by the extensive exchange-rate revisions (and the accompanying uncertainty) or by the intersifications of exchange-controls, or, more generally, that the cost of using the foreign-exchange markets does not increase with even the less desirable forms of exchange-rate flexibility.[8]

III. Test of the Hypotheses

The testing of our hypotheses is difficult because there are no direct measures of the explanatory variables---a predicament, however, which is hardly novel. Fortunately, data are available for some reasonably good proxy variables. For example, unusually large covered interest differentials are associated by some analysts with speculative runs and by others with government restraints over covered interest arbitrage,[9] and as a rule such large differentials probably are closely correlated both with stringent exchange restrictions and with the uncertainty that accompanies large-scale speculation.

While covered interest differentials thus warrant our attention, computation of the appropriate differentials sometimes demands data that are not available; moreover, variations in these differentials probably seldom represent fully the variations in exchange-rate uncertainty stemming from all major sources. Therefore, two other proxy variables for uncertainty will also be considered. The first such variable, suggested by the illustration in the preceding section, is change in the exchange rate. Second, uncertainty may also be enhanced by actions, meetings, or pronouncements of government officials concerned with exchange rates.[10]

With these considerations in mind, and assuming linearity, we can specify the model as follows:

(1) $$M^o \equiv a + b_1 ED + b_2 |\Delta r^o / r^o| + b_3 G,$$

where $M^o \equiv (A^o - B^o)/B^o$;

$A \equiv$ the asking price in dollars for a unit of foreign currency, $B \equiv$ the bid price, and the superscript ^{o} indicates spot;

$ED \equiv$ the "excess-over-normal" covered interest differential for a 90 day term, in terms of absolute value and at an annual rate;[11]

$r \equiv (A+B)/2$; and

$G \equiv$ an official action, meeting, or pronouncement which appears likely to have a significant effect on market uncertainty.

Our concern is to explain the day-to-day variation observed in M^o for eight different currencies while currencies were "floating" during 1971. In equation (1) the constant term then is the minimum percentage markup consistent with the normal daily trading volume and the degree of competition among foreign-exchange traders in 1971.[12]

The variable G actually consists of a set of dummy variables. During the prolonged "crisis" of 1971, meetings of high government officials often engendered press speculation as to whether the meeting would be followed by new government measures in the foreign-exchange market. Consequently, newspapers and other current records available to us were scanned to identify all meetings between finance ministers or heads of government of the countries in whose currencies we are interested. In the equation pertaining to each currency, all meetings involving the finance minister or head of government associated with that currency were represented by dummy variables. One variable was used to represent all meetings of the "Group of Ten" countries; another was used to represent all meetings of the European Economic Community; finally, every other eligible meeting was represented by its own distinct variable. Each of these variables was assigned the value of one both for the last working day(s) before the meeting(s) it represented and for each day of the meeting(s) and was assigned the value of zero elsewhere.

In addition, each pronouncement which was made by a finance minister or a head of government and which appeared likely to have a strong effect on market uncertainty was represented in the equation (or equations) concerned by its own dummy variable having the value of one for the first working day that could have been affected by the pronouncement (and having the value of zero elsewhere). Finally, each policy measure which it seemed would stimulate apprehension (or reduce it) was also represented by a dummy variable, given the value of one only for the first working day that could have been influenced by the measure. Our selection procedure resulted in the incorporation of about seven dummy variables in the typical equation; all policy measures selected were control measures.

It seems that the full uncertainty-effects of official pronouncements and new control measures, and also of the variable $|\Delta r^o/r^o|$, might be realized only with a lag. Foreign-exchange traders may frame their apprehensions about future rate changes on the basis not only of current changes but of changes in the recent past; and some time may be required for the dissipation of concern generated by official statements and policy initiatives. Consequently, in the estimation of equation (1), one-period lags of these variables were introduced, and when the results suggested longer lags, the Almon polynomial distributed lag (PDL) technique was employed.[13]

With these dummy variables and one-period lags, then, equation (1) was originally estimated by the ordinary least squares technique[14] for each of eight different currencies,[15] as the availability of data for flotation periods would permit; and, unless the results warranted a PDL, the Cochrane-Orcutt approach was used in cases where the Durbin-

