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EXCHANGE RATE EXPECTATIONS AND THE RISK PREMIUM: TESTS FOR A CROSS-SECTION OF 17 CURRENCIES

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ABSTRACT

Survey data on a broad cross section of 17 currencies are used to determine whether the forward discount moves primarily in response to changes in expectations of depreciation, or in the risk premium. We find that changes in expected depreciation are quantitatively significant. However we also find evidence, in contrast to earlier studies involving only four or five major currencies, that variation in the risk premium constitutes a large part of variation in the forward discount as well.

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1. INTRODUCTION

Many studies have found that the discount in the forward exchange market is a biased predictor of the future change in the spot exchange rate.[1] In the absence of further information, it is difficult to tell whether this finding is evidence of a time-varying exchange risk premium, as many authors claim, or whether investors' expectations themselves are subject to in-sample bias as others argue. Recently a number of papers have attempted to use survey data as an independent source of information on investors' expectations.[2] These studies have tended to find little or no evidence of a time-varying risk premium. But they have been confined to exchange rates for four foreign currencies (the Yen, Mark, Pound and Swiss Franc against the dollar). These may be five of the least risky currencies in the world, by the measure of inflation variability for example.

It is possible that casting the net over a wider sample of countries, including smaller and less-developed countries, would turn up more evidence of a risk premium. On the other hand, in such a data set there may be even more reason for investors to have well-defined expectations of currency appreciation or depreciation, as reflected in either forward rates or survey data, than in the standard set of major industrialized

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[1] See Hodrick (1987) and Froot and Thaler (1990) for surveys of findings in the rational expectations methodology.

[2] See 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).

currencies, where the "random-walk" model of zero expected change often seems to fit the data.

In this paper we apply a new data set to the problem of exchange rate expectations and the risk premium. This data set is derived from Currency Forecasters' Digest (hereafter CFD). CFD collects and publishes forecasts each month for several forecast horizons (for details, see the Data Appendix). The chief advantage of exploiting this data set is that it covers 17 exchange rates for which forward markets exist, and includes several for newly industrializing countries in Asia, and smaller developed countries in Europe and elsewhere. The hope is that with a much broader and more heterogeneous set of currencies, interesting new patterns can be identified. As in Froot and Frankel (1989), 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, standard results showing the biased nature of forward rates as predictors of future spot rates will be replicated in this sample. The nature of the risk premium is then investigated in a setting where we have direct observations on the expected depreciation. Concluding remarks follow.

2. DATA AND GENERAL METHODOLOGY

Economists often look askance at the use of survey data.

Critics of such data argue that economists should pay more attention to what people do than to what they say. Alternative measures of expectations have their own limitations however. Hence, macroeconomists have long resorted to various survey measures such as the Livingstone survey of macroeconomic variables. 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).

One aspect of our dataset which mitigates the severest criticisms is that the participants are closely involved in the relevant market -- more so in the Livingstone survey for instance (see below).

The exchange rate forecasts are usually compiled on the fourth Thursday of each month. Our sample runs from February of 1988 to February of 1991, for 17 exchange rates.[3] The survey includes some additional exchange rates that we exclude from our sample because the cuurencies either are not traded in forward markets, 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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[3] These data are proprietary with Currency Forecasters' Digest of White Plains, NY and were obtained by subscription by the Institute for International Economics. The survey has apparently been conducted for some years, but the subscription did not begin until 1988.

emphasizes. This measure is the harmonic mean:[4]

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

The spot rates used to compute expected rates of change are contemporaneous with the forecast compilation,[5] and are the London midday interbank middle rate, as reported in CFD. 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.[6] In this paper, we will be investigating the nature of the three and twelve month horizon forecasts. For those regressions involving the ability to forecast *ex post* exchange rates, there exists the econometric problem of overlapping

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[4] 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 R^2 in excess of 94%.

[5] 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 yielded similar 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.

