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Exchange Rate Expectations: A Survey of Survey Studies

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Abstract

This paper presents a brief survey of the empirical literature on survey-based exchange rate expectations. The literature in general supports the presence of a non-zero risk premium and rejects the hypothesis of rational expectations. The crucial result is that, while short-run expectations tend to move away from some long-run "normal" values, long-run expectations tend to regress toward them. If this nature of short-run expectations increases the volatility of exchange rate movements, there may be a basis for some official measure to minimize short-run exchange rate movements.

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Table of Contents

Summary

This paper presents a brief survey of the empirical literature on survey-based exchange rate expectations. Three broad generalizations emerge from the empirical literature. First, survey data generally indicate that expected changes in nominal exchange rates are not equal to interest rate differentials. However, the implied risk premia appear to be stable over time, suggesting that assets denominated in different major currencies can be considered perfect substitutes, at least for changes in fundamentals observed during the sample period. Second, almost all empirical tests reject the hypothesis that exchange rate expectations are rational. Except for certain time periods and horizons, survey expectations are shown to be biased predictors of future exchange rates, and forecast errors seem to be correlated with variables that are known to be in the set of information available when the expectations are formed.

Third, most important, survey data consistently suggest a crucial behavioral difference between short-run (generally shorter than one month) and long-run (generally longer than three months) expectations. Specifically, while depreciations have a tendency to be followed by expectations of further depreciations in the short run, they tend to be followed by expectations of moderate reversals (appreciations) in the long run. If the nature of short-run expectations increases the volatility of exchange rate movements relative to what is warranted by long-run fundamentals, there may be a basis for arguing that some type of policy action is useful in preventing unnecessary (and potentially harmful) exchange rate movements in the short run.

I. Introduction

While it is firmly established that expectations play a central role in the determination of exchange rates, little is known about the exact nature of those expectations. Of course, the problem with empirically testing hypotheses about exchange rate expectations is that they are unobservable. In the past, a popular way to get around this problem has been to use either the forward exchange rate or the ex post spot exchange rate as a proxy of the expected exchange rate.

There is an obvious drawback to this approach. First, the use of the forward exchange rate presupposes that there is no risk premium, when the absence of a risk premium itself is a hypothesis of interest. Second, the use of the ex post exchange rate imposes rationality on expectations, when the nature of expectations can only be determined empirically. Most empirical tests involving exchange rate expectations are thus joint tests of a hypothesis about the degree of risk aversion (or a more structural model of exchange rate determination) and a hypothesis about the nature of expectations.

In order to avoid the joint nature of conventional hypothesis testing, an increasing number of researchers have recently begun to use survey data in tests involving exchange rate expectations. The use of observable survey expectations allows separate testing of an underlying model of exchange rate determination and a hypothesis about expectations. Perhaps for good reasons, there is strong professional resistance to use of non-market data. For one thing, there is no assurance that economic agents have enough incentive to disclose their truthful expectations. Moreover, even if they did, no precise link seems to exist between average (or individual) expectations and the actual exchange rates that are in fact marginal prices in the foreign exchange market. However, in the absence of better alternatives, an empirical literature based on survey data of exchange rate expectations has been expanding in recent years. This paper is a brief survey of this growing literature.

The paper is organized as follows. Section II briefly summarizes the features of five major sets of survey data used in the literature. Section III presents three important descriptive characteristics of survey exchange rate expectations. Section IV surveys major empirical results on forward discounts and risk premia, section V on the rationality of expectations, section VI on the mechanism of expectations formation, and section VII on the relationship between short-run and long-run expectations. Finally, the concluding section presents a summary and a few policy implications.

II. Data sets

Five sets of survey data have been used in the literature (Table 1). First, the oldest data set comes from the (roughly) annual surveys of the

Table 1. Major Surveys of Exchange Rate Expectations

Surveys	Descriptions
American Express Banking Corporation (Amex), London	January 1976-July 1985; roughly annually; a sample of 250-300 financial market experts; the British pound, deutsche mark, Japanese yen, Swiss franc, and French franc against the U.S. dollar; 6-month and 12-month expectations.
Economist's Financial Report (Economist), London	June 1981-present; every 6 weeks; a sample of 14 international banks; the British pound, deutsche mark, Japanese yen, Swiss franc, and French franc against the U.S. dollar; 3-month, 6-month and 12-month expectations.
Money Market Services (MMS), New York and London 1/	October 1984-present; weekly; a sample of about 30 professional traders; the British pound, deutsche mark, Japanese yen, Swiss franc against the U.S. dollar; 1-week and 1-month expectations.
Godwins, London	January 1981-present; monthly; a sample of over 50 investment managers; the British pound's effective exchange rate and bilateral rate against the U.S. dollar; 12-month expectations.
Japan Center for International Finance (JCIF), Tokyo	May 1985-present; semi-monthly; a sample of 44 market participants; the Japanese yen against the U.S. dollar; 1-month, 3-month and 6-month expectations.

1/ For the period between November 1982 and October 1984, the surveys were bi-weekly and included only 2-week and 3-month expectations.

6-month and 12-month expectations of over 250 monetary officials and other financial market experts, conducted by American Express Banking Corporation (Amex) of London for the period 1976-85. The exchange rates in the surveys were the U.S. dollar rates of five major currencies, namely, the British pound, deutsche mark, Japanese yen, Swiss franc and French franc. A problem with the Amex data is that the surveys were irregular and conducted by mail, making the timing of surveys somewhat imprecise. The Amex survey was discontinued in 1985.

Second, the Economist Financial Report (Economist) has been publishing telephone surveys of the 3-month, 6-month and 12-month expectations of 14 leading international banks every six weeks since 1981. The exchange rates in the surveys are the same as the Amex data, comprising the U.S. dollar rates of the five major currencies.

Third, a similar data set comes from weekly telephone surveys on the 1-week and 1-month exchange rate expectations conducted by Money Market Services (MMS) of California. Weekly surveys have been conducted, since 1984, in both New York and London, and each sample includes about 30 professional traders. Between November 1982 and October 1984, the surveys were bi-weekly and consisted of 2-week and 3-month expectations. The exchange rates in the MMS data are the U.S. dollar rates of four major currencies, namely, the British pound, deutsche mark, Japanese yen and Swiss franc.

Fourth, since January 1981, Godwins of London has conducted monthly surveys of 50 leading investment managers. The Godwins data contain only the 12-month qualitative expectations of the effective and the U.S. dollar exchange rates of the British pound. That is to say, the survey asks the respondents only their opinions of the direction of expected future change, i.e., whether the exchange rate would go up, go down, or remain the same. Taylor (1989), the only researcher to have used the Godwins data, employed a subjective probability method to derive a quantitative series of mean expectations in his study.

Finally, semi-monthly telephone surveys have been conducted since May 1985 by the Japan Center for International Finance (JCIF), a private institution affiliated with the Japanese Ministry of Finance. The JCIF data contain the 1-month, 3-month and 6-month expectations of the U.S. dollar exchange rate of the Japanese yen held by 44 market participants in Tokyo. The surveys have consistently included the same respondents classified into six industry groups, consisting of banks and brokers, securities companies, general trading companies, insurance companies, importers, and exporters; the data can thus be used both as panel data and as industry data.