Watson statistic suggested autocorrelation of the residuals.[16] An obvious variation of equation (1) is to substitute M^{90} for M^{o} and $|\Delta r^{90}/r^{90}|$ for $|\Delta r^{o}/r^{o}|$ (where the superscript ^{90} indicates 90 days forward). This variant was estimated by the same procedure as equation (1) for each of the same currencies except the yen, for which the necessary data on forward rates are not available. In the estimation of both M^{o} and M^{90}, the variable $|(r^{90}-r^{o})/r^{o}|$ was used as a crude substitute for ED in the case of currencies for which data on ED are not available, on the grounds that large covered differentials are often accompanied by large forward premiums or discounts.[17]

The statistical results are shown in Tables 1 and 2, which list the estimated equations in the order of their general acceptability to us in explaining spot percentage markups. Dummy variables for which the estimated coefficients were not significant at the 0.05 level have been dropped from the equations; a two-tailed test was used for the coefficients of dummy variables representing new controls (since it is often hard to form a reasonable hypothesis as to whether a particular control will initially enhance or reduce exchange-rate uncertainty), and a one-tailed test was applied to the other dummy coefficients. Equations with dummy variables were also estimated without the dummies (and are shown without them), since there is perhaps more doubt that dummies capture the intended effects than that other variables do.

Table 1

Regression Equations for Percentage Markups on Spot Transactions in Eight Different Currencies at Daily Close of Business in New York Interbank Market, for Selected Periods in 1971

Currency and time period	$\bar{R}^2$ and Durbin-Watson	Coefficients of Explanatory Variables (Defined in Note Below) and t-ratios											
		ED_t	$\frac{\lvert r_t^{90}-r_t^0\rvert}{r_t^0}$	$\frac{\lvert r_t^0-r_{t-1}^0\rvert}{r_{t-1}^0}$	$\frac{\lvert r_{t-1}^0-r_{t-2}^0\rvert}{r_{t-2}^0}$	G_t^1	G_{t-1}^1	G_t^2	G_t^3	G_t^4	G_t^5	G_t^6	Intercept
U.K. pound 8/23-12/17 (76 obs.)	$\bar{R}^2$=0.78 d =2.30	0.0255 (7.48)		0.0396 (5.85)	0.0472 (6.10)	-0.0002 (-2.73)	-0.0003 (-3.99)						0.0001 (6.06)
U.K. pound 8/23-12/17 (76 obs.)	$\bar{R}^2$=0.72 d =1.88	0.0201 (5.57)		0.0375 (5.23)	0.0415 (4.91)								0.0001 (5.97)
Japanese yen 8/27-12/17 (66 obs.)	$\bar{R}^2$=0.75 d =2.01[a]	b	b	0.1734 (1.72)				0.0016 (2.09)	0.0205 (10.23)				0.0025 (10.25)
Japanese yen 8/27-12/17 (66 obs.)	$\bar{R}^2$=0.34 d =1.93	b	b	0.6461 (5.88)									0.0029 (7.42)
Italian lira 8/23-12/17 (67 obs.)	$\bar{R}^2$=0.43 d =2.14	b	0.0954 (4.37)	0.4220 (4.95)						-0.0018 (-2.73)			0.0001 (0.78)
Italian lira 8/23-12/17 (67 obs.)	$\bar{R}^2$=0.38 d =2.06	b	0.1008 (4.42)	0.3142 (3.97)									0.0001 (1.05)
Belgian franc 8/23-12/17 (72 obs.)	$\bar{R}^2$=0.34 d =1.92	0.0811 (1.83)		0.3156[c] (5.49)									0.0003 (2.06)
French franc 8/23-12/17 (74 obs.)	$\bar{R}^2$=0.26 d =2.06	0.0082 (4.30)		0.08[illegible]1 (1.89)									0.0000 (0.03)
German mark 5/10-12/17 (139 obs.)	$\bar{R}^2$=0.24 d =1.69	-0.0015 (-0.48)		0.0466 (6.65)									0.0002 (7.00)
Dutch guilder 5/10-12/17 (138 obs.)	$\bar{R}^2$=0.32 d =2.16	0.0175 (0.86)		0.1646[c] (7.65)									0.0001 (3.32)
Swiss franc 8/16-12/17 (81 obs.)	$\bar{R}^2$=0.51 d =1.79	b	0.0117 (1.10)	0.1328[c] (4.74)							0.005 (2.37)	0.0021[c] (4.40)	-0.0000 (-0.01)
Swiss franc 8/16-12/17 (81 obs.)	$\bar{R}^2$=0.39 d =1.30	b	0.0229 (2.04)	0.1868[c] (6.75)									-0.0002 (-1.32)

