2-1-1983

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THE CENTER FOR INTERNATIONAL BUSINESS STUDIES

Institute of International Banking

WORKING PAPERS IN INTERNATIONAL BANKING

February 1983 No. 2

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THE EXPECTATIONS HORIZON IN THE DETERMINATION OF EXCHANGE RATES AND INTEREST RATES

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ABSTRACT

Inflationary expectations are known to affect exchange rates and interest rates. This study examines the role of the expectations horizon in the determination of exchange rates and interest rates, focusing on the Deutsche mark and U.S. dollar currencies for the period of the mid-1970's. The results indicate that neglect in investigating different expectations horizons may lead to incorrect understanding of the role played by expectations in exchange rate and interest rate determination.

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In the monetarist approach inflationary expectations serve as an important determinant of exchange rates and interest rates. With repect to exchange rates, inflationary expectations lead to the adjustment of currency portfolios, thereby affecting the relative price of currencies. For example, a higher relative inflation of the home currency leads to a substitution from home currency to foreign currency, resulting in a higher exchange rate for the home currency. With respect to interest rates, inflationary expectations affect the holding of money balances vis-a-vis other domestic assets: a higher inflation rate leads to a substitution of other assets for money balances.

Given this role of inflationary expectations, the purpose of this paper is to investigate whether inflationary expectations have a uniform impact on the determination of exchange rates and interest rates. When inflationary expectations for several currencies differ, we would expect a non-uniform impact. Such a result would be consistent with the purchasing power parity and Fisher International relationships.

A second objective of this paper is to investigate the expectations horizon and whether a common horizon exists for the determination of exchange rates and interest rates.

We use the Bilson (1976) monetarist model of the exchange rate to test for the role of inflationary expectations in exchange rate determination. A testable form of the model is:

$$s = a + b\, m_1 - c\, m_2 + d\, i_1 - e\, i_2 - f\, y_1 + g\, y_2 \quad (1)$$

where, s = the current exchange rate,

m = the equilibrium level of money supply,

i = the nominal interest rate,

y = the level of real income,

subscripts 1 and 2 represent countries 1 and 2, and all variables, with the exception of "i", are in logarithms.

In expression (1), inflationary expectations determine the exchange rate through nominal interest rates. The Fisher relationship between nominal interest rates and inflation rates in empirically testable form is:

$$i = a + b\, (\hat{P}/P)^e \quad (2)$$

where $(\hat{P}/P)^e$ = the expected inflation rate.

Recognising expression (2) for nominal interest rates in (1), we

have:[1]

$$s = a + b\, m_1 - c\, m_2 + d\, (\hat{P}/P)^e_1 - e\, (-P/P)^e_2 + f\, y_1 - g\, y_2 \qquad (3)$$

The interesting feature of (3) is that is shows the relationship between inflation rates and the level of exchange rates while the relative form of purchasing power parity theory argues for a relationship between inflation rates and the rate of change of exchange rates. The findings of this study are based on empirical tests of (2) and (3).

Tests are performed for the Deutsche mark and U.S. dollar currencies during the sample period October 1973 - May 1977. The DM/$ exchange rate began floating in April 1973. Making allowance for disorderly market conditions that existed during the initial period of the float, we began our tests for the exchange rate from October 1973. In order to acquaint the reader with the data, Table 1 shows the data volatility for the sample period. The exchange rate is not the most volatile variable; it is more volatile than the U.S. Euro-rate, but less volatile than the German Euro-rate. Even the income variable of both countries is more volatile than the exchange rate. Given such variability in fundamental variables, it is not surprising that exchange rates have been so volatile. In a rational market, the volatility of fundamental variables that determine the exchange rate is one reason for exchange rate volatility.

A mechanism needs to be postulated for the generation of inflationary expectations in (3). Let us consider the case of perfect foresight for expectations. One month, three month, six month and twelve month expectation horizons are considered. For example, for a one month expectation horizon, the average inflation rate for the next month and the current month, when decisions are made at the end of the current month, are assumed to be known.

Table 2 shows the results of the tests for the DM/$ exchange using expression (3). The money supply variable uses the M2 measure, and the inflation rates are based on CPI. This was done in deference to our finding that M2 was better than M1 and CPI was better than WPI. Of the different expectation horizons considered, the twelve month horizon is seen to do the best. For the result with the twelve month horizon, all coefficients are of the correct sign, and all variables, with the exception of German income, are significant. The constant term is insignificant, which is a correct feature. From the coefficient values for the inflation variable, the impact of expectations on the exchange

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[1]The real interest rate is assumed to be the same in both countries.

Table 1

The Mean Value, Standard Deviation and Coefficient of Variation of Data

(October 1973 - May 1977)

	U.S.			Germany		
Item	Mean	S.D.	C.V.	Mean*	S.D.	C.V.
Consumer Price Index (CPI)	0.65	0.29	0.45	0.49	0.31	0.65
Wholesale Price Index *WPI)	0.99	0.82	0.83	0.54	0.66	1.22
Euro-interest rate	-1.51	8.98	-5.95	0.17	19.19	114.77
Exchange rate (DM/$)				-0.23	2.57	-11.39
M1 money supply	0.53	3.41	6.49	0.85	3.44	4.06
M2 money supply	0.67	1.68	2.50	0.89	1.36	1.52
Industrial Production Indix (IPI)	0.07	1.42	19.71	-0.02	1.34	-68.26

*Monthly percentage change values

Data Sources: I.M.F., International Financial Statistics

Harris Bank Trust publications

Table 2

Test of the Monetarist Model of the Exchange Rate

DM/$ Rate: October 1973 - May 1977

$$s = a + bm_1 - cm_2 + d\,(\Delta P/P)_1^e - e\,(\Delta P/P)_2^e + fy_1 - gy_2 \qquad (3)$$

