

Section III: Stabilization Policies: International Aspects

FLEXIBLE EXCHANGE RATES IN THE 1970s

Jacob A. Frenkel

INTRODUCTION

Our recent experience with a system of flexible exchange rates had led to a renewed interest in the operations of foreign exchange markets and in studying the principal determinants of exchange rates. The 1970s witnessed the dramatic evolution of the international monetary system from a regime of pegged exchange rates which prevailed for about a quarter of a century since the Bretton Woods conference into a regime of flexible (though managed) rates. The emergence of the new legal and economic system confronted traders, national governments and international organizations with new economic problems, choices and instruments. During the 1970s exchange rates have fluctuated widely and inflation rates accelerated. The international monetary system had to accommodate extraordinarily large oil related shocks which affected trade flows in goods and assets. Huge oil payments had to be recycled. Uncertainties concerning future developments in international politics reached new heights and the prospects for the world economy got gloomier. These developments have placed unprecedented pressures on the markets for foreign exchange as well as on other asset markets.

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They have been associated with a large slide in the value of the U.S. dollar, and have resulted in speeding up the creation of new institutions like the European Monetary System which provides the formal framework for the management of exchange rates among members. The increased interdependence among countries and the recognition that exchange rate policies by one national government exert influence on other economies have also induced a legal response from international organizations. For example, in late April 1977, the Executive Board of the International Monetary Fund approved the details of the second amendment to Article IV of the amended Articles of Agreement dealing with the principles and procedures for surveillance of member countries' exchange rate policies.

These developments provide the background for this paper which is intended to present a brief survey of key issues and lessons from the experience with floating rates during the 1970s. The main orientation of the paper is empirical and the analysis is based on the experience of three exchange rates: the Dollar/Pound, the Dollar/French Franc and the Dollar/DM. In the second section I analyze the efficiency of the foreign exchange markets by examining the relationship between spot and forward exchange rates; in that context I also examine and interpret the extent of exchange rate volatility. The analysis of the foreign exchange markets is important because it sheds light on several questions like: 1) have exchange rates fluctuated "excessively?" 2) is there evidence that speculation in the foreign exchange markets is destabilizing? 3) is there evidence that there is "insufficient" speculation in the foreign exchange markets? 4) is there evidence for a market failure in the sense that there are unexploited profit

opportunities? These issues are relevant for assessing the performance of floating rates as well as for discussing whether there is a case for government intervention in the foreign exchange markets. The analytical framework that is used for interpreting the volatility of exchange rates and the association between spot and forward rates is the modern theory of exchange rate determination. Within this perspective exchange rates are viewed as the prices of assets that are traded in organized markets and, like the prices of other assets, are strongly influenced by expectations about future events.

The relationship between exchange rates and interest rates is analyzed in the third section from the perspective of the monetary approach to the exchange rate. This analysis is of particular relevance in view of the new policies of the Federal Reserve Board, which were announced on October 6, 1979, that are intended to curb inflation and to support the dollar. One of the key issues that is raised in this section is the distinction between anticipated and unanticipated changes in rates of interest. The policy implication of this distinction is obvious. As an analytical matter this distinction is important because the modern approach to exchange rate determination implies that exchange rates are strongly influenced by "news" which by definition is unpredicted. Therefore, unanticipated rather than anticipated changes in interest rates should have a strong effect on changes in exchange rates. This prediction is tested empirically.

The fourth section analyzes the relationship between exchange rates and prices by examining the patterns of deviation from purchasing power parities. This examination is relevant for assessing whether the flexible exchange rate system was successful in insulating national

economies from foreign shocks, and whether it provided policymakers with an added instrument for the conduct of macroeconomic policy. The evidence on deviations from purchasing power parities is also relevant for the discussion of whether there is a case for managed float. The fifth section concludes the paper with some concluding remarks.

THE EFFICIENCY OF THE FOREIGN EXCHANGE MARKET AND THE MOVEMENT OF EXCHANGE RATES

In this section I analyze the principal characteristics of the relationship between spot and forward exchange rates which seem to emerge from the experience of the 1970s. Following an analysis of the efficiency of the foreign exchange market I discuss the more general issues underlying the relationships between spot and forward rates and their volatility.

The Efficiency of the Foreign Exchange Market

One of the central insights of the monetary (or the asset market) approach to the exchange rate is the notion that the exchange rate, being a relative price of two assets, is determined in a manner similar to the determination of other asset prices and that expectations concerning future course of events play a central role in affecting current exchange rates.¹

If the foreign exchange market is efficient and if the exchange rate is determined in a fashion similar to the determination of other asset prices, we should expect current prices to reflect all currently

¹For collections of articles summarizing this approach see the Scandinavian Journal of Economics, no. 2, 1976, and Frenkel and Johnson (1978).

available information. Expectations concerning future exchange rates should be incorporated and reflected in forward exchange rates. Thus, to examine the efficiency of the market, I first regress the logarithm of the current spot exchange rate, $\ln S_t$, on the logarithm of the one-month forward exchange rate prevailing at the previous month, $\ln F_{t-1}$, as in equation (1).²

$$(1) \quad \ln S_t = a + b \ln F_{t-1} + u_t$$

If the market for foreign exchange is efficient and if the forward exchange rate is an unbiased forecast of the future spot exchange rate, then we expect that: 1) the constant term in equation (1) should not differ significantly from zero,³ 2) the slope coefficient should not differ significantly from unity and, 3) the residuals should be serially uncorrelated. I examine three exchange rates: the Dollar/Pound, the Dollar/Franc and the Dollar/DM. Equation (1) was estimated using monthly data for the period June 1973 - July 1979. The beginning of the period was determined by the attempt to concentrate on the experience of the current exchange rate regime (following the initial post Bretton-Woods transition period). The resulting ordinary least-

²For an application of the same methodology in analyzing the efficiency properties of the foreign exchange market during the German hyperinflation of 1921-1923 see Frenkel (1976, 1977, 1979). For an application to other exchange rates during the 1920s, see Frenkel and Clements (1980), for an application to the 1920s and the 1970s, see Krugman (1977); for an interesting analysis using time-series and cross-section data, see Bilson (1979), for an analysis of market efficiency using novel econometric techniques, see Hakkio (1979a), and Hansen and Hodrick (1980), and for surveys, see Levich (1978, 1979).

³More precisely, if (assuming risk neutrality) the forward rate measures the expected value of the future spot rate, then the constant term in the logarithmic equation (1) should be $-0.5\sigma_u^2$; see Frenkel (1979).

squares estimates are reported in Table 1. Also reported in Table 1 are additional regressions which will be analyzed shortly. As may be seen for the Dollar/DM exchange rate, the hypotheses that (at the 95 percent confidence level) the constant term does not differ significantly from zero and that the slope coefficient does not differ significantly from unity cannot be rejected. These hypotheses are rejected for the Dollar/Franc exchange rate and are rejected (marginally) for the Dollar/Pound exchange rate. The joint hypotheses, however, that the constant is zero and that the slope coefficient is unity cannot be rejected at the 95 percent for the Dollar/Pound and the Dollar/DM exchange rates and at the 99 percent for the Dollar/Franc exchange rate. The test statistics for testing the joint hypotheses are reported in the column headed by F in Table 1.

It was argued above that in an efficient market, expectations concerning future exchange rates are reflected in forward rates, and that spot exchange rates reflect all currently available information. If forward exchange rates prevailing at period $t-1$ summarize all relevant information available at that period, they should also contain the information that is summarized in data corresponding to period $t-2$. It thus follows that including additional lagged values of the forward rates in equation (1) should not greatly affect the coefficients of determination and should not yield coefficients that differ significantly from zero. The results reported in Table 1 are consistent with this hypothesis; in all cases the coefficients of $\ln F_{t-2}$ do not differ significantly from zero and the inclusion of the additional lagged variables does not improve the fit. Furthermore, in all cases the Durbin-Watson statistics are consistent with the hypothesis of the

Efficiency of Foreign Exchange Markets
Monthly Data: June 1973 - July 1979
(standard errors in parentheses)

Dependent Variable: $\ln S_t$	Estimation Method	Constant	$\ln F_{t-1}$	$\ln F_{t-2}$	R^2	s.e.	D.W.	F	n
Dollar/Pound	OLS	.033 (.017)	.956 (.024)		.96	.027	1.72	1.86	
	OLS	.031 (.018)	1.047 (.116)	-.088 (.113)	.96	.027	1.94		
	IV	.035 (.018)	.953 (.024)		.96	.027	1.72		.90
Dollar/Franc	OLS	-.237 (.078)	.843 (.051)		.79	.029	2.23	4.83	
	OLS	-.225 (.082)	.706 (.117)	.146 (.117)	.79	.029	1.90		
	IV	-.219 (.079)	.855 (.052)		.79	.029	2.25		2.73
Dollar/DM	OLS	-.023 (.027)	.971 (.032)		.93	.032	2.12	.51	
	OLS	-.019 (.028)	.913 (.119)	.063 (.122)	.93	.032	1.96		
	IV	-.022 (.028)	.972 (.033)		.93	.032	2.12		.02

Note: s.e. is the standard error of the equation and R^2 is the coefficient of determination; in the case of instrumental variables estimation the R^2 was computed as $1 - \text{Var}(\hat{u}_t) / \text{Var}(u_t)$. The F statistic tests the joint restriction that the constant equals zero and the slope equals unity. The test statistic is distributed as $F(2,71)$. Critical values for $F(2,71)$ are 3.13 (95 percent) and 4.92 (99 percent). The instrumental variable (IV) estimation method is used in order to allow for the possibility of errors in variables arising from using $\ln F_{t-1}$ as a proxy for the expected future spot rate; the instruments are a constant and Durbin's rank variable. The m-statistic which tests for the absence of errors in variables is distributed χ^2 with 2 degrees of freedom. The critical value for $\chi^2(2)$ is 5.99 (95 percent).

absence of first-order autocorrelated residuals and an examination of higher order correlations (up to 12 lags) shows that no correlation of any order is significant.

To further examine the relationship between the various exchange rates we note that one of the assumptions underlying equation (1) was the notion that the forward exchange rate measures the unobservable value of the expected future spot exchange rate. This assumption provided the justification for using equation (1) instead of the more fundamental relationship that is embodied in equation (2):

$$(2) \quad \ln S_t = a + b \ln(S_t^e | t-1) + \epsilon_t$$

where $(S_t^e | t-1)$ denotes the expected spot exchange rate for period t based on the information available at period $t-1$. If, however, the forward exchange rate at $t-1$ is a "noisy" proxy for the expected future value of the spot rate, (i.e., it measures it with a random error) then we would obtain that

$$(3) \quad \ln F_{t-1} = \ln(S_t^e | t-1) + v_{t-1}; E(v_t) = 0$$

and substituting equation (3) into equation (2) yields:

$$(4) \quad \ln S_t = a + b \ln F_{t-1} + (\epsilon_t - bv_{t-1}).$$

In this case the error term in equation (1) would be $u_t = \epsilon_t - bv_{t-1}$, and the assumption that the covariance between $\ln F_{t-1}$ and u_t is zero would entail a specification error, and the application of the ordinary least-squares (OLS) procedure would yield inconsistent estimates due to the classical errors in variables bias.

In order to examine the possibility that the OLS estimates might be subject to the errors in variables bias, one needs to test the hypothesis that $\text{cov}(u_t, F_{t-1}) = 0$. This test follows the specification test outlined by Hausman (1978).⁴ To perform the test equation (1) was estimated by applying the OLS procedure as well as by using an instrumental variables (IV) estimation method. Under the null-hypothesis of no misspecification the OLS coefficients vector \hat{b}_0 is an efficient and an unbiased estimate of the true coefficient vector. Under the alternative hypothesis of misspecification the vector \hat{b}_0 is biased and an unbiased coefficient vector \hat{b}_1 can be obtained by applying an instrumental variables estimation procedure. The test-statistic relevant for testing the null-hypothesis can be written as

$$(5) \quad m = (\hat{b}_1 - \hat{b}_0)'(\text{var } \hat{b}_1 - \text{var } \hat{b}_0)^{-1}(\hat{b}_1 - \hat{b}_0)$$

where $\text{var}(\hat{b}_1)$ and $\text{var}(\hat{b}_0)$ denote the variance-covariance matrices of \hat{b}_1 and \hat{b}_0 , respectively. Under the null-hypothesis m is distributed (in large samples) as χ^2 with two degrees of freedom. Table 1 reports the results of estimating equation (1) by applying the instrumental variables estimation method. As may be seen for all exchange rates the two vectors of coefficients b_1 and b_0 are very close to each other. For example, for the Dollar/Pound exchange rate the constants are .033 and .035 and the slopes are .956 and .953, consequently, the resulting m statistic is .90 which is well below 5.99 -- the critical value of

⁴This test was recently applied by Obstfeld (1978) to the analysis of the foreign exchange market during the 1970s and by Frenkel (1980a, 1980b) to the analysis of the foreign exchange markets during the 1920s.

$\chi^2(2)$ at the 95 percent confidence level. The m statistics corresponding to the other exchange rates are also below this critical value. It is concluded, therefore, that the use of the forward exchange rate as a proxy for expectations does not introduce a significant errors in variables bias and thus the use of the OLS estimation procedure seems appropriate.

The efficiency of the foreign exchange market and the rationality of using data from the forward market to measure expectations can also be analyzed from a different angle. Consider equation (6):

$$(6) \quad x_t = \alpha_0 + \alpha_1 t + \sum_{i=1}^n \beta_i x_{t-i} + \gamma \pi_{t-1} + w_t$$

where x_t denotes the percentage change in the spot exchange rate ($\ln S_t - \ln S_{t-1}$), π_{t-1} denotes the forward premium on foreign exchange ($\ln F_{t-1} - \ln S_{t-1}$), t denotes time, n denotes the number of lags, and w denotes an error term. If π_{t-1} summarizes all available information concerning the future evolution of the exchange rate, then given the value of the forward premium π_{t-1} , the past history of the percentage change of the exchange rate should not "help" the prediction (i.e., the past history should not be viewed as Granger-causing future changes), and the joint hypotheses that α_1 and β_i are zero should not be rejected. The results of applying these tests to the three exchange rates for various number of lags are reported in Table 2. Also reported in Table 2 are the results of testing the joint hypotheses that α_1 and β_i are zero and that γ , the coefficient of the forward premium, is unity. The relevant statistic for testing the null-hypothesis is an F-statistic which is reported in Table 2. As is evident in all cases the null-hypothesis cannot be rejected at the 95 percent confidence level

since the values of the various F-statistics fall well below the corresponding critical values. It is concluded, therefore, that the forward premium on foreign exchange may be viewed as a rational expectations measure of the percentage depreciation of the currency in that it incorporates the available information that is contained in the series of past depreciations.

The principal conclusions that may be drawn from the previous discussion are that the behavior of the foreign exchange market during the 1970s has been broadly consistent with the general implications of the efficient market hypothesis and that the forward exchange rate summarizes the relevant available information concerning the future evolution of the rate.

Exchange Rate Movement: Volatility and Predictability

In this section I analyze the volatility of exchange rates and the extent to which this volatility is predictable. To set the stage for the analysis, I present in Figure 1 the daily and quarterly percentage changes in the three exchange rates. This figure indicates that the various exchange rates have been very volatile and that the degree of volatility of day-to-day changes in the exchange rates have been extraordinarily high and has been much smaller when averaged over longer periods. Further, the standard errors of the regressions in Table 1 indicate that the forecasts of future spot exchange rates based on the forward rates are imprecise: the standard errors of the equations are about 3 percent per month.

These characteristics of price changes are typical to auction and to organized asset markets. In such markets current prices reflect

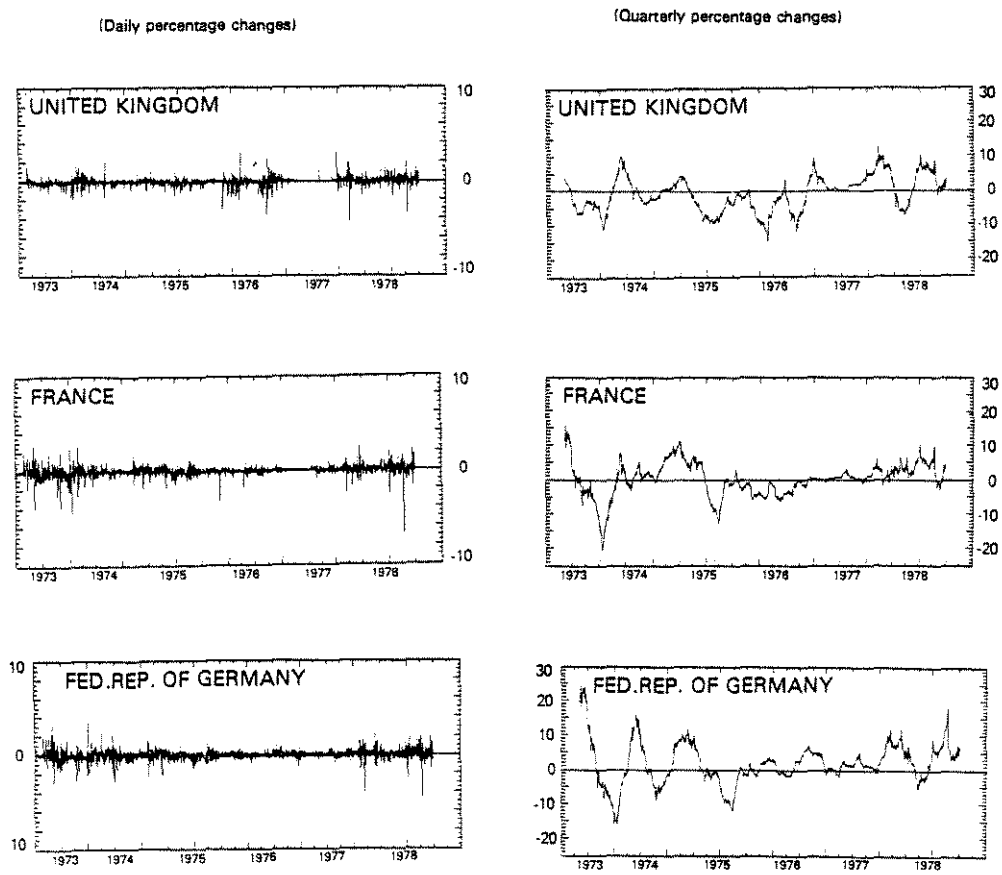
Table 2

Test of Rationality of Forward Premium Prediction of Currency Depreciation
Monthly Data, June 1973 - July 1979

Dependent Variable $\ln S_t - \ln S_{t-1}$	Null Hypothesis	Number of Lags	F-statistic
Dollar/Pound	$\alpha_1 = 0, \beta_1 = 0$	3	$F(4,64) = 1.680$
		4	$F(5,62) = 1.610$
		5	$F(6,60) = 1.231$
		6	$F(7,58) = 1.141$
	$\alpha_1 = 0, \beta_1 = 0, \gamma = 1$	3	$F(5,64) = 1.555$
		4	$F(6,62) = 1.518$
		5	$F(7,60) = 1.207$
		6	$F(8,58) = 1.131$
	$\alpha_1 = 0, \beta_1 = 0, \gamma = 1$	3	$F(5,64) = 1.436$
		4	$F(6,62) = 1.519$
Dollar/Franc	$\alpha_1 = 0, \beta_1 = 0$	3	$F(4,64) = 1.175$
		4	$F(5,62) = 1.327$
		5	$F(6,60) = 1.087$
		6	$F(7,58) = 1.014$
	$\alpha_1 = 0, \beta_1 = 0, \gamma = 1$	3	$F(5,64) = 1.436$
		4	$F(6,62) = 1.519$
		5	$F(7,60) = 1.146$
		6	$F(8,58) = 1.063$
	$\alpha_1 = 0, \beta_1 = 0, \gamma = 1$	3	$F(5,64) = 1.123$
		4	$F(5,62) = 1.262$
Dollar/DM	$\alpha_1 = 0, \beta_1 = 0$	5	$F(6,60) = 1.321$
		6	$F(7,58) = 1.342$
	$\alpha_1 = 0, \beta_1 = 0, \gamma = 1$	3	$F(5,64) = 1.183$
		4	$F(6,62) = 1.287$
		5	$F(7,60) = 1.403$
		6	$F(8,58) = 1.525$

Figure 1

SHORT-RUN VARIABILITY IN EXCHANGE RATES IN TERMS OF U.S. DOLLARS,
APRIL 2, 1973 - DECEMBER 31, 1978



Source: Artus and Young (1979).

expectations concerning future course of events, and changes in expectations are immediately reflected in corresponding changes in prices. Periods which are dominated by uncertainties, new information, rumors and announcements are likely to be periods in which changes in expectations are the prime cause of fluctuations in asset prices. Further, since the information which alters expectations must be new, the resulting fluctuations in price cannot be predicted by lagged forward exchange rates which are based on past information.⁵ Therefore, during such periods, one should expect exchange rates to exhibit large fluctuations and to be unbiased but imprecise forecasts of future spot rates.

To gain further insights into the implications of this perspective on the relationship between predicted and realized changes in exchange rates, I present in Figures 2-4 plots of predicted and realized changes in exchange rates for the three pairs of currencies where the predicted change is measured by the lagged forward premium. Also presented in these figures are the differentials in national inflation rates which are discussed in the fourth section. The key fact which emerges from these figures is that predicted changes in exchange rates account for a very small fraction of actual changes.⁶

⁵The analysis of the role of "news" in determining current exchange rates and in explaining forecast errors from the forward rate has been made forcefully by Mussa (1976a, 1976b, 1977, 1979a). See also Dornbusch (1978). The large degree of volatility is also analyzed by McKinnon (1976) who attributes it to insufficient speculation.

⁶These and the following empirical regularities are analyzed in detail in Mussa (1979a). See also Frenkel and Mussa (1980). An interesting extension would examine the relationship between the variances of predicted and actual changes in exchange rates in a manner analogous to that of Shiller (1979).

