NBER WORKING PAPERS SERIES

ARE EXCHANGE RATE EXPECTATIONS BIASED? TESTS FOR A CROSS-SECTION OF 25 CURRENCIES

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Working Paper No. 3807

NATIONAL BUREAU OF ECONOMIC RESEARCH
1050 Massachusetts Avenue
Cambridge, MA 02138
August 1991

This paper was written while the second author was a Visiting Fellow at the Institute for International Economics, 11 Dupont Circle, Washington, D.C. 20036. The authors wish to thank David Bowman and Steve Phillips for comments, and Julia Lowell for both comments and assistance. The authors would also like to thank the Institute for Business and Economic Research and the Institute for International Studies for support. This paper is part of NBER's research program in International Studies. Any opinions expressed are those of the authors and not those of the National Bureau of Economic Research.

NBER Working Paper #3807
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ABSTRACT

We investigate the properties of exchange rate forecasts with a data set encompassing a broad cross section of currencies. The key finding is that expectations appear to be biased in our sample. This result is robust to the possibility of random measurement error in the survey measures. Investors would be better off placing less weight on their forecasts or the forward rate, and more on the current spot rate.

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1. INTRODUCTION

In this paper we apply a new data set to the problem of assessing whether exchange rate expectations are unbiased. This data set is derived from Currency Forecasters' Digest (hereafter CFD). CFD collects and publishes forecasts for over 25 exchange rates, and includes several for newly industrializing countries in Asia, Latin American LDCs, and smaller developed countries in Europe and elsewhere, each month. The hope is that with a much broader and more heterogeneous set of currencies, interesting new patterns can be identified.[1] We allow for the possibility of measurement error in the survey data as a reflection of the "true" expectations of investors.

This paper is organized in the following fashion. The data and general approach are discussed in the next section. In Section 3, descriptive statistics are reported. Section 4 assesses the question whether exchange rate expectations are biased forecasts of future spot rates. Section 5 offers some final observations.

2. DATA AND GENERAL METHODOLOGY

Survey data are generally viewed with suspicion by economists. Those skeptical of the usefulness of survey data usually argue that as social scientists, we should pay more

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[1] Earlier papers using survey data are restricted to five major currencies: Dominguez (1986), Frankel and Froot (1987, 1990), Froot and Frankel (1989), Goodhart (1988) and Ito (1990). A review of this emerging literature is available in Takagi (1991).

attention to what people do, rather than to what they say.

Unfortunately, alternative measures of expectations have their own limitations. Consequently, macroeconomists have resorted to various survey measures such as the Livingstone survey of inflationary expectations. Several recent studies have found that survey data do contain useful information about future events (e.g. Dokko and Edelstein, 1989; Englander and Stone, 1989). Indeed, to the extent that the forecasters represented in the CFD survey participate directly in the relevant markets (see below), the case for using such data is perhaps even firmer than that for the aforementioned domestic surveys.

The exchange rate forecasts are usually compiled on the fourth Thursday of each month. Our data set runs from February of 1988 to February of 1991, for about 25 exchange rates.[2] The survey includes some additional exchange rates that we exclude from our sample because they either begin toward the end of the sample period, or appear too intermittently to be useful.

The survey respondents are reported to number approximately 45, of which two-thirds are multinational firms and the remainder forecasting firms or the economics departments of banks. We use as the measure of expectations the "consensus forecast" that CFD

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[2] These data are proprietary with Currency Forecasters' Digest of White Plains, NY, and obtained by subscription by the Institute for International Economics. The survey has apparently been conducted for some years, but the subscription of the IIE did not begin until 1988.

emphasizes. This measure is the harmonic mean:[3]

$$\bar{X} = [\Sigma_i w_i (1/X_i)]^{-1} \qquad \Sigma_i w_i = 1$$

The spot rates used to compute expected rates of change are the London midday interbank middle rate, as reported in CFD and are contemporaneous with the forecast compilation.[4] The forward rates are similarly dated London close rates. They are the arithmetic average of the bid and ask rates.