Table 1
(Continued)

[a]Cochrane-Orcutt technique used to reduce autocorrelation of residuals.

[b]No satisfactory measure of this variable was available.

[c]Sum of lag coefficients estimated by PDL of degree 2. Individual coefficients and t-ratios are as follows:

	$\frac{\lvert r^o_t - r^o_{t-1}\rvert}{r^o_{t-1}}$	$\frac{\lvert r^o_{t-1} - r^o_{t-2}\rvert}{r^o_{t-2}}$	$\frac{\lvert r^o_{t-2} - r^o_{t-3}\rvert}{r^o_{t-3}}$	$\frac{\lvert r^o_{t-3} - r^o_{t-4}\rvert}{r^o_{t-4}}$	$\frac{\lvert r^o_{t-4} - r^o_{t-5}\rvert}{x^o_{t-5}}$	G^6_t	G^6_{t-1}	G^6_{t-2}	G^6_{t-3}
Belgian franc	0.0838 (1.73)	0.1750 (3.83)	0.0568 (1.25)						
Dutch guilder	0.0411 (3.00)	0.0549 (5.40)	0.0480 (4.83)	0.0205 (1.58)					
Swiss franc	0.0238 (1.55)	0.0306 (4.05)	0.0320 (3.25)	0.0280 (3.61)	0.0186 (1.16)	0.0006 (2.97)	0.0006 (3.67)	0.0005 (3.04)	0.0003 (1.41)
Swiss franc	0.0431 (2.81)	0.0291 (3.51)	0.0262 (2.48)	0.0345 (4.19)	0.0539 (3.61)				

Note: For definitions of the regression variables and sources of data, see note at end of Table 2.

Table 2

Regression Equations for Percentage Markups on 90-Day Forward Transactions in Seven Different Currencies at Daily Close of Business in New York Interbank Market, for Selected Periods in 1971

Currency and time period	$\bar{R}^2$ and Durbin-Watson	Coefficients of Explanatory Variables (Defined in Note Below) and t-ratios: ED_t	$\frac{\lvert r_t^{90}-r_t^0 \rvert}{r_t^0}$	$\frac{\lvert r_t^{90}-r_{t-1}^{90} \rvert}{r_{t-1}^{90}}$	G_t^5	G_t^6	Intercept
U.K. pound 8/23-12/17 (76 obs.)	$\bar{R}^2$=0.36 d =1.90[a]	0.0454 (5.99)		0.0479 (3.48)			0.0002 (10.83)
Italian lira 8/23-12/17 (55 obs.)	$\bar{R}^2$=0.63 d =1.66	b	0.3344 (7.48)	0.4684 (3.40)			0.0010 (4.20)
Belgian franc 8/23-12/17 (39 obs.)	$\bar{R}^2$=0.35 d =1.71	-0.1039 (0.65)		0.2047[c] (4.13)			0.0017 (8.55)
French franc 8/23-12/17 (64 obs.)	$\bar{R}^2$=0.40 d =1.76[a]	0.0799 (5.87)		0.1904 (1.72)			-0.0004 (-0.82)
German mark 5/10-12/17 (139 obs.)	$\bar{R}^2$=0.05 d =1.92	0.0038 (0.38)		0.0719 (3.05)			0.0006 (6.11)
Dutch guilder 5/10-12/17 (135 obs.)	$\bar{R}^2$=0.35 d =1.63	0.0501 (1.81)		0.2229[c] (7.74)			0.0005 (9.23)
Swiss franc 8/16-12/17 (81 obs.)	$\bar{R}^2$=0.81 d =1.73	b	0.0447 (2.17)	0.2183[c] (3.90)	0.0019 (4.59)	0.0120[c] (12.33)	-0.0001 (-0.32)
Swiss franc 8/16-12/17 (81 obs.)	$\bar{R}^2$=0.27 d =0.70	b	0.1095 (2.97)	0.4116[c] (3.95)			-0.0011 (-2.17)

Table 2
(continued)

[a] Cochrane-Orcutt technique used to reduce autocorrelation of residuals.