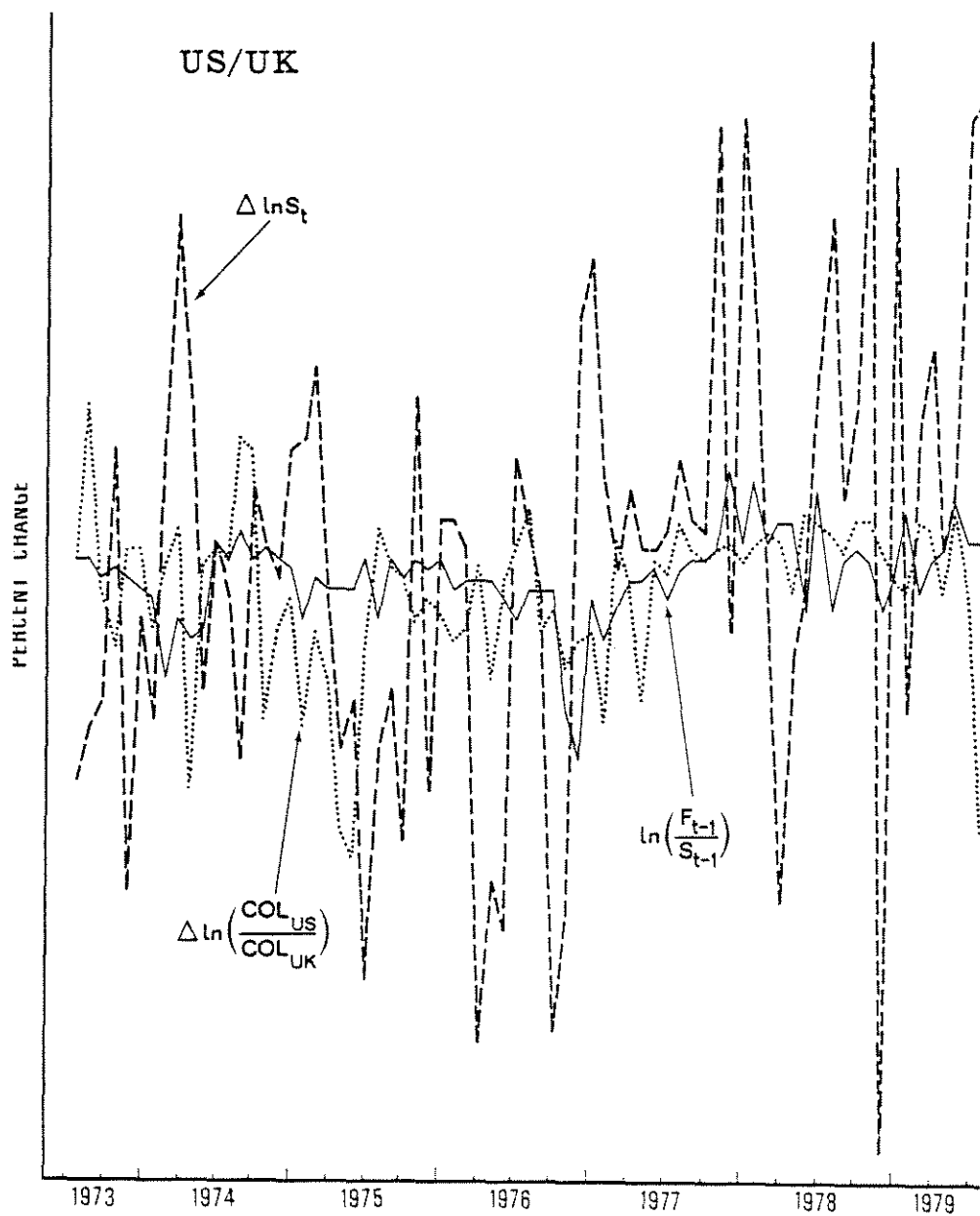


Figure 2: Monthly percentage changes of the U.S./U.K. consumer price indices [$\Delta(\ln COL_{US}/COL_{UK})$], of the \$/£ exchange rate, ($\Delta \ln S_t$), and the monthly forward premium; [$\ln(F_{t-1}/S_{t-1})$] July 1973 - July 1979.

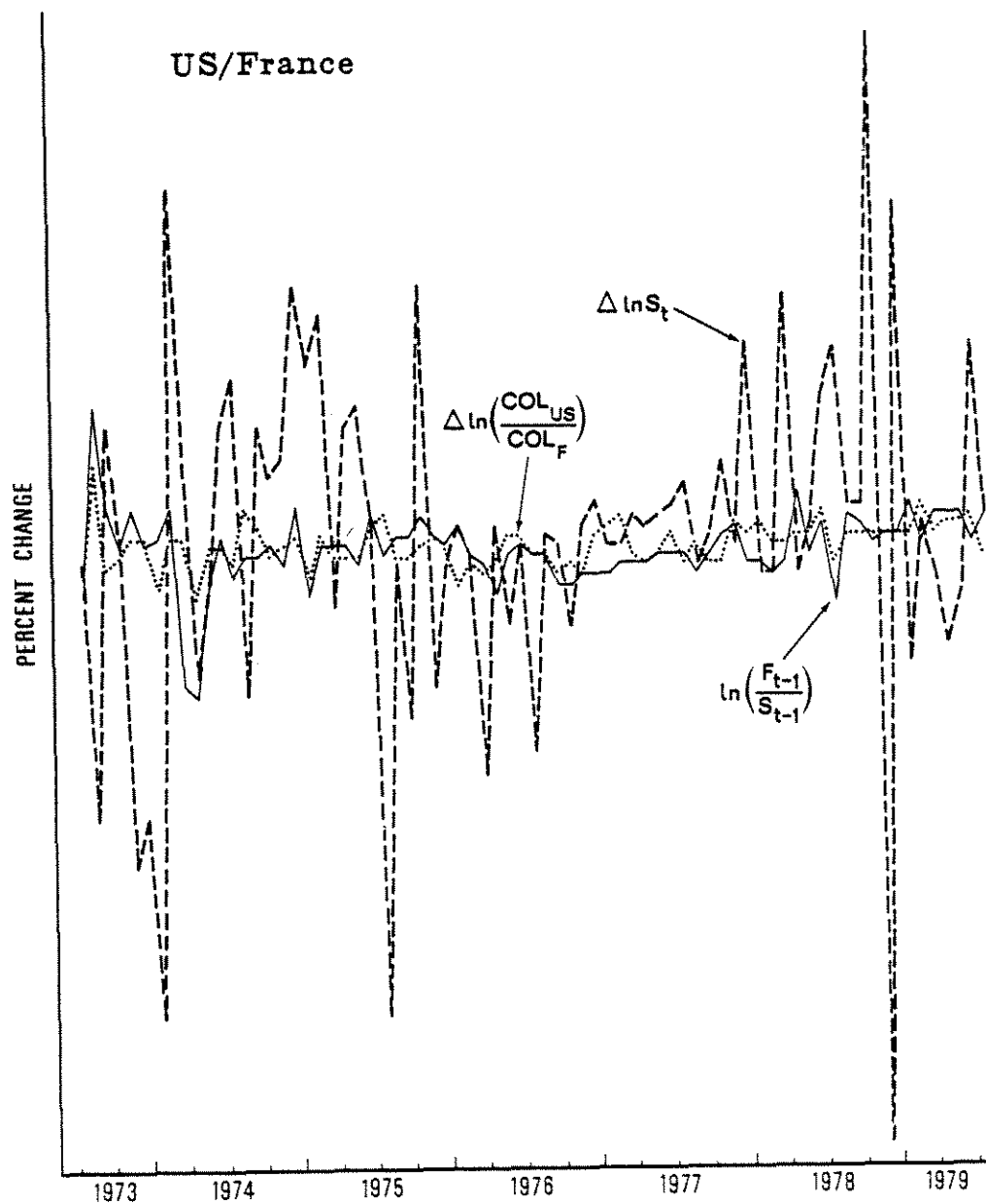


Figure 3: Monthly percentage changes of the U.S./France consumer price indices, $[\Delta(\ln COL_{US}/COL_F)]$, of the \$/F.Fr. exchange rate, $(\Delta \ln S_t)$, and the monthly forward premium; $[\ln(F_{t-1}/S_{t-1})]$ July 1973 - July 1979.

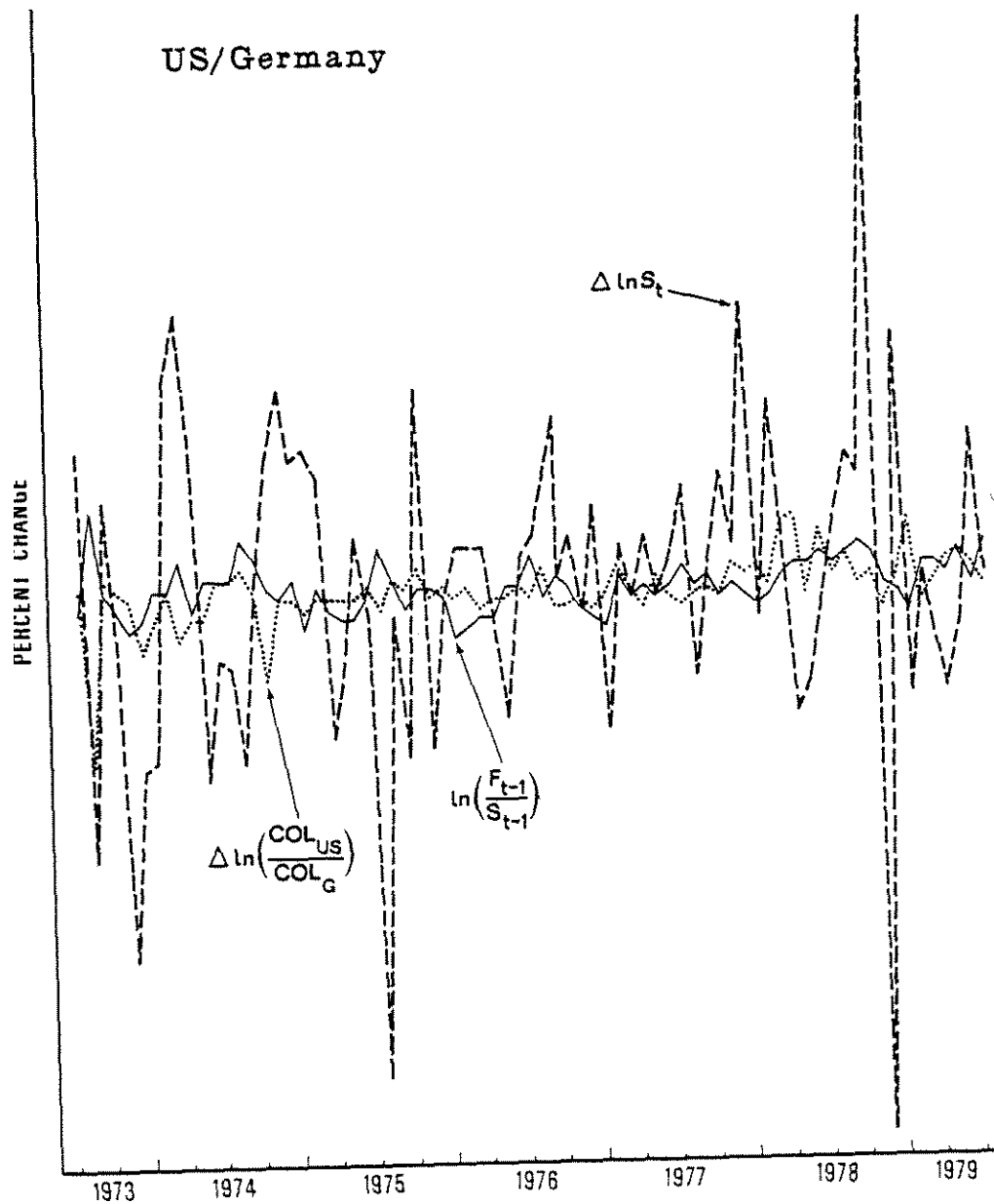


Figure 4: Monthly percentage changes of the U.S./German consumer price indices, $[\Delta(\ln COL_{US}/COL_G)]$, of the \$/DM exchange rate, $(\Delta \ln S_t)$, and the monthly forward premium; $[\ln(F_{t-1}/S_{t-1})]$ July 1973 - July 1979.

This fact suggests that the bulk of exchange rate changes seem to be due to "new information" which, by definition, could not have been anticipated and reflected in the forward premium or discount which prevailed in the previous period.

In order to examine this hypothesis, I present in Figures 5-7 plots of the spot and the contemporaneous forward exchange rates for the three pairs of currencies. Also presented are the ratios of national price levels which are discussed in the fourth section. If the dominant factor underlying changes in rates is new information, which alters views about current and expected future exchange rates by approximately the same amount, then one should expect a high correlation between movements of spot and forward rates. This fact is clearly demonstrated by Figures 5-7 where it is seen that spot and forward exchange rates tend to move together and by approximately the same amplitude (the vertical difference between the two rates correspond to the forward premium or discount on foreign exchange). The high correlation between movements in spot and forward rates is expected since the two rates respond at the same time to the same flow of new information. This characteristic is typical to the foreign exchange market as well as to other markets for stocks and durable assets. The recent pattern of gold prices provides a useful example of this general principle. Table 3 reports the spot and the future price of gold as recorded recently in the New York Commodity Exchange on four recent consecutive days. The two key facts which are illustrated by this table are the extent of day-to-day volatility in gold prices and the uniformity by which these changes are reflected in the price of gold for immediate delivery as well as in the prices for the twelve future delivery dates.

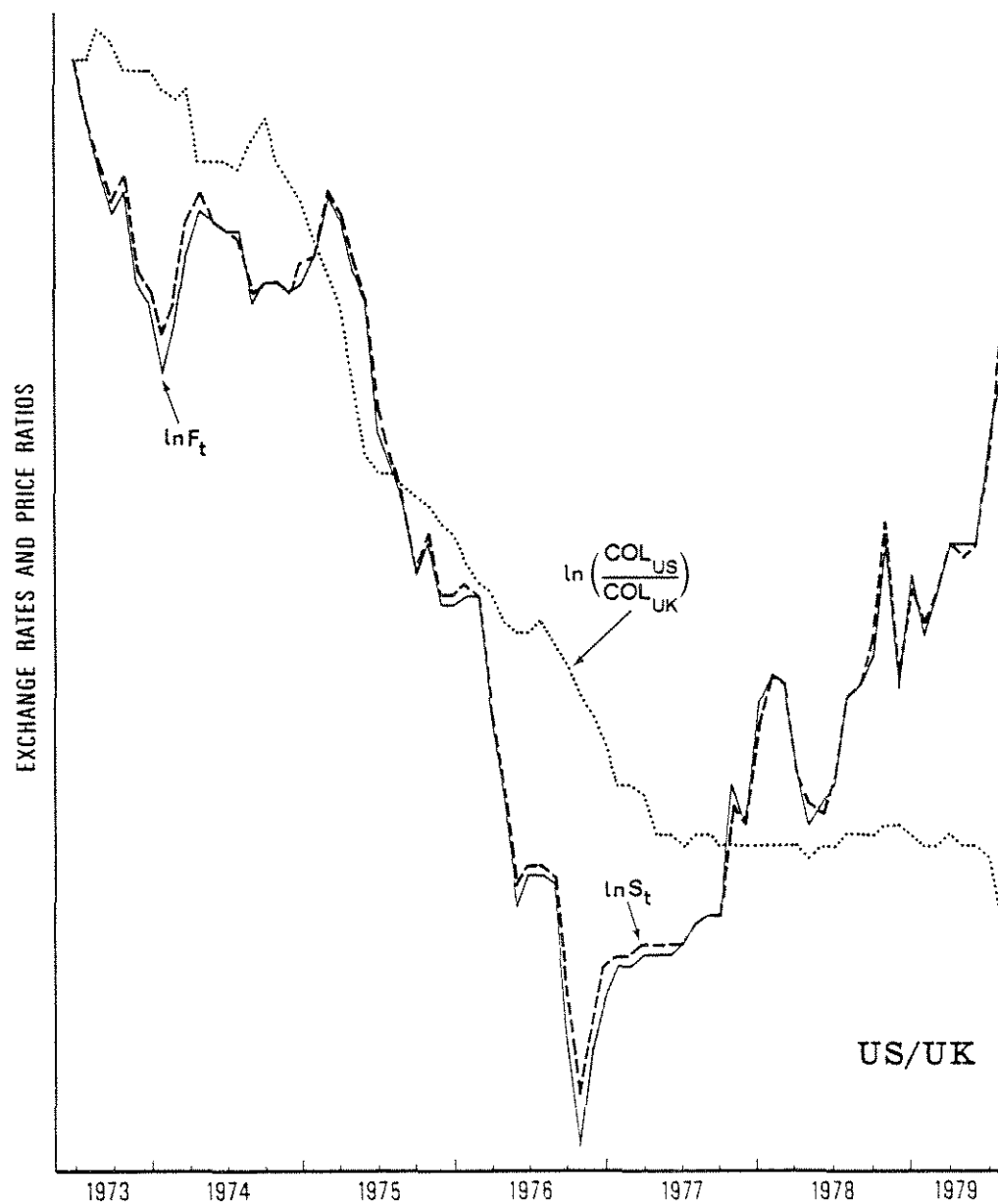


Figure 5: Monthly observations of the Dollar/£ spot ($\ln S_t$) and Forward ($\ln F_t$) Exchange Rates and the Ratio of the U.S./U.K. Cost of Living Indices [$\ln (COL_{US}/COL_{UK})$ (scaled to equal the spot exchange rate at the initial month)]: June 1973 - July 1979.

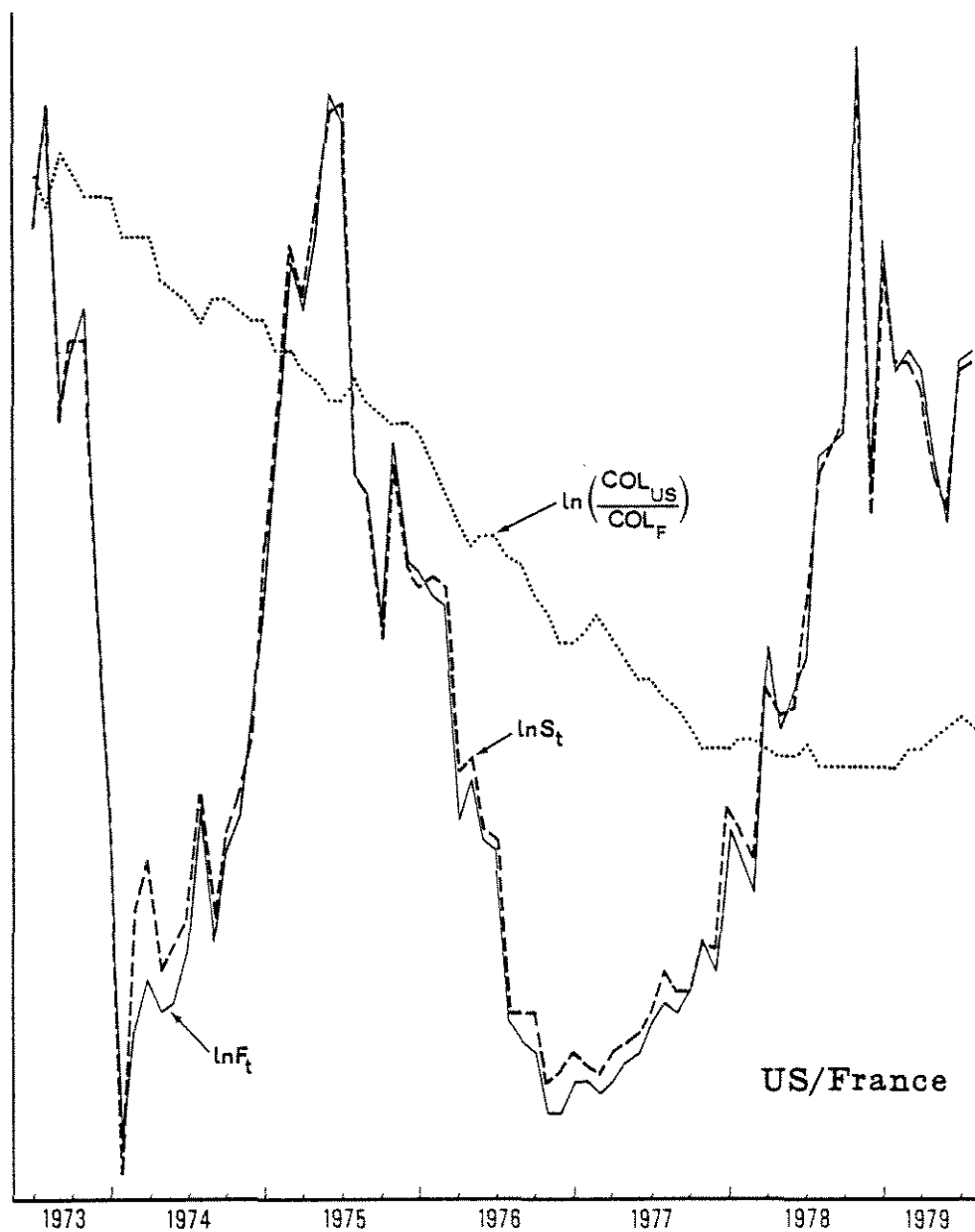


Figure 6: Monthly observations of the Dollar/Fr. spot ($\ln S_t$) and Forward ($\ln F_t$) Exchange Rates and the Ratio of the U.S./French Cost of Living Indices [$\ln(COL_{US}/COL_F)$ (scaled to equal the spot exchange rate at the initial month)]: June 1973 - July 1979.

