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ARE FOREIGN EXCHANGE FORECASTS RATIONAL?
New Evidence from Survey Data

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Tests of rationality in foreign exchange markets have been inconclusive because of disagreement over the relevant asset pricing model. This paper uses a newly available set of data on foreign exchange expectations to directly test the rationality of four foreign currency markets. Overall, the results reject the rational expectations hypothesis.

1. Introduction

In the era of flexible exchange rates, relative currency prices are clearly expectations driven. Are these expectations – and therefore exchange markets – rational? To date, empirical tests have focussed on the efficiency of the forward rate, testing whether it is an unbiased predictor of future spot rates. However, because exchange market efficiency does not preclude the existence of a risk premium, these tests involve the joint hypothesis of a specific risk/return relationship, and rationality. Recent work has tested for risk-neutrality and rationality, consistently rejecting this joint hypothesis. [1] But it remains unclear whether this rejection shows expectations to be biased and inefficient, or whether it simply reflects the existence of a time-varying risk premium.

This paper directly examines exchange market rationality by analyzing a new set of survey data on actual foreign exchange expectations for four currency markets. [2] The data allow, for the first time, single hypothesis, model-free tests of expectations in foreign currency markets.

The methodology and respondent sample for this survey inspire unusual confidence. The 30 respondents are professional exchange forecasters whose business careers presumably depend upon the accuracy of their predictions. Therefore, the standard arguments against surveys – in particular, that they do not adequately reflect the marginal player in the market [Mishkin (1981)] – are clearly less problematic with this sample than in most surveys. There is equal reason to have confidence in the survey's design and execution. Unlike many surveys which are administered through the mail, the

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[1] See, for example, Tryon (1979), Hansen and Hodrick (1980), Hakkio (1981), Cumby and Obstfeld (1981), and Hsieh (1984).

[2] Thanks to Mark Porter and David Broder from Money Market Services, Inc. of Belmont, California for providing me with surveys of the English pound sterling, the German mark, the Swiss franc and the Japanese yen.

survey used here is conducted by telephone each Wednesday after noon EST. [3] This pointed timing minimizes the problem of different information sets across respondents. [4]

2. The tests

All the one- and two-week-ahead, non-overlapping forecast regressions in the following tables were estimated over the four currencies using seemingly unrelated regressions (SUR). [5] The one- and three-month-ahead forecasts are taken bi-weekly and therefore overlap. This introduces bias into the standard errors, because lagged forecast errors are not in the information set. [6] The Hansen and Hodrick (1983) procedure for obtaining asymptotically correct estimates for the covariance matrix of the OLS estimator was therefore used on the overlapping forecasts, assuming a moving average process of order one for the bi-weekly one-month forecasts and order five for the bi-weekly three-month forecasts. Care was taken in aligning the survey data with the appropriate spot and forward rates. [7] Further, the relevant institutional features of forward contract delivery timing have been taken into account as discussed in detail by both Meese and Singleton (1980) and Hsieh (1984). [8]

Tables 1 and 2 present regressions of actual spot depreciation ($X_{t+i} - X_t$) on forecasted depreciation ($E_t X_{t+i} - X_t$). Rationality requires that the coefficient on forecasted depreciation be one, the constant be zero, and the disturbances be serially uncorrelated. Tryon (1979) shows that using the change in the spot rate, rather than the level, constitutes a more stringent test of rational expectations (RE). Change-form regressions distinguish whether it is the current spot rate or the forecast that actually has predictive power. [9]

These tables show RE rejected at the 0.01 level for all equations but the one-month-ahead \$/Yen regression, which rejects at the 0.05 level. The negative coefficients in the longer horizon equations are particularly striking, implying that forecasters generally got not only the magnitude but also the direction of exchange rate movements wrong. [10] Further, across both short- and long-horizon

[3] From January 1983 to October 10, 1984 MMS forecasters were asked bi-weekly to predict the spot rate two weeks and three months from the day of the survey. Since October 24, 1984 forecasters have been asked weekly for their one-week-ahead forecasts and bi-weekly for their one-month-ahead forecasts.

[4] Frankel and Froot (1985) and Froot (1985) use a semi-annual mail survey by Amex Bank Review and the Economist Financial Report to examine exchange rate expectations, although their results are consistent with this papers findings, because the respondents were not polled simultaneously and the number of survey dates was small, the confidence level of their tests is probably considerably lower.