The regressions are run on a pooled time series/cross section.[5] In this paper, we will be investigating the nature of the three- and twelve-month horizon forecasts. Regressions involving the ability to forecast ex post exchange rates

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[3] The harmonic mean is a measure of central tendency which reduces the weight on outliers. It contrasts with other measures of central tendency which give either more weight to the extremes (such as arithmetic averages) or no weight (as in the trimmed mean). The modal or median response is available, but looks very similar to the harmonic mean. Regressions of the harmonic mean on either the arithmetic mean, or the mode yield adjusted R^2 statistic in excess of 94%.

[4] We estimated the data collection date to be approximately one week before the compilation date. Problems with dating have been encountered in other samples (such as the AMEX survey). In other studies, attempts to adjust the data to accommodate different dating schemes have had little effect on the regression results. In this study, some sensitivity analyses have been performed on time series data, using an alternative timing scheme. Different point estimates are obtained in the regressions, but the conclusions on the hypothesis tests are usually unchanged.

[5] We also ran regressions in individual time series (reported in an Appendix available upon request). The results are consistent with those reported in this paper in a qualitative sense, although there is much variation in the estimated slope coefficients, as one would expect from the relatively small number of observations in each time series.

encounter the econometric problem of overlapping observations. Because the data are sampled at intervals finer than the forecast horizon, the regression residuals will exhibit a moving average process of order k-1 (where k is the forecast horizon). Thus generalized least squares yields inconsistent estimates, and in order to make correct inferences a Hansen (1982) heteroskedasticity-and-serial-correlation-robust estimate of the parameter covariance matrix should be used.[6]

3. UNCONDITIONAL BIAS

Many studies have concluded that the forward discount is a biased predictor of the future spot rate. As indicated in Table 1, this result is replicated in our sample (see Frankel and Chinn, 1991, for a more detailed analysis). The estimates are obtained by running a regression of the relevant variable on a constant and 24 currency dummies. More often than not, the forward discount is of opposite sign to the ex post depreciation, at both the three- and 12-month horizons.

[TABLE 1 about here]

The survey expectations at the three month horizon in general point in the right direction. At the longer horizon

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[6] This is case (v) of Hansen's (1982) GMM technique. Other applications to overlapping exchange rate forecasts, in a strictly rational expectations methodological framework, include Hansen and Hodrick (1980, 1983).

however, they, like the forward rates, point in the wrong direction.

[TABLE 2 about here]

More formal tests of unbiasedness are provided in Table 2. (Note that these figures are expressed in terms of forecast error = actual - predicted). The forecast errors are smaller than those reported in Frankel and Froot (1987), except for certain high inflation countries (Argentina, Brazil and Mexico). This result is partly attributable to the nature of the period that is covered by the survey: exchange rates were relatively quiescent, compared to the 1981-86 period studied previously. Another reason is that the standard errors are fairly large, since there are relatively few observations per currency. Hence, even though the mean errors are quantitatively substantial, they are statistically insignificant.

This observation applies with much less force to the forward rate errors. The t-statistics are much larger and, especially at the twelve month horizon, there are more rejections of the zero forecast error hypothesis.

4. ARE CONDITIONAL EXPECTATIONS UNBIASED?

Previous studies examining the issue of unbiasedness in expectations have usually imposed the auxiliary assumption of risk neutrality under which the forward rate equals the expected

future rate. Unbiasedness of the forward discount is overwhelmingly rejected, as it is in our sample (Frankel and Chinn, 1991). But it is impossible to tell whether the rejection of the null hypothesis is due to a bias in investors' expectations or to a risk premium that separates the forward rate from the expected future spot rate, without additional information such as that provided by the surveys.