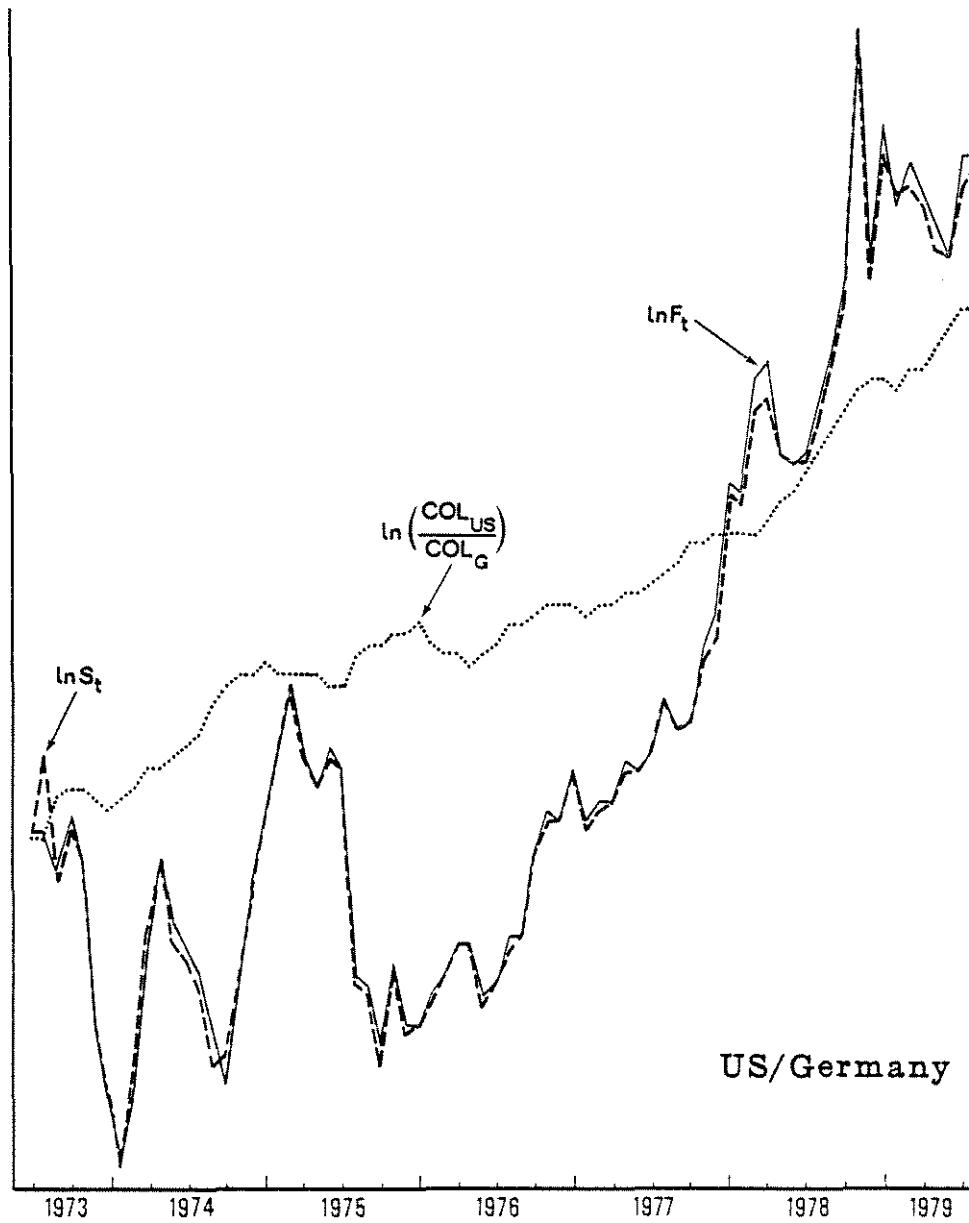


Figure 7: Monthly observations of the Dollar/DM spot ($\ln S_t$) and Forward ($\ln F_t$) Exchange Rates and the Ratio of the U.S./German Cost of Living Indices [$\ln(COL_{US}/COL_G)$ (scaled to equal the spot exchange rate at the initial month)]: June 1973 - July 1979.

Table 3
Futures Price of Gold on Consecutive Days
Daily Data: October 1, 1979 - October 4, 1979

Delivery Date	Price (per ounce) and change from previous day							
	Oct. 1, 79	Change	Oct. 2, 79	Change	Oct. 3, 79	Change	Oct. 4, 79	Change
1979 October	416.0	21	411.0	-5.0	393.5	-17.5	369.7	-23.8
November	419.5	20	416.0	-3.5	397.7	-18.3	377.7	-20.0
December	424.5	20	421.0	-3.5	402.5	-18.5	382.5	-20.0
1980 February	432.8	20	429.6	-3.2	410.7	-18.9	390.7	-20.0
April	440.9	20	438.0	-2.9	418.8	-19.2	398.8	-20.0
June	448.6	20	446.0	-2.6	426.6	-19.4	406.6	-20.0
August	456.3	20	454.0	-2.3	434.4	-19.6	414.4	-20.0
October	464.0	20	462.0	-2.0	442.2	-19.8	422.2	-20.0
December	471.5	20	469.8	-1.7	449.8	-20.0	429.8	-20.0
1981 February	478.9	20	477.5	-1.4	457.5	-20.0	437.5	-20.0
April	486.1	20	485.0	-1.1	465.0	-20.0	445.0	-20.0
June	493.3	20	492.5	-0.8	472.5	-20.0	452.5	-20.0
August	500.5	20	500.0	-0.5	480.0	-20.0	460.0	-20.0

Note: These prices are settlement prices at the Commodity Exchange, New York as reported in the Wall Street Journal October 2-5, 1979

Another feature which is revealed by Figures 5-7 is that the contemporaneous spot and forward exchange rates are approximately equal thus indicating that the market's best forecast of the future spot rates (approximately) the current spot rate. This phenomenon reflects the fact that, as an empirical matter, exchange rates have followed approximately a random walk process. For such a process, current prices are indeed the best forecasts of future prices. To the extent that the exchange rate had some drift, the above statement should be interpreted in reference to that drift. This empirical phenomenon seems to correspond to the actual paths of exchange rates even though it does not reflect a theoretical necessity.

The final characteristic of the foreign exchange market is described by Figures 8-10, which plot for the three pairs of currencies the spot exchange rate and the forward premium on forward exchange. Since the units of the spot rate and the forward premium are fundamentally different, the two series were normalized by subtracting from each series its mean and by dividing by the corresponding standard error. The fact which emerges from these figures is that generally (though not always) there is a positive correlation between the expected depreciation of the currency (as measured by the forward premium in foreign exchange) and the spot exchange rate. This positive correlation may be rationalized by noting that currencies which are expected to depreciate are traded at a discount in the forward market and, on average, these currencies also command a lower foreign exchange value in the spot market. This correlation is interpreted further in the next section.

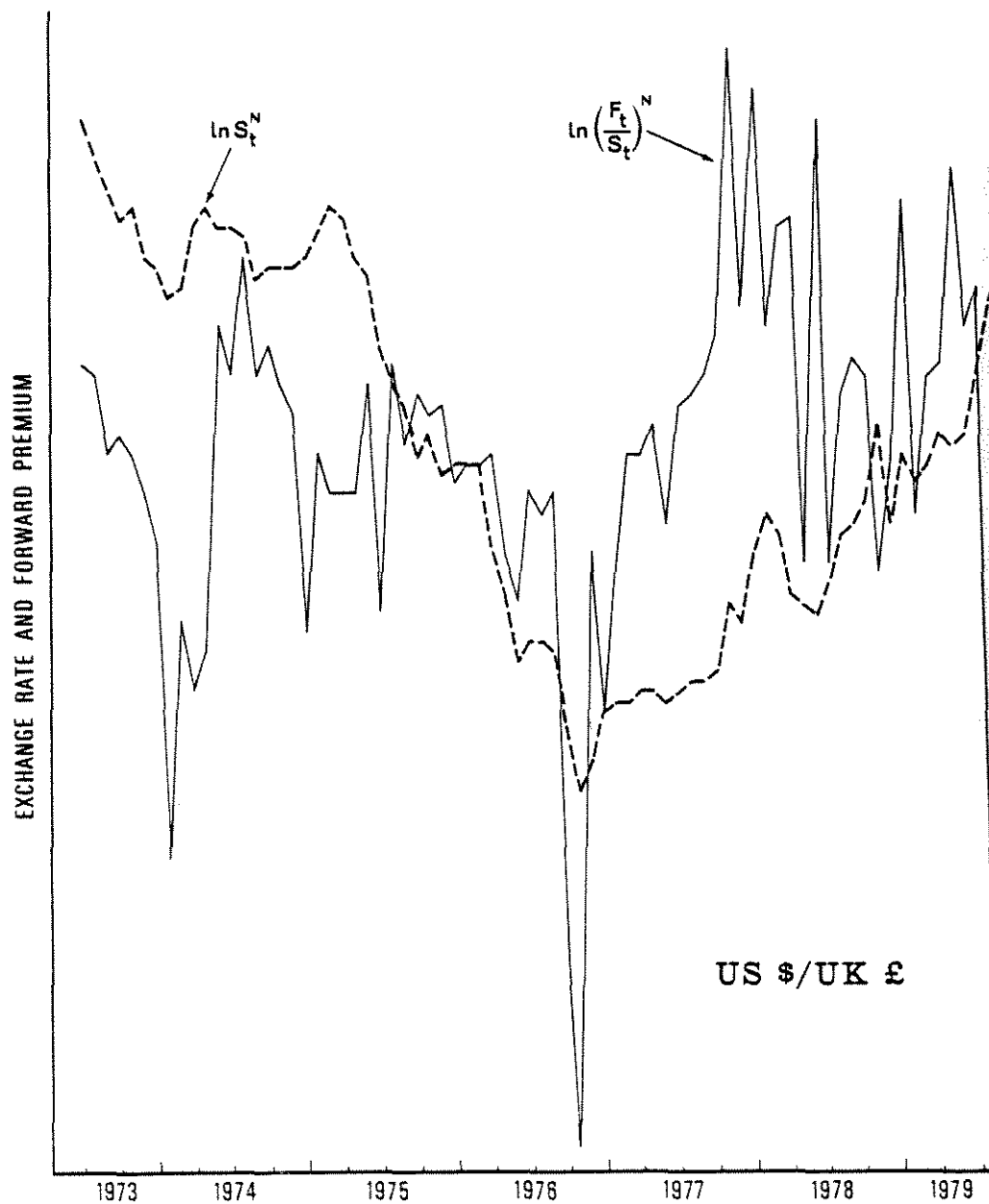


Figure 8: Monthly observations of the normalized Dollar/£ spot exchange rate ($\ln S_t^N$) and the normalized forward premium [$\ln (F_t/S_t)^N$]. Both series are normalized by subtracting from each series its mean and by dividing by the corresponding standard error: June 1973 - July 1979.

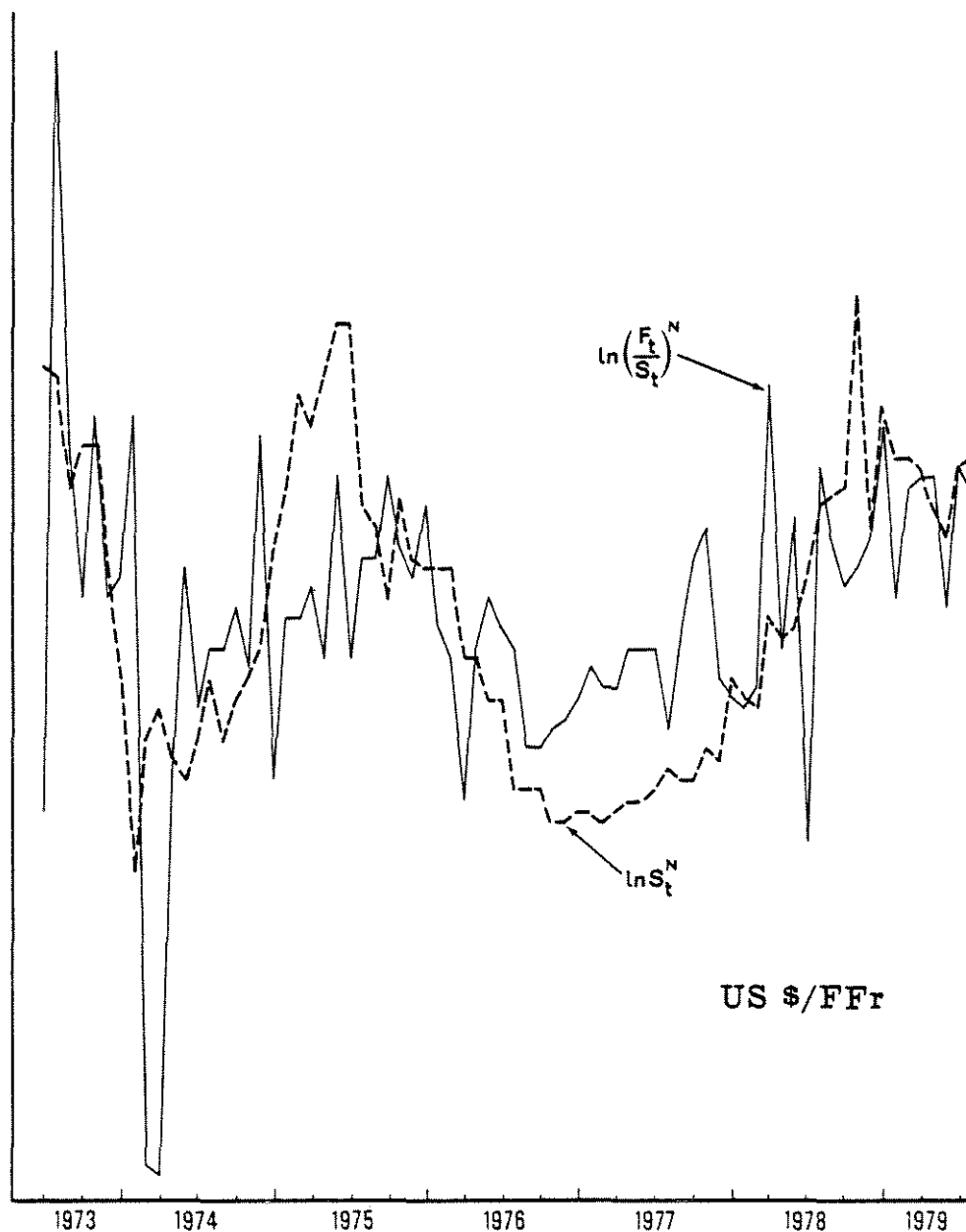


Figure 9: Monthly observations of the normalized Dollar/Fr. spot exchange rate ($\ln S_t^N$) and the normalized Forward Premium [$\ln(F_t/S_t)^N$]. Both series are normalized by subtracting from each series its mean and by dividing by the corresponding standard error: June 1973 - July 1979.

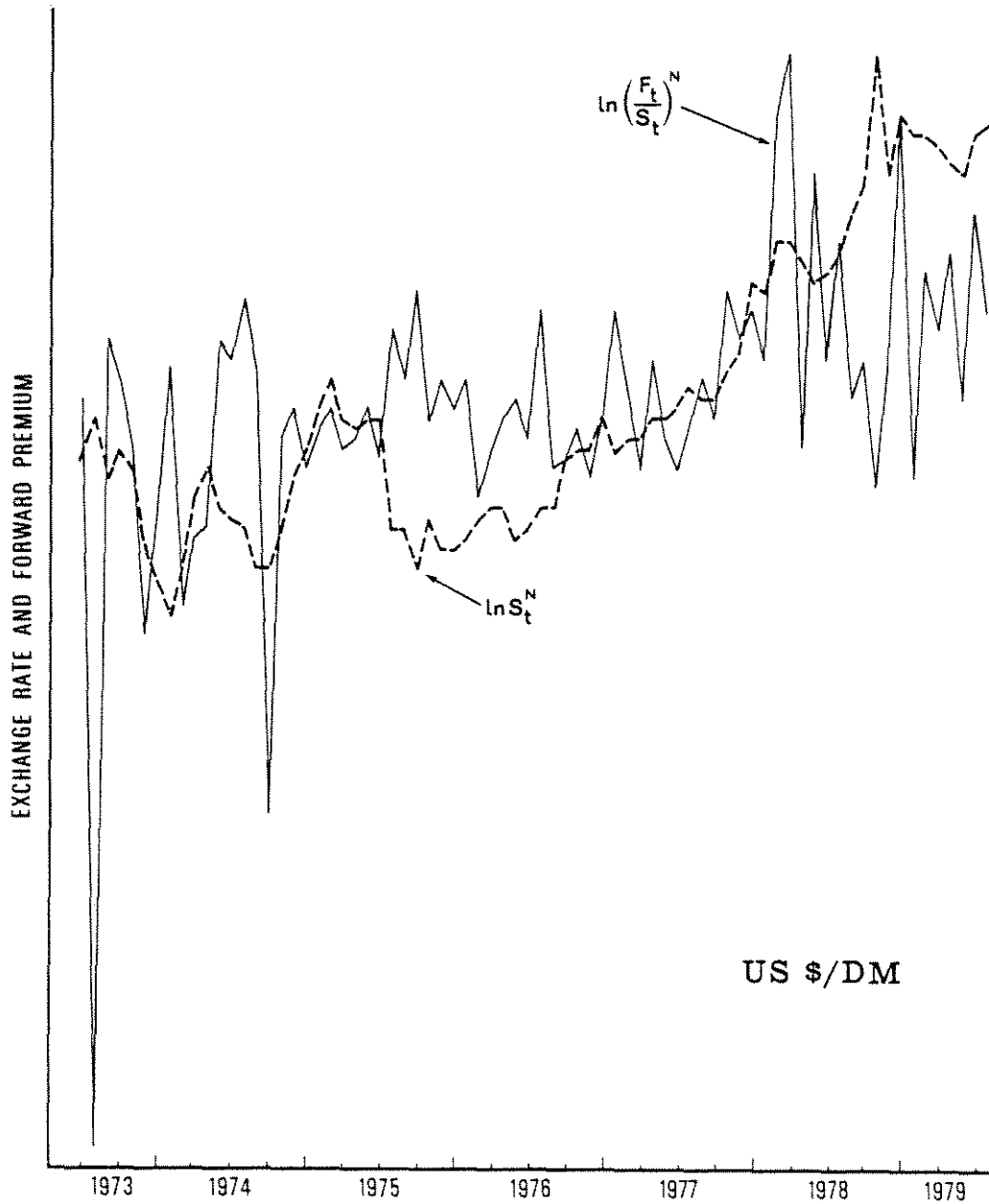


Figure 10: Monthly observations of the normalized Dollar/DM spot ($\ln S_t^N$) and the normalized Forward Premium [$\ln (F_t/S_t)^N$]. Both series are normalized by subtracting from each series its mean and by dividing by the corresponding standard error: June 1973 - July 1979.

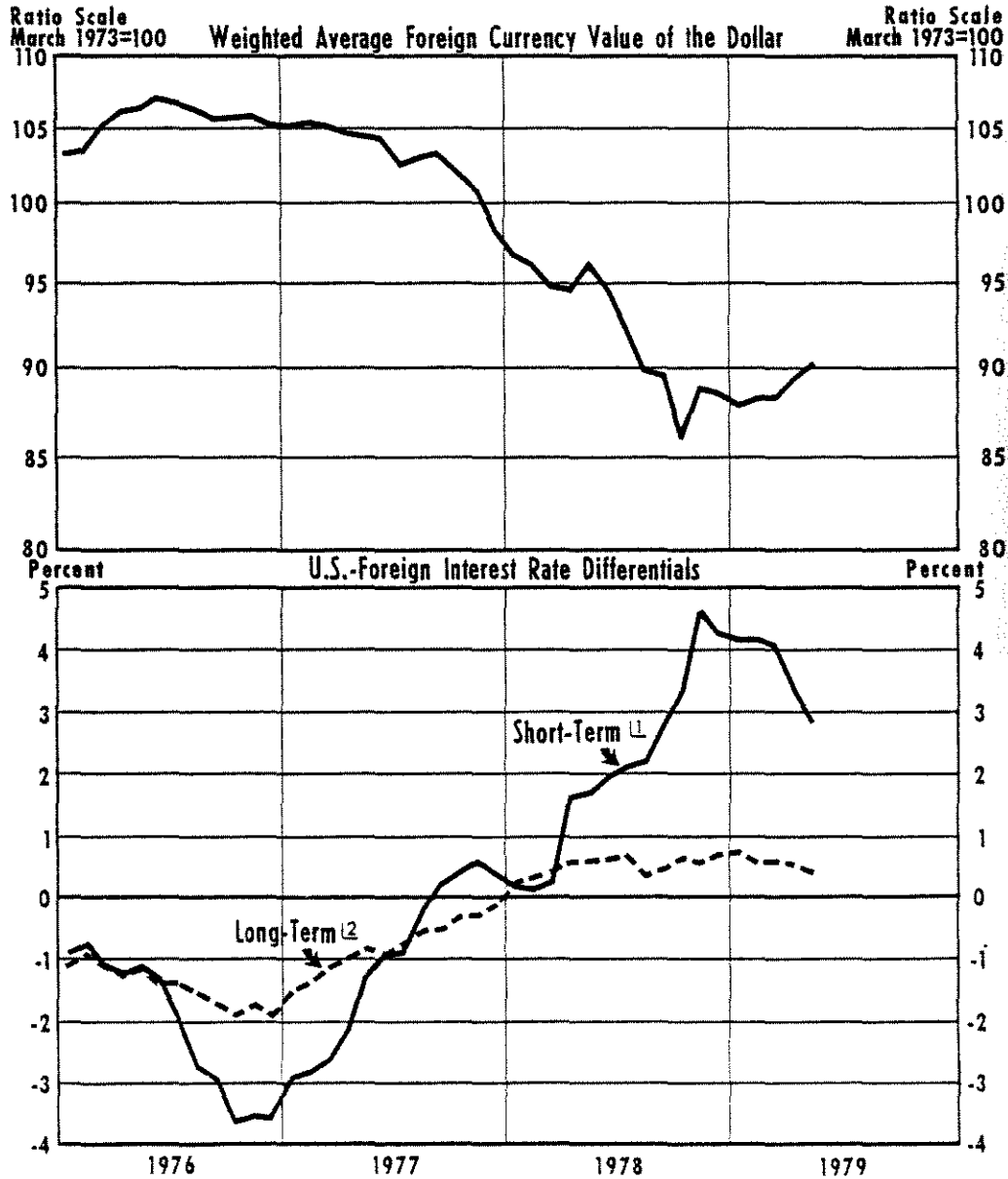
EXCHANGE RATES, INTEREST RATES AND INNOVATIONS

In this section I analyze the relationship between exchange rates and interest rates from the analytical perspective of the monetary approach to the exchange rate. To set the stage for the analytical development it is useful to recall the typical analysis which generally predicts a negative association between the rate of interest and the exchange rate. According to that analysis, a higher rate of interest attracts foreign capital which induces a surplus in the capital account of the balance of payments and thereby induces an appreciation of the domestic currency (i.e., a lower spot exchange rate). Another variant of the popular approach states that the higher rate of interest lowers spending and thus induces a surplus in the current account of the balance of payments which results in a lower spot exchange rate. A third variant of this approach claims that the higher rate of interest implies (via the interest parity theory) a higher forward premium on foreign exchange and to the extent that at a given point in time the forward exchange rate is predetermined by past history, (an assumption that is clearly rejected by the evidence on the comovements of spot and forward rates), the required rise in the forward premium will be brought about by a lower spot rate (i.e., by an appreciation of the domestic currency). Whatever the route, this approach predicts a negative relationship between the rate of interest and the spot exchange rate (or alternatively, a positive relationship between the rate of interest and the foreign exchange value of the domestic currency).

