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(Almost) A Quarter Century of Currency Expectations Data: Interest Rate Parity and the Risk Premium

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(Almost) A Quarter Century of Currency Expectations Data: Interest Rate Parity and the Risk Premium

by

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Abstract: I re-examine whether the presence of an exchange risk premium or biased expectations explains why the forward premium fails to predict exchange rates changes. The re-examination is undertaken using survey-based data on exchange rate expectations over a long sample extending from August 1986 to October 2009 period. I find that on a time series basis, (i) forward rate bias persists into the most recent period, (ii) the forward rate better predicts expected depreciation, suggesting uncovered interest parity holds, (iii) these patterns persist in panel regressions, and (iv) survey based expectations are biased predictors of exchange rate changes. The implication is that the standard measure of the exchange risk premium, identified using the rational expectations hypothesis, provides misleading inferences.

Keywords: forward rate unbiasedness, efficient markets hypothesis, risk premium, survey data, rational expectations.

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1. INTRODUCTION

One of the key puzzles in international macroeconomics is the failure of the forward rate to predict future movements in the spot exchange rate. Another way of putting this is that, if covered interest parity holds, then interest differentials fail to predict the direction of exchange rate changes. This *seeming* violation of uncovered interest parity is one of the most robust stylized facts in the discipline. While this outcome can be explained by appealing to the presence of an exchange risk premium, the difficulty in relating measured risk premiums to observable macroeconomic phenomena has meant that dispensing with one puzzle leads to yet another puzzle.

I emphasize the word "seeming" because in fact most empirical papers assessing uncovered interest parity are actually joint tests of uncovered interest parity and the rational expectations hypothesis. Frankel has termed this composite the "unbiasedness hypothesis". The forward rate unbiasedness hypothesis is consistent with the UIP, rational expectations and covered interest parity (so that the forward discount equals the interest differential). These distinctions, while straightforward, are critical for understanding why the forward rate might not predict the future spot rate. It could be because of an exchange risk premium; or it could be because expectations are not on average unbiased.

This paper, I eschew the approach of assuming the rational expectations hypothesis, and instead use survey based measures of exchange rate expectations to proxy for market expectations. Early contributions in this vein were Dominguez (1986), Frankel and Froot (1987), and Froot and Frankel (1989).[1] The empirical results presented in this paper are based on a data set derived from FXForecasts, the successor to *Currency Forecasters' Digest* and *Financial Times Currency Forecaster*. This data set has the advantage of spanning nearly a quarter of a century (23 years) for several of the currencies. To my knowledge, this is the longest sample period over which survey data has been used to analyze the foreign exchange market.

To anticipate the results, I find that the forward discount does positively correlate with expected depreciation, in a manner consistent with uncovered interest parity. In contrast, the usual relationship holds for ex post exchange rate changes, over the corresponding sample periods – that is interest differentials tend to point in the wrong direction for future changes in exchange rates. Panel regression results from the two approaches are less divergent, but even in these regressions, interest differentials predict incorrectly the direction of change in exchange rates at the year horizon.

These results are consistent with biased exchange rate expectations. I show that for many cases (particularly where the results differ substantially between regressions using the actual changes and expected changes) the exchange rate bias is significant.

I also find that the exchange risk premium identified using survey data behaves much differently than that implied by rational expectations. This is a finding that is more clearly highlighted when using a longer sample period. In particular, the risk premia based on survey data are much more persistent than the risk premia obtained using the conventional approach. Furthermore, the evidence suggests negative risk premia for the Japanese yen and Swiss franc (relative to the US dollar).

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[1] Takagi (1991) reviewed the early literature. Chinn and Frankel (1994), and Frankel and Chinn (1993) use this data source.

This paper is organized in the following fashion. In section 2, I discuss the uncovered interest parity condition, combined with the rational expectations hypothesis (sometimes called the risk neutral efficient markets hypothesis, or "RNEMH"), and in section 3, UIP is evaluated empirically, under the conventional rational expectations hypothesis as well as the case where survey data are used to measure expectations. Section 4 examines why these differing results might arise. Section 5 provides some panel estimates, while Section 6 concludes.

2. Uncovered Interest Parity, the Unbiasedness Hypothesis and the Risk Neutral Efficient Markets Hypothesis

Let s_t be the price of foreign currency in units of domestic currency at time t, $f_{t,t+k}$ is the forward value of s for a contract expiring k periods in the future (both in logs). Suppose the forward rate (in logs, f) differs from the expected future spot rate (denoted by the e superscript) by a premium that compensates for the perceived riskiness of holding domestic versus foreign assets. The risk premium, η, is defined as:

$$f_{t,t+k} = s^e_{t,t+k} + \eta_{t+k} . \qquad (1)$$

Subtracting the log spot rate at time t from both sides, and rearranging yields:

$$s^e_{t,t+k} - s_t = \left(f_{t,t+k} - s_t\right) - \eta_{t+k} . \qquad (2)$$

Expected depreciation equals the forward discount, minus the risk premium. Note that if covered interest parity holds,

$$f_{t,t+k} - s_t = (i_{t,k} - i^*_{t,k}) . \qquad (3)$$

and the risk premium is zero, then equation (2) becomes the familiar uncovered interest parity condition:

$$\Delta s^{e}_{t,t+k} = (i_{t,k} - i^{*}_{t,k}) \qquad (4)$$

Where $i_{t+,k}$ is the k-period yield on the domestic instrument, and i^{*}_{t+k} is the corresponding yield on the foreign instrument.