[b] No satisfactory measure of this variable was available.

[c] Sum of lag coefficients estimated by PDL of degree 2. Individual coefficients and t-ratios are as follows:

	$\frac{\lvert r^{90}_{t}-r^{90}_{t-1}\rvert}{r^{90}_{t-1}}$	$\frac{\lvert r^{90}_{t-1}-r^{90}_{t-2}\rvert}{r^{90}_{t-2}}$	$\frac{\lvert r^{90}_{t-2}-r^{90}_{t-3}\rvert}{r^{90}_{t-3}}$	$\frac{\lvert r^{90}_{t-3}-r^{90}_{t-4}\rvert}{r^{90}_{t-4}}$	$\frac{\lvert r^{90}_{t-4}-r^{90}_{t-5}\rvert}{r^{90}_{t-5}}$	G^6_t	G^6_{t-1}	G^6_{t-2}	G^6_{t-3}	G^6_{t-4}
Belgian franc	-0.0176 (-0.48)	0.0430 (2.47)	0.0723 (2.80)	0.0702 (3.99)	0.6369 (1.03)					
Dutch guilder	0.0565 (3.05)	0.0595 (4.40)	0.0572 (4.26)	0.0496 (2.81)						
Swiss franc	0.0022 (0.08)	0.0642 (4.24)	0.0849 (4.63)	0.0644 (4.06)	0.0025 (0.09)	0.0048 (11.97)	0.0031 (11.84)	0.0019 (6.55)	0.0012 (4.62)	0.0010 (2.69)
Swiss franc	0.0361 (0.72)	0.0375 (1.30)	0.0607 (1.74)	0.1055 (3.64)	0.1719 (3.34)					

Note: The definitions and sources of data for the regression variables in Tables 1 and 2 are as follows:

Percentage markup: (A-B)/B, where A is the asking price in dollars for a unit of foreign currency at the closing in the New York interbank market, and B is the bid price. Data were supplied by the First National Bank of Boston.

ED: The "excess-over-normal" covered interest differential for a term of 90 days, in terms of absolute value and at an annual rate, where the "normal" covered differential is the average of the absolute values of the differential for Wednesdays, January-April, 1971. The interest rates used in the computations are the three month Eurodollar deposit rate in London and, depending upon the currency being considered, the three month domestic interbank rate in London, Brussels, Amsterdam, Paris, or

Table 2
(continued)

Frankfurt. Exchange rates used are New York interbank market rates. As a rule, interest rates are as of about mid-day in the foreign countries concerned, while exchange rates commonly are for an hour or two later. These data as well as the computations of covered differentials were supplied by the Federal Reserve Bank of New York.

r^o and r^{90}: Data on these variables, which are fully defined on p. 8, were supplied by the First National Bank of Boston.

G^1: This variable was assigned the value of zero for all days except August 31, for which it was set equal to one. On August 31 the U.K. Government prohibited interest payments on any increase in the sterling bank deposits of non-sterling area residents, and banned additional non-resident deposits with financial institutions and local authorities. Non-residents were prohibited from purchasing additional sterling CDs, as well as government, government-guaranteed, and local authority securities maturing before October 1, 1976. Also, permission was withdrawn for banks to switch non-resident currency deposits into sterling for lending to residents. Data for this and all other "G" variables are from newspapers and other records available to us.

G^2: This variable was given the value of one for days of and the last day before each meeting of representatives of the "Group of Ten" countries, and was set equal to zero elsewhere; it takes the value one on September 14-16, November 29-December 1, and December 16-17.

G^3: This variable was set equal to zero for all days but December 14, for which it takes the value of one. On December 14 Presidents Nixon and Pompidou issued a joint pronouncement that they would "work toward a prompt realignment of exchange rates through a devaluation of the dollar and revaluations of some other currencies."