We now move to an explicit evaluation of the forecasting characteristics of our expectations measures. A common procedure is to regress the ex post depreciation on the survey measure of expected depreciation. In that case, the unbiasedness proposition is represented by the null hypothesis that coefficient on expected depreciation equal unity. Such a test attempts to detect what Bilson (1981) called "excessive speculation" or "over-excitability": a coefficient less than one. An equivalent test is to run a regression of the forecast error on expected depreciation.

$$\Delta s_{t+k} - \Delta \hat{s}^e_{t,t+k} = \alpha_1 + \beta_1 \Delta \hat{s}^e_{t,t+k} + u_{1,t+k} \qquad (1)$$

Now the unbiasedness hypothesis is represented by the null hypothesis that $\beta_1=0$, and the alternative, by $\beta_1 < 0$. If the alternative is accepted, then investors could make better guesses by betting against the consensus forecast. These regressions were run on both the entire sample, and a sample excluding the

three high-inflation countries, Argentina, Brazil and Mexico.[7] Estimates for this equation are presented in Table 3.

[TABLE 3 about here]

Six regressions are reported. Two constrain the intercept for all currencies to be the same; but Chi^2 tests for the restriction are rejected. Focusing attention on the unconstrained regressions, one finds that the estimate of β_1 is negative, and large in economic terms. One cannot reject the null that the coefficient is -1, at the three month horizon, and can only reject at the 10% level at the 12 month. In both cases, the zero coefficient null is strongly rejected. When the sample excludes the high inflation countries of Argentina, Brazil and Mexico, then the rejection of a zero-coefficient becomes even more prounounced.

The finding of conditional bias over the 1988-90 period is interesting because it corroborates results in Frankel and Froot (1987) which noted the persistent errors in the wake of the dollar's mid-1980s rise and fall. Here, the results obtain over a period of relative dollar stability.

The survey forecasts may measure investors "true"

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[7] A regression allowing a separate slope coefficient for this group of three countries indicates that (for the three month horizon) the null that all slope coefficients are the same can be rejected at the 1% level. While other divisions of the sample are plausible (e.g. Argentina, Brazil, Chile), the differential slope coefficient is usually smaller, as is the t-statistic.

expectations with error. Even if the measurement errors are random, then the coefficient estimate in equation (1) is biased.[8] There exists an alternative test that is similar in spirit to equation (1), but is not subject to bias in the event of random measurement error in the survey data. One can substitute the forward discount for the expected depreciation on the right hand side of equation (1), and obtain:

$$\Delta s_{t+k} - \Delta \hat{s}^{e}_{t,t+k} = \alpha_2 + \beta_2 fd_{t,t+k} + u_{2,t+k} \qquad (2)$$

This equation is similar in spirit to equation (1) because a number of studies have shown that the forward discount is highly correlated with expected depreciation as measured by the survey data.[9]

[TABLE 4 about here]

At the three- and 12-month horizons, very large and negative estimates of β_2 are obtained.[10] The null hypothesis that $\beta_2 = 0$ is even more strongly rejected than before.[11] The implication

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[8] When two-stage least squares is implemented on a regression of ex post depreciation on expected depreciation, the coefficients become even more negative. Because the standard errors become larger, however, one can reject the null hypothesis of unity in only one case.

[9] Froot and Frankel, 1989; Frankel and Chinn, 1991.

[10] These results are similar to those reported in Frankel and Froot (1990, Table 3).

[11] Note that the set of currencies covered by this test constitute a subset of the ones in Table 3.

of this finding is quite interesting: investors could reduce their forecast errors by betting against the forward rate.

5. CONCLUSIONS

The following points flow from the preceding analysis. Expectations are biased in the sample investigated. This result does not necessarily imply irrationality, as the observed in-sample bias may reflect a peso problem or learning behavior. The former issue pertains to an extreme non-normality of the realizations, so that certain low-probability events induce an apparent bias in finite samples. The latter aspect has been discussed most recently by Lewis (1989): unbiasedness is implied by rational expectations only when the true model is available to all agents, presumably in some sort of steady-state. If agents are learning about an evolving environment, then errors might not have zero mean.