The forward discount equals expected depreciation if the risk premium is zero.[2] This is sometimes termed the forward rate efficient markets hypothesis. Equations (2) and (4) are not directly testable, however, in the absence of observations on market expectations of future exchange rate movements. To make this hypothesis testable, it is tested jointly with the assumption of rational expectations. Using the rational expectations methodology, future realizations of s_{t+k} will equal the value expected at time t plus a white-noise error term ξ_{t+k} that is uncorrelated with all information known at t, including the interest differential and the spot exchange rate:

$$s_{t+k} = s^{re}_{t,t+k} + \xi_{t+k} , \qquad (5)$$

Where the "re" superscript denotes the rational expectations measure. Then, applying the expression (2) one obtains the following relationship,

$$\Delta s_{t,t+k} = \left(f_{t,t+k} - s_{t} \right) - \eta_{t,t+k} + \xi_{t+k} , \qquad (6)$$

where the left-hand side of equation (6) is the realized change in the exchange rate from t to t+k. According to the forward rate efficient markets hypothesis, the risk premium is zero and both the risk premium and the error term are assumed to be orthogonal to the interest differential.

In a regression context, the estimated parameter on the forward premium will have a probability limit of unity in the following regression:

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[2] Note that some approximations and simplifying assumptions have been made in order to arrive at this expression. See Engel (1996).

$$\Delta s_{t,t+k} = \alpha + \beta \left(f_{t,t+k} - s_t\right) + \varepsilon_{t+k}. \tag{7}$$

If the joint hypothesis holds, then the disturbance in equation (7) becomes simply the rational expectations forecast error $\xi_{t,t+k}$, which by definition is orthogonal to all information known at time t, including the forward discount.

Forward rate unbiasedness is a weaker condition than the risk neutral efficient markets hypothesis. All that is required for forward rate unbiasedness is that any risk premium and/or non-rational expectations error be uncorrelated with the forward discount, while the risk neutral efficient markets hypothesis requires in addition that no other regressors known at time t should have explanatory power.[3]

Estimates of equation (7), assuming covered interest parity, using values for k that range up to one year typically reject the unbiasedness restriction on the slope parameter. For instance, the survey by Froot and Thaler (1990), for instance, finds an average estimate for β of -0.88.[4]

One can relax the assumption regarding expectations, and replace it with another: that survey based expectations are a good measure for market expectations. Hence, instead of equation (7), estimate.

$$\Delta\hat{s}^{e}_{t,t+k} = \alpha' + \beta'\left(f_{t,t+k} - s_t\right) + \tilde{\varepsilon}_{t+k}. \tag{8}$$

where $\hat{s}^{e}_{t,t+k} \equiv \hat{s}^{e}_{t,t+k} - s_t$ is the expected depreciation implied by survey data. Under the null hypothesis of uncovered interest parity, the probability limit of β' equals unity as long as the as long as error term is uncorrelated with the interest differential.

Froot and Frankel (1989) demonstrate that the standard tests for forward rate bias yield

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[3] The constant term may reflect a constant risk premium demanded by investors on foreign versus domestic assets. Default risk could play a similar role, although the latter possibility is less familiar because tests of UIP (as well as CIP) generally use returns on assets issued in offshore markets by borrowers with comparable credit ratings.

[4] Similar results are cited in surveys by MacDonald and Taylor (1992) and Isard (1995).

radically different results when one uses survey-based measures of exchange rate depreciation. They find that most of the variation of the forward discount appears to be related to expected depreciation, rather than a time varying risk premium, thereby lending credence to UIP. [Since covered interest parity holds for these currencies, the forward discount is equivalent to the interest differential].

Chinn and Frankel (1994) document the fact that it is difficult to reject the forward rate unbiasedness hypothesis for a broader set of currencies, when using forecasts provided by the *Currency Forecasters' Digest* (*CFD*), although there is some evidence of a risk premium at the 12 month horizon. Chinn and Frankel interpret the differing results as arising from a wider set of currencies – they examine 17 currencies as opposed to the 5 or so examined by Frankel and Froot – where the assumption of perfect substitutability of debt instruments is less likely to hold.