III. Some Characteristics of Survey Data

Before proceeding to review the empirical literature on survey-based exchange rate expectations, one should take note of general qualitative characteristics of the survey data. Among many such characteristics, this section will summarize three of them under the headings of heterogeneity, underprediction and "twist", as a background against which major empirical studies can be reviewed.

1. Heterogeneity

While, in what will follow, we adopt the convention of treating expectations as if they were homogeneous, the limitation of this standard practice should be noted at the outset. In reality, any survey data will immediately reveal that expectations have a distribution. If we take the exchange rate of the Japanese yen against the U.S. dollar as an example, the standard deviations have roughly ranged in recent years between 2 and 5 yen per dollar (1-3.5 percent) for 1-month expectations, between 3 and 8 yen (1.5-5.5 percent) for 3-month expectations, and between 3 and 11 yen (1.5-7.5 percent) for 6-month expectations. As expected, there is a tendency for dispersion (as measured by standard deviations) to increase for longer-term expectations, although the size of increase appears to be far less than would be the case if the variance were to remain constant over expectations horizons (Chart 1). Casual observation also indicates that: from the time immediately preceding the Louvre accord in February 1987, the degree of dispersion declined significantly; and that the degree of dispersion began to increase again in the first part of 1989.

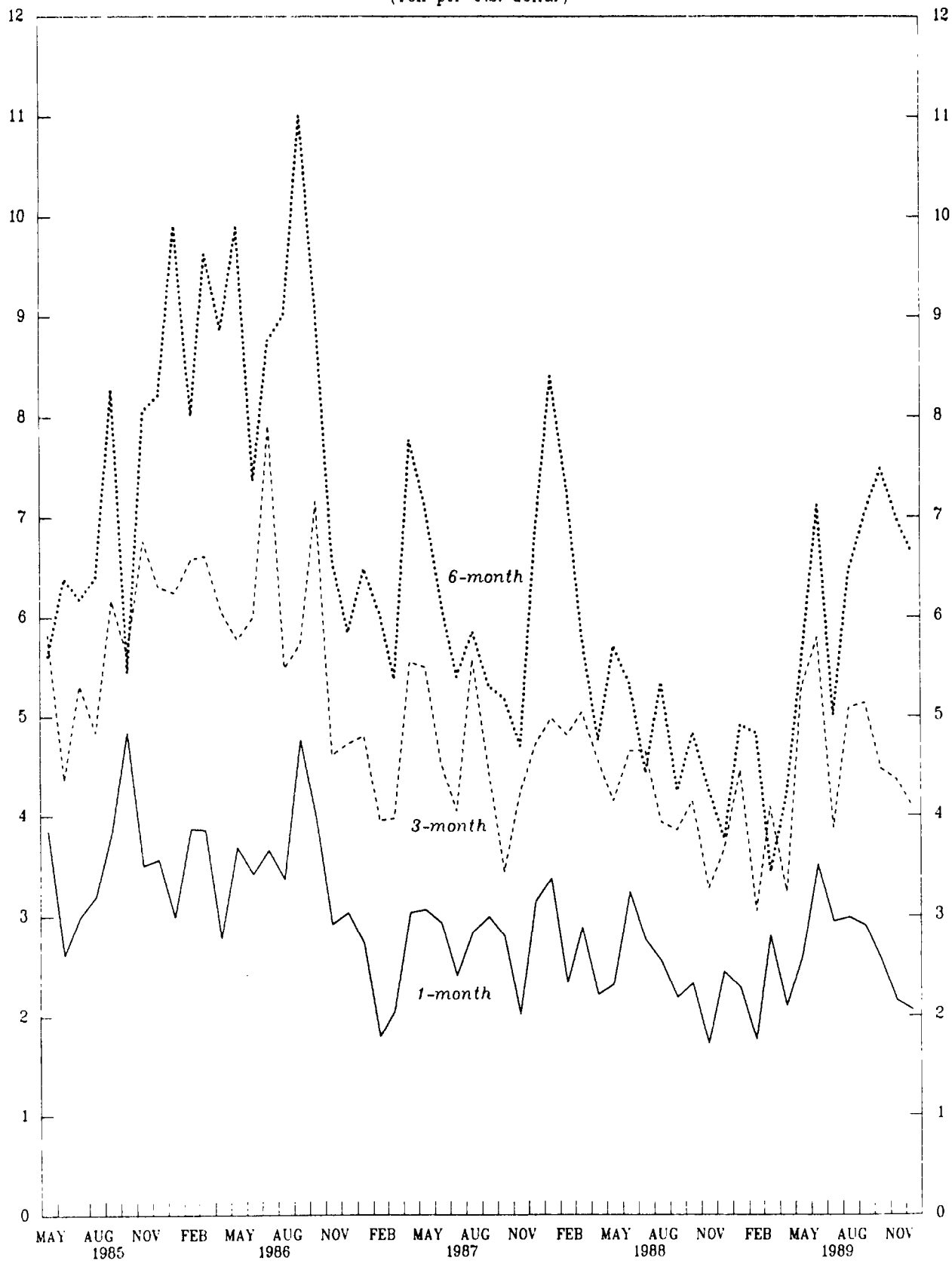
This heterogeneity in expectations may reflect, in addition to usual distributional factors, systematic individual or group effects. On the basis of disaggregated JCIF data, for example, Wakita (1989) and Ito (1989) found significant industry-specific bias in expectations. According to their findings, exporters expressed greater expected yen depreciation (or smaller expected yen appreciation) and importers expressed exactly the opposite expectations. This systematic expectational bias in favor of one's interest may indicate either wishful thinking or strategic behavior (to influence the movement of the exchange rate in a desired direction). Wakita (1989) suggests a possibility that such industry-specific bias may reflect private information, while Ito (1989) argues that, to the extent that individuals are not likely to possess private information, the presence of individual effects must reflect the failure of the rational expectations hypothesis.

2. Underprediction

Another important characteristic of survey data is a general tendency for the expected future exchange rate of all time horizons to follow closely the current spot exchange rate. This means that expected changes in exchange rates as reported in survey data tend to underpredict consistently

Chart 1. Standard Deviations of Expected Exchange Rates May 1985 to December 1989[1/]

(Yen per U.S. dollar)



Source: Japan Center for International Finance (JCIF).

1/ Monthly time-series of 1-month, 3-month, and 6-month expected exchange rates of the Japanese yen against the U.S. dollar.

the extent of actual exchange rate movements; this is demonstrated by Chart 2, which depicts the actual and expected exchange rates of the U.S. dollar against the Japanese yen during the recent period of sharp dollar depreciation. This is another way of saying that much of actual exchange rate change is unexpected; this is consistent with a similar conclusion based on forward exchange rates as a measure of expected exchange rates (Mussa 1979).

For the earlier period of dollar appreciation (i.e., from 1981 through early 1985), survey data indicated a persistent underprediction of the extent of the actual dollar appreciation. In fact, the market participants surveyed in general expected the major currencies to appreciate against the U.S. dollar (Table 2). In contrast, during the period of dollar depreciation (i.e., from late 1985 through early 1987), the market participants expected a much more moderate depreciation of the dollar; they even expected a sizable appreciation of the dollar against the British pound, when the dollar in the event depreciated in subsequent months. This characteristic of expectations is important to bear in mind when we interpret the results of rational expectations tests.