These predictions, however, do not seem to be in accord with the broad facts. Over the recent period the rise in the rate of interest in the U.S. (relative to the foreign rate of interest) has been

Figure 11

Foreign Exchange Value of the U.S. Dollar and Interest Rate Differentials



Sources: Federal Reserve Statistical Release H.13; Federal Reserve Bulletin; International Monetary Fund, International Financial Statistics.

1 Secondary market rates for 90-day large certificates of deposit in the United States less the weighted average of foreign three-month money market rates.

2 U.S. long-term government bond yields less the weighted average of foreign long-term government bond yields.

Latest data plotted: May

associated with a rise in the spot exchange rate (i.e., with a depreciation of the dollar). Figure 11 illustrates the point by plotting the foreign exchange value of the U.S. dollar against the interest rate differential. As is evident, in contrast with the popular prediction, the higher (relative) rate of interest in the U.S. has been associated with a higher exchange rate (i.e., with a lower foreign exchange value of the dollar). This contradiction, however, does not arise when the exchange rate is analyzed from a monetary (or an asset market) perspective to which we now turn.

The major building blocks of the monetary approach are hypotheses concerning the properties of the demand for money and money market equilibrium and hypotheses concerning the link between domestic and foreign prices.⁷ Consider first the equilibrium in the money markets. The supplies of domestic and foreign real balances are M/P and M^*/P^* where M and P denote the nominal money supply and the price level, respectively, and where variables pertaining to the foreign country are indicated by an asterisk. Denoting the demands for real balances by L and L^* (both of which are functions which are specified below), equilibrium in the money markets is attained when

$$(7) \quad L = M/P \text{ and}$$

$$(8) \quad L^* = M^*/P^*.$$

⁷For theoretical developments and applications of the approach see, for example, Dornbusch (1976a, 1976b), Kouri (1976), Mussa (1976a), Frenkel (1976), Frenkel and Johnson (1978), Frenkel and Clements (1980), Bilson (1978), Hodrick (1978), and Frankel (1979).

From equations (7)-(8), equilibrium in the money markets implies that the ratio of the two price levels is:

$$(9) \quad \frac{P}{P^*} = \frac{M}{M^*} \frac{L^*}{L}.$$

The second building block links domestic and foreign prices. Assuming the simple version of purchasing power parity implies that:⁸

$$(10) \quad P = SP^*$$

Using equation (10) in (9) yields

$$(11) \quad S = \frac{M}{M^*} \frac{L^*}{L}$$

which expresses the exchange rate in terms of domestic and foreign supplies and demands for money. To gain further insight into the determinants of the exchange rate and to set the stage for the empirical estimation, assume that the demand for money depends on real income (y) and the rate of interest (i) according to:

$$(12) \quad L = ay^\eta e^{-\alpha i}$$

⁸For a discussion of the choice of the relevant price index to be used in equation (10), see Frenkel (1978). This simple version of the purchasing power parity theory is used here to simplify the exposition. To the extent that there are systematic deviations from purchasing power parity they can be incorporated into the final exchange rate equation. Similarly, to the extent that purchasing power parities holds in the long run but not in the short run, the final exchange rate equation will reflect these dynamic characteristics. To the extent that purchasing power parity pertains to traded goods only, the exchange rate equation would also contain terms which relate to the relative prices of traded to non-traded goods; for a formulation along these lines, see Dornbusch (1976b) and for an empirical application, see Clements and Frenkel (1980). A more refined specification would allow for the effects of tariffs on the relationship between domestic and foreign prices as well as for short-run effects of unanticipated money on output rather than only on prices and the exchange rate.

$$(13) \quad L^* = b^* y^* \eta^* e^{-\alpha^* i^*}$$

Using equations (12)-(13) in (11) and assuming for simplicity of exposition that foreign and domestic parameters of the demand for money are the same, i.e., that $\alpha = \alpha^*$, and that $\eta = \eta^*$, we obtain:

$$(14) \quad \ln S = C + \ln \frac{M}{M^*} + \eta \ln \frac{y^*}{y} + \alpha (i - i^*)$$

where $C \equiv \ln(b^*/a)$.

Equation (14) relates the exchange rate to the ratios of domestic to foreign money supplies and incomes and to the interest rate differential.⁹ Most pertinent to the present purpose and in agreement with the facts summarized by Figure 11, equation (14) yields a positive relationship between the rate of interest and the exchange rate. The economic interpretation of this association in the context of the U.S. dollar and the inflationary environment is as follows: a rise in the domestic (relative) rate of interest is primarily dominated by a rise in the expected (relative) rate of inflation which induces a decline in the demand for real cash balances; for a given path of the nominal money supply, asset market equilibrium requires a price level which is higher than the price which would have prevailed otherwise. Since the domestic price level is linked to the foreign price through some form of purchasing power parity, and since the path of the foreign price is

⁹It should be noted that a similar set of variables would also appear in the reduced form of a variety of alternative models. The dependence of the demand for domestic money on the domestic rate of interest and the dependence of the demand for foreign money on foreign rate of interest is assumed only for simplicity of exposition. A more general formulation would recognize that the demands for domestic and foreign monies depend on all margins of substitution. See Frenkel and Clements (1980).

assumed to be given, the higher domestic price can only be achieved through a rise in the spot exchange rate (i.e., through a depreciation of the currency).

This explanation of the positive association between interest rates and exchange rates has an intuitive appeal in that it implies that, in an inflationary environment, a relatively rapid rise in prices is associated with high nominal rates of interest as well as with a depreciation of the currency in terms of foreign exchange. The traditional prediction of a negative relationship between interest rates and the exchange rate may, however, be reconciled with the monetary approach under the assumption that it concentrates on the short-run liquidity effects of monetary changes. Accordingly, in the short-run, a higher rate of interest may arise from tight money which induces an appreciation rather than a depreciation of the currency.¹⁰ It should be emphasized, however, that during an inflationary environment (like the one prevailing in the U.S. in recent years) the variations in the rate of interest are most likely to be dominated by variations in inflationary expectations rather than by liquidity effects associated with changes in the ratio of money to bonds. In such an environment the rate of interest is expected to be positively correlated with the exchange rate.

The discussion provides an illustration of the difficulties associated with using the rate of interest as the relevant monetary indicator. Traditionally, the height of the rate of interest was the

¹⁰The short-run liquidity effects is emphasized in Dornbusch (1976b). The role of inflationary expectations in dominating exchange rate developments is emphasized in Frenkel (1976). Frenkel (1979) and Edwards (1979) attempt to integrate these two factors.

criterion for assessing whether monetary policy has been easy or tight: a high interest rate was interpreted as indicating a tight monetary policy while a low interest rate was interpreted as indicating an easy monetary policy. By now it is well recognized that during inflationary periods it is vital to draw a distinction between nominal and real rates of interest and, as a result, during inflationary periods the rate of interest may provide a very misleading interpretation of the stance of monetary policy. The same logic applies with respect to the analysis of the relationship between exchange rates and interest rates.

The foregoing analysis also provides the explanation for the observation (which was noted previously) that generally there is a positive correlation between the forward premium on foreign exchange and the level of the spot rate. Since the spot rate is expected to be positively correlated with interest rate differential and since, according to the interest parity theory, that differential must equal the forward premium on foreign exchange, it follows that the forward premium is also expected to be positively correlated with the level of the spot rate.¹¹ That positive correlation may also be rationalized by noting that currencies which are expected to depreciate are traded at a

¹¹For evidence on the robustness of the interest parity relationship, see Frenkel and Levich (1977). The positive association between the spot exchange rate and the forward premium has been interpreted in terms of an explicit monetary model. It is noteworthy that this positive association would be predicted by any model in which current exchange rate reflects immediately the expectations of future depreciation. See, for example, Mussa (1976a) and Frenkel and Mussa (1980). Since the rate of interest and the exchange rate are dimensionally incommensurate, their association raises questions that are familiar from the discussions of the Gibson Paradox. In a separate paper, I intend to examine the relationship between exchange rates and the forward premium (or the interest differential) in light of the various explanations of the Gibson Paradox.

discount in the forward market and, on average, these currencies also command a lower foreign exchange value in the spot market.

Prior to proceeding with the empirical evidence on the relationship between exchange rates and interest rates it might be useful to highlight some of the main features of the monetary approach which are reflected in equations (11) and (14). First, these equations demonstrate the symmetric roles that are being played by the supplies of domestic and foreign monies and the demands for these monies. Since the demands for monies depend on real variables like real incomes as well as on other real variables which underlie expectations and rates of interest, it is clear that the monetary approach does not imply that the exchange rate depends only on the relative supplies of money; nor does it imply that real variables do not affect the equilibrium exchange rate. Second, from the policy perspective the monetary approach brings to the forefront the implications of the homogeneity postulate: ceteris paribus a rise in the quantity of money results in an equiproportionate rise in the exchange rate. This illustrates the intimate connection between monetary policy and exchange rate policy. Third, the positive relationship between interest rates and exchange rates and the central role played by inflationary expectations imply that policies which attempt to induce an appreciation of the currency should aim at reducing inflationary expectations. The reduction in inflationary expectations would halt the depreciation of the currency in terms of goods and in terms of foreign exchange, and would result in lower nominal rates of interest while maintaining (or even raising) real rates of interest.

The discussion in the second section and, in particular, the contributions by Mussa (1977, 1979a) and Dornbusch (1978) emphasized that the predominant cause of exchange rate movements is news which could not have been anticipated. It was also argued in the second section that the forward rate seems to summarize the information that is available to the market when the forward rate is being set. We may therefore express the spot rate at period t as a function of factors which have been known in advance and are summarized by the lagged forward rate, as well as a function of the "news."

$$15) \ln S_t = a + b \ln F_{t-1} + \text{"news"}$$

The empirical difficulty is in identifying the variable which measures the "news." Assuming that asset markets clear relatively fast and that the "news" is immediately reflected in (unexpected) changes in the rates of interest we may write equation (15) as

$$16) \ln S_t = a + b \ln F_{t-1} + \alpha [(i - i^*)_t - E_{t-1}(i - i^*)_t]$$

where the bracketed term denotes the innovation in the interest differential and where $E_{t-1}(i - i^*)_t$ denotes the interest differential which is expected to prevail in period t based on the information available at $t - 1$. The expected interest rate differential was computed from a regression of the interest differential on a constant and on two lagged values of the differential.¹² The previous analysis of the relationship

¹²An alternative way to compute the expected differential would use data on the term structure of interest rates. Since data on the differential of 2-month rates are not readily available, this computation would require interpolations.

between interest rate differential and the exchange rate implies that the coefficient α is expected to be positive.

Table 4 reports the OLS estimates of equation (16) for the three exchange rates over the period June 1973-July 1979. As may be seen, in all cases the coefficients of the unexpected interest differential are positive and in most cases the coefficients are statistically significant. In order to verify the importance of using the series of innovations in the interest differential, Table 4 also reports estimates of regressions which replace the innovations by the actual series of the interest differential as well as regressions which include both the innovation and the actual differential. In all cases the coefficients of the actual interest differential do not differ significantly from zero.¹³ To allow for a simultaneous determination of interest rates and exchange rates, equation (16) was also estimated using a two-stage-least-squares estimation procedure. These results are reported in Table 5, and again in all cases the coefficients of the unexpected interest differential are positive. These coefficients are highly significant in the Dollar/Pound exchange rate but insignificant in the other two rates. On the whole, the record shows that during the 1970s exchange rates and interest rate differential have been associated positively and thus indicating that during that inflationary period the same factors which induced a rise in the interest differential also induced a rise in the spot exchange rates. Furthermore, consistent with

¹³In order to check whether the dollar rescue policies of November 1978 have had a systematic effect on the estimates, these regressions were also estimated for the period up to September 1978. The results did not change materially.

Table 4
Interest Rate Differentials and Exchange Rates
Monthly Data: June 1973 - July 1979
(standard errors in parentheses)

Dependent Variable $\ln S_t$	Constant	$\ln F_{t-1}$	$(1-i^*)_t$	$[(1-i^*)_t - E_{t-1}(1-i^*)_t]$	s.e.	R ²	D.W.
Dollar/Pound							
	.032 (.019)	.959 (.025)	.017 (.096)		.027	.95	1.73
	.030 (.017)	.961 (.024)		.388 (.165)	.026	.96	1.77
	.019 (.019)	.968 (.024)	-.155 (.111)	.546 (.199)	.026	.96	1.80
Dollar/Franc							
	-.335 (.100)	.776 (.067)	.184 (.125)		.029	.79	2.11
	-.301 (.079)	.801 (.051)		.377 (.132)	.028	.81	2.22
	-.231 (.104)	.851 (.070)	.195 (.188)	.540 (.206)	.028	.81	2.32
Dollar/DM							
	-.070 (.43)	.926 (.045)	.237 (.229)		.032	.93	2.02
	-.037 (.027)	.955 (.032)		.601 (.271)	.031	.94	2.08
	-.040 (.046)	.952 (.047)	.024 (.290)	.583 (.349)	.031	.94	2.08

NOTE: Interest rates are the one-month (annualized) Euromarket rates. The expected interest rate differential $E_{t-1}(1-i^*)_t$ was computed from a regression of the interest differential on a constant and on lagged values of the differential. $(1-i^*)_t$ denotes actual interest rate differential where i denotes the rate of interest on securities denominated in U.S. dollars and i^* denotes the rate of interest on securities denominated in foreign currency. $\{(1-i^*)_t - E_{t-1}(1-i^*)_t\}$ denotes the unexpected interest rate differential.

Table 5
Interest Rate Differential and Exchange Rates
Monthly Data: June 1973 - July 1979; Instrumental Variables
(standard errors in parentheses)

Dependent Variable $\ln S_t$	Constant	$\ln F_{t-1}$	$(1-i^*)_t$	$[(1-i^*)_t - E_{t-1}(1-i^*)_t]$	s.e.	R ²	D.W.
Dollar/Pound							
	.020 (.020)	.966 (.026)	-.153 (.117)		.027	.95	1.69
	.027 (.016)	.965 (.022)		.435 (.164)	.024	.97	1.79
	.017 (.017)	.971 (.022)	-.142 (.098)	.425 (.160)	.023	.97	1.78
Dollar/Franc							
	-.145 (.125)	.909 (.085)	-.301 (.234)		.036	.69	2.18
	-.279 (.081)	.816 (.053)		.216 (.165)	.029	.80	2.22
	-.184 (.126)	.883 (.086)	-.260 (.225)	.165 (.199)	.034	.73	2.21
Dollar/DM							
	-.006 (.047)	.987 (.049)	-.135 (.307)		.034	.92	2.11
	-.040 (.031)	.951 (.036)		.555 (.380)	.034	.92	2.07
	-.040 (.053)	.951 (.055)	-.001 (.003)	.555 (.402)	.034	.92	2.07

NOTE: Interest rates are the one-month (annualized) Euromarket rates. The expected interest rate differential $E_{t-1}(1-i^*)_t$ was computed from a regression of the interest differential on a constant and on two lagged values of the differential. Two-stage least squares estimation method was used. The instruments for the interest differential were a constant and two lagged values of the differential and the instruments for the unexpected differential were a constant and Durbin's rank variable $(1-i^*)_t$ denotes actual interest rate differential where i denotes the rate of interest on securities denominated in U.S. dollars and i^* denotes the rate of interest on securities denominated in foreign currency. $[(1-i^*)_t - E_{t-1}(1-i^*)_t]$ denotes the unexpected interest rate differential.

the hypothesis that current changes in exchange rates are primarily a response to new information, the evidence shows the importance of the innovations in the interest differential.

The principle that current exchange rates already reflect expectations concerning the future course of events implies that changes in exchange rates are primarily due to innovations. In the present section this principle was applied to the analysis of the relationship between exchange rates and interest rate differential. The principle, however, is general. For example, it implies that the relationship between a deficit in the balance of trade and the exchange rate depends crucially on whether the deficit was expected or not. A deficit that was expected may have no effect on the exchange rate since the latter already reflected these expectations. In contrast, an unexpected deficit in the balance of trade may contain significant new information that is likely to induce a strong effect on the exchange rate.¹⁴

EXCHANGE RATES AND PRICES

One of the striking facts concerning the relationship between prices and exchange rates during the 1970s is the extent to which the evolution of prices and exchange rates have not coincided. The originators and proponents of the purchasing power parity doctrine (Wheatley and Ricardo during the first part of the 19th century and Cassel during the 1920s) have viewed the doctrine as an extension of the quantity

¹⁴For a further elaboration on the relationship between exchange rates, and the current account, see Dornbusch and Fischer (1978) and Rodriguez (1978). For a special emphasis on the role of innovations in the trade balance, see Mussa (1979c) and for empirical evidence, see Hakkio (1979b).

theory of money to the open economy. By now the consensus seems to be that purchasing power parities can be expected to hold in the long-run, if most of the shocks to the system are of a monetary origin which do not require changes in relative prices. To the extent that most of the shocks reflect "real" changes (like differential growth rates among sectors), the required changes in sectoral relative prices may result in a relatively loose connection between exchange rates and aggregate price levels. The experience during the 1970s illustrates the extent to which real shocks (oil embargo, supply shocks, commodity booms and shortages, differential productivity growth) result in systematic deviations from purchasing power parities. As illustrated in Figures 2-4, short-run changes in exchange rates have not been closely linked to short-run differentials in the corresponding national inflation rates, particularly as measured by consumer price indices. Furthermore, this loose link seems to be cumulative. As illustrated in Figures 5-7, divergences from purchasing power parities, measured in terms of the relationship between exchange rates and the ratio of consumer price indices, seem to persist.

The loose link between prices and exchange rates is illustrated in Table 6 which reports the results of regressions of changes in the exchange rates on changes in (wholesale) prices. As may be seen, for the Dollar/Pound and the Dollar/Franc exchange rate, the slope coefficients are very close to unity; for the Dollar/DM exchange rate the slope coefficient is less close to unity. Furthermore, in all cases the parameter estimates are extremely imprecise. The results are even poorer when the wholesale price indices are replaced by the cost of living indices. It should be noted, however, that to some extent this

Table 6
Relative Purchasing Power Parity; Instrumental Variables
Monthly Data: June 1973 - July 1979
(standard errors in parentheses)

Dependent Variable $\Delta \ln S_t$	Constant	$\Delta \ln(P_w/P_w^*)$	s.e.	D.W.
Dollar/Pound	.003 (.005)	.999 (.653)	.039	1.71
Dollar/Franc	-.001 (.004)	.891 (.682)	.030	2.38
Dollar/DM	-.001 (.008)	1.313 (2.057)	.036	1.92

Note: $\Delta \ln S_t$ and $\Delta \ln(P_w/P_w^*)$ denote, respectively, the percentage change in the spot exchange rate and in the ratios of the wholesale price indices. s.e. is the standard error of the regression. Two stage least-squares estimation method, is used; the instruments are a constant, time, time squared, and lagged values of the dependent and independent variables.

phenomenon is specific to the 1970s. During the floating rates period of the 1920s, the doctrine of purchasing power parities seems to have been much more reliable.¹⁵

The discussion in the second section emphasized that in periods which are dominated by "news," which alters expectations, exchange rates (and other asset prices) are expected to be highly volatile. Aggregate price indices, on the other hand, are not expected to reveal such a degree of volatility since they reflect the prices of goods and services which are less durable and, therefore, are likely to be less sensitive to the news which alters expectations concerning future course of events. It follows, therefore, that in periods during which there is ample "news" which cause large fluctuations in exchange rates, there will also be large deviations from purchasing power parities.¹⁶ The different degrees of volatility of prices and exchange rates are illustrated in Table 7, which reports the average absolute monthly percentage changes in the various exchange rates and prices. As is evident, the mean absolute change in the various spot exchange rates has been about 2 percent per month (and even slightly higher for the changes in the forward rate). The magnitudes of these changes have been more than double the magnitudes of the changes in most of the various price indices, as well as in the ratios of national price levels. For example,

¹⁵For evidence see Frenkel (1976, 1978, 1980b) and Krugman (1978).

¹⁶On this, see Mussa (1979a). It is noteworthy that the emphasis in the text has been on the words large fluctuations; this should be contrasted with periods during which there are large secular changes in the exchange rate (like the changes which occurred during the German hyperinflation). During such periods the secular changes do not stem necessarily from "news" and need not be associated with deviations from purchasing power parities.