Expectation horizon	a	b	c	d	e	f	g
One month	4.546	0.483	-1.187	0.017	-0.004	-0.582	0.822
	(2.99)	(1.77)	(-3.27)	(2.10)	(-0.36)	(-1.71)	(3.29)
	RSQ = 0.797 F = 23.61 D.W. = 1.768 s.e. = 0.023						
Three month	4.213	0.400	-0.961	0.013	-0.0005	-0.735	0.837
	(2.82)	(1.55)	(-2.69)	(2.14)	(-0.11)	(-2.19)	(3.34)
	RSQ = 0.798 F = 23.76 D.W. = 1.824 s.e. = 0.023						
Six month	4.175	0.481	-1.026	0.018	-0.005	-0.715	0.807
	(3.13)	(2.10)	(-2.94)	(3.26)	(-1.37)	(-2.22)	(3.59)
	RSQ = 0.822 F = 27.60 D.W. = 1.860 s.e. = 0.021						
Twelve month	2.081	0.463	-0.955	0.025	-0.010	-0.429	0.895
	(1.42)	(2.12)	(-278)	4.02)	(-2.90)	(-1.28)	(4.37)
	RSQ = 0.837 F = 30.84 D.W. = 1.860 s.e. = 0.021						

Notes: All results are based on the Cochrance-Orcutt procedure for the correction of serial correlation of residuals.
Figures within parenthesis represent "t" values.

rate can be observed: for the DM/$ rate, a 10% German inflation rate depreciates the Deutsche mark 2.5% while a 10% U.S. inflation rate depreciates the dollar 1%. In other words, a common 10% inflation rate in both countries depreciates the Deutsche mark 1.5%. Therefore a deviation in relative purchasing power parity is observed. Such deviations in relative purchasing power parity in the short run have been obtained in most empirical tests.[2] Further analysis of the results shows that the German inflation rate has been significant for all expectation horizons considered. In this respect, the coefficient value is seen to be greater the longer the expectation horizon considered. In other words, the longer the expectation horizon considered, the lower the demand for Deutsche mark and the higher the DM/$ exchange rate. This result is consistent with a period of accelerating inflation. In such an environment, the longer the expectation horizon the higher the inflation rate.

Let us next examine the results for expression (2). For the Deutsche mark and U.S. dollar Euro-rates, no significant estimates were obtained for the sample period October 1973 - May 1977. But expansin of the data set to include the earlier months of 1973 produced some significant estimates. In the case of the Deutsche mark, a sample period of April 1973 - May 1977 resulted in a significant estimate for the twelve month expectation horizon. A 10% inflation rate in Germany produces a 7.5% increase in the Euro-rate. In the case of the U.S. dollar, again a twelve month expectation horizon was observed to be significant in a sample period January 1973 - May 1977. A 10% U.S. inflatin rate increases the Euro-rate by 5.4%. A perfect Fisher relation would call for a 10% increase in the Euro-rate with a 10% inflation rate. Therefore deviations from a perfect Fisher relationship are observed in both countries. With such deviations, a 10% common inflation rate produces a 2.1% (i.e. 7.5% - 5.4%) difference in the two Euro-rates, in favor of the Deutsche mark. This assumes that the real interest rate is the same in both countries.

We therefore have the following results for the DM/$ exchange rate in the period of the mid-70s.

(1) A 10% common inflation rate in Germany and U.S. leads to the depreciation of the Deutsche mark by 1.5%, and a relative increase for the German Euro-interest rate by 2.1%. Deviations in relative purchasing power parity and Fisher relation (2) were observed in both countries in this regard. Nevertheless, Fisher International is approximately seen to hold. Fisher

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[2]See L.H. Officer (1976) for a survey of the literature on purchasing power parity theory.

Table 3

Test of the Fisher Relationship

$$\ln i = a = b \ (\Delta P/P)^{e} \quad (2)$$

Currency and period	One month expectation		Three month expectation		Six month expectation		Twelve month expectation	
	a	b	a	b	a	b	a	b
Deutsche Mark 4/73 - 5/77	1.758	-0.003	1.759	-0.004	1.492	0.207	0.611	0.751
	(8.05)	-0.06)	(7.78)	(-0.06)	(6.99)	(1.75)	(1.10)	(2.07)
	RSQ = 0.725 DW = 1.96 s.e.= 0.234		RSQ = 0.725 DW = 1.95 s.e.= 0.234		RSQ = 0.742 DW = 1.98 s.e.= 0.227		RSQ = 0.737 DW = 1.86 s.e.= 0.229	
U.S. Dollar 1/73 - 5/77	1.968	0.005	1.985	-0.004	2.044	-0.036	0.938	0.542
	(6.78)	(0.23)	(6.09)	(-0.06)	(5.13)	(-0.27)	(1.83)	(2.16)
	RSQ = 0.902 DW = 1.57 s.e.=0.102		RSQ = 0.902 DW = 1.57 s.e.= 0.102		RSQ = 0.902 DW = 1.56 s.e.=0.102		RSQ = 0.908 DW = 1.64 s.e.= 0.098	

Figures within parenthesis denote "t" values.

International asserts that the country with the higher interest rate has a depreciation of its currency to offset the interest differential in its favor. This would follow from financial capital mobility and arbitrage.

(2) This exercise illustrates the importance of the expectations horizon. The above result is based on a twelve month expectation horizon for one month exchange rate and interest rates. Therefore, empirical investigators of expectations would be well-advised to consider different expectations horizons.

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