3. Twist

The final important characteristic of survey data is a tendency for longer-run expectations to reverse the direction of the short-run expectations. That is to say, depreciation tends to be followed by expectations of further depreciations in the short run, but by expectations of moderate reversals (or appreciations) in the long run. This characteristic has been called in the literature as a "twist" in expectations.

This tendency becomes conspicuous during periods of sharp exchange rate movement, as in the recent period of dollar depreciation against the major currencies. For example, when we look at the movements of the expected exchange rates of the U.S. dollar against the Japanese yen during the 6-month period between October 1985 and March 1986 (covering expectations for the period between November 1985 and September 1986), we note that the market participants surveyed expected the dollar to continue to depreciate over the period of one month but to appreciate over the period of six months (Chart 3). Some have interpreted this as reflecting the view of market participants that exchange rates are determined by "momentum" models in the short run but return to historical norms over longer periods (see Section VI for a further discussion).

IV. Forward Discounts and Risk Premia

The presence or absence of a risk premium has been of significant interest to economists and policy makers because it has far-reaching implications for the substitutability of assets denominated in different

Table 2. Actual and Expected Dollar Depreciations in Selected Sample Periods

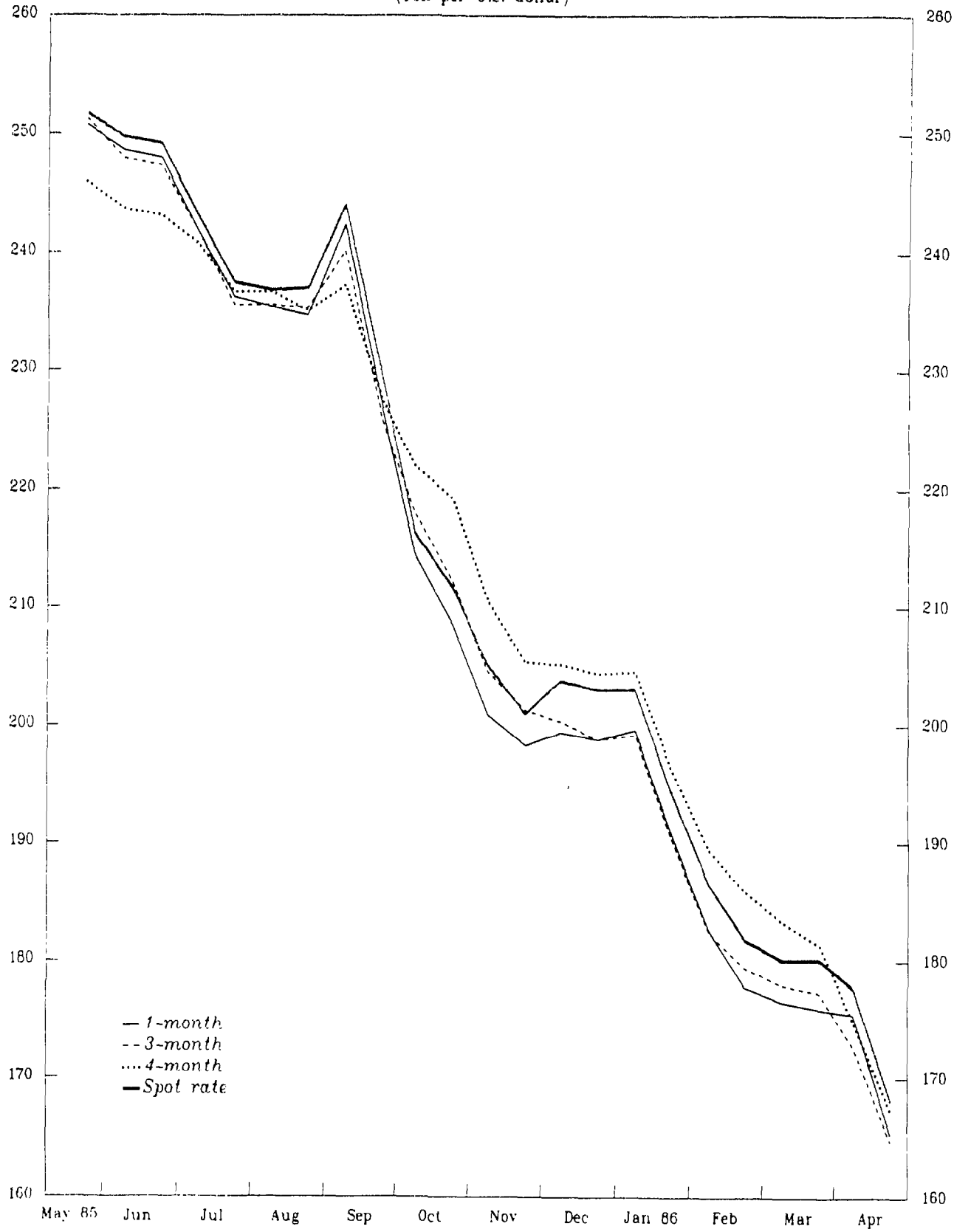
Data	Dates	Currency	Horizon	Actual	Expected
MMS 1/	1/83-10/84	pound	2-week	-16.15	- 2.66
			3-month	-13.92	4.46
		mark	2-week	-15.19	5.09
			3-month	-13.92	0.37
		yen	2-week	- 4.23	8.40
			3-month	- 2.90	8.68
	10/84-2/86	pound	1-week	14.96	-12.84
			1-month	10.13	-11.91
		mark	1-week	21.36	2.84
			1-month	23.82	- 2.26
		yen	1-week	24.39	5.40
			1-month	27.55	2.99
Economist 1/	6/81-12/85	pound	6-month	- 6.79	4.19
			12-month	- 9.47	3.38
		mark	6-month	- 0.96	12.39
			12-month	- 5.60	10.67
JCIF	5/85- 1/87	yen	1-month	25.20	16.80
			3-month	30.32	5.00
			6-month	26.16	- 0.40
	2/87- 7/89		1-month	6.60	11.88
			3-month	2.24	9.20
			6-month	1.48	5.20

Average annualized logarithmic change in basis points (roughly equal to percentage change); an increase in value means a depreciation of the U.S. dollar against the British pound, deutsche mark, or Japanese yen.

1/ Frankel and Froot (1987a).