Table 2
(continued)

G^4: This variable was assigned the value of zero for all days except December 15, for which it was set equal to one. On December 15 Italian commercial banks extended non-payment of interest to all foreign-held lira deposits.

G^5: This variable was given the value of zero for all days but August 23, for which it was set equal to one. On August 23 it was reported that the IMF was suggesting specific exchange-rate adjustments.

G^6: This variable was assigned the value of zero for all days but August 27, for which it was given the value of one. On August 27 the Swiss National Bank and the Swiss Bankers' Association agreed to extend the interest payment ban on foreign funds that had flowed into Switzerland since July 31 to all franc placements; the ban had initially applied only to funds with a maturity of less than six months.

The results shown in Tables 1 and 2 do not refute our hypotheses, except that official meetings, pronouncements, or new control measures appear to have directly affected the markups somewhat less often than we had supposed.[18] It appears, as we had suspected, that the announcement of controls sometimes operates to reduce markups, no doubt by decreasing apprehension that current exchange rates might undergo abrupt change.[19] In other cases, the announcement apparently generates uncertainty about the impact of the control.

It is likely that the coefficients of determination would have been higher had more reliable data been available for the covered interest differentials. For example, the differentials were computed as of the forenoon in New York, while the only available percentage markup quotations which we could associate fairly accurately with any point in time were the quotations at the market closing.[20] Moreover, the choice of interest rates to use in computing covered differentials, and the reliability of the quotations for those rates, also pose difficult problems; indeed, data were not available to permit a daily measure of the covered differential for the yen, the lira, or the Swiss franc.

The unavailability of a good measure of the covered differential probably also accounts for the rather peculiar results (including the long lags) obtained in the equations for the markup on the Swiss franc. Those equations suggest that exchange restrictions were very important, but the dummy variables probably do not capture the continuing influence of the restrictions, while a reliable measure of the covered differential might well succeed in doing so.

IV. Conclusions

Instances of significant and sustained exchange-rate flexibility have been quite rare, so that there is very little direct evidence on whether foreign-exchange markets perform more efficiently or less efficiently with considerable exchange-rate flexibility. This paper attempts to shed additional light on this important question by identifying the immediate determinants of the cost of executing foreign-exchange transactions. The regression results obtained are highly provisional, but they do suggest that the cost of using the foreign-exchange markets commonly rises with increases in two proxy variables: the covered interest differential and the rate of change in the exchange rate. Not only are these results interesting in their own right, but they imply that a tentative conclusion about the relative costs of using the markets under different exchange-rate regimes could be based on inferences as to whether these two proxy variables would typically assume significantly higher values under one regime than under another. In this connection, a few general considerations are worth reciting.

Large-scale speculation on a change in a governmentally managed rate probably is a typical contributor to large covered interest differentials.[21] Such differentials are usually also associated with government restrictions designed to influence an exchange rate; and, as the events of 1971 illustrated, it is abrupt changes in these restrictions or in other government rate-fixing policies that often precede dramatic changes in rates.[22] The common element in these cases---and, indeed, the essence of "fixed" exchange rates---is strong government intervention, or changes in that intervention. In other words, strong government intervention probably often raises (sometimes with a long lag, as intervention may suppress a disequilibrium up to a point) the values of the factors which determine the cost of foreign-exchange trading. This inference is consistent with the direct evidence concerning the Canadian dollar, the one currency which at this writing has been allowed to float relatively freely for an extended period of time.[23] As shown in Figures 1 and 2, the percentage markup on this currency remained remarkably stable throughout the unsettled year of 1971; the level of the markup was virtually the same as it had been during the untroubled portion of Canada's most recent fixed-rate period.[24]

Of course, these considerations are hardly conclusive, and it is still conceivable that the long-run private cost of using the foreign-exchange markets is lower under a system of adjustable pegs than under flexible rates. But since international commerce is not an end in itself, the question would then arise whether government fixing of exchange rates provided a subsidy to international commerce that was not in the interest of society.[25]

Footnotes

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[1]See H. Houthakker (1962), M. Friedman and R. Roosa (1967, pp. 39-41), P. Einzig (1968), G. Pelli (1970), and H. Fowler (1972).