Note that the object I identify as the risk premium need not be a true exchange risk premium, such as that identified by Bacchetta and van Wincoop (2009). In that case, infrequent portfolio decisions account for the gap between the forward rate and the expected spot rate.

3. Empirics

In this section, I compare the results from the standard unbiasedness tests and the test for UIP using survey data.

3.1 Unbiasedness

First, consider the results of estimating equation (7):

$$\Delta s_{t,t+k} = \alpha + \beta \left(f_{t,t+k} - s_t\right) + \varepsilon_{t+k} . \qquad (7)$$

Table 1 reports the results from estimating the standard ex post UIP regression (UIP incorporating rational expectations), often known as the "Fama regression" (1984). While data are available at the 1, 3, 6 and 12 month horizons, only results for the three and 12 months horizons are reported. Under the maintained hypothesis, the errors should be serially uncorrelated at the one month horizon. At the multi-month horizons, even under the null of rational expectations, there should be moving average serial correlation of order k-1 (Hansen and Hodrik, 1980), i.e., order 2 and order 11 for the three month and 12 month horizon regressions, respectively. However, we report the estimates using Newey-West standard errors, as there appears to be serial correlation, according the Durbin Watson statistics, above and beyond that implied by overlapping horizons.

In the top panel of Table 1.1 and 1.2 are presented the estimates for the euro legacy currencies (as well as the euro). For the legacy currencies, the sample ends in such a way that the last forecasted exchange rate is 1998M12. That means that at the three month horizon, the sample ends at 1998M09. For the euro, the sample begins at 1999M01 and ends at 2009M10 (and thus incorporates forecasts of the euro in 2010M01). The results are much in line with those reported elsewhere in the literature. Slightly over half the point estimates are negative; despite this, the standard errors are so large that one can reject the null of a coefficient of unity less than half of the time.

On the other hand, the positive coefficients are associated with the currencies of Ireland, Italy and Spain – countries that exhibited relatively high inflation during the sample period. This finding is consistent with Chinn and Meredith's (2004) conclusion that the currencies of the higher inflation countries tended to conform to the unbiasedness hypothesis at short horizons. In this earlier sample, all the adjusted R-squared statistics are quite low.

The bias is also evident for the newest currency in the data set – the euro. In this case, the imprecision of the estimates is sufficiently large at the 3 month horizon that one cannot reject the null of a coefficient of unity at any horizon. However, the point estimate is very negative, sufficiently so that one can reject unbiasedness at the 12 month horizon.

Panel 2 of Tables 1.1 and 1.2 reports the estimates for currencies estimated over the full sample. The Swedish krone at the three month horizon is the lone instance where the coefficient is above unity. Otherwise, the slope coefficients are below one, and particularly at the 12 month horizon, significantly so.

An interesting result is that the point estimates are quantitatively close to the posited value of unity in two cases – Sweden and Spain. Italy's coefficients at the short horizon is very high, in excess of 2. It is interesting in the latter two countries' currencies, the rate of the inflation over the sample period (which ends in 1998M12) is the highest. This result is consistent with the findings in Chinn and Meredith (2004). High inflation currencies tend to exhibit positive coefficients in unbiasedness regressions, equivalent here to the Fama regression.

3.2 Uncovered Interest Parity

The results of estimating *ex ante* uncovered interest parity stand in stark contrast to those from *ex post* UIP. In order to implement the tests, we use extended versions of the data used in Chinn and Frankel (1994). These are data provided by *FX Forecasts*, the successor organization to *Currency Forecaster's Digest*, and the data used are at the 3 and 12 month horizons.

Table 2 presents the results. The most obvious and striking difference is that there is only one negative estimated coefficient for all the currencies (Japan at the 3 month horizon). In all other instances, the estimated coefficients are positive, and in most cases reject the null of zero.

On the other hand, one *can* reject the null hypothesis of a unit coefficient consistent with the UIP hypothesis in only 8 cases (of which four cases pertain to the situation where the point estimate is above unity).

If one wants to focus on the major currencies, such as the Deutschemark and the euro, the UK pound, Swiss franc, and Japanese yen, one finds that in almost all instances, one can't reject the null of a unit coefficient, with the exception of the Japanese yen and UK pound. So for key currencies, UIP does seem to hold.

Why do the results differ to so widely between each approach to expectations? One can examine this from a mechanical perspective. If exchange rate expectations, as measured by the survey data, point in a substantially different direction from the actual exchange rate changes, then one would expect differing results. One can quantify the differences by examining whether expected changes exhibit bias.

$$\Delta s_{t,t+k} = \gamma + \theta(\Delta \hat{s}_{t,t+k}) + u_{t+k} . \qquad (9)$$

These results are reported in Tables 3.1 and 3.2, for the 3 month and 12 month horizons, respectively. One interesting fact is that almost all the survey-based forecasts are biased, and exhibit very small correlation with the actual exchange rate changes. However, it is also notable that in most of the cases where the beta coefficients switch from negative to positive are the instances where the survey-based expected changes are negatively correlated with the actual changes.