Chart 2. Actual and Expected Exchange Rates May 1985 to April 1986 [1/]

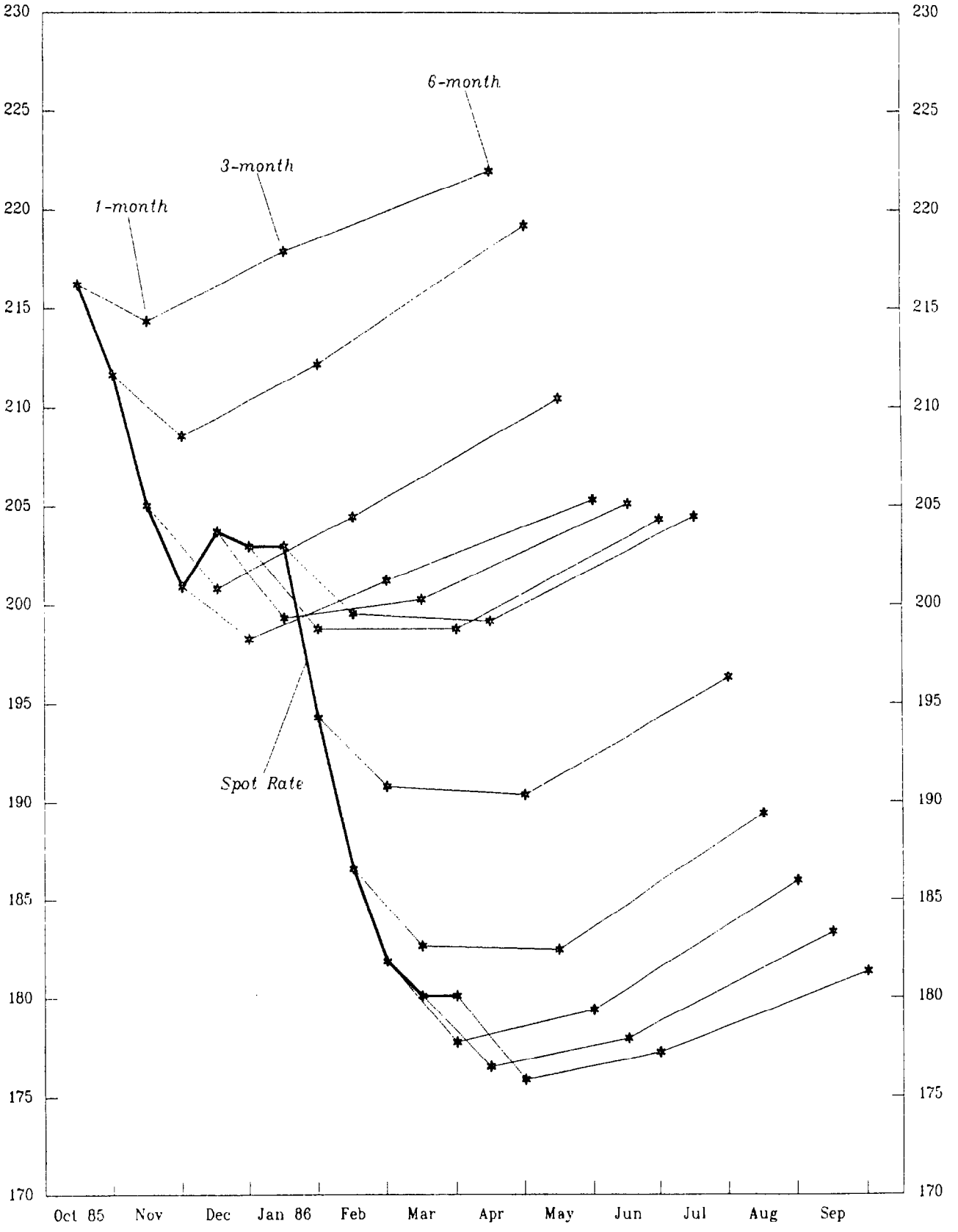
(Yen per U.S. dollar)



Source: Japan Center for International Finance (JCIF).

1/ Semi-monthly time-series of the spot and 1-month, 3-month, and 6-month expected exchange rates of the Japanese yen against the U.S. dollar.

Chart 3. Twists in Exchange Rate Expectations October 1985 to September 1986 1/



Source: Japan Center for International Finance (JCIF).

1/ Semi-monthly time-series of the spot and 1-month, 3-month, and 6-month exchange rates of the Japanese yen against the U.S. dollar. The expected exchange rates are dated according to the future periods for which the expectations are formed.

currencies and hence for the efficacy of sterilized foreign exchange market intervention. The use of survey data allows the direct measurement of a risk premium from the observation of the forward discount (fd), which can be decomposed into the expected currency depreciation and a risk premium,

$$fd_{t+j} = {}_tf_{t+j} - s_t$$
$$= (E_t s_{t+j} - s_t) + rp_t, \qquad (1)$$

where ${}_tf$ is the log of the forward exchange rate set in period t, E_t is a mathematical expectations operator conditional on the set of information available in period t, s_t (s_{t+j}) is the log of the spot exchange rate in period t (t+j), and rp_t is a risk premium; an increase in the exchange rate is defined as a depreciation of the domestic currency (the U.S. dollar).

Table 3 presents the decomposition of the forward discount of the U.S. dollar into expected depreciation (as reported in survey data) and the risk premium in selected sample periods. For the most part, we note that the dollar was expected to depreciate against the deutsche mark and the Japanese yen by an amount greater than the size of the forward discount; in contrast, the dollar was expected to appreciate against the British pound by an amount greater than the size of the forward premium. In general, exchange rate expectations were positively correlated with the forward discount (i.e., the currencies that were expected to depreciate were at a forward discount).

While descriptive statistics suggest the presence of a risk premium, one wants to know if the risk premium is significant (in a statistical sense) and if it is correlated with the forward discount. This question is important because it sheds light on the source of the forward discount bias. The forward rate can fail to be an unbiased predictor of the future exchange rate either because of the failure of rational expectations (to be treated in the next section) or because of such a time-varying risk premium.

The null hypothesis that the correlation of the risk premium with the forward discount is zero can be tested by running the following regression:

$$E_t s_{t+j} - s_t = a_1 + a_2\, fd_{t+j} + e_t \qquad (2)$$

where e is a random error term. The null hypothesis is that a_2=1.

According to the results of Froot and Frankel (1989) as selectively summarized in Table 4, we note that the hypothesis of a_2=1 was rejected for 1-month expectations but could not be rejected for expectations of three months or longer (see Sections VI and VII for the difference between short-run and long-run expectations). There is thus little evidence that a risk premium is correlated with the forward discount, at least for longer-run

Table 3. Decomposition of the Forward Discount on the U.S. Dollar in Selected Sample Periods

Data	Currency	Horizon	Forward Discount	Expected Depreciation	Risk Premium
MMS 1/					
10/84- 2/86	pound	1-month	-3.85	-11.91	8.06
	mark		3.23	- 2.26	5.49
	yen		1.68	2.99	-1.31
1/83-10/84	pound	3-month	0.37	4.46	-4.09
	mark		4.68	8.33	-3.65
	yen		3.85	8.68	-4.83
Economist 1/					
6/81-12/85	pound	3-month	-0.06	3.66	-3.72
		6-month	0.14	4.19	-4.05
		12-month	0.36	3.38	-3.02
	mark	3-month	4.36	11.84	-7.48
		6-month	4.35	12.39	-8.04
		12-month	4.24	10.67	-6.43
	yen	3-month	4.67	12.66	-7.99
		6-month	4.74	12.94	-8.20
		12-month	4.66	10.67	-6.01
Godwin 2/					
1/81- 7/85	pound	12-month	-0.79	-6.41	5.62
JCIF					
5/85- 2/87	yen	3-month	1.52	5.00	-3.48
		6-month	1.64	-0.40	2.04
2/87- 7/89		3-month	3.64	9.20	-5.56
		6-month	3.64	5.20	-1.54

Average annualized logarithmic changes in basis points (close to percentage change).

1/ Frankel and Froot (1987a).
2/ Taylor (1989).