[6] 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.

observations. Since 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). This means that in order to make correct inferences, a Hansen (1982) serial correlation-robust estimate of the parameter covariance matrix should be used.[7]

3. TIME VARIATION IN THE RISK PREMIUM

Many studies have concluded that the forward discount is a biased predictor of the future spot rate. Controversy centers, however, on whether this bias is due to variation in the risk premium, or a bias in expectations. Consider the following commonly-estimated regression:

$$\Delta s_{t+k} = \alpha_1 + \beta_1 \, fd_{t,t+k} + u_{t+k} \qquad (1)$$

where Δs is the annualized change in the log of the spot rate between the end of period t and t+k; and fd is the annualized log difference of the forward rate (at the end of period t for k months hence) and the spot rate at period t.

The null hypothesis of unbiasedness is represented as $\beta_1=1$. (A constant is allowed to account either for a constant risk premium, or for the convexity term arising from Jensen's Inequality.) The common finding is rejection of the null, with

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[7] 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). These standard errors are also heteroskedasticity consistent, since the White Chi^2 tests indicate that heteroskedasticity is a problem in most regressions.

β_1 usually estimated to be much closer to zero (or even less than zero) than to unity. This finding is most often taken to be evidence that most of the variation in the forward discount constitutes a time-varying risk premium, defined by $rp_{t,t+k} \equiv fd_{t,t+k} - \Delta s^e_{t,t+k}$.

It is of interest to begin our study by checking whether this standard empirical result is replicated in our sample. A pooled sample regression was run on equation (1).

[TABLE 1 about here]

The results are presented in Table 1. As expected, the key parameter estimate is substantially below unity and indeed less than zero. The null hypothesis is resoundingly rejected, even when using standard errors that are robust with respect to both heteroskedasticity and serial correlation. The rejection of $\beta_1 = 1$ is especially strong when each country is allowed to have its own unconstrained constant term, as it should. (Even under the joint null hypothesis of a zero risk premium and rational expectations, there may be a constant convexity term that varies from country to country.[8]) The question is the source of the bias in the forward discount.

To assess whether the bias is due to expectational errors or a time-varying risk premium, one can regress the expected

[8] The constant terms are not reported in the tables to conserve space.

depreciation, $\Delta\hat{s}^e$ as estimated by the CFD survey, on the forward discount, as suggested by Froot and Frankel (1989). That is:

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

The null hypothesis that the slope coefficient is zero is strongly rejected.[9] Thus, at least some of the variation in the forward discount must be due to expected depreciation. In other words, one can reject the hypothesis that all of the variation in the forward discount is due to a time-varying risk premium.

[TABLE 2 about here]

The next question is whether any of the variation in the forward discount can be attributed to a risk premium or, in other words, whether we can reject the hypothesis of a unit coefficient. Here we get different answers depending on whether we look at the three month results or the 12-month results. Overall, there is more evidence to support the existence of a risk premium in this cross-section of 17 currencies than there was in the earlier studies of five major currencies. The coefficient estimate of .55 is significantly different from 1, for example, in the case where the 12-month horizon is used and the intercept terms are constrained to be equal across

[9] Results of these regressions report GMM standard errors since there is some evidence of serial correlation. Although the correlation is not due to overlapping observations, empirically, assuming MA(2) errors in calculating robust standard errors appears adequate. Assuming higher order MAs yielded similar estimates of the standard errors.

currencies.[10] Under the null hypothesis β_2=1, there are two possible interpretations of the error term: it could consist of any time-varying risk premium that is not correlated with the forward discount, or of random measurement error in the survey data.

At the three month horizon, however, one can reject the null hypothesis that $\beta_2 = 1$, i.e., that all the variation in the forward discount is due to variation in expectations. Thus there is some evidence of a time-varying risk premium unlike in the narrower five-currency sample of Froot and Frankel (1989).

The regression is also capable of shedding light on a claim set forth by Fama (1984) and Hodrick and Srivastava (1986) (FHS) that expected depreciation is less variable than the exchange risk premium. The FHS claim is:

$$var(\Delta s^e_{t,t+k}) < var(rp_{t,t+k}) \qquad (3)$$

To see the relevance of the regression results for this claim, note that (3) can be re-written as:

$$var(\Delta s^e) < var(fd) + var(\Delta s^e) - 2*cov(fd, \Delta s^e)$$

Rearranging:

$$1/2 \geq \frac{cov(fd_{t,t+k}, \Delta s^e_{t,t+k})}{var(fd_{t,t+k})} \qquad (4)$$

As Froot and Frankel (1989) observe, the probability limit of the

[10] This can be considered a more powerful test of the no-risk-premium hypothesis than the unconstrained case, because under that null hypothesis all intercept terms are zero.