Another point of commonality with the rational expectations-UIP hypothesis is that the proportion of variation explained is very low, with the exception of the 12 month horizon.

Morever, a high degree of serial correlation is evident in both the unbiasedness and and UIP regressions.

3.3 Panel Regressions

The basic outlines of these results persist when undertaking panel analysis. In general, the slope coefficients obtained using the rational expectations hypothesis are less than those obtained using survey data. For the euro legacy currencies at the three month horizon, the contrast is the strongest. The unbiasedness regression coefficient estimates are negative, while the UIP regression coefficients are positive; there is a difference also for the twelve month horizon.

The contrast disappears when examining non-euro currencies over the full sample at the three month horizon. Yet, it appears at the twelve month horizon. There the difference is statistically and numerically different.

Overall, the panel regressions indicate that there is substantial evidence against forward rate unbiasedness, using either the rational expectations assumption, or using survey data as proxies for market expectations. At the twelve month horizon, the evidence is more in accord with forward rate unbiasedness.

4. The Risk Premium

In simple models, the exchange risk premium arises from the correlation of currency returns with the marginal utility of consumption. Of course, numerous researchers have failed to relate the risk premium identified using rational expectations to macroeconomic fundamentals.[5]

Here, I examine how the risk premium defined under rational expectations differs from

[5] See Engel (1996) for a discussion, and Engel (2011) for a recounting of what attributes the risk premium must fulfill.

that defined using survey data. The three month risk premia are illustrated in Figure 1. The blue line presents the risk premia obtained using survey data, while the red line depicts the conventional risk premia implied by the rational expectations hypothesis. Clearly, the risk premia obtained using the survey data are much more persistent than the rational expectations implied; they also exhibit much less high frequency volatility.

To formally quantify the degree of persistence, I sampled the three month risk premia every three months (end of each quarter), so as to eliminate the overlapping data issue. The results of regressing these sampled data on the lagged risk premia are presented in Table 5.

The pattern is striking. In almost every case, the risk premium obtained using survey data is highly persistent, while that obtained using the rational expectations is not. In fact it would be hard to distinguish the latter from white noise; the AR(1) coefficient for the rational expectations derived risk premium is essentially zero. In contrast, the half-life of a typical survey-based risk premium is about 2 quarters.

It's conceivable that the earlier stylized fact that the exchange risk premium is unrelated to macroeconomic variables is in fact an artifact of the questionable assumption of rational expectations. I reserve that question for future research.

5. Conclusions

In this study, I have re-examined the forward rate uncovered interest parity hypothesis, using the rational expectations hypothesis, and using survey data, to identify expected exchange rate changes. I arrive at the following conclusions:

- Forward rate unbiasedness is generally generally rejected a currency by currency basis using the rational expectations hypothesis.

- The forward discount deviates from expected depreciation in about a third of the currencies when using survey data based expectations. Assuming covered interest parity holds, this means the interest differential does on average predict correctly the direction of *expected* exchange rate changes. Nonetheless, one can still reject the null of uncovered interest parity in many cases, particularly at the three month horizon.
- Oftentimes, the difference in the results is linked to the finding of bias in exchange rate expectations. This finding suggests that biased expectations are an important reason why the forward discount (and hence the interest differential) point in the wrong direction for subsequent ex post exchange rate changes.
- Panel regression estimates indicate a failure to reject the risk neutral efficient markets hypothesis at the three month horizon, while the slope coefficient is always positive using survey data.
- The risk premium identified using survey data differs substantially in terms of persistence and high frequency volatility from the standard risk premium. The survey-data based risk premium is much more persistent.

Future work should test for heterogeneity across major vs. minor currencies, and whether pooling across currencies is justified. In addition, I plan to investigate whether the risk premium identified using survey data is linked to any macro variables, including those suggested by theory (consumption growth, inflation, etc.).

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Table 1.1. Unbiasedness Regressions, Three Month Horizon

coefficient	BE	FR	GY	IR	IT	NE	SP	EU	
constant	0.011	0.008	0.008	0.039	-0.055	0.008	-0.037	0.003	
	0.032	0.030	0.031	0.031	0.061	0.031	0.053	0.034	
beta	-0.551	-0.010	**-0.243**	0.115	2.477	-0.115	1.509	0.220	
	0.912	0.854	**0.283**	1.063	1.819	0.999	1.284	1.315	
Obs.	146	146	146	146	146	146	146	130	
adj.R Sq.	-0.002	-0.007	-0.003	-0.007	0.067	-0.007	0.032	-0.007	
DW	0.542	0.546	0.568	0.573	0.665	0.562	0.706	0.677	
coefficient	DE	NO	SN	SW	UK	JP	AU	CA	NZ
constant	0.008	0.013	0.016	0.001	0.002	-0.065	0.034	0.004	0.023
	0.023	0.027	0.029	0.029	0.022	0.025	0.029	0.019	0.045
beta	-0.051	**0.366**	1.562	-0.403	0.956	**-2.358**	-0.378	**-0.492**	-0.353
	0.705	**0.291**	0.453	0.855	0.659	**0.855**	0.965	**0.565**	1.508
Obs.	279	279	279	279	279	279	279	279	250
adj.R Sq.	-0.004	0.001	0.140	-0.002	0.010	0.049	-0.003	-0.001	-0.003
DW	0.614	0.615	0.607	0.604	0.647	0.597	0.834	0.771	0.556