Table 4. Forward Discounts: Summary Results of Froot and Frankel (1989)

Equation (2): $E_t s_{t+j} - s_t = a_1 + a_2 fd_{t+j} + e_t$

Data	Currency 1/	Horizon	a_2 2/	F 3/
MMS, 11/82- 1/88	All	1-month	3.07 (0.47)**	36.34**
Economist, 6/81-12/85	All	3-month	1.30 (0.26)	16.55**
		6-month	1.03 (0.17)	52.06**
		12-month	0.93 (0.15)	65.82**
Amex, 1/76-7/85	All	6-month	1.21 (0.21)	6.32**
		12-month	0.88 (0.28)	8.10**

1/ All against the U.S. dollar. See Table 1 for the currencies included in each data set.

2/ Standard errors in parentheses; ** indicates that the hypothesis of a_2=1 is rejected at the one percent level of significance.

3/ F-statistics on the joint hypothesis of a_1=0 and a_2=1; ** indicates that the hypothesis is rejected at the one percent level of significance.

expectations. However, the F-statistics rejected the joint hypothesis of $a_1=0$ and $a_2=1$, suggesting the presence of a non-zero risk premium (see also Table 3). The failure to reject the hypothesis of $a_2=1$ may be interpreted as evidence of the perfect substitutability of assets denominated in different currencies, to the extent that a change in expected exchange rates is fully reflected in a one-to-one change in forward exchange rates at least for changes in fundamentals observed during the sample period.

V. Rationality of Expectations

The overwhelming majority of the empirical literature is concerned with the rationality of survey exchange rate expectations, defined in terms of either of the two criteria: (1) whether the expected exchange rate is an unbiased predictor of the future spot exchange rate (unbiasedness); and (2) whether the expected exchange rate fully incorporate all available information (orthogonality). The tests of rational expectations reported in the literature also correspond to these two types.

1. Unbiasedness

Unbiasedness is an important aspect of the rationality of exchange rate expectations. The use of survey data allows direct testing of the hypothesis that the expected spot exchange rate for period t+j (formed in period t) is an unbiased predictor of the future spot rate (in period t+j),

$$s_{t+j} = b_1 + b_2 E_t s_{t+j} + u_t, \qquad (3)$$

where the survey expectation $E_t s_{t+j}$ is free from the presence of a risk premium, and u is a random error term. Tests of the unbiasedness of exchange rate expectations would involve tests of the hypothesis of $b_1=0$ and $b_2=1$, when equation (3) is estimated, usually in first difference form.

Dominguez (1986) and Ito (1989) regressed actual depreciation on expected depreciation using MMS and JCIF data, respectively, for different time horizons and for different dollar exchange rates (Table 5). For the earlier period (1983-85), Dominguez almost unanimously rejected the joint hypothesis of $b_1=0$ and $b_2=1$ for 1-week, 1-month and 3-month expectations for all currencies. The negative estimates of b_2 for some exchange rates suggest that the forecasts missed the direction of exchange rate movements. Moreover, the estimate of b_2 was below unity in many cases, implying the tendency of forecasters to overpredict the size of future dollar depreciations.

For the later period (1985-87), however, Ito (1989) could not reject the joint hypothesis except for the 6-month expectation. The difference between the two studies may reflect the extraordinary nature of the earlier sample period. As we noted earlier, the period studied by Dominguez was one in which the U.S. dollar continued to appreciate on a sustained basis

Table 5. Unbiasedness: Some Regression Estimates

Equation (3): $s_{t+j} = b_1 + b_2 E_t s_{t+j} + u_t$

Studies	Currency 1/	Horizon	b_1	b_2	x^2 2/
Dominguez (1986) MMS, 1983-85	pound	1-week	0.001	-0.171**	44.3**
			(0.003)	(0.181)	
		1-month	-0.001	-0.505**	21.4**
			(0.006)	(0.329)	
		3-month	-0.029**	-0.450**	39.2**
			(0.015)	(0.395)	
	mark	1-week	0.002	0.049**	48.8**
			(0.003)	(0.137)	
		1-month	0.014	-0.248**	15.1**
			(0.007)	(0.392)	
		3-month	-0.043**	0.412	23.3**
			(0.016)	(0.529)	
	yen	1-week	0.003	0.502**	12.8**
			(0.002)	(0.146)	
		1-month	0.015	0.404*	6.2*
			(0.008)	(0.291)	
		3-month	0.003	-0.457**	9.4**
			(0.016)	(0.626)	
Ito (1989) JCIF, 1985-87	yen 3/	1-month	-0.028	-0.485	2.6
			(0.017)	(0.969)	
		3-month	-0.043	1.167	5.2
			(0.034)	(1.167)	
		6-month	-0.119**	0.908	10.1**
			(0.041)	(0.741)	

Standard errors are in parentheses; * (**) indicates rejection of the unbiasedness hypothesis at the 5 (1) percent level of significance.

1/ Against the U.S. dollar.
2/ x^2-statistics on the joint hypothesis that b_1=0 and b_2=1.
3/ Average data.

despite expectations to the contrary. Given the extremely low values of R^2 in all of these studies (not reported in the table), only very little portion of actual exchange rate changes were predicted in practice. The exact outcome of empirical tests of the unbiasedness hypothesis is thus likely to depend on the sample.

2. Orthogonality

Orthogonality is another important aspect of the rationality of exchange rate expectations. If expectations are to be efficient (in the sense that they incorporate all available information), their predictable power cannot be improved by inclusion of any variable that is already in the set of information available at the time when the expectations are formed. That is to say, prediction errors must be uncorrelated with any variable in the set of known information. This orthogonality condition can be formally tested by running the following regression,

$$E_t s_{t+j} - s_{t+j} = c_1 + c_2 X_t + v_t \qquad (4)$$

where the left-hand-side variable is a prediction error, X_t is a set of information known in period t, and v is a random error term; popular candidate variables for X_t have included forward discounts (or nominal interest rate differentials), and lagged exchange rates. The orthogonality hypothesis is that $c_1=c_2=0$.

Table 6 summarizes some of the regression results, along with the choice of X_t variables and samples, reported in the literature. While the summary is by no means exhaustive, it gives an indication of the range of results that have been obtained from survey studies. As a general rule, we find that, given the large standard errors, t-tests often failed to reject the separate null (orthogonality) hypothesis of $c_1=0$ or $c_2=0$. However, χ^2- or F-statistics almost unanimously rejected the joint orthogonality hypothesis of $c_1=c_2=0$, particularly for time horizons longer than three months. These results, taken together, seem to suggest that the expected exchange rates as reported in the survey data did not fully incorporate all available information.

VI. Mechanisms of Expectations Formation

Regardless of whether or not expectations are rational, it is of independent interest to investigate how they are formed. Survey data have been used to test three broad types of expectations formation mechanism, according to the classification popularized by Frankel and Froot (1987a): extrapolative, adaptive and regressive expectations. It should be noted in this exercise that no attempt is being made to decide which of the three expectations mechanisms is correct or even closest to the actual process.