β coefficient in (2) is:

$$\text{plim } \hat{\beta}_2 = \frac{\text{cov}(u_{2,t+k}, fd_{t,t+k}) + \text{cov}(\Delta \hat{s}^e_{t,t+k}, fd_{t,t+k})}{\text{var}(fd_{t,t+k})} \quad (5)$$

Assuming the measurement error is uncorrelated with the forward discount, then the probability limit of the regression estimate is the same as the expression in the RHS of (4). Hence, if one can reject the null hypothesis that $\beta_2 \leq 0.5$, then one is rejecting the FHS hypothesis that the variation in the expectation of depreciation is less than the variation in the risk premium.

At the 12 month horizon one can reject the hypothesis $\beta_2 \leq 0.5$, but at the 3 month horizon one cannot. Again, there is slightly more evidence of a time-varying risk premium than in the narrower sample of countries considered in Froot and Frankel (1990).

We can improve on the results in Table 2 by using Zellner's technique of Seemingly Unrelated Regressions (SUR) to take advantage of the positive correlation of error terms that probably exists across dollar exchange rates. In periods when forecasters are optimistic regarding the dollar, for example, their forecasts of the dollar value of most of the other individual currencies will go down. SUR results are reported in Table 3. We also correct for the first-order autocorrelation which appears to be present.

[TABLE 3 about here]

In Table 3 there is no longer a major difference between the results at the three-month and 12-month horizons. In both cases, we can easily reject both the extreme of a zero coefficient and a unit coefficient. In other words, although we find statistically significant evidence for the importance of expected depreciation as before, we now also find as strong evidence for the importance of an exchange risk premium as an explanation for part of the variation in the forward discount. Indeed, the coefficient estimates are below half for the case where the intercept terms are unconstrained, and the standard errors are small enough that the difference is statistically significant. This finding implies that a little more than half of the variation in the forward discount is attributable to variation in the risk premium.

4. CONCLUSIONS

The consistent finding we obtain is rejection of the null hypothesis that all of the variation in the forward discount is due to variation in the risk premium. Expected depreciation is important. This result obtains not because of the particular characteristics of the specific sample being investigated, but seems to generalize to different periods, and narrower sets of exchange rates. Nevertheless, casting the net over a wider cross-section of currencies has clearly turned up more evidence in favor of the risk premium than was evident in earlier tests of the five major currencies.

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TABLE 1
Bias in the Forward Discount

$$\Delta s_{t+k} = \alpha_1 + \beta_1 fd_{t,t+k} + u_{1,t+k}$$

February 1988 - February 1991

Term (k)	3 month constr.	3 month unconstr.	12 month constr.	12 month unconstr.
OLS $\hat{\beta}_1$	-0.671	-2.881	-0.370	-3.409
OLS SE	(0.246)	(0.419)	(0.167)	(0.317)
Het.SE	(0.251)	(0.466)	(0.159)	(0.303)
GMM SE	(0.409)	(0.645)	(0.455)	(0.629)
t: β_1=0	1.641	4.374***	0.815	5.420***
t: β_1=0.5	2.863***	5.149***	1.912**	6.215***
t: β_1=1	4.086***	5.924***	3.011***	7.010***
Chi^2 (2) Sig.	27.101*** (.000)		15.720*** (.000)	
Chi^2 (18) Sig.		71.404*** (.000)		136.518*** (.000)
d.f.	571	555	423	407
$\overline{R}^2$	.01	.06	.01	.28
DW	0.580	0.720	0.156	0.323
White	3.081	15.729***	2.449	1.368

Notes:

OLS β is the point estimate from the OLS regression. SE is the standard error. OLS Het. SE is the White heteroskedasticity consistent SE. GMM SE is a heteroskedasticity-consistent Generalized Method of Moments standard error. GMM SE is from regressions with de-meaned data.

t is the absolute value of the t-statistic using the OLS point estimate and GMM standard error. Chi^2 is the Wald test for the null hypothesis that the constants (or constant) equal(s) zero and the slope coefficient equals unity, with 2 or 18 d.f.