Our results imply that survey participants could reduce their forecast errors by betting against the forward rate. In fact investors would do better to ignore current information, and forecast the exchange rate as a random walk.[12] The rejections of unbiasedness do not appear to be due to measurement error in the survey sample.

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[12] This finding applies to low inflation currencies, which happen to be the ones with forward markets. Different conclusions might arise if one could evaluate this hypothesis for Argentina, Mexico and Brazil, for example.

DATA APPENDIX

Currency Forecasters' Digest is published monthly. The data are proprietary. The publication indicates that the forecasts apply to a specific date, usually either the third or fourth Thursday in the month. The forecasts include 1, 3, 6 and 12 month horizon forecasts, with the following measures: Harmonic mean, arithmetic mean and modal mean. Contemporaneously dated spot rate data are also provided. All rates are converted to domestic currency units per US dollar.

The following currencies are surveyed:

Mnemonic	Currency	FR	A?	T/I
DM	West German DM	F		
FFR	French Franc	F		
DKR	Danish Krone	F		
UK	UK Pound Sterling	F		
NTH	Netherlands Guilder	F		
SFR	Swiss Franc	F		
SKR	Swedish Krone	F		
IRE	Irish Punt	F		
BFR	Belgian Franc	F		
LIR	Italian Lire	F		
NKR	Norwegian Krone	F		
SP	Spanish Peseta	F		
YEN	Japanese Yen	F		
TAI	Taiwanese Dollar			
AUS	Australian Dollar	F		
SNG	Singapore Dollar	F	A	
PHL	Philippine Peso		A	
KOR	Korean Won			
SAR	South African Rand	F	A	
CAN	Canadian Dollar	F		
ARG	Argentine Austral			
MEX	Mexican Peso			
CHL	Chilean Peso			T
BRZ	Brazilian Cruzeiro/ado			I
BOL	Venezuelan Bolivar			T

Key: F: Forward rate available. A: Alternating monthly. T: Series terminates before Feb. 1992. I: Many missing values due to currency change.

Forward rates are the arithmetic average of bid and ask rates at London close, as reported by DRIFACS.

To minimize the number of missing observations, a recursive Chow-Lin (1976) procedure for interpolation was used for the expectations series. The missing observations are November 1989, February 1990 and April 1990. The related series used in the interpolation procedure is the contemporaneous (log) spot rate.

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TABLE 1
Descriptive Statistics
(in percent per annum)

Forecast Horizon	Dates	Expected Depreciation $\hat{s}^{e}_{t,t+k} - s_t$	Forward Discount $f_{t,t+k} - s_t$	Actual Depreciation $s_{t+k} - s_t$
Three Month				
DM	4/88-2/91	-7.66 %	-1.76 %	-4.29 %
FFR		-4.51	0.95	-4.18
DKR		-5.27	1.25	-4.25
UK		-6.18	4.22	-2.09
NTH		-7.65	-1.28	-4.16
SFR		-7.77	-2.14	-3.18
SKR		-7.07	3.52	-2.19
IRE		-6.31	1.02	-4.26
BFR		-6.20	1.51	-4.82
LIR		-3.04	3.46	-3.71
NKR		-7.07	3.67	-2.66
SP		-7.41	4.62	-5.84
YEN		-8.17	-2.68	1.73
TAI		-7.32	na	-1.76
AUS		7.71	6.31	-2.09
SNG		0.20	-2.01	-5.38
PHL		10.16	na	na
KOR		6.54	na	-1.06
SAFR		6.72	6.80	6.50
CAN		0.31	3.06	-2.64
ARG		220.51	na	244.52
MEX		29.65	na	9.01
CHL		21.49	na	24.505
BRZ		287.96	na	265.89
BOL		24.73	na	19.79