Table 6. Orthogonality: Some Regression Results

Equation (4): $E_t s_{t+j} - s_{t+1} = c_1 + c_2 X_t + v_t$

Studies	X_t	Currency 1/	Horizon	c_1	c_2	χ^2/F 2/
Dominguez (1986); MMS, 1983-85	Forward discount	pound	1-month	0.012	-1.26	5.9
				(0.017)	(1.56)	
			3-month	-0.039**	-7.89**	128.8**
				(0.006)	(1.03)	
		mark	1-month	0.019	-1.14	6.4*
				(0.008)	(1.18)	
			3-month	0.003	-4.96	36.9**
				(0.053)	(4.33)	
		yen	1-month	0.015	-0.36	3.1
				(0.008)	(0.78)	
			3-month	0.003	-3.26	6.9*
				(0.035)	(3.59)	
Froot and Frankel (1989); Economist, 1981-85	Forward discount	all 3/	3-month	--	2.51	1.3
					(1.29)	
			6-month	--	2.99	1.5
					(1.60)	
			12-month	--	0.52	6.0**
					(1.23)	
Amex, 1976-85			6-month	--	3.63**	3.3**
					(1.34)	
			12-month	--	3.11*	1.5
					(1.30)	
MMS, 1982-88			1-month	--	4.81**	8.7**
					(1.22)	
Ito (1989); JCIF, 1985-87	Lagged exchange rate change	yen	1-month	0.004	0.17	3.9
				(0.010)	(0.20)	
			3-month	0.042	0.31	9.5**
				(0.025)	(0.23)	
			6-month	0.114**	0.23	18.9**
				(0.036)	(0.36)	
MacDonald and Torrance (1989); MMS(UK), 1982-87	Nominal interest differential	pound	1-month	-0.014**	8.20**	19.6**
				(0.004)	(1.55)	
		mark	1-month	0.033**	12.31**	14.7**
				(0.011)	(3.34)	
		yen	1-month	0.018*	7.41*	4.6
				(0.010)	(3.48)	

Standard errors are in parentheses; * (**) indicates rejection of the orthogonality hypothesis at the 5 (1) percent level of significance.

1/ Against the U.S. dollar.
2/ χ^2-statistics on the joint hypothesis that $c_1=c_2=0$; for Froot and Frankel (1989) only, F-statistics are reported.
3/ All the currencies in the sample are pooled.

1. Extrapolative expectations

The first type of expectations formation mechanism is called extrapolative expectations,

$$E_t s_{t+j} - s_t = g\,(s_t - s_{t-j}), \tag{5a}$$

or $$E_t s_{t+j} = h\, s_t + (1-h)\, s_{t-j}. \tag{5b}$$

where $h \equiv (1+g)$. This mechanism is called extrapolative for the obvious reason that the expected currency movement for the next period is given by the past currency movement for the most recent period, as indicated in equation (5a). Equation (5a), however, can equivalently expressed as equation (5b), which indicates that an extrapolated expectation of the spot exchange rate for period t+j is given by a weighted average of the current spot exchange rate and the lagged exchange rate for period t-j.

Of crucial interest is the sign of the coefficient g; $g<0$ is the case of distributed lag (where past currency movement is followed by an expectation of currency movement in the opposite direction), $g=0$ is the case of static expectations (where currency movement is expected to follow a random walk), and $g>0$ is the case of bandwagon expectations (where past currency movement is followed by an expectation of currency movement in the same direction). In the case of bandwagon expectations, $g>1$ indicates that expectations are explosive.

Table 7 summarizes some of the major regression results on the signs and magnitudes of g reported in the literature. First, we find in almost all cases that the t-statistics rejected the hypothesis of static expectations (i.e., $g=0$); this means that, despite the fact that empirical exchange rated followed a process that is closely approximated by a random walk (Mussa 1979; Takagi 1988), market participants did not expect the future exchange rates to follow the same process.

Second, we note that the sign of g is positive (i.e., bandwagon expectations) for the short-run horizons of one or two weeks and one month; the sign of g is negative (distributed-lag expectations) for the long-run horizons of six and twelve months; and the sign of g was mixed for the 3-month expectations. This behavioral difference between short-run and long-run expectations is a general characteristic of survey expectations that will be repeatedly shown throughout this section. As to the magnitude of the estimates, the regression results indicated that the absolute values of g was less than unity in all cases. This means that, for the bandwagon-type of short-run expectations, expectations were stabilizing.

Table 7. Extrapolative Expectations: Some Regression Results

Equation (5a): $E_t s_{t+j} - s_t = g\,(s_t - s_{t-j})$

Studies	Currency 1/	Horizon	g
Frankel and Froot (1987a);			
MMS, 1983-84	all 2/	3-month	0.039* (0.017)
Amex, 1976-85		6-month	-0.299** (0.049)
		12-month	-0.380** (0.080)
Frankel and Froot (1987b);			
MMS, 1983-84	yen	2-week	0.114* (0.055)
		3-month	0.069** (0.023)
MMS, 1984-86		1-week	0.239** (0.049)
		1-month	0.121** (0.044)
Economist, 1981-85		3-month	-0.143** (0.052)
		6-month	-0.178** (0.050)
		12-month	-0.342** (0.066)
Amex, 1976-85		6-month	-0.291* (0.112)
		12-month	-0.441* (0.170)
Bank of Japan (1989); 3/			
JCIF, 1985-89	yen	1-month	0.029 (0.022)
		3-month	-0.122** (0.024)
		6-month	-0.249** (0.032)
Froot and Frankel (1990);			
MMS, 1984-88	all 2/	1-week	0.13** (0.04)
		1-month	0.08 (0.07)
Economist, 1981-88		3-month	-0.08** (0.03)
		6-month	-0.17** (0.03)
		12-month	-0.33** (0.05)

Standard errors are in parentheses; * (**) indicates that the coefficient is significant at the 5 (1) percent level of significance.

1/ Against the U.S. dollar.
2/ All the currencies in the sample are pooled.
3/ The right-hand-side variable is always $(s_t - s_{t-2})$ in bi-weekly data, regardless of the choice of j.

2. Adaptive expectations

The second mechanism is called adaptive expectations, in which expected currency movement is determined as a fraction of the current prediction error,

$$E_t s_{t+j} - s_t = k\,(E_t s_t - s_t), \tag{6a}$$

or $$E_t s_{t+j} = (1-k)\,s_t + k\,E_t s_t. \tag{6b}$$

As equation (6b), an alternative expression, indicates, the adaptively formed expected exchange rate is given by a weighted average of the current exchange rate and the lagged expected exchange rate.

Adaptive expectations, however, have not been extensively investigated in the empirical literature. Table 8 summarizes some of the empirical results on the sign and magnitude of k that are reported in two studies by Frankel and Froot (1987a, 1987b). First, we again find that the signs of k tended to differ for different time horizons, although the distinction between short-run and long-run expectations is less clear-cut than in the case of extrapolative expectations. For the MSS data containing the expectations over 1-week to 3-month horizons, the sign of k was unanimously negative, indicating that unanticipated appreciation for the current period (i.e., an increase in value of the right-hand-side expression in equation (6a)) leads to continued expected appreciation (i.e., a fall in value of the left-hand-side expression).

On the other hand, for the long-run expectations of three to twelve months, the sign of k was generally positive; the negative estimates in Frankel and Froot (1987a) were statistically insignificant. Although these results are not conclusive, they are consistent with an expectations mechanism under which unanticipated appreciation leads to expected depreciation in the longer run. This may reflect the belief of market participants that there is a long-run "normal" level for the exchange rate. In all cases, the absolute values of all the coefficients were less than unity, suggesting that expectations were stabilizing.