White is a heteroskedasticity test, distributed Chi^2, with d.f. equal to 3. (Note: tests is conducted on demeaned data for the unconstrained regressions.)

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

TABLE 2
Pooled Time-Series/Cross-Section Regression:
Test for Time Varying Risk Premium

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

February 1988 - February 1991

Term (k)	3 month constr.	3 month unconstr.	12 month constr.	12 month unconstr.
OLS $\hat{\beta}_2$	0.815	0.423	0.549	1.055
OLS SE	(0.093)	(0.135)	(0.062)	(0.112)
Het. SE	(0.107)	(0.148)	(0.058)	(0.116)
GMM SE	(0.182)	(0.203)	(0.097)	(0.185)
t: β_2=0	4.478***	2.858***	5.647***	5.703***
t: β_2=0.5	1.731*	0.520	0.505	3.000***
t: β_2=1	1.016	3.899***	4.649***	0.297
Chi^2 (2):	138.666***		41.807***	
Sig.	(.000)		(.000)	
Chi^2 (18):		334.58***		119.11***
Sig.		(.000)		(.000)
d.f.	600	584	601	585
$\bar{R}^2$	.11	.34	.11	.19
DW	0.776	1.047	0.665	0.770
White	30.082***	11.319***	8.780**	3.962

Notes:

OLS β is the point estimate from the OLS regression.

SE is the standard error. OLS Het. SE is a White heteroskedasticity-consistent standard error. GMM is a heteroskedasticity consistent-Generalized Method of Moments standard error, assuming MA processes of order two. Assuming higher order lags implies only slightly different results.

t is the absolute value of the t-statistic using the OLS point estimate and either the White heteroskedasticity-consistent or the GMM standard error.

Chi^2 is the Wald test for the null hypothesis that the constants (or constant) equal(s) zero and the slope coefficient equals unity, with 2 or 18 d.f. Sig. is the significance level of the rejection. *(**)[***] indicates significance at 10% (5%) [1%] level.

TABLE 3
Seemingly Unrelated Regressions:
Test for Time Varying Risk Premium

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

February 1988 - February 1991

Term (k)	3 month (constrained intercept)	3 month	3 month	3 month
SUR $\hat{\beta}_2$	0.596	0.253	0.308	0.234
SE	(0.042)	(0.058)	(0.057)	(0.066)
AR(1)		0.416		0.247
SE		(0.039)		(0.041)
t: β_2=0	14.243***	4.375***	5.360***	3.534***
t: β_2=0.5	2.286**	4.259***	3.368***	4.030***
t: β_2=1	9.619***	12.879***	12.140***	11.606***
d.f.	35	17	35	17

Term (k)	12 month (constrained intercept)	12 month	12 month	12 month
SUR $\hat{\beta}_2$	0.502	0.401	0.732	0.321
SE	(0.015)	(0.024)	(0.053)	(0.047)
AR(1)		0.367		0.232
SE		(0.040)		(0.042)
t: β_2=0	33.472***	16.626***	13.713***	6.823***
t: β_2=0.5	0.133	4.125***	4.377***	3.809***
t: β_2=1	33.200***	24.958***	5.057***	14.447***
d.f.	35	17	35	17

Notes:
Omits Singapore dollar and South African Rand.
SUR β is the point estimate from the SUR procedure.
SE is the asymptotic standard error.
*(**)[***] indicates significance at 10% (5%) [1%] level.

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 of missing values 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.

7/31/91

APPENDIX TO

EXCHANGE RATE EXPECTATIONS AND THE RISK PREMIUM

Tests for a Cross-Section of 17 Currencies

by

Jeffrey Frankel and Menzie Chinn

This appendix provides the individual currency by currency regressions, corresponding to the regressions in the paper. Table A1 reports regressions evaluating the unbiasedness of forward rates. Table A2 presents regressions of the expected change on the forward discount.