Forecast Horizon	Dates	Expected Depreciation $s^{e}_{t,t+k} - s_t$	Forward Discount $f_{t,t+k} - s_t$	Actual Depreciation $s_{t+k}-s_t$
Twelve Month				
DM	2/89-2/91	2.08 %	-2.41 %	-5.62 %
FFR		4.75	0.46	-5.97
DKR		4.25	0.79	-5.74
UK		3.66	3.11	-1.44
NTH		2.12	-1.93	-5.57
SFR		2.34	-2.91	-4.85
SKR		2.04	2.32	-2.73
IRE		3.46	0.61	-5.55
BFR		4.35	-0.17	-6.31
LIR		6.01	3.10	-5.42
NKR		2.69	3.15	-3.11
SP		2.26	3.76	-7.69
YEN		1.01	-3.39	5.18
TAI		-10.34	na	-2.21
AUS		5.89	5.96	1.13
SNG		0.47	-2.58	-5.48
PHL		8.11	na	7.13
KOR		-8.95	na	0.15
SAFR		6.51	5.87	5.45
CAN		0.60	2.08	-2.30
ARG		141.59	na	298.21
MEX		43.99	na	11.14
CHL		21.31	na	23.86
BRZ		217.75	na	321.91
BOL		24.44	na	17.03

Notes: *(**)[***] indicates significance at 10%(5%)[1%].

TABLE 2
Unconditional Bias in Forecasts of Future Exchange Rates

Forecast Horizon	Survey Forecast Error $s_{t+k} - \hat{s}^e_{t,t+k}$			Forward Rate Error $s_{t+k} - f_{t,t+k}$		
	Mean	SE	t-stat	Mean	SE	t-stat
Three Month 4/88-2/91						
DM	3.37 %	11.9	0.28	-2.53 %	3.70	0.68
FFR	0.33	11.9	0.03	-5.13	3.70	1.39
DKR	1.02	11.9	0.09	-5.50	3.70	1.49
UK	2.65	11.9	0.22	-6.31*	3.70	1.71
NTH	3.85	11.9	0.32	-2.87	3.70	0.78
SFR	4.60	11.9	0.39	-1.04	3.70	0.28
SKR	4.88	11.9	0.41	-5.71	3.70	1.54
IRE	2.05	11.9	0.17	-5.28	3.70	1.43
BFR	1.37	11.9	0.11	-5.26	3.81	1.38
LIR	-0.67	11.9	0.06	-7.16*	3.70	1.94
NKR	4.41	11.9	0.37	-6.33*	3.70	1.71
SP	1.56	11.9	0.13	-10.47***	3.70	2.83
YEN	9.90	11.9	0.83	4.41	3.70	1.19
TAI	5.52	12.2	0.45	na	na	na
AUS	-9.79	11.9	0.82	-8.39**	3.70	2.27
SNG	-4.51	16.9	0.27	-3.69	3.75	0.98
PHL	-12.07	69.6	0.17	na	na	na
KOR	5.48	12.1	0.45	na	na	na
SAFR	1.66	12.6	0.13	0.23	3.81	0.06
CAN	-2.95	11.9	0.25	-5.70	3.70	1.54
ARG	24.01**	11.9	2.01	na	na	na
MEX	-20.64*	11.9	1.73	na	na	na
CHL	3.02	16.4	0.18	na	na	na
BRZ	-27.46**	13.1	2.09	na	na	na
BOL	-4.21	12.7	0.33	na	na	na