3. Regressive expectations

Finally, the last expectations mechanism discussed in the literature is called regressive expectations, and has a general form,

or $$E_t s_{t+j} - s_t = q\,(\underline{s}_t - s_t), \tag{7a}$$

$$E_t s_{t+j} = (1-q)\,s_t + q\,\underline{s}_t, \tag{7b}$$

where $\underline{s}_t$ is the long-run equilibrium exchange rate. This mechanism is called regressive for the obvious reason that the actual exchange rate is assumed to regress toward the equilibrium exchange rate (at the speed of

Table 8. Adaptive Expectations: Some Regression Results

Equation (6a): $E_t s_{t+j} - s_t = k\,(E_t s_t - s_t)$

Studies	Currency 1/	Horizon	k	
Frankel and Froot (1987a);				
Economist, 1981-85	all 2/	3-month	0.080**	(0.020)
		6-month	0.052**	(0.016)
		12-month	-0.009	(0.024)
MMS, 1983-84		3-month	-0.027	(0.022)
Amex, 1976-85		6-month	-0.070	(0.120)
		12-month	0.095**	(0.021)
Frankel and Froot (1987b);				
MMS, 1983-84	yen	2-week	-0.074	(0.049)
		3-month	-0.054	(0.037)
MMS, 1984-86		1-week	-0.129*	(0.053)
		1-month	-0.091	(0.046)
Economist, 1981-85		3-month	0.142*	(0.054)
		6-month	0.121**	(0.038)
		12-month	0.150*	(0.054)

Standard errors are in parentheses; * (**) indicates that the coefficient is significant at the 5 (1) percent level of significance.

1/ Against the U.S. dollar.
2/ All the currencies in the sample are pooled.

adjustment given by q); in this formulation, the expected exchange rate can also be expressed as a weighted average of the current exchange rate and the long-run equilibrium exchange rate.

Obviously, the estimate of q would depend on what model is used to specify the equilibrium exchange rate ($\underline{s}_t$); popular candidates in the literature have been constants, moving averages, and purchasing power parity (PPP) exchange rates. If the sign of q is found to be positive, the expectation is regressive such that the exchange rate is expected to move in the direction of the specified long-run equilibrium rate; on the other hand, the negative sign of q would indicate an expectations mechanism under which the exchange rate is expected to deviate from the long-run equilibrium rate.

Table 9 summarizes some of the representative regression results reported in the literature. In general, we find that the sign of q was negative for the short-run expectations of one week to one month; the sign of q was positive for the long-run expectations of six and twelve months (except when the coefficient was statistically insignificant); and the sign of q for the 3-month expectations were ambiguous. The negative sign of q for the short-run expectations suggests that exchange rate expectations can be destabilizing in the short run. Once again, we find a striking contrast in behavior between short-run and long-run expectations, as we did in the case of extrapolative and adaptive expectations.

VII. Short-Run and Long-Run Expectations

Regardless of which expectations formation mechanism is assumed, short-run (generally shorter than one month) and long-run (generally longer than three months) expectations have been shown to display strikingly different behavior. There is a tendency for short-run expectations to respond to lagged exchange rate movements in the same direction or move away from some long-run "normal" values, while the tendency of the long-run expectations is to respond to lagged movements in an opposite direction or move towards the long-run normal values. This behavioral difference between short-run and long-run expectations has generated considerable interest in recent years in terms of how to characterize such behavior ("consistency") and how to explain it ("chartists and fundamentalists").

1. Consistency

As a way to capture this apparent behavioral difference between short-run and long-run expectations, Froot and Ito (1989) have recently proposed an analytical concept called consistency, which is a weaker condition of rationality; it is a weaker condition because it does not require that expectations have a certain relationship with the actual exchange rate process. It is important to note, however, that consistency is a model-based concept, such that rejection of the consistency hypothesis is a

Table 9. Regressive Expectations: Some Regression Results

Equation (7a): $E_t s_{t+j} - s_t = q\ (\underline{s}_t - s_t)$

Studies	Currency 1/	$\underline{s}$	Horizon	q	
Frankel and Froot (1987a);					
MMS, 1983-84	all 2/	constant	3-month	0.010	(0.016)
Economist, 1981-85			3-month	0.036**	(0.010)
			6-month	0.076**	(0.013)
			12-month	0.172**	(0.016)
Amex, 1976-85			6-month	-0.000	(0.024)
			12-month	0.079*	(0.035)
MMS, 1983-84		PPP	3-month	-0.021	(0.015)
Amex, 1976-85			6-month	0.032	(0.020)
			12-month	0.124**	(0.028)
Frankel and Froot (1987b);					
MMS, 1983-84	yen	PPP	2-week	-0.094**	(0.020)
			3-month	-0.167**	(0.037)
MMS, 1984-86			1-week	-0.042**	(0.012)
			1-month	-0.075**	(0.019)
Economist, 1981-85			3-month	-0.024	(0.057)
			6-month	-0.036	(0.057)
			12-month	0.080	(0.086)
Amex, 1976-85			6-month	0.022	(0.048)
			12-month	0.119**	(0.059)
Bank of Japan (1989);					
JCIF, 1985-89	yen	6-month Moving Average	1-month	-0.085**	(0.014)
			3-month	0.088**	(0.026)
			6-month	0.374**	(0.031)
Froot and Frankel (1990);					
Economist, 1981-88	all 2/	PPP	3-month	0.010	(0.014)
			6-month	0.048**	(0.018)
			12-month	0.143**	(0.030)

Standard errors are in parentheses; * (**) indicates that the coefficient is significant at the 5 (1) percent level of significance.

1/ Against the U.S. dollar.
2/ All the currencies in the sample are pooled.

rejection of the joint hypothesis of consistency and a particular expectations formation process. 1/

To simplify exposition, assume that the expected one-period depreciation from t to t+1 is determined by the lagged one-period depreciation from t-1 to t as follows:

$$E_t(s_{t+1}) - s_t = w_1 (s_t - s_{t-1}). \tag{8}$$

Equation (8) expresses the mechanism of short-run expectations formation. By updating equation (8), we can express the expected one-period depreciation from t+k-1 to t+k as:

$$E_t(s_{t+k} - s_{t+k-1}) = w_1^k (s_t - s_{t-1}) \tag{9}$$

This means that the expected k-period depreciation from t to t+k can be expressed in terms of the one-period lagged depreciation from t-1 to t as follows:

$$E_t(s_{t+k} - s_t) = \sum_{i=1}^{k} E_t(s_{t+i} - s_{t+i-1})$$

$$= \sum_{i=1}^{k} w_1^i (s_t - s_{t-1}) \tag{10}$$

Equation (10) is the expected k-period expectation from t to k, as obtained from sequentially updating the expected one-period expectation by k times. Now, assume next that the expected k-period depreciation from t to k can also be directly determined by the one-period lagged depreciation from t-1 to t as follows:

$$E_t(s_{t+k} - s_t) = w_k (s_t - s_{t-1}) \tag{11}$$

Equation (11) is the mechanism of long-run expectations formation, analogous to equation (8) for the short-run expectations. Consistency, defined by Froot and Ito (1989), requires that the k-period expectation obtained iteratively from short-run expectations (equation (10)) equal the same k-period expectation obtained directly (equation (11)). In terms of this simple model, consistency thus imposes the following cross equation restriction when equation (8) and (11) are estimated,

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1/ Boughton (1988) suggests an interesting possibility that short-run and long-run markets are segregated in terms of market participants. According to this interpretation, the expectations of foreign exchange participants in each market can be rational even if they are not consistent with those in the other market.

$$w_k = \sum_{i=1}^{k} (w_1^i). \qquad (12)$$

The restriction (12) indicates that, as long as the absolute value of w_1 is less than unity, the sign of w_k must be the same as the sign of w_1, indicating that the "twist" observed between short-run and long-run expectations in the previous section cannot be consistent. However, such a conclusion is valid only if one accepts an autoregressive process of order one as the correct expectations formation process. For an alternative time-series process, it can be shown that consistent expectations can generate a twist. Tests of consistency is thus conditional upon the hypothesis about the correct expectations formation process.