[2]Various surveys have reported that the users of the foreign-exchange markets are generally untroubled by the effects on the markets of a high degree of rate flexibility; but these surveys have provided no data regarding the influence of flexibility on the costs of the services provided by foreign-exchange traders. For such surveys, see N. Fieleke (1972 a,b), R. Fitzsimons (1971), and The Economist (1971).

[3]A fuller justification for this measure will be developed in following passages of this paper. At this point we simply note that in the U.S. economy transactions prices commonly change in the same general way as quoted prices, and that an increase in the markups which banks charge each other on "wholesale" transactions will surely be paralleled by an increase in the markups which they charge their nonbank, "retail" customers. For an endorsement of this markup as an

indicator of social cost, and for a criticism of another indicator commonly used by exchange-market participants, see F. Machlup (1970).

[4]For a discussion of price formulation in the securities markets, see G.P.E. Clarkson (1965).

[5]Perhaps the best published evidence as to whether risk-bearing is rewarded can be found in the study by L. Fisher and J. Lorie (1964). Most theorizing on the subject seems to agree with Irving Fisher's assertion that "Usually . . . an uncertain income will be valued at less than its mathematical expectation" (quoted by K. Arrow, 1971, p. 24).

[6]It is consistent with this view that foreign-exchange traders, in discussing these matters, express much more concern over exchange restrictions and exchange-rate uncertainty than over fluctuations in volume as such.

[7]With respect to the <u>demand</u> price offered (in the form of a percentage markup) for the services of foreign-exchange traders, it seems unlikely that foreign-exchange restrictions or uncertainty about exchange-rate changes would be considered endogenous in any demand function that might reasonably be constructed. Because the supply function is a reduced form, there is no need, for our purposes, to consider the demand function any further. Cf. J. Johnston (1963, p. 234).

[8]Statements by "insiders" support the assumption made in the text. For example, the <u>International Economic Letter</u> of First National City

Bank (1971, p. 13) asserts, "When uncertainty about exchange rates grows and large fluctuations are anticipated, exchange dealers protect themselves against loss by increasing the spread between buying and selling rates. The result is to raise materially the cost to businesses engaged in international trade." Also see W. Page (1971).

[9]For support for the former view, see H. Grubel (1966, pp. 16-17, 20, and 35); for the latter view, see E. Sohmen (1966, pp. 3-9, 30, and 1970, pp. 312-13). There is a growing body of literature which seeks to explain the existence of covered interest differentials; for example, see H. Stoll (1972) and L. Officer and T. Willett (1970) and the works cited therein.

[10]A good example is the statement on June 19, 1972, by Denis Healey, the British Labor party's spokesman on finance. His prediction that the pound sterling would be devalued by July or August was widely credited with hastening that event (New York Times, 1972). It should be noted that official actions, meetings, or pronouncements might cause foreign-exchange traders to suspect a rate change but provide little basis for predicting the magnitude or the timing of the change, with the result that the other explanatory variables considered in the text would not adequately represent such officially generated uncertainty; an illustration would be the announcement of a control the details of which were not immediately specified.

[11]The "normal" covered differential for a particular foreign currency (vis-à-vis the U.S. dollar, of course) is assumed to be the

average differential (without regard to sign) for January-April, 1971. That is, this period was taken as a representative "crisis-free," or "normal," period during which covered differentials were attributable to influences other than large-scale speculation or stringent exchange restrictions. For additional information on the construction of ED, see the note accompanying Table 2.

[12]That is to say, the constant is the average percentage markup which would have been quoted at times (in 1971) when there was an absence of change in the exchange rate, of stringent exchange restrictions, of large-scale speculation, and of unsettling noises by government officials, given the long run normal daily trading volume and the degree of bank competition.

[13]Before the "final" regression equations were selected, PDLs of $|\Delta r^o/r^o|$ were inserted into each equation not already incorporating such a PDL, as a last check on the lag structure of this variable.