Forecast Horizon	Survey Forecast Error $s_{t+k} - \hat{s}^e_{t,t+k}$			Forward Rate Error $s_{t+k} - f_{t,t+k}$		
	Mean	SE	t-stat	Mean	SE	t-stat
Twelve Month 2/89-2/91						
DM	-7.70 %	6.66	1.16	-3.21 %	2.83	1.41
FFR	-10.72	6.66	1.61	-6.43**	2.83	2.27
DKR	-10.00	6.66	1.50	-6.54**	2.83	2.31
UK	-5.10	6.66	0.77	-4.55	2.83	1.61
NTH	-7.70	6.66	1.16	-3.65	2.83	1.29
SFR	-7.19	6.66	1.08	-1.94	2.83	0.69
SKR	-4.77	6.66	0.72	-5.05*	2.83	1.79
IRE	-9.01	6.66	1.35	-6.16**	2.83	2.18
BFR	-10.66	6.66	1.60	-6.14**	2.83	2.17
LIR	-11.42*	6.66	1.72	-8.52***	2.83	3.01
NKR	-5.80	6.66	0.87	-6.26**	2.83	2.21
SP	-9.95	6.66	1.49	-11.45***	2.83	4.05
YEN	4.18	6.66	0.63	8.57***	2.83	3.03
TAI	8.13	6.94	1.17	na	na	na
AUS	-4.76	6.66	0.71	-4.83*	2.83	1.71
SNG	-5.07	9.61	0.53	-2.90	2.83	1.03
PHL	-0.98	10.0	0.10	na	na	na
KOR	9.10	6.80	1.34	na	na	na
SAFR	-1.05	6.66	0.16	-0.42	2.83	0.15
CAN	-2.90	6.66	0.44	-4.38	2.83	1.55
ARG	156.62***	6.66	23.52	na	na	na
MEX	-32.85***	6.66	4.93	na	na	na
CHL	2.55	11.1	0.23	na	na	na
BRZ	116.64***	10.0	11.62	na	na	na
BOL	-7.41	6.66	1.11	na	na	na

Notes: *(**[***] indicates significance at 10%(5%)[1%].

TABLE 3
Regression of forecast error on expected depreciation

$$\Delta s_{t+k} - \Delta \hat{s}^{e}_{t,t+k} = \alpha_1 + \beta_1 \Delta \hat{s}^{e}_{t,t+k} + u_{1,t+k}$$

Term (k)	3 month (intercept constrained)	3 month	3 month (No Arg., Brz.,Mex.)	12 month (intercept constrained)	12 month	12 month (No Arg., Brz.,Mex)
β_1	-0.187	-0.861	-1.456	0.612	-1.770	-1.408
SE	(0.031)	(0.066)	(0.113)	(0.042)	(0.103)	(0.086)
Het SE	(0.089)	(0.209)	(0.106)	(0.118)	(0.350)	(0.095)
GMM SE	(0.150)	(0.267)	(0.117)	(0.268)	(0.397)	(0.141)
t: β_1=0	-1.245	-3.228***	-12.44***	+2.285***	-4.456***	-9.986***
t: β_1=-1	+5.420***	+0.521	-20.99***	+6.015***	-1.940*	-17.078***
df	765	741	648	565	539	481
$\bar{R}^2$	0.04	0.18	0.20	0.27	0.71	0.45
DW	0.502	0.424	0.614	0.183	0.282	0.223
W	92.550***	65.854***	2.441	195.64***	135.81***	26.411***

Notes:
"Intercept constrained" indicates that all the exchange rates are constrained to have the same intercept term.

OLS $\hat{\beta}$ is the point estimate from the OLS regression.

SE is the OLS asymptotic standard error. OLS Het. SE is a heteroskedasticity-consistent standard error. GMM is a heteroskedasticity and serial correlation consistent-Generalized Method of Moments standard error. GMM SE is from regressions with de-meaned data.

W is a White Chi^2 test for heteroskedasticity.
*(**)[***] indicates significance at 10% (5%) [1%] level.