Froot and Ito (1989) estimated a system of either two or three equations subject to the cross equation consistency restrictions; they used both first-order and second-order autoregressions to describe the expectations formation process. According to their estimation results (Table 10), consistency could not be rejected for the immediate horizon of 1 week/1 month expectations, indicating that these very short-run expectations behave in a similar fashion. In contrast, for the horizon encompassing 3/6/12 months, 1/3 months, or 1/6 months expectations, the cross equation consistency restrictions were unanimously rejected for the expectations of different horizons at least two months apart. Froot and Ito attribute this finding to the observation that short-run expectations tend to overreact relative to longer-run expectations when the exchange rate changes.

2. Chartists and fundamentalists

As a way to explain the difference between short-term and long-term expectations, Froot and Frankel (1990) suggested that participants in the foreign exchange market may be using two types of forecasting techniques (see also Frankel and Froot, 1986 and 1988). It may be that, for the short-run forecasts, the predominant method is "chartist" or technical analysis; and that, for the longer-run forecasts, the common method is fundamental analysis based on such "fundamental" variables as purchasing power parity. They present evidence based on annual Euromoney surveys that the weight of chartists in the market has been increasing in recent years. To the extent that, at least in the short run, the market is dominated by chartists who concentrate on the recent pattern of price movements, the increasing influence of chartists may have been a factor for the increased volatility of exchange rates in recent years.

It is, however, too early to give a final verdict on the cause of exchange rate volatility. A recent study by Allen and Taylor (1989), based on a survey of over 200 foreign exchange market practitioners in London, questions the notion that chartism necessarily increases volatility.

Table 10. Consistency: Summary Results of Froot and Ito (1989)

Data set	Horizon	Currency 1/	AR order	x^2 2/
Economist, 1981-87	3/6/12 months	pound	1	12.7**
			2	19.5**
		mark	1	32.3**
			2	60.1**
		yen	1	73.6**
			2	142.9**
MMS, 1984-87	1 week/1 month	pound	1	0.8
			2	1.4
		mark	1	1.8
			2	11.0**
		yen	1	1.9
			2	11.2**
MMS (UK), 1984-87	1 week/1 month	pound	1	1.6
			2	1.4
		mark	1	0.1
			2	2.1
		yen	1	0.1
			2	2.3
JCIF, 1985-87	1/3 month	yen	1	546.1**
			2	832.1**
	3/6 month	yen	1	1483.3**
			2	1135.9**

1/ Against the U.S. dollar.
2/ Wald statistics on the cross-equation restrictions imposed by consistency; ** indicates that the restrictions are rejected at the one percent level of significance.

According to this study, Allen and Taylor find that, while chartism is the most actively used forecasting method over short time horizons (intraday to one week), it is by no means used exclusively. Both the chartist and fundamentalist methods are often used in a complementary manner, with the latter assuming greater weight at longer horizons. Moreover, there was no evidence that chartist expectations overreacted to changes in the current spot exchange rate and were thus destabilizing.

VIII. Conclusions and Some Policy Implications

This paper has presented a brief survey of the empirical literature on survey-based exchange rate expectations. After summarizing the features of survey data sets and the broad descriptive characteristics of survey exchange rate expectations, the paper reviewed the empirical literature under the headings of forward discounts and risk premia, rationality of expectations, mechanisms of expectations formation, and short-run and long-run expectations.

Three broad generalizations emerged from the survey of the empirical literature. First, survey data generally indicated the presence of a non-zero risk premium, which appeared to be uncorrelated with the forward discount at least for longer-run expectations. This means that changes in the forward discount fully reflects changes in the expected exchange rate, so that assets denominated in different major currencies can be considered to be perfect substitutes, at least for longer-run changes in fundamentals observed during the sample period.

Second, empirical tests were generally unfavorable to the hypothesis that exchange rate expectations are rational in terms of both unbiasedness and orthogonality. Except for certain time periods and horizons, survey expectations were shown to be biased predictors of future exchange rates and the forecast errors were correlated with some variables that are known to be in the set of information available when the expectations are formed. Given the extraordinary nature of some sample periods, however, the rejection of the rationality hypothesis may be saying more about the peculiarity of actual exchange rate movements than the nature of exchange rate expectations. 1/ Lewis (1989), for example, suggests that systematic forecast errors can be consistent with the behavior of rational agents who are learning about the new process governing fundamental economic variables.

1/ The rejection may also reflect the so-called "peso problem", which is a finite sample bias attributable to the failure of correct expectations to materialize during the sample period. In the earlier period of dollar appreciation, for example, the consistent bias in expectations might have reflected the expectations of rational agents who correctly perceived the dollar to be "too high".

Third, the most substantive conclusion that emerged from the literature concerns the consistently observed behavioral difference between short-run (generally shorter than one month) and long-run (generally longer than three months) expectations. Short-run expectations tend to respond to lagged exchange rate movements in the same direction and move away from some long-run "normal" values, while long-run expectations tends to respond to lagged movements in an opposite direction and move towards the long-run normal values. This suggests the possibility that the foreign exchange market in the short run reflects an element of "noise trading", trading that is based on factors other than "fundamentals".

The conventional wisdom of economists has long held that such noise traders would on average buy high and sell low, and thus would be driven out of the market. De Long, Shleifer, Summers and Waldmann (1987), however, have recently proposed a model in which such noise traders may survive in the long run, even if they buy high and sell low on average. In this model, noise traders are rewarded with a higher return for the greater risk they assume; moreover, the greater risk introduced by noise trading would lead rational investors to demand a higher return on risky assets, such that the asset prices can deviate from their fundamental values. Noise trading could also cause a greater volatility of price movements relative to what is warranted by the movements of long-run fundamentals.

If it is indeed the case that a major portion of the short-run volatility of exchange rate movements is attributable to the chartist nature of short-run exchange rate expectations, the literature may provide justification for some type of policy measure to intervene in the foreign exchange market in the short run. For example, this may call for a fixed transactions tax in the foreign exchange market, which would increase the cost of short-run trading relative to long-run trading. A majority of economists, however, will probably remain sceptical of such a policy recommendation until they become convinced of a firm theretical link relating <u>average</u> expectations to <u>marginal</u> prices in the foreign exchange market.

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