[5] Currency arbitrage carries the implication that there is probably contemporaneous correlation of error terms across currencies. Zellner's (1962) joint estimation technique resulted in an efficiency gain over estimating each currency individually.

[6] The econometric problem which arises when the sample interval is finer than the interval over which forecasts are made is discussed in detail in Hansen and Hodrick (1980,1983) and Hansen (1982).

[7] All series are in logarithms. The actual market spot and forward rates were provided by DRI and the NY Federal Reserve Bank and are the average of the New York certified noon bid and ask rates.

[8] Forward contracts are set for the same date however many months ahead (i.e., Jan. 1 to Feb. 1 for a one-month contract) but delivery takes place two business days later (one day for Canada). However, unless the trader is holding a covered position, she must cover for the above example on Feb. 1 as her spot transaction also takes two business days. This paper assumes that forward contracts are uncovered so that spot rates are aligned two days before actual delivery of the forward contract.

[9] Level-form rationality tests rejected unbiasedness for six of the eight short-horizon equations and all of the three-month overlapping horizon equations at the 0.01 level. The one-month ahead level forecasts were found consistent with rational expectations.

[10] One way to interpret the negative coefficients is in the context of the 'peso problem'; the existence of a small probability of a large depreciation which did not occur over the sample period used. Indeed, the dollar had sold at a forward discount against most currencies over the sample period while the long-awaited actual dollar depreciation did not begin until March 1985.

Table 1
$X_{t+i} - X_t = b_0 + b_1(E_t X_{t+i} - X_t) + u_{t,i}$, $i = 1, 2$ (wk). [a]

Currency	Horizon	Smpl	b_0	b_1	$D.W.$	R^2	$\chi^2(2)$
\$/Stlg	2-wk	83–84	−0.005 (0.003) [b]	0.034 (0.119) [c]	1.99	0.003	96.2 [c]
	1-wk	84–85	0.001 (0.003)	−0.171 (0.181) [c]	1.85	0.05	44.3 [c]
\$/DM	2-wk	83–84	−0.004 (0.002) [b]	0.122 (0.095) [c]	1.79	0.03	155.3 [c]
	1-wk	84–85	0.002 (0.003)	0.049 (0.137) [c]	1.85	0.01	48.8 [c]
\$/SWF	2-wk	83–84	−0.004 (0.002) [b]	0.101 (0.091) [c]	1.80	0.01	84.0 [c]
	1-wk	84–85	0.002 (0.003)	0.064 (0.118) [c]	1.88	0.01	62.3 [c]
\$/Yen	2-wk	83–84	−0.001 (0.002)	0.166 (0.100) [c]	2.05	0.02	69.3 [c]
	1-wk	84–85	(0.003) (0.002)	0.502 (0.146) [c]	1.59	0.07	12.8 [c]

[a] The numbers in parentheses are the estimated standard errors of the coefficients, [b] denotes rejection at the 0.05 level and [c] at the 0.01 level for the hypotheses that $b_0 = 0$ and $b_1 = 1$. The chi-square, $\chi^2(2)$, statistic pertains to the joint hypothesis that $b_0 = 0$, $b_1 = 1$.

Table 2
$X_{t+i} - X_t = b_0 + b_1(E_t X_{t+i} - X_t) + u_{t,i}$, $i = 1, 3$ (mo). [a]

Currency	Horizon	Smpl	b_0	b_1	MA	R^2	$\chi^2(2)$
\$/Stlg	3-mo	83–84	−0.029 (0.015) [c]	−0.450 (0.395) [c]	5	0.01	39.23 [c]
	1-mo	84–85	−0.001 (0.006)	−0.505 (0.329) [c]	1	0.05	21.44 [c]
\$/DM	3-mo	83–84	−0.043 (0.016) [c]	0.412 (0.529)	5	0.01	23.26 [c]
	1-mo	84–85	0.014 (0.007)	−0.248 (0.392) [c]	1	0.01	15.07 [c]
\$/SWF	3-mo	83–84	−0.033 (0.009) [c]	0.054 (0.099) [c]	5	0.001	35.38 [c]
	1-mo	84–85	0.012 (0.008)	−0.374 (0.425) [c]	1	0.02	11.52 [c]
\$/Yen	3-mo	83–84	0.003 (0.016)	−0.457 (0.626) [c]	5	0.02	9.38 [c]
	1-mo	84–85	0.015 (0.008)	0.404 (0.291) [b]	1	0.01	6.22 [b]

[a] The numbers in parentheses are the estimated standard errors of the coefficients, [b] denotes rejection at the 0.05 level and [c] at the 0.01 level for the hypotheses that $b_0 = 0$ and $b_1 = 1$. MA is the moving average assumption for the disturbances. The chi-square, $\chi^2(2)$, statistic pertains to the joint hypothesis that $b_0 = 0$, $b_1 = 1$.