Notes: OLS regression estimates; Newey-West standard errors. Top panel, 1986M08-1998M09, except for EU, 1999M01-2009M10. Bottom panel, 1986M08-2009M10, except for NZ, 1989M01-2009M10. Entries in **bold face** denote significance at the 5% level, for null hypothesis of beta=1.

Table 1.2. Unbiasedness Regressions, Twelve Month Horizon

coefficient	BE	FR	GY	IR	IT	NE	SP	EU	
constant	0.002	0.002	-0.002	0.006	-0.016	-0.002	-0.013	-0.021	
	0.017	0.018	0.017	0.018	0.025	0.017	0.029	0.019	
beta	**-0.965**	-0.148	**-0.323**	0.102	1.283	**-0.549**	0.785	**-1.963**	
	0.808	0.719	**0.602**	0.741	0.778	**0.642**	0.768	**1.265**	
Obs.	146	146	146	146	146	146	146	130	
adj.R Sq.	0.034	-0.006	0.000	-0.006	0.086	0.012	0.032	0.064	
DW	0.186	0.193	0.197	0.176	0.244	0.187	0.157	0.265	

coefficient	DE	NO	SN	SW	UK	JP	AU	CA	NZ
constant	-0.001	-0.001	0.003	-0.034	-0.003	-0.091	0.018	-0.008	-0.000
	0.014	0.015	0.017	0.019	0.016	0.014	0.022	0.011	0.039
beta	**-0.527**	**0.054**	0.697	**-1.301**	0.404	**-2.492**	**-0.875**	-0.017	-0.664
	0.637	**0.467**	0.644	**0.700**	0.930	**0.534**	**0.545**	0.552	1.425
Obs.	279	279	279	279	279	279	279	279	250
adj.R Sq.	0.010	-0.003	0.022	0.059	0.001	0.214	0.026	-0.004	0.001
DW	0.190	0.185	0.150	0.227	0.181	0.284	0.185	0.181	0.124

Notes: OLS regression estimates; Newey-West standard errors. Top panel, 1986M08-1997M12, except for EU, 1999M01-2009M10. Bottom panel, 1986M08-2009M10, except for NZ, 1989M01-2009M10. Entries in **bold face** denote significance at the 5% level, for null hypothesis of beta=1.

Table 2.1. Uncovered Interest Parity Regressions, Three Month Horizon

coefficient	BE	FR	GY	IR	IT	NE	SP	EU	
constant	0.032	0.036	0.033	-0.016	-0.002	0.036	0.032	-0.019	
	0.018	0.018	0.017	0.018	0.021	0.017	0.027	0.010	
beta	0.956	0.825	0.609	0.990	1.309	1.659	0.326	0.628	
	0.439	0.477	0.258	0.505	0.346	0.431	0.452	0.267	
Obs.	141	140	141	141	141	141	141	128	
adj.R Sq.	0.071	0.048	0.112	0.079	0.141	0.166	0.004	0.007	
DW	0.366	0.374	0.379	0.455	0.433	0.309	0.410	2.255	
coefficient	DE	NO	SN	SW	UK	JP	AU	CA	NZ
constant	0.002	-0.027	0.001	0.034	0.018	0.010	-0.053	-0.012	0.245
	0.011	0.013	0.011	0.012	0.011	0.015	0.010	0.005	0.087
beta	0.953	0.857	**0.198**	1.243	**0.176**	**-0.473**	**1.781**	**0.591**	3.801
	0.342	0.267	**0.150**	0.344	**0.226**	**0.415**	**0.189**	**0.188**	2.324
Obs.	272	235	272	272	272	272	272	272	243
adj.R Sq.	0.055	0.153	0.028	0.071	0.000	0.007	0.188	0.018	0.016
DW	1.272	0.857	0.666	1.263	0.959	0.654	1.430	2.282	0.439

Notes: OLS regression estimates; Newey-West standard errors. Top panel, 1986M08-1998M09, except for EU, 1999M01-2009M10. Bottom panel, 1986M08-2009M10, except for NZ, 1989M01-2009M10. Entries in **bold face** denote significance at the 5% level, for null hypothesis of beta=1.