TABLE 4
Regressions of forecast error on forward discount

$$\Delta s_{t+k} - \Delta \hat{s}^{e}_{t,t+k} = \alpha_2 + \beta_2 fd + u_{2,t+k}$$

Term (k)	3 month	3 month	12 month	12 month
intercept:	constrained	unconstrained	constrained	unconstrained
OLS β_2	-1.624	-3.468	-1.072	-5.201
OLS SE	(0.279)	(0.478)	(0.204)	(0.375)
OLS Het. SE	(0.294)	(0.539)	(0.189)	(0.377)
GMM SE	(0.464)	(0.732)	(0.488)	(0.722)
t: β_2=0	-3.500***	-4.738***	-2.197**	-7.200***
df	553	537	410	394
$\bar{R}^2$	0.06	0.09	0.06	0.36
DW	0.661	0.777	0.199	0.415

Notes:
"Intercept constrained" indicates that all the exchange rates are constrained to have the same intercept term.

OLS $\hat{\beta}$ is the point estimate from the OLS regression.

SE is the OLS asymptotic standard error. OLS Het. SE is a heteroskedasticity-consistent standard error. GMM is a heteroskedasticity and serial correlation consistent-Generalized Method of Moments standard error.
White is a Chi^2 test for heteroskedasticity.

* (**) [***] indicates significance at 10% (5%) [1%] level.

APPENDIX TO

ARE EXCHANGE RATE EXPECTATIONS BIASED? Tests for a Cross-Section of 25 Currencies

by

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This appendix reports the results of the regressions performed on each time series. The regression is the ex post depreciation on the ex ante expected depreciation.

$$\Delta s_{t+k} = \alpha_1 + \beta_1 \Delta s^e_{t,t+k} + u_{i,t+k}$$

The regressions are implemented in this form so as to make explicit the amount of correlation between the ex post and ex ante measures, as indicated by the adjusted R^2 statistics. To make the results comparable to those in Table 3, subtract one off the coefficient on expected depreciation.

TABLE A1
Tests of Bias in Survey Expectations
$\Delta s_{t+k} = \alpha_1 + \beta_1 \Delta s^e_{t,t+k} + u_{1,t+k}$
February 1988 - February 1991

Exch. Rate	(k)	Term Const.	$\hat{\beta}_1$	$\bar{R}^2$	SER	DW	d.f.
DM	3	-9.193	-0.640	0.01	22.409	0.558	32
		(5.957)	(0.594)				
DM	12	-4.690	-0.446	0.00	11.893	0.184	23
		(2.541)	(0.429)				
FFR	3	-3.646	0.119	-.03	22.185	0.535	32
		(4.491)	(0.529)				
FFR	12	-4.065	-0.401	-.01	12.323	0.176	23
		(3.327)	(0.471)				
DKR	3	-3.186	0.201	-.03	22.740	0.519	32
		(4.977)	(0.589)				
DKR	12	-4.286	-0.342	-.02	13.437	0.144	23
		(3.380)	(0.359)				
UK	3	-13.230	-1.802	0.17	22.220	0.833	32
		(5.570)	(0.657)				
UK	12	3.552	-1.366	0.36	10.187	0.432	23
		(2.423)	(0.359)				
NTH	3	-6.347	-0.286	-.02	23.091	0.563	32
		(5.866)	(0.566)				
NTH	12	-4.572	0.472	0.00	12.067	0.178	23
		(2.597)	(0.452)				
SFR	3	-11.166	-1.028	0.04	26.048	0.643	32
		(6.847)	(0.668)				
SFR	12	-2.777	-0.887	0.06	15.281	0.188	23
		(1.721)	(0.251)				