TABLE A1
Bias in the Forward Discount
$\Delta s_{t+k} = \alpha_1 + \beta_1 fd_{t,t+k} + u_{1,t+k}$
February 1988 - February 1991

Exch. Rate	(k)	Term Const.	$\hat{\beta}_1$	$\bar{R}^2$	SER	DW	d.f.
DM	3	-13.745 (4.523)	-5.384 (1.692)	0.22	19.882	0.998	32
DM	12	-19.216 (3.226)	-5.648 (1.140)	0.50	8.466	0.458	23
FFR	3	-1.378 (4.394)	-2.949 (2.452)	0.01	21.717	0.657	32
FFR	12	-5.342 (2.649)	-1.373 (2.045)	-.02	12.395	0.144	23
DKR	3	-0.741 (4.354)	-2.805 (1.757)	0.05	21.925	0.689	32
DKR	12	-5.538 (3.024)	-0.258 (1.679)	-.04	13.577	0.127	23
UK	3	22.635 (8.130)	-5.867 (1.726)	0.24	21.166	0.947	32
UK	12	19.631 (2.566)	-6.772 (1.082)	0.78	5.972	1.165	23
NTH	3	-11.368 (4.232)	-5.625 (1.852)	0.20	20.426	1.181	32
NTH	12	-15.826 (2.705)	-5.322 (1.082)	0.49	8.622	0.552	23
SFR	3	-13.524 (5.494)	-4.847 (1.695)	0.18	24.095	1.084	32
SFR	12	-24.457 (3.501)	-6.730 (1.012)	0.64	9.432	0.633	23
SKR	3	6.245 (5.996)	-2.396 (1.525)	0.04	15.579	0.750	32
SKR	12	3.614 (3.058)	-2.737 (1.148)	0.16	7.509	0.320	23

Exch. Rate	(k)	Term Const.	$\hat{\beta}_1$	$\bar{R}^2$	SER	DW	d.f.
IRE	3	0.048 (3.688)	-4.217 (1.484)	0.18	14.601	0.648	32
IRE	12	-3.511 (2.345)	-3.366 (1.286)	0.20	11.058	0.186	23
BFR	3	0.681 (4.960)	-2.936 (2.014)	0.04	22.167	0.567	30
BFR	12	-6.915 (2.488)	-3.639 (2.185)	0.07	12.302	0.208	23
LIR	3	-3.551 (11.890)	-0.045 (3.286)	-.03	20.533	0.572	32
LIR	12	-0.704 (8.181)	-1.520 (2.550)	-.03	10.441	0.168	23
NKR	3	-8.584 (7.033)	1.614 (1.715)	-.00	18.280	0.593	32
NKR	12	-13.257 (3.340)	3.220 (0.933)	0.31	7.927	0.323	23
SP	3	7.272 (9.123)	-2.838 (1.826)	0.04	20.192	0.811	32
SP	12	10.032 (4.076)	-4.709 (1.010)	0.46	7.375	0.539	23
YEN	3	-10.840 (7.175)	-4.689 (2.169)	0.10	24.510	0.746	32
YEN	12	-17.606 (2.353)	-6.730 (0.654)	0.81	3.994	1.621	23
AUS	3	-15.300 (11.538)	2.094 (1.724)	0.01	22.428	0.604	32
AUS	12	12.941 (5.740)	-1.984 (0.939)	0.13	6.560	0.488	23
SNG	3	-8.326 (2.266)	-1.312 (0.829)	0.05	8.837	0.715	31
SNG	12	-10.781 (2.290)	-2.053 (0.848)	0.17	3.364	0.465	23

Exch. Rate	(k)	Term Const.	$\hat{\beta}_1$	$\bar{R}^2$	SER	DW	d.f.
SAR	3	21.297 (9.559)	-2.099 (1.300)	0.05	20.552	0.518	30
SAR	12	26.603 (4.327)	-3.601 (0.706)	0.05	6.153	0.865	23
CAN	3	-3.688 (2.404)	0.343 (0.710)	-.02	6.005	1.203	32
CAN	12	-3.796 (0.848)	0.718 (0.383)	0.10	1.449	1.084	23

Notes: SER is standard error of regression. DW is Durbin-Watson statistic. d.f. is number of degrees of freedom. Figures in the parentheses are standard errors.