Table 2.2. Uncovered Interest Parity Regressions, Twelve Month Horizon

coefficient	BE	FR	GY	IR	IT	NE	SP	EU	
constant	0.042	0.038	0.045	-0.029	0.012	0.043	0.019	-0.029	
	0.007	0.007	0.006	0.008	0.009	0.007	0.010	0.008	
beta	1.078	0.960	**1.412**	0.803	1.129	1.294	0.657	1.333	
	0.214	0.224	**0.204**	0.293	0.179	0.202	0.199	0.358	
Obs.	139	140	141	141	139	141	139	128	
adj.R Sq.	0.223	0.183	0.419	0.163	0.288	0.332	0.154	0.142	
DW	0.468	0.434	0.486	0.542	0.487	0.401	0.461	0.838	
coefficient	DE	NO	SN	SW	UK	JP	AU	CA	NZ
constant	-0.002	-0.018	-0.012	0.031	-0.009	0.030	-0.056	-0.012	0.075
	0.007	0.007	0.007	0.007	0.008	0.008	0.005	0.003	0.028
beta	1.417	0.842	1.198	1.417	1.575	**0.401**	**1.656**	0.781	2.140
	0.231	0.243	0.257	0.299	0.299	**0.268**	**0.124**	0.156	0.792
Obs.	272	233	272	272	272	272	272	272	243
adj.R Sq.	0.251	0.143	0.305	0.175	0.233	0.017	0.484	0.163	0.090
DW	0.528	0.438	0.568	0.439	0.467	0.313	0.630	1.002	0.246

Notes: OLS regression estimates; Newey-West standard errors. Top panel, 1986M08-1997M12, except for EU, 1999M01-2009M10. Bottom panel, 1986M08-2009M10, except for NZ, 1989M01-2009M10. Entries in **bold face** denote significance at the 5% level, for null hypothesis of beta=1.

Table 3.1 Bias, Three Month Horizon

coefficient	BE	FR	GY	IR	IT	NE	SP	EU	
constant	-0.005	0.003	0.003	0.048	0.022	0.001	0.017	-0.003	
	0.035	0.033	0.033	0.031	0.035	0.034	0.035	0.032	
gamma	**0.222**	**0.074**	**0.059**	**0.231**	**0.254**	**0.080**	**0.256**	**-0.091**	
	0.271	**0.255**	**0.262**	**0.264**	**0.279**	**0.269**	**0.334**	**0.131**	
Obs.	141	140	141	141	141	141	141	128	
adj.R Sq.	0.003	-0.006	-0.006	0.006	0.002	-0.006	0.004	-0.006	
DW	0.548	0.554	0.558	0.572	0.482	0.562	0.662	0.711	
coefficient	DE	NO	SN	SW	UK	JP	AU	CA	NZ
constant	0.005	0.019	0.043	0.005	0.021	0.000	0.020	-0.001	0.034
	0.022	0.030	0.037	0.022	0.026	0.021	0.032	0.015	0.023
gamma	**-0.038**	**-0.160**	**0.150**	**-0.037**	**-0.184**	**0.010**	**-0.476**	**-0.154**	**0.107**
	0.145	**0.249**	**0.228**	**0.145**	**0.171**	**0.216**	**0.204**	**0.251**	**0.074**
Obs.	272	235	272	272	272	272	272	272	272
adj.R Sq.	-0.003	0.000	-0.002	-0.003	0.001	-0.004	0.017	0.000	0.034
DW	0.622	0.696	0.456	0.600	0.610	0.560	0.933	0.848	0.584

Notes: OLS regression estimates; Newey-West standard errors. Top panel, 1986M08-1998M09, except for EU, 1999M01-2009M10. Bottom panel, 1986M08-2009M10. Entries in **bold face** denote significance at the 5% level, for null hypothesis of gamma=1.

Table 3.2 Bias, Twelve Month Horizon

coefficient	BE	FR	GY	IR	IT	NE	SP	EU
constant	0.010	0.012	0.002	0.000	0.016	0.002	0.009	-0.008
	0.021	0.019	0.019	0.018	0.015	0.019	0.018	0.022
gamma	**-0.203**	**-0.255**	**-0.070**	**-0.120**	**0.219**	**-0.061**	**0.216**	**0.237**
	0.280	**0.258**	**0.244**	**0.291**	**0.341**	**0.255**	**0.314**	**0.331**
Obs.	139	140	141	141	139	141	139	128
adj.R Sq.	0.003	0.010	-0.006	-0.004	0.005	-0.006	0.001	0.005
DW	0.166	0.184	0.173	0.165	0.156	0.166	0.134	0.163

coefficient	DE	NO	SN	SW	UK	JP	AU	CA	NZ
constant	-0.006	-0.004	0.009	-0.012	-0.003	-0.017	-0.007	-0.006	0.017
	0.013	0.015	0.016	0.013	0.012	0.013	0.016	0.011	0.015
gamma	**0.052**	**0.308**	**0.247**	**0.055**	**0.311**	**-0.036**	**-0.055**	0.425	**0.551**
	0.182	**0.190**	**0.273**	**0.167**	**0.228**	**0.236**	**0.266**	0.393	**0.148**
Obs.	272	233	272	272	272	272	272	272	272
adj.R Sq.	-0.003	0.027	0.011	-0.002	0.023	-0.003	-0.003	0.021	0.169
DW	0.167	0.191	0.154	0.192	0.162	0.176	0.182	0.170	0.116