Table 7

Mean Absolute Percentage Changes in Prices and Exchange Rates
 Monthly Data: June 1973 - July 1979

Country	Variable					
	WPI	COL	Stock Market	Exchange Rates Against the Dollar		COL/COL _{US}
				spot	forward	
.	.009	.007	.037	-	-	-
.	.014	.012	.066	.021	.021	.007
nce	.011	.009	.054	.020	.021	.003
many	.004	.004	.030	.024	.024	.004

Note: All variables represent the absolute values of monthly percentage changes in the data. WPI denotes the wholesale price index and COL denotes the cost of living index. Data on prices and exchange rates are from the IMF tape (May 1979 version). The stock market indices are from Capital International Perspective, monthly issues.

the mean monthly change in the cost of living price index was .4 percent in Germany, .7 percent in the U.S., .9 percent in France and 1.2 percent in the U.K. These differences are even more striking for the detrended series.

The notion that exchange rates have been volatile is clearly illustrated by Figures 2-4 and by Table 7. The comparison of the magnitudes of the changes in the exchange rates with the magnitudes of the changes in the price indices and in the ratios of national price levels may suggest, according to a narrow interpretation of the purchasing power parity doctrine, that exchange rate fluctuations have been "excessive." The previous discussion, however, has emphasized that exchange rates, being the relative prices of assets, are fundamentally different from the price indices of goods and services and, therefore, are expected to exhibit a different degree of volatility in particular during periods that are dominated by "news." An alternative yardstick for measuring the degree of exchange rate fluctuations would be a comparison with prices of other assets. Indeed, while exchange rate changes have been large relative to changes in national price levels, they have been considerably smaller than changes in the prices of other assets like gold, silver, many other commodities that are traded in organized markets, and common stocks. For example, Table 7 also reports the mean absolute monthly percentage change in stock market indices. As may be seen, the mean monthly change in these indices ranged from over 3 percent in Germany to over 6 percent in the U.K. By these standards it is difficult to argue that exchange rates have been excessively volatile.

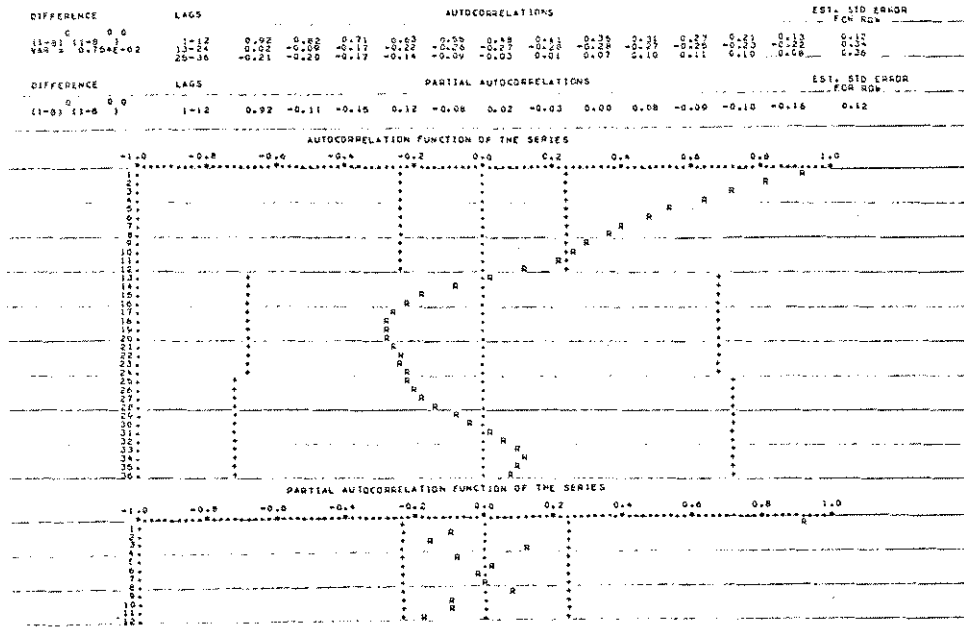
The fundamental difference between the characteristics of exchange rates and national price levels is also reflected in their time series properties. The monthly changes in exchange rates exhibit little or no serial correlation while national price levels do exhibit a degree of serial correlation. The serial correlation of national price levels has been rationalized in recent macroeconomic theorizing in terms of costs of price adjustment, the existence of nominal contracts, confusion between relative and absolute prices and confusion between permanent and transitory changes. This difference between the time series properties of exchange rates and prices is reflected in the low correlation between the practically random month-to-month exchange rate changes and the serially correlated differences between national rates of inflation.

Given the short-run deviations from purchasing power parities, it is relevant to explore whether these deviations tend to diminish with time or tend to persist or even grow in size. In order to examine the patterns of the deviations, I have computed the autocorrelation functions and the partial autocorrelation functions of these deviations for the wholesale and the cost of living price indices. The deviation from purchasing power parities during month t is denoted by Δ and is defined as:

$$(17) \quad \Delta_t = \ln S_t - \ln(P/P^*)_t.$$

Figures 12-14 illustrate the patterns of the deviations for the three exchange rates. As may be seen, the general pattern is very similar for the three exchange rates and for the two price indices. In all cases the autocorrelation function tails off at what seems to be an

Figure 12
The Dollar/Pound: Deviations from PPP with Wholesale Price Indices



The Dollar/Pound: Deviations from PPP with Cost of Living Indices

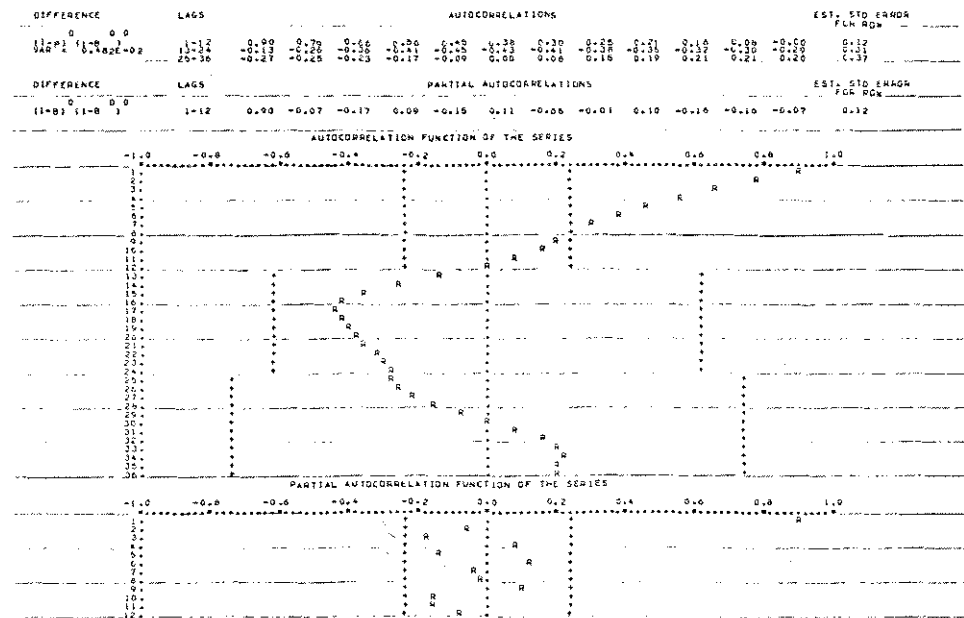
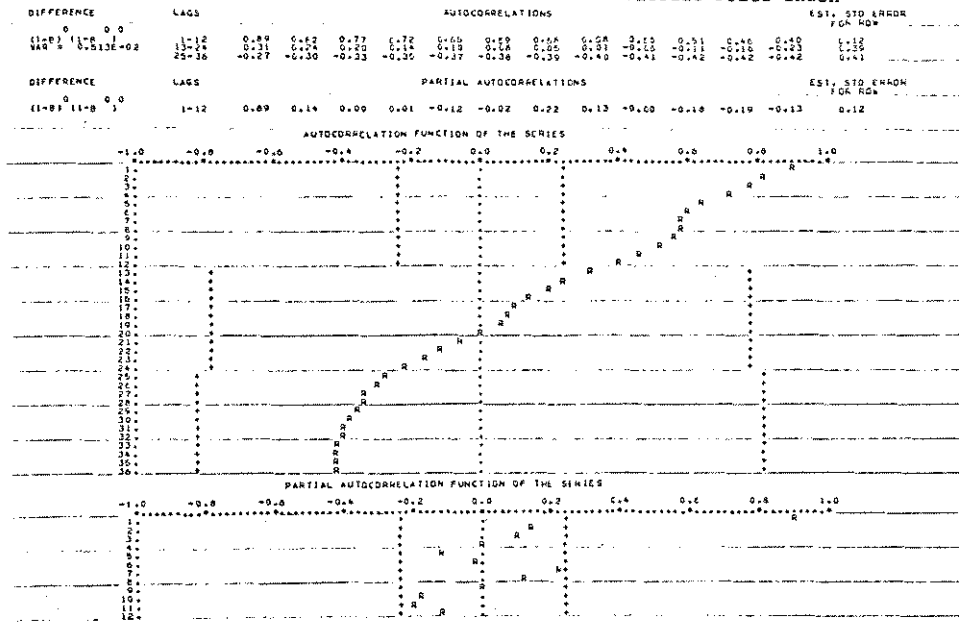


Figure 13

The Dollar/Franc: Deviations from PPP with Wholesale Price Index



The Dollar/Franc: Deviations from PPP with Cost of Living Indices

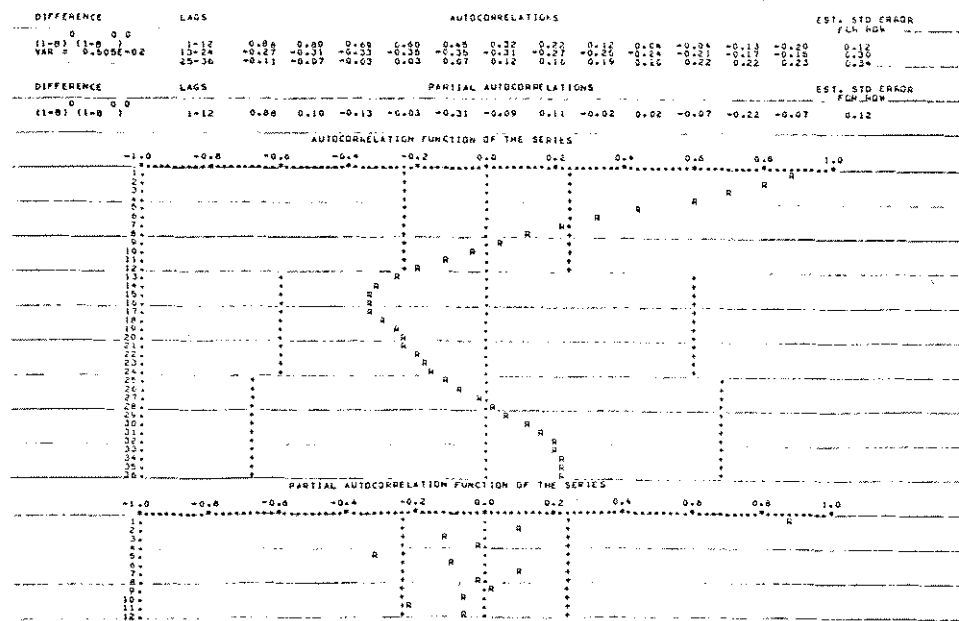
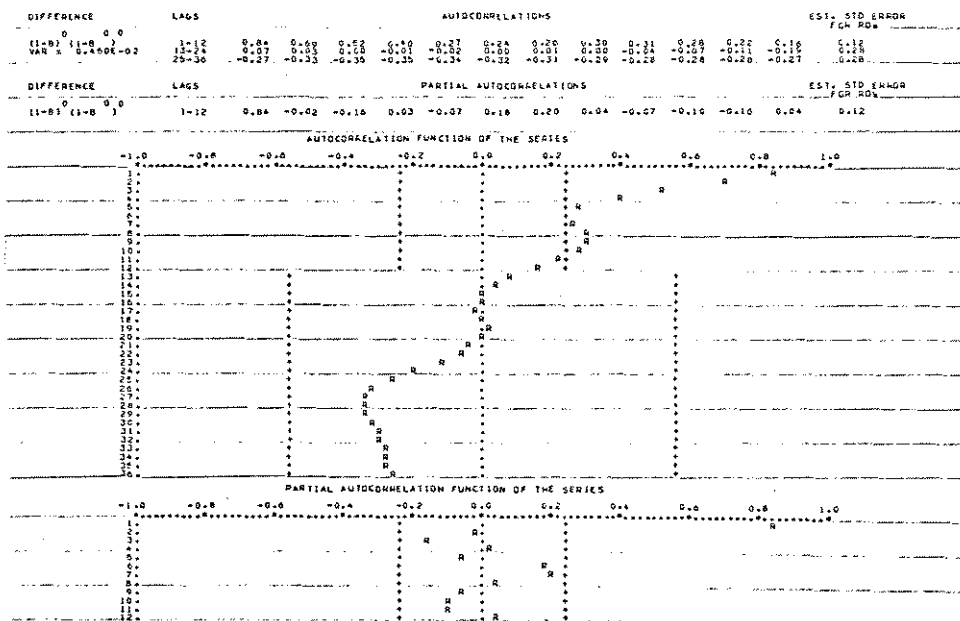
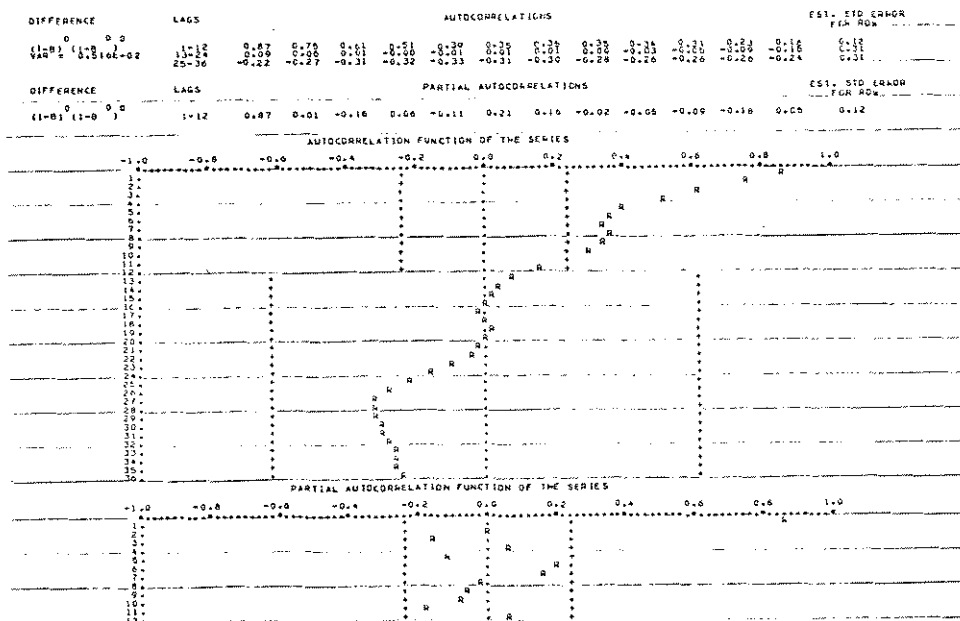


Figure 14
The Dollar/DM: Deviations from PPP with Wholesale Price Indices



The Dollar/DM: Deviations from PPP with Cost of Living Indices



exponential rate and, in all cases, the partial autocorrelation function shows a spike at the first lag. This pattern seems to indicate (as might have been expected on the basis of the time series properties of exchange rates and price indices) that the deviations from purchasing power parities follow a first order autoregressive process. It is noteworthy, however, that in all cases the value of the autoregression term is about 0.9, indicating the possibility that the series may not satisfy the stationarity requirement. To allow for this possibility, I have also examined the autocorrelation functions and the partial autocorrelation functions of $\Delta_t - \Delta_{t-1}$, i.e., of the first difference of the deviations from purchasing power parities. The results indicate that these differences are serially uncorrelated, thus implying that the deviations Δ_t follow a random walk process.¹⁷ In view of this possibility, I conclude that the deviations from purchasing power parities seem to follow a first order autoregressive process but that the data do not provide sufficient evidence to reject the alternative hypothesis of a random walk. Finally, it may be noted that the main difference between accepting the AR(1) rather than the random walk hypothesis relates to the economic interpretation of the two alternative processes. The random walk process implies that deviations from purchasing power parities do not tend to diminish with the passage of time while the stable AR(1) process implies that there are mechanisms which operate to ensure that in the long-run purchasing power parities

¹⁷If the deviations follow a random walk process, then they do not entail (ex ante) unexploited profit opportunities. For an analysis of equilibrium deviations from purchasing power parities, see Saidi (1977).

are satisfied. For the purpose of forecasting the near future, however, there is a very little difference between using the AR(1) process with an autoregressive coefficient of 0.9 and using the random walk process.

CONCLUDING REMARKS

In this paper I examined some aspects of the operation of flexible exchange rates. The analysis was based on the experience of the 1970s. The principle conclusions which may be drawn from the empirical work are:

- (1) In spite of the extraordinary turbulence in the markets for foreign exchange, it seems that to a large extent the markets have operated efficiently. It should be noted, however, that in this context the concept of "efficiency" is somewhat narrow in that it only refers to the notion that the markets do not seem to entail unexploited profit opportunities. A broader perspective should deal with the social cost of volatility in terms of the interference with the efficiency of the price system in guiding resource allocation, as well as with the cost of alternative outlets for the disturbances that are currently reflected in the volatility of exchange rates.
- (2) The high volatility of exchange rates (spot and forward) reflect an intrinsic characteristic of the relative price of monies and other assets. The price of gold and the price of stocks as well as exchange rates between national monies depend critically on expectations concerning future course of events, and adjust rapidly in response to new information. In this

perspective the exchange rate (in contrast with the relative price of national outputs) is being viewed as a financial variable.

- (3) During inflationary periods variations in nominal rates of interest are dominated by changes in inflationary expectations; as a result, high nominal rates of interest are expected to be associated with high exchange rates (a depreciated currency). This relationship was demonstrated within the analytical framework of the monetary approach to the exchange rate, and was supported by the empirical work. In this context the key finding was the dependence of exchange rate changes on the changes in the rates of interest. This finding is in accord with the analytical prediction that current exchange rates already reflect current expectations about the future while changes in the current exchange rates primarily reflect changes in these expectations which, by definition, arise from new information.
- (4) The experience of the 1970s does not support the predictions of the simple version of the purchasing power parity doctrine which relates the values of current prices to current exchange rates. The empirical work showed that deviations from purchasing power parities can be characterized by a first order autoregressive process.

One of the key analytical insights that is provided by the monetary (or the asset market) approach to the exchange rate is that exchange rates reflect not only current circumstances but also those circumstances which are expected to

prevail in the future. This anticipatory feature of the exchange rate (which is emphasized by Mussa, 1979b) does not characterize (at least to such a degree) the prices of national outputs. As a result, during periods which are dominated by frequent changes in expectations about the future, one may expect to find frequent deviations from purchasing power parities when the latter are computed using current prices.¹⁸

¹⁸This phenomenon was recognized by Gustav Cassel -- the most recognized proponent of the purchasing power parity doctrine. Since this paper was prepared for presentation on October 20, 1979 -- the date of Cassel's birthday (Cassel was born on October 20, 1866) it seems appropriate to conclude with the quote that reflects this key idea.

The international valuation of the currency will, then generally show a tendency to anticipate events, so to speak, and become more an expression of the internal value that the currency is expected to possess in a few months, or perhaps in a year's time (Cassel, 1930, pp. 149-50).

DATA APPENDIX

1. Exchange Rates

The spot exchange rates are end-of-month rates obtained from the IMF tape (May 1979 version, updated to July 1979 using the November 1979 issue of the International Financial Statistics) obtained from the International Monetary Fund. The forward exchange rates are end-of-month rates for one month maturity. The forward rates for the U.K. Pound and the DM for the period June 1973 - June 1978 are bid prices obtained from the International Money Market (IMM). For the period July 1978 - July 1979 they are sell prices obtained from the Wall Street Journal. The forward rates for the French Franc for the period June 1973-July 1974 are bid prices calculated from the Weekly Review publication of the Harris Bank which reports the spot rate and the forward premium; in each case the closest Friday to the end of the month was chosen. For the period August 1974 - June 1978 the rates are bid rates obtained from the IMM and for the period July 1978 - July 1979 they are sell prices obtained from the Wall Street Journal.

2. Prices

The wholesale and cost of living price indices are period averages obtained from the IMF tape, lines 63 and 64, respectively.

3. Rates of Interest

All interest rates are 1-month Eurocurrency rates obtained from the Weekly Review of the Harris Bank. In all cases the figures used correspond to the last Friday of each month.

4. Stock Markets

The stock market indices correspond to the last trading day of the month. The sources are Capital International Perspective, Geneva, Switzerland, monthly issues.

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INTERNATIONAL STABILIZATION POLICY UNDER FLEXIBLE EXCHANGE RATES

H. Robert Heller

Being the only speaker at this conference to represent the business sector, I will focus my remarks on the effects of the flexible exchange rate system -- as it has operated throughout the seventies -- on the business sector. In particular, I will discuss three aspects of the topic: First of all, I will address myself to the question of whether the flexible exchange rate system and its actual operation in the years since 1971 have served the economy, and in particular, the business sector well. Second, I will offer my views as to what policy changes would improve the operation of the present system. Third, I will adopt a longer perspective and indicate what international monetary reforms might improve the operation of the system.

THE CONSEQUENCES OF FLEXIBLE EXCHANGE RATES

The operation of the flexible exchange rate system since 1971 has entailed a significant increase in costs to the business sector. In particular, there are adverse effects on international trade, international capital movements, and foreign investment. I will also argue that the increased costs to the private sector were not offset by a greater freedom for the policymakers to pursue more appropriate macro-economic stabilization policies or other direct savings realized by the public sector.

Dr. Heller is Vice President for International Economics, Bank of America, NT + SA, San Francisco, California.

But I should like to make it clear at the outset that there are at present no viable alternatives to the flexible exchange rate system. As long as there are large differences in inflation rates among nations, a fixed exchange rate system will not be viable. What we perceive as the cost of flexible exchange rates is therefore truly the cost associated with high and differential inflation rates. Nevertheless, the flexible exchange rate system does little to make countries adopt non-inflationary policies. It is in that sense that the flexible exchange rate system has also been associated with fluctuating exchange rates and the costs thereof.