Table 3
$(X_{t+i} - X_t) - (E_t X_{t+i} - X_t) = b_0 + b_1({}_tF_{t+i} - X_t) + u_{t,i}, \quad i = 1, 3.$ [a]

Currency	Horizon	Smpl	b_0	b_1	MA	R^2	$\chi^2(2)$
\$/Stlg	3-mo	83–84	−0.039 (0.006) [b]	−7.89 (1.03) [c]	5	0.37	128.8 [c]
	1-mo	84–85	0.012 (0.017)	−1.26 (1.56)	1	0.03	5.9
\$/DM	3-mo	83–84	0.003 (0.053)	−4.96 (4.33)	5	0.08	36.9 [c]
	1-mo	84–85	0.019 (0.008) [c]	−1.14 (1.18)	1	0.03	6.4 [b]
\$/SWF	3-mo	83–84	0.65 (0.049)	−7.89 (3.19) [c]	5	0.26	69.4 [c]
	1-mo	84–85	0.015 (0.009)	−1.15 (1.11)	1	0.05	3.5
\$/Yen	3-mo	83–84	0.003 (0.035)	−3.26 (3.59)	5	0.06	6.9 [b]
	1-mo	84–85	0.015 (0.008)	−0.357 (0.783)	1	0.01	3.1

[a] Here, [b] denotes rejection at the 0.05 level and [c] at the 0.01 for the hypothesis that $b_0 = b_1 = 0$. The value of the chi-square statistic, $\chi^2(2)$, pertains to the test of the joint hypothesis that $b_0 = b_1 = 0$.

equations the coefficient on the forecast variable is insignificantly different from zero for all but the one-week-ahead \$/Yen equation, suggesting that the forecasts do no better than the contemporaneous spot in predicting future spot-rate changes.

A second set of tests examined the informational efficiency of the forecasts. If any available information would have improved the forecasts, then they are not optimal in the Muth (1961) sense. Since the survey is taken after 12 p.m. EST, the noon New York forward rate is available to forecasters. Table 3 presents the estimated regression results of the median forecast error on the appropriately aligned forward premium $({}_tF_{t+i} - X_t)$; efficiency requires that neither the constant nor the coefficient on the forward premium be significantly different from zero.

The regression results in table 3 indicate that the forward premium contains additional information for the three-month-ahead forecasts, but not for the one-month-ahead forecasts. While the \$/DM one-month-ahead forecast also rejected the efficiency hypothesis, it is the constant term, not the forward premium, which leads to the rejection. These results imply that the three-month-ahead forecasts were inefficient, as they could have been improved with information available from the three-month-ahead forward rate.

3. Summary and conclusions

The survey data analyzed in this paper allow a direct examination of the rationality of foreign exchange expectations. Over the past three years the consensus forecasts have failed consistently at

predicting future changes in the spot rate. Indeed, neither the forecasts nor the forward rate [11] did better than the current spot rate in forecasting the future spot rate. [12] Further, the coefficients on the longer horizon forecasts are generally less than one. This indicates a tendency for forecasters to over-predict the size of future spot depreciation. More generally, this lends some support to the hypothesis that financial market participants tend to overreact to stochastic shocks.

Overall, these tests can be interpreted as adding to prior evidence on the irrationality of exchange markets, allowing a higher-powered rejection of the rationality hypothesis than was possible without direct observations of agents' expectations.

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[11] Rationality tests were performed on the forward rates over 1983–1985. Consistent with previous findings in the literature, tests reject rationality for both the one- and three-month rates.

[12] These results might appear hard to reconcile with the fact that investors pay for the MMS forecasts while spot rates are publicly available. However, it should be remembered that these tests examined average forecast accuracy over a short time period. MMS forecasts may prove more accurate over the longer run; or they may be valuable to market participants when used in conjunction with other, more event-specific information.