Notes: OLS regression estimates; Newey-West standard errors. Top panel, 1986M08-1997M12, except for EU, 1999M01-2009M10. Bottom panel, 1986M08-2009M10. Entries in **bold face** denote significance at the 5% level, for null hypothesis of gamma=1.

Table 4. Panel Regressions

	Early	Early	Full	Full	Early	Early	Full	Full
	RatEx 3 Month	Survey 3 Month	RatEx 3 Month	Survey 3 Month	RatEx 12 Month	Survey 12 Month	RatEx 12 Month	Survey 12 Month
beta	0.913	1.255	1.106	**0.318**	0.524	0.978	**-0.220**	1.221
	(0.442)	(0.185)	(0.225	**(0.144**	(0.408)	(0.215)	**(0.364)**	(0.207)
Obs.	336	335	828	815	84	84	205	204
Adj.R sq.	-0.006	0.179	0.021	0.062	-0.058	0.387	-0.036	0.146

Notes: OLS point estimates from fixed effects regressions. Non-overlapping data, regular standard errors. Early pertains to euro legacy currencies, upper panels of Table 1 (except euro), from 1986m08-1998m09. Full pertains to currencies in lower panels of Table 1, from 1986m08-2009m10. Entries in **bold face** denote significance at the 5% level, for null hypothesis of beta=1.

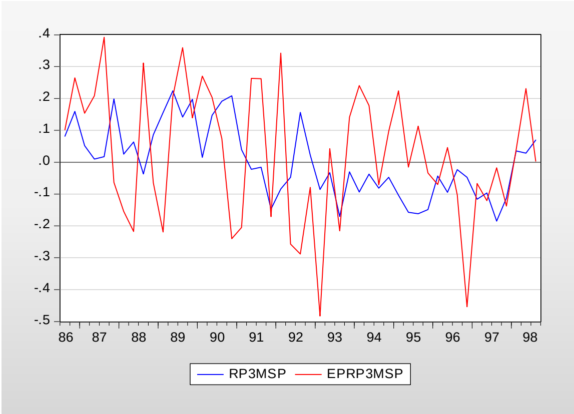
Table 5. Persistence in the Risk Premium, Three Month Horizon

coefficient	RatEx BE	Survey BE	RatEx FR	Survey FR	RatEx GY	Survey GY	RatEx IR	Survey IR	RatEx IT	Survey IT	RatEx NE	Survey NE	RatEx SP	Survey SP	RatEx EU	Survey EU
constant	0.002	-0.017	0.009	-0.018	0.009	-0.018	-0.049	0.004	0.003	-0.005	-0.001	-0.012	0.018	0.000	0.005	-0.006
	0.028	0.014	0.028	0.014	0.036	0.017	0.029	0.012	0.030	0.010	0.029	0.011	0.031	0.012	0.028	0.018
rho	**0.213**	**0.546**	0.182	**0.543**	0.082	0.310	0.170	**0.576**	0.143	**0.627**	0.142	**0.654**	0.176	**0.648**	0.150	**0.390**
	0.102	**0.106**	0.109	**0.095**	0.104	0.244	0.099	**0.099**	0.110	**0.075**	0.090	**0.073**	0.114	**0.088**	0.110	**0.041**
Obs.	48	48	48	48	48	48	48	48	48	48	48	48	48	48	43	43
adj.R Sq.	0.025	0.285	0.012	0.280	-0.015	0.077	0.008	0.314	-0.001	0.399	-0.001	0.422	0.010	0.408	0.001	0.129
Q(4)-stat	6.804	2.728	6.875	3.194	3.258	5.055	6.431	0.944	5.464	4.327	8.378	2.744	1.188	5.464	2.594	0.801
p-value	0.147	0.604	0.143	0.526	0.516	0.282	0.169	0.918	0.243	0.364	0.079	0.601	0.88	0.243	0.628	0.938