International Trade

The thesis has been advanced that flexible exchange rates discourage foreign trade. There are several reasons for expecting a dampening effect on foreign trade under a system of flexible exchange rates.

First of all, there is simply the increased uncertainty of exchange rate fluctuation that will have to be borne by one or the other party to trade transactions. It is important to note that we are not involved in a zero-sum game here. While in simple arithmetic terms one party's gain must be the other party's loss, the increased uncertainty will affect both parties to the transaction. As long as people are risk-averse, there will be a net loss because the welfare losses associated with a 50/50 chance of losing one million dollars are greater than the welfare gains of a 50/50 chance of winning one million dollars. That's the reason why we find few corporate presidents wagering last quarter's corporate earnings on a double or nothing bet on the outcome of this weekend's football game or at the roulette wheels in Las Vegas.

Second, while it is possible to engage in forward currency transactions to eliminate the foreign exchange risk, one should keep in mind that there is not only a brokerage cost associated with these transactions, but that there exist no organized forward markets for the vast majority of currencies -- especially those of the developing countries. The system therefore has an inherent bias against trade with the developing countries -- some of which have the widest exchange rate fluctuations due to their high inflation rates.

Third, there is the natural competitive instinct that makes the businessman think -- "maybe I should wait one more week before I cover in the forward market to obtain a better rate. Or worse yet, if I cover this week, and my competitor obtains a better forward rate next week, then I will lose the contract altogether." If the rate turns in a disadvantageous direction, the businessman may then not even bid on the contract.

Fourth, there are costs for the individual firm associated with the necessity to collect information on exchange rates, to ensure that proper accounting and legal procedures are followed, to maintain staff to call up the banks, make appropriate calculations, keep records, and perhaps even hire an economist or consulting firm to prepare a foreign exchange forecast.

All these costs are deadweight losses to the private sector as a whole, because we are playing a zero sum game where one firm's foreign exchange gains will be another firm's foreign exchange losses. Gone are the good old days when one merely had to outwit the central bank that could not make up its mind as to how much longer it should attempt to maintain an exchange rate that had long ago become unrealistic.

Instead, the private sector has to maintain all the required ancillary services just in an attempt to stay even and not to wind up on the losing side of the currency seesaw.

United States businessmen are particularly affected by the introduction of flexible exchange rate because most international trade used to be denominated in U.S. dollars. Now, only half of world trade is denominated in dollars and half in other currencies.

In particular, firms entering new markets often find that they have to adapt to local conditions if they wish to penetrate new markets. National pride of some of the newly developing countries may also play an important role in their insistence to utilize their own currency to an increasing extent.

While some empirical studies failed to find an effect of flexible exchange rate on the volume of international trade, I find this evidence hard to believe.

The simplest of all possible calculations show that foreign trade increased at an annual rate of 8.8 percent in real terms during 1963-73, while the rate of increase in 1973-75 amounted to only 4.3 percent per annum. That is, the rate of increase in the volume of international trade was cut in half under the flexible exchange rate system. While it is true that this does not imply that the flexible exchange rate system caused this decline, -- and I will have to say more on that topic later -- it is certainly true that the flexible exchange rate system did not prevent the decline in the trade volume either.

Finally, I need not point out that the myth that flexible exchange rate would always balance our international trade is nothing but that -- a myth. People who drew the opposite conclusion from textbooks in

international economics forgot to read the fine print: namely that it was assumed that there were no international capital movements. Only in such a world can perfect purchasing power parity hold and will imports automatically be balanced by exports of equal value.

In the real world, capital movements are very much with us, and they are not so much determined by actual international price differentials, but by the expectation of price level changes at some future date.

Capital Movements

This brings me to the second major point to be covered: the impact of flexible exchange rate on international capital movements.

First of all, it is clear by now that international capital movements have not served as the great stabilizer of exchange rates that they are supposed to be. According to theory, well-informed private speculators will act to stabilize the exchange rate, buying the currency when it is low and selling it when it is high. But who are these well-informed speculators? The actors with the greatest amount of expertise in the area, the large commercial banks, are highly reluctant to take open foreign exchange positions. They are trade-oriented, not speculation-oriented. Much more money is to be made by actively trading in the market, and earning a small spread on each transaction than by maintaining an open position and hoping for the best. The situation is not unlike the one of a grocery store owner, who makes his money buying and selling tomatoes, and not by hoping to make a killing in the market when the tomato crop in Mexico goes sour and the price skyrockets. U.S. Treasury data show that on average U.S. commercial banks were

holding less than \$100 million in open foreign exchange positions. This aggregate amount for all U.S. banks is not much larger than some of the individual transactions foreign exchange traders are called upon to execute.

This leaves private corporations and individuals as the potential market stabilizers. While corporations do take foreign exchange positions, they are typically designed to offset some commercial transactions rather than as a deliberate attempt to take an open position. The corporate treasurer who attempts to make a career out of realizing foreign exchange profits is a rare, and probably short-lived, breed. Instead, the typical corporate strategy can more properly be described as one of foreign exchange loss-avoidance rather than of foreign exchange speculation.

The final group -- private individuals -- is certainly increasingly active in the market. They are probably more active in the organized non-bank foreign exchange markets, such as the IMM (International Monetary Market, a division of the Chicago Mercantile Exchange) than in the commercial bank market. Prior to the Herstatt calamity, private speculators had access to the bank market largely through small banks. Since 1974 most major banks have reduced the foreign exchange lines made available to the smaller banks, thereby sharply limiting their access to the interbank market. Consequently, most individuals are active in the IMM and the New York exchanges. As a rough generalization, it may be said that these exchanges are equal to the transactions carried out by one major U.S. bank as far as its influence on the market is concerned.

Considering all this, it still remains true that a speculator is able to make profits more consistently by running with the markets rather than by taking a position and hoping for a turn-around in the market. To try to pinpoint market turn-arounds is exceedingly difficult as everyone who has tried his luck at it knows.

The upshot is that the herd instinct in foreign exchange markets is still very powerful and the well-informed speculating loner is the exception rather than the rule. Consequently, speculative activity may well accentuate rather than reduce exchange rate fluctuations.

Investment

The uncertainty surrounding the exchange value of the currencies has also taken its toll on the willingness of investors to engage in foreign direct investments and in long-term construction activity abroad.

Increasingly, foreign countries insist on denominating long-term construction contracts in their own currency, forcing the American businessman to shoulder the foreign exchange risk. Foreign direct investment and long-term construction projects that may take five or even ten years to complete are particularly affected by the exchange rate uncertainty because there are no organized forward markets in which such long-term exposures may be hedged. In addition, many of these projects are located in countries for whose currencies not even regular forward markets or capital markets exist, thereby making hedging an impossibility. Under such circumstances the only options open to the businessman are to assume the foreign exchange risk or to forget about the contract.

Foreign investment activity is also greatly complicated by changing currency values. What might be a profitable foreign operation at one exchange rate may rapidly become unprofitable as the foreign exchange rate changes. In addition, arbitrary accounting rules -- such as FASB 8 -- may have significant impact on a firm's profit and loss position regardless of the profitability of the underlying manufacturing activities. At best, the effects of exchange rate changes on the balance sheet make it much more difficult to evaluate the profitability of the investment. At worst, it leads to erroneous investment decisions and ultimately a retreat from international activities.

The Public Sector

The question arises whether the additional costs imposed upon the private sector of the economy are counterbalanced by benefits to the public sector of the economy. While this is a difficult question to answer, I believe that it must be answered in the negative.

Benefits may accrue to the economy by the creation of an economic environment that would bring about a greater freedom to pursue appropriate economic policies, foster higher growth, or lessen inflationary pressures. On all these counts the actual experience with flexible exchange rates has been discouraging. Of course, the ultimate proof of any of these propositions is impossible to attain. It would require a replay of history under a fixed exchange rate regime -- and that is clearly impossible.

Economic inference makes it also difficult to see why a floating exchange rate regime should be characterized by high growth and little inflation. The fundamental point is that the flexible exchange rate

system does not lessen the balance of payments constraint -- it merely changes its nature.

It is difficult to decide whether a loss of foreign exchange reserves or a fall in the foreign exchange rate provides a more rigid policy constraint. But while the loss of foreign exchange reserves under a fixed exchange rate system provides not only a self-limiting constraint in that no country has either unlimited reserves or unlimited access to international credit, the loss of reserves eventually forces the adoption of a more restrictive monetary policy which will tend to bring the country in line with the global inflation rate.

Flexible exchange rates do not have such self-limiting properties, and it has instead been suggested that the depreciation of a currency may well lead to the development of vicious circles where currency depreciation brings about more inflation because of its immediate impact on the price of imported commodities. The rekindled inflationary forces in turn may force a further depreciation and so on.

While the statistical evidence on the validity of this theory is far from complete and doubtful, it stands to reason that a fixed exchange rate system operates as an equalizer of international inflation differentials, while a flexible exchange rate system tends to accentuate inflation differentials.

As far as the international businessman is concerned, it is clear which one constitutes the more attractive environment: given a choice between similar -- even if high -- inflation rates in all countries and an environment of widely divergent inflation rates, the businessman is likely to choose the former one.

However, it is questionable which one of the two alternatives is best for all people of the world.

For the central banker, floating rates do not seem to have brought a more relaxing lifestyle either. Gross foreign exchange market intervention on behalf of central banks amounted to a record of \$72 billion dollars in the half year ending July 31, 1979. To put this number into proper perspective, let us remind ourselves that the total foreign exchange reserves of all countries in the world totalled the same amount in 1971, the last year of the fixed exchange rate system. Increasing, rather than less, official intervention has been the hallmark of the flexible exchange rate system in the seventies.

The International Monetary System

The exchange value of the dollar against the DM (deutsche mark) or SFR (Swiss franc) has been cut in half over the last decade. That such a precipitous decline in the value of the world's leading reserve currency cannot be without impact on the role of this currency in the world and on the international monetary system itself goes without saying.

A superficial glance at the percentage of official foreign exchange reserves held in the form of dollars shows that the market share of the dollar has remained virtually constant at 80 percent. However, these figures are -- in my opinion -- highly misleading. While high U.S. Treasury officials have argued that the dollar purchases on behalf of foreign central banks were proof of their confidence in the U.S. dollar, it is probably more appropriate to argue that these official dollar purchases were largely the result of intervention designed to stop an even further slide of the dollar. The foreign central banks

were the reluctant victims of a declining dollar and not the exuberant investors they are made out to be.

In fact, foreign central banks of floating currency countries have reduced the share of dollars in their foreign exchange reserve portfolio from over 90 percent in 1970 to less than 75 percent in 1976. So have the central banks of countries other than the main industrialized countries, who acquired the dollars as a result of their intervention policy. In other words, those central bankers that were free to consider the dollar as a portfolio investment instead of an intervention currency did in fact switch away from the dollar.

The decline of the dollar in official foreign exchange portfolios was also masked to some extent by the even faster decline of the British pound in international significance. Central banks have switched out of pounds and purchased DM over the last decade, so that the position of the pound is now held by the mark. It stands to reason that central banks would have wanted to acquire DM anyhow, and had it not been for the fact that the pound was even weaker than the dollar, the switch out of dollars would certainly have been more pronounced.

In addition to the decline in the value of the U.S. dollar, there are other reasons that make it attractive for central banks to diversify their foreign exchange portfolios to an increasing extent. First of all, it is clear that a diversified currency portfolio increases its overall stability. Second, as exchange rates fluctuate it may be prudent to hold reserves in the currency of one's trading partners. Third, the same argument applies to the denomination of the currency in which the country's external debt is denominated. In that connection it is important to note the very rapid swing away from

dollar-denominated international bond issues in recent years. In 1976 the value of dollar-denominated international bond issues was still three times as large as the value of DM bonds, but by 1978 the DM volume was equal to the dollar volume. Consequently, the need to make amortization and interest payments in marks will continue to increase in the future and with it the desirability of holding marks as liquid reserve assets.

We may therefore conclude that: one, the flexible exchange rate system has been associated with a significant increase in costs to the private sector; two, that it has not brought about a climate for the conduct of more effective stabilization policies; three, that it has not decreased the cost of intervention for central banks; and four, that it has fostered the decline of the dollar as the world's leading currency.

I will now consider several measures that might improve the effectiveness of stabilization policies under the flexible exchange rate system.

IMPROVING THE OPERATION OF THE FLEXIBLE EXCHANGE RATE SYSTEM

At the present time, there exists no viable alternative to the flexible exchange rate system. The main reason for this conclusion is simple: as long as differential inflation rates among countries prevail, it is not possible to impose or to achieve exchange rate stability. The framers of the new Article IV of the IMF (International Monetary Fund) Articles of Agreement were fully aware of this point: exchange rate stability cannot be achieved without internal stability in the relevant economies. To blame the flexible exchange rate system for

the additional costs that have to be borne -- especially by the private sector -- would be to blame the messenger for the bad news.

Nevertheless, there are certain improvements in the operation of the flexible exchange rate system that can be made in order to enhance its effectiveness and to reduce the costs associated with it. These are the lessons we can learn from the experience gained during the seventies to enhance the operation of the international monetary system during the eighties.

It will be convenient to group the suggestions into two broad categories: those pertaining to improving U.S. monetary and exchange rate policy and those relevant for the international monetary system.

Possible U.S. Policy Improvements

It should be feasible to improve U.S. monetary and exchange rate policy with a view towards enhancing the stability of exchange rates.

The first set of suggested steps pertains to the conduct of U.S. monetary policy, and it is gratifying that the Federal Reserve has already announced the adoption of monetary targets and their supremacy over interest rate targets. The experience of having to chase the market interest rates higher and higher during the summer of 1979 while real interest rates remained negative and the money supply grew out of control was an important factor in influencing the October 1979 decision to use bank reserves instead of the Federal Funds rate as an immediate operating target.

Of course, both the Federal Reserve and the other market participants will have to gain experience and confidence in the operation of the new system to ensure its proper functioning. In that connection it

is somewhat disconcerting to note that the introduction of the new system was not handled in a fashion designed to make its implementation as smooth as possible, but was conducted in an abrupt and disruptive fashion that resulted in the introduction of uncertainty, confusion over the intentions of the Federal Reserve, and thereby greater market instability -- the very symptoms that the Federal Reserve action should have helped to alleviate rather than to foster.

Nevertheless, the overall thrust of the new policy is good, and once the dust has settled the targeting on the monetary aggregates should prove to be a significantly better system than the interest-target approach used in the past.

The operation of the system could be further enhanced by the announcement of intermediate range monetary targets as guideposts for the Federal Reserve. Such three to five-year targets could be very helpful in signalling to the private sector the clear intention of the Federal Reserve to reduce monetary growth rates to non-inflationary levels and to provide a framework for orderly and sustained economic growth. Of course, such targets must be strictly adhered to, so that confidence in the policy statements of the authorities will be enhanced. To use the announcement of official targets to influence expectations without appropriate follow-through and implementation merely creates a climate in which all policy pronouncements will be doubted and will therefore become less and less effective.

In that connection it is also important to have a realistic monetary growth target supported by a coordinated fiscal strategy. To announce a reduced monetary growth target while the public sector borrowing requirements are expected to increase drastically might not

constitute a credible policy package in that context. Monetary policy cannot work in isolation and must be seen as one ingredient in a coordinated policy package aimed at achieving economic stability.

The central bank can also play an important role in reducing erratic exchange rate fluctuations as the November 1978 policy actions showed. There is a significant difference between intervention to maintain an exchange rate that has become unrealistic, and intervention to turn around a market trend that has become disequilibrating. Central banks have now learned the lesson that there is little to be gained by trying to maintain an unrealistic exchange rate. Not only are the foreign exchange losses incurred staggering, but the domestic consequences of such ill-advised intervention are also disadvantageous. A central bank that sells its currency in foreign exchange markets to keep it from appreciating increases the monetary base by providing more of its own currency. This in turn increases inflationary pressures at a later date, thereby leading to domestic instability.

Similarly, a central bank that depends on unrealistically high exchange rates will soon find that the foreign exchange reserve losses are staggering and will be forced to permit a more drastic exchange rate realignment at a later date or to impose exchange controls with all undesirable consequences attached to such measures.

In contrast, central bank intervention to turn the foreign exchange market around and to end a trend that has clearly become destabilizing can be highly successful as the November 1978 U.S. policy measures showed. The essential ingredient to the success of such an intervention policy is the simultaneous adoption of domestic monetary policy measures that attack the root cause of the exchange rate

movement. It will be recalled that from November 1978 until April 1979 there was virtually no monetary growth in the U.S. This was taken by the markets as a signal that the Federal Reserve was prepared to pursue a tight, anti-inflationary monetary policy and the dollar remained stable during that period. In April 1979 the money supply again began to grow at an excessive rate, driving up interest rates, increasing inflationary pressures, and bringing the dollar under renewed pressure, thereby necessitating the November 1979 policy actions.

Possible Improvements in the International Monetary System

It is my belief that the world economy could function quite well under a dollar standard, where the dollar is the dominant global unit of account, transaction currency, and store of value. An indispensable precondition for the functioning of such a system is the unquestioned stability of the dollar in terms of real purchasing power. Domestic inflation and the accompanying erosion of the currency's value in foreign exchange and international commodity markets will have the unavoidable consequences of reducing the dollar's international role. The British inflation and decline in the value of the pound resulted in the elimination of that currency from the reserve currency status that it once enjoyed. Continued double-digit inflation in the United States will undoubtedly bring about the demise of the dollar as a reserve currency as well.

It is up to the United States to get its own house in order if she wishes to preserve the international stature of the dollar. The benefits flowing to the international community as a result of such action would undoubtedly be great.

The most likely alternative to a dollar standard is at present the development of a multiple-currency reserve standard, where several currencies, in addition to the dollar, will serve an international role. However, it should be realized that such a multiple-currency standard is inherently unstable and is likely to lead ultimately to severe financial and economic disturbances. For the same reason that bimetallism proved to be unstable, it will be found that relatively small differences in national inflation rates among the different key currencies will lead to relatively large shifts in capital flows among these countries. Such capital flows will exacerbate balance of payments difficulties, as capital is likely to flow into a country that already enjoys a current account surplus. Consequently, exchange rate movements will be accentuated, official intervention will have to become even larger, or capital controls will have to be introduced. Ultimately, it is likely that capital controls cannot be avoided, and the very benefits of a liberal international financial order will be destroyed.

The only feasible realistic alternative to a multiple-currency system is at present a system based on the SDR (Special Drawing Rights). The recent decline of the dollar has consequently led to a renewed interest in the SDR as an international reserve asset. This turn of events is not without irony, because the SDR was born in 1968 out of fear that there might be a shortage of dollars when the U.S. balance of payments would return to surplus. Instead, the SDR is now likely to assume a larger role on the international economic scene because there is a perceived surplus of dollars. The renewed interest in

a dollar/SDR substitution account is the natural outgrowth of these developments.

To move the SDR firmly to the center of the international monetary system would require at least three steps: to base the IMF exclusively on the SDR, to make the SDR usable -- that is transferable -- among private entities, and to make the SDR inflation-proof. Let me briefly elaborate on each one of these points.

Recently, the Economic Counsellor of the IMF, Mr. J. J. Polak, set forth a plan that would make the SDR the centerpiece of all IMF operations. This innovative and farsighted suggestion would significantly enhance the importance of the SDR and make it a more central asset in the international monetary system. In addition, such a move would also have the advantage of unifying many of the Fund operations that are now proliferated among an ever larger and more complex variety of "accounts" and "facilities."

Second, the SDR should be made transferable among private as well as public holders. When the SDR is freely traded in international financial markets its usefulness and liquidity will be greatly enhanced. The SDR is not likely to assume a significant role in world financial markets until it is also used widely for commercial transactions that create a need to effect payments in SDRs. But if SDRs are not freely transferable between private and official holders, it is unlikely that they will assume an important role as an international means of payment. Transferability of the SDR among private parties is therefore essential if the international monetary system is to be based firmly on the SDR.

Third, the SDR should be turned into a true global standard of value by rendering it inflation-proof. Traditionally, gold has fulfilled the role of an international standard of value but official actions and the recent speculative fever have deprived gold of its status as a stable measuring rod. Instead, it has become a highly speculative commodity.

As presently constituted, the SDR offers some protection against the risk inherent in differential inflation rates by providing the holder with a diversified currency basket. But it should be noted that the value of this currency basket in terms of real purchasing power deteriorates along with the weighted average of the inflation rates experienced by the sixteen countries represented in the SDR basket. A superior inflation hedge is always available to the investor -- be it a monetary authority or a private entity -- by not holding the currencies of high inflation countries. The SDR, as presently constituted, forces the investor to accept the depreciating currencies of the high inflation countries that do not enter the SDR interest rate calculations based on the five most important currencies only. Hence, the SDR as presently constituted is not a particularly attractive asset.

The inflation-proofing of the SDR would make it a truly superior international asset that could play an increasingly important role on the world financial scene by providing a universal unit of account, a monetary transaction medium, and a stable store of value. Such an inflation-proofing of the SDR could be accomplished by linking it to a price index of the sixteen countries making up the SDR basket. Of course, there are many operational problems to be considered, but these

are not inherently more complex than those that had to be resolved when the SDR as currently constituted was created.

Of course, there remains a very disturbing thought: If all the individual countries are unwilling or unable to take the necessary steps to bring inflation under control, why should we assume that all these nations acting in concert through an institution would be any more willing or able to act in a manner that would expose their own shortcomings? Nevertheless, it may be possible to achieve an international consensus on the creation of such an asset because the alternative of continued international monetary disruption is associated with high costs for all.

The only other feasible alternative for the eighties is a rapid reduction in the U.S. inflation rate, such that the international role of the dollar will be preserved in the decades to come. Without a stable dollar that can serve as the anchor of the international monetary system there is not likely to be exchange rate stability. The elimination of inflation in the U.S. and in other countries will therefore be a precondition for the improvement of the operation of the international monetary system. Stability cannot be imposed by the international monetary system or found by manipulating the system. International monetary and exchange rate stability can be achieved only by first attaining domestic stability.