[14]Although our basic supply price function was in reduced form, the proxy variables used in the estimating equation may invite some bias, since rising transaction costs (including M) contribute to larger covered differentials (represented by ED). To construct a model that could actually be estimated without the possibility of such bias would probably be impossible, given the present state of the art and the limitations of the available data. In our view, the questions investigated in this paper are important enough that the possibility of biased results should not forestall the investigation, provided the

bias may not be severe and we are alerted to interpret the results with caution. That any bias will not be severe is suggested by the fact that there were frequent and widespread reports of bursts of speculation and of new exchange controls (the factors to be represented by ED) during the period under analysis, so that causation probably ran predominantly from ED to M, as posited by the model. It is also worthy of note, at this point, that the simple correlation between ED and $|\Delta r^o/r^o|$ is low or nil for each currency for which data on ED are available, ranging in value from -0.02 for the mark to 0.34 for the Belgian franc, for the period being examined.

[15] Although the markup on the Canadian dollar is plotted in Figures 1 and 2, no regressions were run to explain this markup since it scarcely ever rose above the "normal" level.

[16] It was not possible to utilize the Cochrane-Orcutt and PDL techniques simultaneously.

[17] In an earlier version of this paper, the variable $|(r^{90}-r^o)/r^o|$ was included in the equation for each currency (except the yen, for which the necessary data are not available), on the reasoning that foreign-exchange traders might expect more rapid change in the spot rate (and thus widen their bid-asked spreads), the larger the near-term forward premium or discount. However, the several traders who read that version were unanimous and unequivocal in rejecting the suggestion that they accepted the forward rate as a reliable forecast of the future

spot rate. (By contrast, H. Working (1961, pp. 161-62) has argued that "Futures prices tend to be highly reliable estimates of what should be expected on the basis of contemporarily available information . . . .")

[18] It may be, of course, that the influence of such official activities is captured fairly well by the other explanatory variables. Similarly, government intervention in the form of purchases or sales of foreign exchange would presumably influence the percentage markup indirectly by affecting the rate of change in the exchange rate or perhaps by affecting the forward premium or discount; but the mere presence of the government in the market might have a direct and distinct influence. To test for this latter influence, we included in several regression equations a measure of central bank market transactions (without regard to sign) in the currency concerned, based on internal Federal Reserve data. The coefficients of all such measures were not significant at even the 0.10 level, although the data available to us were not comprehensive.

[19] This is not to say, of course, that the long-run effect of the control itself is to reduce the markup; indeed, we would expect the opposite. It should be noted that, with one exception, no control measure appears to have been announced on a working day earlier than the day the control took effect, so that, with this one exception, the announcement and the introduction of the control affected market uncertainty at the same time.

[20]It should also be noted that the exchange-rate quotations used in computing any particular covered differential sometimes pertain to a time of day several hours different from that for the interest rate quotations which were used. (See the note accompanying Table 2.)

[21]In this connection, to the extent that ED represents large scale speculation, the low correlation between $|\Delta r/r|$ and ED (cf. fn. 11) suggests that speculation was not massive when the authorities allowed exchange rates to vary.

[22]The rapid rate changes of 1971 and the associated increases in transaction costs were clearly the heritage of earlier governmental fixings at disequilibrium levels, and it is far from obvious that such high transaction costs would continue with sustained (even impure) floats. On the contrary, Figures 1 and 2 show that transaction costs for "floating" currencies trended sharply downward throughout the period of the general "float," that is, from August through November, as exchange rates were allowed to move nearer their market-equilibrium levels.

[23]It is not claimed that the Canadian dollar has been allowed to float perfectly freely. But if increases in reserves or exchange restrictions are used as the criteria, there is no doubt that after June 1, 1970, the Canadian dollar has generally been allowed to respond much more freely to market influences than most other currencies have been.

[24] Cf. Fieleke (1972b, pp. 180-86).

[25] Cf. A. Lanyi (1969). Herbert Grubel has suggested to me that exporters and importers would pay more in total markups under highly flexible than under fixed rates, assuming that the quoted unit markups were to remain about the same, because under flexible rates more trade would be transacted through the forward market, where unit markups are higher than in the spot market. This interesting point is, of course, distinct from the issue, addressed in this paper, of whether exchange-market intermediaries perform as efficiently under flexible as under fixed rates.

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