TABLE A2

Test for Time Varying Risk Premium

$\Delta s^e_{t,t+k} = \alpha_2 + \beta_2 fd_{t,t+k} + u_{2,t}$

February 1988 - February 1991

Exch. Rate	(k)	Term Const.	$\hat{\beta}_2$	$\bar{R}^2$	SER	DW	d.f.
DM	3	-8.224 (1.280)	-0.196 (0.488)	-.02	6.481	0.918	35
DM	12	3.297 (0.923)	0.783 (0.382)	0.08	4.681	0.647	35
FFR	3	-5.397 (1.450)	0.424 (0.765)	-.02	7.227	1.047	35
FFR	12	3.173 (0.923)	1.202 (0.567)	0.09	4.475	0.725	35
DKR	3	-5.766 (1.332)	0.087 (0.552)	-.03	6.751	0.824	35
DKR	12	2.715 (1.025)	0.966 (0.508)	0.07	4.765	0.709	35
UK	3	-7.213 (2.209)	0.194 (0.457)	-.02	5.776	1.004	35
UK	12	-2.316 (1.694)	1.753 (0.412)	0.32	4.201	0.879	35
NTH	3	-8.634 (1.277)	-0.606 (0.563)	0.00	6.954	1.128	35
NTH	12	2.960 (0.875)	0.601 (0.405)	0.03	4.693	0.707	35
SFR	3	-8.042 (1.337)	-0.119 (0.426)	-.03	6.598	0.846	35
SFR	12	4.427 (0.999)	0.881 (0.349)	0.13	4.656	0.775	35
SKR	3	-10.548 (2.886)	0.902 (0.689)	0.02	7.798	1.093	35
SKR	12	-2.589 (1.716)	1.650 (0.457)	0.25	5.043	0.648	35

Exch. Rate	(k)	Term Const.	$\hat{\beta}_2$	$\bar{R}^2$	SER	DW	d.f.
IRE	3	-6.181 (1.217)	-0.350 (0.457)	-.01	6.495	1.122	35
IRE	12	2.026 (1.036)	1.088 (0.462)	0.11	5.091	0.880	35
BFR	3	-10.456 (1.325)	2.238 (0.531)	0.33	6.005	1.388	33
BFR	12	3.399 (0.795)	1.980 (0.596)	0.23	4.546	0.664	33
LIR	3	-9.188 (3.952)	1.579 (1.044)	0.04	7.303	0.905	35
LIR	12	-1.317 (3.070)	2.037 (0.904)	0.10	4.539	0.708	35
NKR	3	-18.358 (3.952)	2.961 (0.615)	0.38	6.599	1.030	35
NKR	12	-1.855 (2.341)	1.439 (0.678)	0.09	5.827	0.613	35
SP	3	-6.469 (3.384)	-0.302 (0.651)	-.02	7.685	1.202	35
SP	12	-0.978 (2.713)	0.672 (0.570)	0.01	5.638	0.837	35
YEN	3	-8.926 (1.818)	-0.212 (0.570)	-.03	7.350	0.953	35
YEN	12	4.006 (1.325)	1.078 (0.442)	0.12	4.969	0.602	35
AUS	3	4.072 (2.269)	0.580 (0.348)	0.05	4.736	1.347	35
AUS	12	4.512 (0.992)	0.243 (0.171)	0.03	1.369	2.424	35
SNG	3	2.539 (0.868)	1.470 (0.373)	0.46	2.715	na	16
SNG	12	3.687 (0.685)	1.273 (0.310)	0.48	1.608	na	16

Exch. Rate	(k)	Term Const.	$\hat{\beta}_2$	$\bar{R}^2$	SER	DW	d.f.
SAR	3	-0.674 (3.478)	1.053 (0.471)	0.11	7.487	1.633	30
SAR	12	1.946 (1.754)	0.734 (0.274)	0.17	2.571	1.258	30
CAN	3	0.622 (1.039)	-0.039 (0.311)	-.03	2.650	0.874	34
CAN	12	-0.170 (0.743)	0.633 (0.274)	0.11	1.615	0.769	35

Notes: SER is standard error of regression. DW is Durbin-Watson statistic. d.f. is number of degrees of freedom. Figures in the parentheses are standard errors.