FLEXIBLE EXCHANGE RATES AND MONETARY POLICY:
A DISCUSSION OF THE FRENKEL AND HELLER PAPERS

David Laidler

If a conference such as this one, dealing with United States' macro-stabilization policy, had been organized ten years ago it is unlikely that anyone would have suggested devoting an entire session to the operation of the international monetary system. If the suggestion had been made, it would certainly have been greeted with a loud "why?" The very fact that this session is included in this conference epitomizes the most important lesson of all that we have learned about domestic stabilization policy in the last decade--namely that it cannot sensibly be discussed without explicit reference to the international environment within which it is being implemented.

By this I do not simply mean that United States domestic policies have implications for the rest of the world that policymakers should be interested in, or that there are interesting debates about the organization of the international monetary system, the outcome of which will influence the ease with which American business can operate in international markets and which ought therefore to concern American policymakers, though both of these observations are surely true. Rather I mean that the way in which monetary policy impinges upon traditional

Dr. Laidler is Professor of Economics at the University of Western Ontario. This paper draws heavily on work completed under a research grant from the Social Sciences and Humanities Research Council of Canada.

domestic targets, employment, prices and the like, is intimately linked to the operation of the international monetary system.

Since neither of the papers that I am discussing has much to say explicitly about these domestic matters, and that is not to criticize either of them, because one can only say so much in one paper, I believe that it will be useful for me to use these discussant's comments to explore this area in the light of the arguments presented by Frenkel and Heller, rather than to provide a detailed critique of those arguments.

Both of the papers before us deal with the operation of a system of flexible exchange rates. That is only right and proper, given that this is the system (more or less) under which the world is currently operating. However, I believe that it would be wrong for anyone to conclude that the new importance of international factors for United States domestic policy stems from the adoption of a system of flexible exchange rates per se.

In the 1950s and 1960s, United States policymakers were able to operate "as if" the economy they were dealing with was closed, not because the Bretton Woods system was a fixed rate system, but because it was a dollar standard system. As we now know, with the benefit of hindsight, and as some--notably, for example, Robert Triffin (1961)--argued at the time, this did not mean that the United States could indefinitely operate its domestic policies while completely ignoring what in other countries used to be called "the balance of payments constraint." However it did mean that the "constraint" operated sufficiently slowly that, relative to the time horizon for which domestic

stabilization policies are conceived, it seemed unimportant. It would only be if the world were to return to a dollar standard that this happy, for United States policymakers, state of affairs would be restored. However though I understand Robert Heller's nostalgia for such a system, I am much less sanguine than is he about the possibility of the restoration of a dollar standard.

The breakdown of the Bretton Woods system has forcefully reminded us that the amount of seignorage which a banker can extract from his clients depends upon their willingness to pay up. If he tries to extract too much, they will, not without difficulty to be sure, take their business elsewhere. At the risk of oversimplifying, under Bretton Woods, the banker, namely the United States, tried to extract too much seignorage. The current chaotic international monetary system is the result of the customers trying, as best they can, to find somewhere else to do their banking business. A dollar standard is not going to be restored unless it is clear to the rest of the world that the United States has mended its ways, and is not going to repeat its previous policies--either willfully or inadvertently. The only evidence that the past decade has produced to support this view is the recent announcement of monetary policy changes by Mr. Volcker. If that announcement is followed up with action, and past evidence suggests that this cannot be taken for granted, and if the new policies are adhered to long enough to erase the memories of fifteen years of instability, then the possibility of restoring a dollar standard might arise. However, I believe that we would be ill advised to hold our breath in anticipation of the event.

Now this is not to say that the world will inevitably remain on the present flexible exchange rate system into the indefinite future. The problems of operating under such a regime as Heller describes are real ones, although how much they are the result of the flexible exchange rate regime per se, and how much of the underlying monetary instability that forced the adoption of that regime in the first place, is a point that one might want to argue about. There is undoubtedly a demand for a stable monetary unit to serve as a means of exchange, unit of account, and store of value in international transactions, and markets have a way of evolving in order to meet such demands in a manner that verges on the inherently unpredictable. After all, the Bretton Woods system was not designed to put the world on the dollar standard, nor did or indeed could the United States in any way force this outcome; it arose as a result of the voluntary choices of a host of institutions and individuals and the evolution in question only appears inevitable with the benefit of hindsight.

In the current state of knowledge, economic theory enables us to say that, so long as domestic monetary policies remain uncoordinated and unstable, then the international monetary system will also be unstable, whatever its formal institutional framework, and that as such policies become stable and harmonized, then so will the international monetary system become stable and perhaps adopt a new reserve currency, or indeed currencies. It does not enable us to say anything positive about the form that such an evolution is likely to take. Nevertheless, given the array of inflation rates, monetary expansion rates and such at present ruling in various parts of the world, one is tempted to conclude that even the first step towards reestablishing some sort of

unified world monetary system has yet to be taken. The European Monetary System is regarded by some as being the first stage in establishing an important regional base from which such a system might evolve; whether it is or not depends upon whether its members succeed in developing the means to coordinate their domestic policies so as to make them compatible with the maintenance of the System, and they show no signs of doing this.

Be that as it may, as a practical matter any discussion of United States' stabilization policies that is to be of current relevance should take a flexible exchange rate system as its background. Thus the theoretical and empirical material in Frenkel's paper, though it will look rather unfamiliar to many specialists in the analysis of domestic monetary policy, is of considerable relevance to their concerns. I will now turn to some of the issues involved.

It should go without saying that if one is going to discuss the way in which macro-stabilization policies are likely to work against the background of a flexible exchange rate regime, one ought to know something about the way in which the foreign exchange market itself operates. Frenkel deals with this matter from the point of view of what may be referred to as the "Asset Market Approach" to exchange rate theory, an approach which beyond doubt provides a simple and powerful method of analyzing the problem area. Nevertheless, anyone reading Heller's paper immediately after Frenkel's must wonder where many of the concerns he raises, particularly about the large amount of dollar-denominated assets held abroad, fit into Frenkel's analysis. I believe that the answer here is that, although the theoretical framework which

underlies Frenkel's work can deal with these issues, the particular "monetary" version of the asset market approach which he explicitly sets out does so only implicitly, and in a way that his empirical evidence suggests is inadequate.

The basic monetary model of the exchange rate is simplicity itself. With national price levels tied to each other by purchasing power parity and a stable demand for real balances function in each country, domestic price levels, inflation, nominal interest rates and the exchange rate are simultaneously determined by the behavior of the "real" arguments in the demand functions in question, and by that of the supplies of nominal money in the two countries. What does this analysis tell us about the role in influencing the exchange rate of U.S. dollar-denominated assets left over from the period when the dollar was the reserve currency, and currently held abroad? This is a problem which many commentators, including Heller, believe to be of key importance. The monetary model tells us, I believe, that these assets have no special significance. They are interest-bearing assets, and, according to the monetary version of the more general asset market approach, the rate of return on them adjusts to compensate their holders for any anticipated change in their purchasing power over goods and over assets denominated in other currencies. Variations in that rate of return are taken account of in the model because the nominal interest rate they bear is an argument in the U.S. demand for money function.

The above reasoning hinges upon purchasing power parity always holding, but Frenkel's empirical evidence shows that at the very best it does so only on average over rather long time periods, and in a

rough and ready fashion at that. This means that variations in the rate of interest on dollar-denominated assets cannot simultaneously compensate for variations in their purchasing power over goods priced in U.S. dollars and goods priced in foreign currencies. This in turn means that, although some U.S. dollar-denominated assets may be perfect substitutes for those denominated in foreign currencies, others are not. That being the case, the currency in which they are denominated must be a relevant property of at least some classes of securities, and fluctuations in the supply and demand for such securities are likely to impinge upon the behavior of the exchange rate. The behavior of the dollar-deutsche mark exchange rate gives Frenkel more trouble than any other, and surely that is not an accident, given that mark-denominated assets have so often been the destination of funds realized by selling dollar-denominated securities.

There is another characteristic of the U.S. dollar's place in the international monetary system worth noting: it is the unit of account for many international transactions, not the least of which are those involving oil. That means that many international prices are going to be particularly sensitive to the conduct of U.S. domestic monetary policy, and that that policy still has a considerable power, for good or ill depending upon how it is used, over the international economy, a power which it would not have were prices in that economy to be set in other currencies. The frequent references in U.S. debates to oil price increases as being exogenous to domestic policy shows that it is not yet appreciated that oil prices in the world economy respond to U.S. domestic policy and that attempts to cushion their effect by domestic monetary expansion are not just useless but actively harmful.

To put all this in another way, if goods markets cleared as fast as asset markets, if we were always in long-run equilibrium where the concepts of the relative prices of national moneys and of national outputs were interchangeable, the above problems would not arise. However, asset markets do clear faster, and in the short run do dominate the behavior of the exchange rate, so that the distinctions upon which the asset market approach focuses are important. That surely is one implication of the evidence that Frenkel presents. This very fact however seems to me to imply that the asset market approach to exchange rate determination must be carried beyond a simple monetary formulation, as it is, for example, by Boyer (1978), to incorporate explicitly other aspects of portfolio behavior, and to incorporate other aspects of using a particular currency as a unit of account, before it can claim to provide us with a complete toolkit for dealing with foreign exchange rate problems, not least those which Heller raises. Nevertheless, if our toolkit is incomplete, it is still the best one that we have. As Frenkel's paper shows, the asset market approach to analyzing exchange rates is extremely useful, and its use does enable us to come to a clearer understanding of how to conduct domestic policy against a background of exchange rate flexibility.

One of the best established pieces of conventional wisdom in international monetary economics is that high interest rates are associated with a strong currency and low interest rates with a weak one, but one of the best established facts of the last few years is that the high interest rates in fact are associated with weak currencies, and vice versa. As Frenkel shows, the latter prediction is what follows

from the asset market approach, and, as he also shows, that theory's predictions in this respect are confirmed by evidence, generated moreover by an experiment whose validity does not, as far as I can see, in any way hinge upon assuming that purchasing power parity holds. Though I can find nothing to disagree with in anything that Frenkel explicitly says about this matter, there are a few things that he didn't say that do seem to me to be of particular relevance to the theme of this conference.

The conventional wisdom about the relationship between interest rates and the strength or otherwise of a currency has its historical roots in the operation of the gold standard, and in particular in the role played by the central bank rediscount rate in the conduct of monetary policy under such a system, a role summarized in that well-known, but now sadly outdated, aphorism "Seven per cent will draw gold from the moon" (which I have been unable to track down to its original source). Under such a system the long-run time paths of money and prices in the international economy were given by the rate of change of the stock of gold. Though this rate of change was not always smooth and steady, because important new gold discoveries were from time to time made, on average it was. Given that, and given an unquestioned commitment of central banks to maintain the convertibility of domestic money into gold, the anticipated inflation rate was, by comparison with recent experience, not far short of being an exogenous constant. Moreover the principal aim of monetary policy was not to control income and employment but simply to maintain convertibility. In such a world, any increase in a central bank's discount rate represented an increase in the real cost of borrowing from the banking system, and hence led to a

contraction (or at least a slowdown in the rate of expansion) of domestic credit. The monetary consequences of that in turn led to a balance of payments surplus and hence a "strong" currency.

The world of the last ten years has been very different than that which I have just described. With nothing to replace the gold standard's guarantee of long-run price predictability, inflationary expectations have become endogenous and volatile, and their movements dominate fluctuations in nominal interest rates. It is these factors which have led to the association of high interest rates and weak currencies. Both are the consequence of an adverse response of inflation expectations to undisciplined and expansionary monetary policies, as Frenkel has argued.

I believe that the forgoing considerations have two important implications for the conduct of domestic monetary policy in the United States, both now and in the future. First, though at long last an emphasis on controlling monetary aggregates is replacing an emphasis on interest rate targets in the conduct of policy, it would be foolish to believe that the battle here has been finally won. Rather it is still being fought. The advocates of controlling monetary aggregates have always based much of their case upon the difficulty of drawing inferences from a particular value of the interest rate about whether policy is "tight" or "easy," and will continue to do so. The forgoing analysis surely helps to bolster their case, for it shows that there is an important international dimension to the problems to which they have been pointing, a dimension that adds weight to the argument against using interest rates as a policy indicator.

The second implication worth pointing out is not of such immediate concern, but is surely just as important. The forgoing argument amounts to presenting a special case of the following general proposition: the way in which monetary policy impinges upon the domestic economy, and the way in which domestic monetary variables should be interpreted by the authorities depend critically upon the state of the international monetary system and the nature of the country's exchange rate regime. I believe that many of the United States' current policy difficulties have arisen from a failure of the authorities to appreciate the fact that these international factors are of prime rather than secondary importance in the design of policy. To put the matter in its simplest terms, it is not just the way in which United States policy affects the rest of the world that varies with the exchange rate regime and the conduct of policy in other countries; the way in which it affects the United States is also profoundly influenced by these matters. I will now turn to a more specific discussion of this point as it impinges upon the conduct of policy under the present regime.

There is no doubt about the nature of the current macro policy problem facing the United States: it is how to reduce the inflation rate without at the same time causing more of a real contraction than is absolutely necessary (however much that might be). It is also true that there is a wide consensus that getting the monetary expansion rate "under control" must play a key role in tackling this problem. Debates arise when it comes to the question of how to implement such a policy, of specifying what getting monetary expansion "under control" means in practice. At one extreme are those who follow the lead that (I am glad

to learn from Neil Wallace) Sargent and Wallace (1975) never meant to give. They argue for a rapid, pre-announced, monetary slowdown which will, by way of a by now well-known "rational expectations" mechanism, impinge mainly upon prices and will affect output and employment only to the extent that the pre-announcement is not believed.

At the other extreme are those like Modigliani (1977) who believe that a monetary contraction can be fine tuned, while in the middle stand those who would support a gradualist contractionary policy of the type advocated at this conference by Allan Meltzer. To a foreign observer, the striking characteristic of this United States policy debate is the way in which the openness of the United States economy and the nature of the exchange rate regime are virtually ignored by all participants. Nevertheless, the theoretical and empirical results presented by Frenkel at this conference, not to mention a good deal of work on stabilization problems in open economies that has been carried on mainly outside the United States, is extremely relevant to these issues.

Two key questions underlie current debates about stabilization policy. The first concerns the speed with which the private sector of the economy can absorb information about policy and translate that information into price changes, and the second, analyzed by Lucas (1976), concerns the stability over time of the mechanisms whereby information is absorbed and acted upon and the independence or otherwise between those mechanisms and policy actions themselves. If one believes that information is absorbed and acted upon quickly, then rapid monetary contraction is an appropriate anti-inflation policy. If one believes that reactions here are slow, but that their time path in the future can be inferred reliably from past behavior then one will advocate fine

tuning. A slow but unstable, and hence hard to predict, mechanism underpins the case for gradualism. (May I note here in passing that I believe Meltzer's analysis of the case for gradualism, which I largely accept, would be enhanced if he would lay more stress upon the unpredictability of the lag structure of his model in any particular instance, and less upon its drawn out and backward looking nature per se.)

Frenkel's empirical work shows that the foreign exchange market is efficient, in the sense that all available information, including information about policy, is translated quickly into movements of the exchange rate. The exchange rate is, therefore, a price that, other things equal (the qualification is important and I will return to it in a moment) adjusts rapidly to policy changes. A number of recent papers have analyzed versions of the aggregate demand-expectations augmented Phillips curve model, which underlies so much United States policy debate, extended explicitly to incorporate a foreign sector. Though such work is most highly developed for fixed exchange rate regimes--see, e.g., Laidler (1975), Jonson (1976), Jonson, Moses and Wymer (1976), Bilson (1978), Burton (1979)--some results are now available for a flexible rate regime. Thus Laidler (1977) shows, albeit in an extremely primitive model with zero capital mobility, that even where systematic errors are made about the domestic price level, perfect foresight about the exchange rate is sufficient to guarantee that domestic monetary policy impinges solely upon domestic prices and not at all on output. Burton (1979 and forthcoming), in a much more elaborate model that does incorporate capital mobility, a variety of stochastic shocks, and rational expectations, finds that the behavior of the exchange rate is a key source of information for agents and that

the more rapidly information about it is available to them, the more direct is the linkage between domestic monetary policy and domestic prices.

One must be careful not to read too much in the way of policy implications from analytic exercises such as these. Nevertheless, the work that I have referred to does point to the conclusion that a flexible exchange rate, determined in an efficient market, imparts to an economy an extra degree of price flexibility that it does not have under a fixed rate. This in turn suggests that estimates of the output that might be lost in the United States while bringing inflation under control that have been generated from data on the fixed exchange rate period are likely to be exaggerated, even if there is nothing else wrong with the techniques used to derive them.

However, there is a very important qualification to be added to all this. The theoretical results to which I have alluded are premised on the price level, and implicitly the money market, in the rest of the world remaining undisturbed during the theoretical experiment from which they are derived. To put the matter in terms of Frenkel's framework, they apply to situations in which nothing happening abroad disturbs equilibrium in the market for foreign money, or foreign assets in general, so that all disturbances to the exchange rate originate in the behavior of the domestic money supply. Why this is an important qualification is easily seen by considering Frenkel's analysis and his empirical results. If a foreign monetary contraction begins at the same time as a domestic one, the analysis in question tells us that, given for the sake of simplicity that the relative sizes of these contractions are appropriate, nothing will happen to the exchange rate. In

that case domestic money markets must be cleared by domestic output and price level fluctuations without help from a quickly adjusting foreign exchange market. Frenkel's results on purchasing power parity lend weight to the view that domestic prices adjust slowly to monetary disturbances. Thus there is every reason to suppose that in this case, and in the short run, which may nevertheless persist for a long time, much of the effect will be on output.

The implications of looking at Frenkel's empirical results on the efficiency of the foreign exchange market in the light of the macro-models I have cited in the preceding section may be summarized as follows: a single economy seeking to tackle an inflation problem against the background of an otherwise tranquil world economy will find that the existence of an efficient market for foreign exchange under a flexible rate enhances the flexibility of domestic prices. Such an economy will enjoy an easier transition to a lower inflation rate than one would expect from studying closed economy models. However, if that same economy is one among a number faced with a similar problem, then, even with a flexible exchange rate, the pressures of domestic deflation will, if other countries are simultaneously deflating, be concentrated on domestic output. In general, the extent to which this happens in any one country will vary with the conduct of policy abroad.

In the current state of knowledge, I do not believe we can say any more than this, but I would claim that even this much is important to know. Our consideration of the open economy aspect of stabilization policy has, after all, led us to argue that the lags with which information will become available, and hence a basis for action, will vary

with the way in which policy is conducted not only at home but also abroad. The length and variability of such lags are, therefore, in any particular instance, going to be next to impossible for policymakers to predict. However such unpredictability is the very essence of the case for gradualism. The analysis we have been considering does, therefore, make an important contribution to the current U.S. policy debate.

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FLOATING EXCHANGE RATES IN THE 1970s: A DISCUSSION OF THE HELLER PAPER

Geoffrey E. Wood

The first section of Dr. Heller's paper consists of four assertions about the consequences for the world economy of the move to floating exchange rates. On the basis of these four assertions Dr. Heller proceeds to make recommendations first for the future conduct of U.S. economic policy, and second for the future shape of the international monetary system.

In these comments it will be argued first that his four assertions on the consequences of exchange rate flexibility are at the least misleading and, in some cases, not supported by any evidence at present available. It will then be shown that his policy recommendations for the future of the international monetary system are based on misunderstanding both the causes of exchange rate volatility and the reasons for international capital movements. The comments conclude with a summary of what appear to be the true lessons of the floating exchange rates experience of the 1970s.

DR. HELLER'S ASSERTIONS

Dr. Heller asserts that "the operation of the flexible exchange rate system since 1971 has entailed a significant increase in costs to

Dr. Wood is a member of the Centre for Banking and International Finance, The City University, London, England. This is a revised and expanded version of comments made at the conference on Dr. H. Robert Heller's paper. The author is indebted to several conference participants for remarks which have improved these comments.

the business sector." The trouble with that statement is that Dr. Heller does not make clear what comparison he is making when he says costs have increased. There has been a substantial increase in the dispersion of inflation rates in the O.E.C.D. (Organization for Economic Cooperation and Development) area in the 1970s as compared to the 1960s.¹ Had exchange rates remained pegged despite this change, they could only have been kept so by an increasing proliferation of exchange controls to restrict capital movements and of tariffs and quotas to restrict trade, and by increasing volatility of national monetary policies. It is impossible to believe that these developments would not have imposed costs on the business sector, and Dr. Heller certainly does not demonstrate that these costs would be less than the costs imposed by floating exchange rates.

Indeed, it should be pointed out that there is absolutely no evidence in support of Dr. Heller's view that floating exchange rates have inhibited international trade. This issue has been studied fairly extensively, and there is not one study which has found that floating rates have had any dampening effect whatsoever on world trade. But despite that, there may be some truth in this particular belief.

All studies so far undertaken have looked at the effect of the exchange rate regime on international trade as a whole. Recent

¹See Geoffrey E. Wood and Nancy Aamon Jianakoplos, "Worldwide Economic Expansion: Are Convoys or Locomotives the Answer?" Federal Reserve Bank of St. Louis Review, July 1978.

theoretical work by Ronald McKinnon,² supported by forthcoming empirical work by Stephen Carse, John Williamson and the present author,³ suggest that this is not appropriate.

A substantial part of international trade is in primary or semi-manufactured goods. The prices of such goods are continually held close together across countries by arbitrage. Thus traders in such goods are not affected by exchange rate fluctuations provided that they hold inventories equal to their indebtedness arising from trade -- and the evidence is that to a first approximation they do. There is therefore no reason to expect trade in these goods to be in any way affected by exchange rate changes, whether or not these changes are anticipated. In contrast, manufactured goods do not have their prices quickly arbitrated into equality internationally.⁴ Traders in such goods are therefore exposed to exchange risk. Tests for the effects of exchange rate fluctuations on trade should focus on these categories of goods, rather than on trade as a whole; looking at trade as a whole may have led to the concealing of the effect of exchange rate fluctuations on a sub-section of trade. (This hypothesis is currently being explored by the present author, but no results sufficiently reliable to report are at present available.)