Exch. Rate	(k)	Term Const.	$\hat{\beta}_1$	$\bar{R}^2$	SER	DW	d.f.
IRE	3	-5.827	-0.248	-.03	21.870	0.460	32
		(5.223)	(0.576)				
IRE	12	-4.051	-0.433	0.01	12.282	0.170	23
		(2.812)	(0.396)				
BFR	3	-4.864	-0.007	-.03	22.730	0.525	32
		(5.101)	(0.531)				
BFR	12	-4.500	-0.415	-.01	12.792	0.168	23
		(3.230)	(0.453)				
LIR	3	-3.577	0.043	-.03	20.530	0.574	32
		(3.805)	(0.474)				
LIR	12	-2.855	-0.427	0.01	10.251	0.202	23
		(3.089)	(0.385)				
NKR	3	-4.958	-0.325	-.01	18.314	0.604	32
		(4.099)	(0.372)				
NKR	12	-2.620	-0.182	-.02	9.674	0.189	23
		(2.071)	(0.274)				
SP	3	-14.161	-1.123	0.15	19.043	0.731	32
		(4.583)	(0.434)				
SP	12	-7.383	-0.136	-.04	10.245	0.202	23
		(2.169)	(0.315)				
YEN	3	-7.191	-1.091	0.07	24.887	0.704	32
		(6.365)	(0.578)				
YEN	12	6.356	-1.169	0.56	6.176	0.966	23
		(1.253)	(0.210)				
TAI	3	-2.556	-0.108	-.03	10.645	0.581	30
		(2.694)	(0.264)				
TAI	12	-17.723	-1.501	0.41	5.529	0.671	21
		(3.985)	(0.369)				
AUS	3	5.880	-1.033	0.02	22.318	0.704	32
		(7.054)	(0.769)				
AUS	12	0.135	0.169	-.04	7.165	0.402	23
		(5.996)	(0.989)				

Exch. Rate	(k)	Term Const.	$\hat{\beta}_1$	$\bar{R}^2$	SER	DW	d.f.
SNG	3	-4.191 (2.101)	-0.565 (0.568)	-.00	8.652	NA	15
SNG	12	-4.360 (0.837)	-0.518 (0.379)	0.07	2.835	NA	10
PHL	3	NA	NA	NA	NA	NA	NA
PHL	12	-9.053 (7.070)	1.996 (0.843)	0.32	5.981	NA	9
KOR	3	4.984 (2.005)	0.924 (0.237)	0.31	7.316	0.407	31
KOR	12	8.944 (2.834)	0.983 (0.288)	0.32	5.734	0.227	22
SAR	3	16.816 (4.461)	-1.255 (0.426)	0.21	18.746	0.926	28
SAR	12	15.976 (3.689)	-1.618 (0.518)	0.27	7.526	0.791	23
CAN	3	-2.672 (1.041)	0.100 (0.412)	-.03	6.021	1.157	32
CAN	12	-1.961 (0.309)	-0.561 (0.227)	0.18	1.384	1.250	23
ARG	3	326.514 (105.181)	-0.372 (0.431)	-.01	264.516	0.488	32
ARG	12	453.518 (86.501)	-1.097 (0.588)	0.09	116.142	0.335	23
MEX	3	8.487 (1.660)	0.018 (0.038)	-.02	7.055	0.164	32
MEX	12	14.188 (1.498)	-0.069 (0.030)	0.15	3.364	0.119	23
CHL	3	-7.688 (13.837)	1.498 (0.633)	0.21	10.928	1.093	16
CHL	12	6.364 (8.790)	0.821 (0.411)	0.27	2.196	1.237	7

Exch. Rate	(k)	Term Const.	$\hat{\beta}_1$	$\bar{R}^2$	SER	DW	d.f.
BRZ	3	94.293	0.577	0.36	99.966	0.990	26
		(45.589)	(0.144)				
BRZ	12	562.056	-1.046	0.04	43.592	0.552	9
		(188.546)	(0.864)				
BOL	3	35.667	-0.612	0.02	25.103	0.707	30
		(12.442)	(0.468)				
BOL	12	8.518	0.348	0.06	7.490	0.652	23
		(5.548)	(0.219)				

Notes: Term (k) is the forecast horizon in months. Figures in parentheses are asymptotic standard errors.