²Ronald McKinnon, Money in International Exchange, Oxford University Press, New York, 1979.

³Stephen Carse, John Williamson, and Geoffrey E. Wood, Financing Practices in U.K. Foreign Trade, Cambridge University Press, Cambridge, 1980.

⁴See e.g. John Williamson and Geoffrey E. Wood, "The British Inflation: Indigenous or Imported?", American Economic Review, September 1976.

So, despite the absence of confirming evidence, Dr. Heller may be correct in saying that trade has been inhibited by exchange rate fluctuations. But three points should be emphasized. First, he provides no evidence to support his assertion. Second, he should have compared what would have happened to trade under a fixed rate system defended against the consequences of divergent inflation rates by proliferating controls, with the effect of exchange rate fluctuations on trade. Third, even if he is correct that exchange rate fluctuations inhibit trade, it is far from clear that official exchange market intervention is thereby justified.

His second major assertion is that flexible exchange rates have "not brought about a climate for the conduct of more effective stabilization policies." The only possible response to that is to ask why on earth they should. Under a fixed exchange rate system, the burden of mistakes in stabilization policy by any country's government was in part borne by the foreign sector. Excess demand was in part met by foreign supply, while deficient home demand was in part offset by demand from overseas, so long as the demand and supply imbalances were at least partly due to monetary policy. (An example of this is the United Kingdom experience in the 1960s; see Williamson and Wood, *op.cit.*) Floating exchange rates, by eliminating flows across the foreign exchanges, close this safety valve; one should therefore expect (other things being equal) that the performance of stabilization policies should deteriorate rather than improve under floating rates.

But Dr. Heller did not write very precisely at this point; he does not say exactly what he means by the "climate for the conduct of more effective stabilization policies." He may mean not the actual

achievement of such policies, but rather how policymakers have responded to divergences of the economy from its desired path. If that is what he means, then he is pretty clearly wrong. The U.K. is a good example. It was only after the collapse of sterling's foreign exchange value in 1975 that the U.K. government took any serious measures to end the gradually accelerating inflation of the previous twenty years. Why they so responded can only be conjectured; but the explanation may be that floating exchange rates bring home to the electorate the costs of inflationary policies rather more quickly than did fixed rates, and thus may influence their voting behavior at the next election.

Dr. Heller next claims that floating exchange rates have not "decreased the cost of [foreign exchange market] intervention to central banks." Dr. Heller is really very careless in his use of the word "cost." He never tells us what costs he has in mind in the present instance. It is certainly clear, however, that the amounts of intervention have been large, and it is on this issue rather than the undefined one raised by Dr. Heller that we next comment.

Why have exchange rates been so volatile? Where have the private stabilizing speculators been? Dr. Heller does not attempt to answer these questions. Fortunately, an answer has been provided by a large body of previous work. Exchange rate volatility is, in large part, the consequence of volatile national monetary policies. This has been true not just in the 1970s; it was also true in the 1920s. The conclusions of a recently published paper by my colleague Roy Batchelor summarize the evidence very well.

Stable inflation rates are all that is required to keep the trend in exchange rates steady.... efficient exchange markets should keep fluctuations around the trend within the same margins as in the 1920s. What is necessary for exchange rate stability is that monetary expansion be predictable...⁵

The reason for this is admirably expressed in the quotation from Gustav Cassel with which Jacob Frenkel concludes the paper he presented at this conference.

The international valuation of a currency will, then, generally show a tendency to anticipate movements, so to speak, and become more an expression of the internal value that the currency is expected to possess in a few months, or perhaps in a year's time.⁶

The more volatile is a nation's monetary policy, the more frequently will the expected future internal value of its currency change, and so the more frequently will its exchange rate change. The primary source of exchange rate volatility is therefore volatility in national monetary policies. Understanding that is central to drawing the correct lessons for future policy of the exchange rate experience of the 1970s.

Understanding that also helps explain the absence of private stabilizing speculation; because of the volatility of national monetary policies, speculators have had very little basis on which to form expectations of future exchange rates.

In this context, it is worth pointing out that (as Jacob Frenkel shows) exchange rates have been no more volatile than prices in other

⁵Roy Batchelor, "Must Floating Exchange Rates be Unstable?" Annual Monetary Review, Centre for Banking and International Finance, The City University, London, England.

⁶Gustav Cassel, Money and Foreign Exchanges after 1919, pp. 149-150, Macmillan, London, 1930.

asset markets, thus emphasizing the common cause of such volatility. Further, it must be stressed that D. Heller's belief that "speculative activity may well accentuate rather than reduce exchange rate fluctuations" is totally contradicted by evidence that there are no traces of speculative "runs" in the foreign exchange markets.⁷

His last assertion is that floating exchange rates have "fostered the decline of the dollar as the world's leading currency." By this he means that floating exchange rates have led to a fall in the proportion of dollar-denominated assets in the portfolios of individuals and central banks. He is clearly right. Portfolio diversification was to be expected as a consequence of the move to floating rates, and it has indeed happened. But so what? Why is that undesirable? Nowhere does Dr. Heller answer these questions.

U.S. POLICY RECOMMENDATIONS

Turning first to his recommendations for the future conduct of U.S. policy, these are manifestly sensible -- they comprise recommending the announcement of intermediate monetary ranges targeted by base control so as to ensure hitting them. The empirical and theoretical work on the causes of exchange rate volatility, which was referred to earlier, clearly indicates that such a policy would make exchange rates much less erratic in their movements, and such a policy would also help stabilize the U.S. economy as a whole.

⁷See for example Donald S. Kemp, "The U.S. Dollar in International Markets, mid-1970 to mid-1976," Federal Reserve Bank of St. Louis Review, August 1976.

INTERNATIONAL POLICY RECOMMENDATIONS

Dr. Heller does not advise a return to pegged exchange rates; he recognizes that so long as national inflation rates are as diverse as they currently are such a move would not be sustainable. He does, however, encourage official intervention in the foreign exchange markets.

There are, as Dr. Heller recognizes, costs to such intervention-- in particular, there may very well be an impact on domestic monetary policy. Since steady and predictable money growth is the foundation of reasonably stable exchange rates, there are considerable risks that central bank foreign exchange intervention would buy only short term stability. And what are the benefits of exchange rate stability achieved by official intervention in the foreign exchange markets? What can justify official intervention?

Central banks do not in general have any better knowledge than does the private sector of the future course of economic variables. There can be occasions when they do have such knowledge -- because they know their own intentions but have not published them, or because they are privy to the otherwise undisclosed intentions of a foreign central bank. In that case, intervention to prevent a temporary market fluctuation may be justified but such intervention is inferior to making public the confidential knowledge on which it is based. Making the central bank's intentions public would help stabilize not just the foreign exchange market but, to differing degrees, every other market. Publicity, therefore, clearly dominates intervention.

A second defense of occasional intervention may exist if it is found that fluctuating exchange rates do, indeed, inhibit certain categories of trade. If stable national monetary policies are being

pursued, there may still appear to be a case for intervention. The case would be that some of the benefits from exchange rate stabilization accrue not as profits to speculators on the foreign exchanges, but to traders in goods. There would, in other words, be a divergence between the private and social benefits of stabilizing speculation, with the social benefits outweighing the private ones, thus appearing to justify intervention. But here, too, exchange intervention is second best. As has emerged from the literature on protection, a direct subsidy paid to the affected sector is the most efficient means of assisting a sector of an economy.⁸ In the present case, intervening in the exchange markets would mean that all traders in international money markets, not only those in goods affected by fluctuating exchange rates, were being assisted. Here, too, then, while exchange market intervention may conceivably be justified -- although the evidence which may justify it is not yet in -- again the policy is a second best one.

Two further possibilities remain. An exchange rate may be changing very rapidly -- sterling in the three months to July 1979 is an example. This was imposing very rapid adjustment costs on industries already required to respond to a substantial change in the pattern of comparative advantage. If the authorities in such a case can slow the adjustment without loss of monetary control, then there are benefits from their doing so. But the situations when they can do

⁸See J. Bhagwati and V. K. Ramaswami, "Domestic Distortions, Tariffs, and the Theory of the Optimum Subsidy," Journal of Political Economy, February 1963, and Geoffrey E. Wood, "Senile Industry Protection," Southern Economic Journal, January 1975.

so are manifestly rare. The U.K. was able to do so in that episode because a large part of the inflow seemed to have resulted from a desire to buy just the kind of securities the U. K. government would have had to sell to sterilize the inflow, but the experience of Germany in the 1960s and 1970s shows that such episodes are unusual. This case, then, does constitute a modest defense of occasional intervention -- but the circumstances are very special. (And there will still be a welfare cost to the nation if the rate of return earned on international reserves falls short of the rate paid on foreign-owned national debt.)

The fourth, and last, defense is when there is an increased demand on the part of non-residents to hold the money of some country -- not, it should be stressed, assets denominated in that currency, but the currency itself, including of course bank deposits. This does not invariably constitute a reason for supplying the currency; it may, rather, often be an opportunity for reducing the inflation rate. If, however, inflation is at its desired rate, then the increased demand for currency must be met by an increased supply, and the simplest way to be sure of supplying the correct amount is to operate on the foreign exchange market. But this is a very special case indeed.

Summarizing then, the case for official intervention in the foreign exchanges is very weak. Recognizing that there can be substantial fluctuations of exchange rates about their equilibrium values does not imply that these fluctuations should be corrected by official intervention.

Dr. Heller is also concerned about the appropriate reserve asset for the international monetary system. He believes that the currently

evolving reserve asset system is inherently unstable, and that it should be replaced by a single asset system, the asset being either the U.S. dollar or a somewhat modified SDR (Special Drawing Rights).

It is convenient to deal first with his endorsement of a dollar standard. The weakness of such a system was first diagnosed by Robert Triffin.⁹ His diagnosis can be summarized very briefly as follows. The reserve asset, the dollar, can be supplied only by the reserve centre, the United States, running continual deficits in its balance of payments -- but that progressively undermines confidence in the reserve asset which is being thus supplied. Such a system is internally inconsistent. Dr. Heller provides us with no reasons for thinking Triffin to be wrong -- indeed, nowhere does he refer to Triffin so his advocacy of a return to a dollar standard cannot be taken seriously.

The defect with his endorsement of an SDR-based system is that under one set of circumstances the scheme is unnecessary, while under the alternative circumstances it will not work. An international monetary system with all major currencies serving as reserve assets is not, despite his belief to the contrary, inherently unstable. Such a system will not be continually destabilized by capital flows responding to inflation differentials -- so long as these differentials are reasonably stable and predictable. And when these differentials are not stable and predictable, there will be sudden and large movements of

⁹Robert Triffin, Gold and the Dollar Crisis, Yale University Press, New Haven, 1960.

funds from currency to currency whatever the official reserve asset of the system may be.

Tinkering with the reserve asset of the international monetary system cannot substitute for stable domestic monetary policies.

CONCLUSIONS

The lessons for the conduct of international monetary policy which have been provided by the experience of the 1970s can be stated very briefly. Exchange rates will be volatile so long as national monetary policies are volatile. It is not clear what harm this exchange rate volatility does, although the underlying monetary instability does cause considerable harm as Alan Meltzer's paper shows. In any event, the case for exchange market intervention to reduce this volatility is very circumscribed indeed.

Nor can any case be made for trying to prevent portfolio diversification into a range of reserve assets. A multiple asset system will be stable if national monetary policies are stable, and if national monetary policies are unstable then any international monetary system will inevitably be unstable also.

The lesson of the 1970s experience of floating rates, as of every earlier floating exchange rate episode, is that the international monetary system will only be as stable as the set of national monetary systems which it links.

MONETARY POLICY ISSUES FOR THE 1980s

Lawrence K. Roos

As one of the sponsors of this conference, it is a special pleasure to welcome all of you to the Federal Reserve Bank of St. Louis. It is a privilege, as well, to have the opportunity of joining you in pondering how we might learn from past experience in planning monetary policy for the future.

In the time allotted me, I would like to share with you some impressions of past policymaking that I, in my four years as president of the Federal Reserve Bank of St. Louis have gained, and to explore with you what I believe we might look forward to in the years ahead.

Looking back in the 1970s, I would be less than candid if I did not admit to some deep feelings of frustration with the way in which monetary policy has been conducted, as well as to a failure to understand how policies which produced such adverse consequences managed to persist for so extended a period. Perhaps the best way to express my feelings is to focus on a few fundamental concepts which have come to dominate my own understanding of the impact of monetary policy on the economy.

First, and foremost, is the concept that inflation is fundamentally a monetary phenomenon. This is an extraordinarily appealing notion to me, if for no other reason than its generality and sheer

Mr. Roos is President of the Federal Reserve Bank of St. Louis.

simplicity. As Beryl Sprinkel recently noted: "It doesn't take a genius to know that if you pump more and more money into the system, you get inflation." Now, I suppose that if Beryl is correct that it truly does not take a genius to understand this, then there is still hope that this concept will come to be widely accepted. Unfortunately, the time lag necessary for acceptance of this appears to exceed, by a considerable margin, the time lags with which changes in money affect prices.

Because the full impact of changes in the rate of growth of money on the inflation rate occurs over a considerable period of time (estimated variously from three to six years), it is important that monetary policymakers, as well as the general public, clearly understand that the "core" inflation rate, or "underlying" inflation rate, or "basic" inflation rate (to mention just a few of the terms that have been attached to it) is determined by the long-term trend rate of growth in money after adjustments for changes in money demand.

In fact, because long-term changes in velocity have, roughly, had equal and offsetting impacts to that for changes in output, the core inflation rate is essentially equal to the trend growth in money. Because the trend rate of growth of money has approximated seven percent, the current "monetary-induced" rate of inflation is about seven percent. To put it somewhat differently, had there been no oil shocks or other exogenous non-monetary induced impacts on prices, we would nevertheless be currently faced with an inflation rate of about seven percent due solely to the growth in money that has emerged from past monetary policy decisions.

A careful understanding of the difference between the actual inflation rate and the monetary-induced or core rate of inflation is crucial for the proper conduct of monetary policy. Only the monetary-induced rate of inflation should concern monetary policymakers; it is the only component of inflation that they can influence. Exogenous shocks such as those caused by higher energy prices or crop failures will always contribute to the current measured inflation rate, but their impact is transitory. Attention paid to these exogenous influences on prices must never divert monetary policymakers from focusing their actions toward controlling, and reducing, the monetary-induced rate of inflation.

A second key concept that has guided my understanding of the impact of monetary policy is that abrupt and substantial changes in the growth of money, if sufficiently prolonged, have dramatic and usually unfortunate consequences for the economy. Unusually rapid growth in money, if sustained for several quarters, while having some positive effects on employment and output for a short time, will ultimately and inevitably increase the monetary-induced rate of inflation. Similarly, unusually slow growth in money, if sustained for several quarters, will result in reduced growth in output and employment -- perhaps, even a recession, and ultimately reduce the monetary-induced rate of inflation.

Careful understanding of the short-run consequences of sharp fluctuations in the growth of money is crucial for the proper conduct of monetary policy. To avoid undesirable results such as recession or an over-heating of the economy, monetary policymakers must avoid policy actions that result in sudden or capricious changes in the growth of

money. They should, instead, conduct policy in such a way that changes in the growth of money are systematic and gradual.

A third concept that has guided my understanding is that the growth of money can best be controlled, not by focusing on the behavior of interest rates, but by controlling the growth of the monetary base. Since the Federal Reserve controls the largest component of the monetary base -- Federal Reserve credit -- growth of the monetary base is directly and completely in the hands of the Federal Reserve. Similarly, there is considerable evidence that the multiplier linking the monetary base to the money stock is sufficiently stable and predictable to assure a reasonably close relationship between growth of the base and growth of money over all but the shortest-term period. Consequently, the lesson for policymakers is that, if control of the growth of money is to be a crucial part of monetary policy, desired money growth rates should be linked directly in the policy process to the growth of the monetary base.

Finally, a fourth concept which has enabled me to understand the impact of monetary policy on the economy is that economic markets, especially the financial and foreign exchange markets, are reasonably rational and efficient. Thus, increased rates of money growth tend to produce higher interest rates and to lower the value of the dollar on international exchange markets as soon as the financial market participants, who seem to be well aware of the association between money growth and inflation, come to expect increased future inflation rates. It follows that, while so-called "tighter" monetary policy may immediately produce higher interest rates, the same result occurs with "looser" monetary policy in the longer time span. Interest rate

movements per se are unreliable guides to policy. This is especially true when we consider that interest rates, which represent the price of credit, are also affected by a host of non-monetary influences.

Now, none of the above concepts is especially complex and certainly none is likely to be either new or controversial to most of you. However, they do provide an analytical framework for assessing the likely results of monetary policy actions. It is this basis of analysis that has led to my frustration in viewing what has happened over the past four years. No one, who believes as I do that the most significant component of inflation is monetary, could have failed to have been concerned with growth in money that accelerated from five percent over the period from I/73 to III/76 to eight percent from III/76 to III/78, guaranteeing a significant increase in the core rate of inflation. No one, who believes as I do that drastic changes in the growth of money produce undesirable economic consequences, could have failed to be concerned when the money stock, having grown at the rate of eight percent for two years, suddenly dropped to a less than two percent growth for the period from September 1978 to May 1979, virtually assuring a major economic slowdown. And, certainly, no one, who believes as I do that financial markets are rational and efficient, could fail to be disturbed by the current expressions of concern with alleged "tightness" of monetary policy, as judged by the "high" levels of nominal interest rates. Money growth at rates approaching 10 percent and an inflation rate of close to 10 percent are certainly not reflections of tightness. Certainly the financial and foreign exchange market participants have not been fooled; witness the behavior of interest rates and the value of the dollar over the last few months.

But my frustration is not confined only to the unfortunate consequences of past monetary policy actions. It also lies with the monetary policymaking process itself that produced the results we have observed throughout the 1970s. Time and time again, I have observed the achievement of the Federal Reserve's interest rate target while money growth was permitted to wander at will outside its "desired" target ranges. As I noted in an earlier discussion in London last June, the monthly "betting odds" during the past four and a half years have been only about one in two that M1 would remain inside its target range. Moreover, there is little doubt that the conduct of monetary policy, by focusing on stabilization of interest rates, has produced a procyclical pattern in the growth in money. That pattern has tended to exacerbate the impact of cyclical movements and exogenous shocks on the economy.

But, again, none of this is especially new to you. Many of you have contributed over the past decade to studies critical of both the monetary policymaking process and policy consequences. I, too, have been convinced, both by the economic arguments to which I have been exposed, and by a first-hand view of the disappointing results of the policies pursued, that only a major change in the formulation of monetary policy -- away from concentrating on stabilization of interest rates and towards focusing on the monetary base -- would enhance the prospects of successfully achieving the results we desire from monetary policy.

The announcement by Chairman Volcker on Saturday, October 7, that the Federal Reserve is changing its procedures of monetary policymaking to place more emphasis on controlling growth of the reserve aggregates while permitting interest rates to fluctuate freely, represents a giant

step in correcting past mistakes. There is no doubt in my mind that if this new approach is effectively implemented in the upcoming months and years, we can achieve control over the growth of money and, consequently, control over the "basic" rate of inflation. Similarly, we can avoid the adverse real sector impacts that have resulted from unintended drastic short-run fluctuations in the growth of money around its longer-run trend rate of growth. Finally, once the financial market participants are convinced that we have indeed seized control over the growth of money and intend to bring about the gradual reduction in money growth necessary to reduce the core inflation rate, I believe that we will see an end to the surges in interest rates and declines in the value of the dollar which have proved so troubling in the past.

Thus, as you may have inferred from my comments, I am enthusiastic and encouraged about the change in the policymaking process that has occurred. However, my euphoria is restrained by a realization that several problems still remain if this change in policy is to produce the hoped-for results. To assure maximum effect from the Fed's new policy the following steps must be taken:

- 1) Instead of placing sole emphasis on controlling the growth of non-borrowed reserves, policymakers should focus also on growth in the monetary base and total reserves. There are just too many slips twixt growth in non-borrowed reserves and growth in money.
- 2) Policy emphasis must be firmly and fundamentally redirected from concern about movements in the Federal funds rate to concentration on growth in the monetary base and, hence, the money stock. The substance of policy must go

beyond merely widening the permissible range of movements in the Federal funds rate. For, if widened Fed funds rate constraints remain even remotely binding, monetary control cannot succeed.

- 3) The new method must be given adequate time to prove itself. The success of the new monetary control procedure cannot be reasonably evaluated by observing money stock behavior over a short time span. Not even the most ardent academic advocate of base targeting asserts that precise money control is possible over a period of six months or less. At the very least, a one year testing period is necessary for any comparison between previous methods and the current one. Moreover, no one should expect inflation to dissipate in a matter of months. Inflation has been generated over a period of 15 years and cannot be eliminated overnight. It would be tragic if this new approach to policymaking were to be tried and abandoned after a short time because of false expectations.
- 4) Finally, and perhaps most importantly in the short run, the procedures for implementation of the new policy, the rules of the game, must be clearly enunciated to the public. As we have observed during the first week after announcement of the new approach, the lack of clearly articulated rules produced a near panic in financial markets. There is no reason to shroud policy in secrecy and to keep markets guessing. While surprises might have

had some value in policies directed toward money market stabilization, surprises are counterproductive when monetary aggregates become the target.

Above all, the attention of policymakers must be focused on the longer-run impacts of policy. Unfortunately, as Arthur Burns noted in his Per Jacobsson Lecture, the "anguish of central banking" has often come from the short-term political pressures on monetary authorities -- pressures to which, for-bad-and-for-worse, the monetary authorities have all too often succumbed.

What is needed more than ever before is a steady hand on the tiller of monetary policy. Not only will the Fed's new policy be subjected to critical analysis by those who traditionally have doubted the feasibility of monetary control; the very credibility of this country's central bank is at stake. I trust that we will have the wisdom to implement our policy effectively, the openmindedness to judge our progress fairly and the courage to resist whatever pressures might arise to retreat from the historic step we have taken.