coefficient	RatEx DE	Survey DE	RatEx NO	Survey NO	RatEx SN	Survey SN	RatEx SW	Survey SW	RatEx UK	Survey UK	RatEx JP	Survey JP	RatEx AU	Survey AU	RatEx CA	Survey CA	RatEx NZ	Survey NZ
constant	0.011	-0.007	0.015	0.006	-0.010	0.002	-0.016	-0.025	0.002	-0.001	-0.031	-0.023	0.012	0.018	0.010	0.012	-0.042	-0.057
	0.020	0.010	0.024	0.010	0.028	0.009	0.023	0.012	0.024	0.007	0.025	0.008	0.024	0.009	0.014	0.005	0.026	0.034
rho	0.146	**0.493**	0.100	**0.545**	**0.256**	**0.458**	0.072	**0.447**	0.157	**0.632**	0.041	**0.631**	0.154	0.260	**0.154**	**0.235**	**0.310**	**0.662**
	0.080	**0.078**	0.093	**0.128**	**0.071**	**0.097**	0.084	**0.101**	0.090	**0.069**	0.064	**0.056**	0.106	0.167	**0.051**	**0.104**	**0.092**	**0.079**
Obs.	92	92	92	92	92	92	92	92	92	92	92	92	92	92	92	92	82	82
adj.R Sq.	0.011	0.228	-0.001	0.284	0.055	0.203	-0.006	0.191	0.014	0.392	-0.009	0.379	0.013	0.059	0.013	0.045	0.086	0.440
Q(4)-stat	4.861	1.069	1.841	1.532	2.329	6.154	6.139	2.039	6.069	7.227	12.71	9.669	0.552	4.73	3.356	14.22	0.804	2.465
p-value	0.302	0.899	0.765	0.821	0.675	0.188	0.189	0.729	0.194	0.124	0.013	0.046	0.968	0.316	0.5	0.007	0.938	0.651

Notes: Estimates from autoregression. Newey-West standard errors. Entries in **bold face** denote significance at the 5% level, for null hypothesis of rho=0.

Figure 1
Three Month Risk Premia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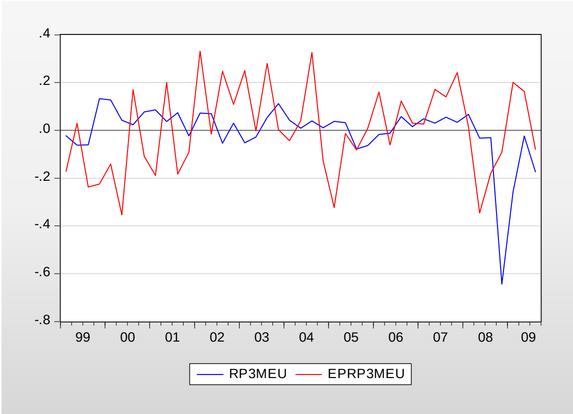
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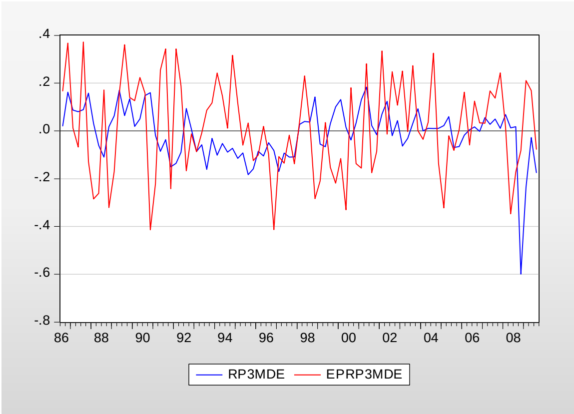
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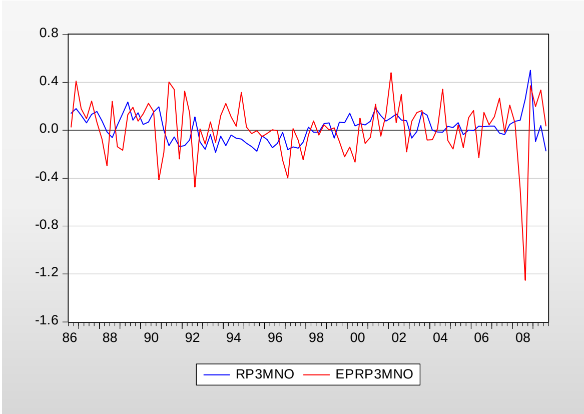
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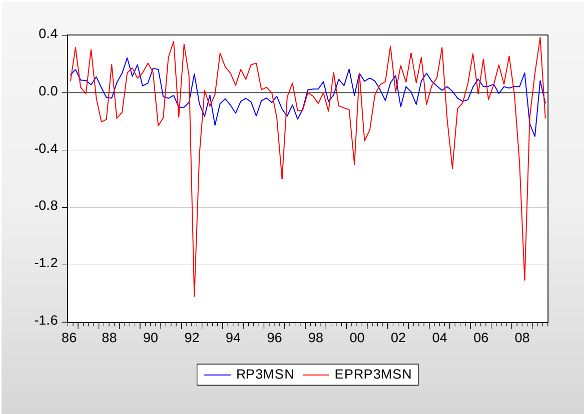
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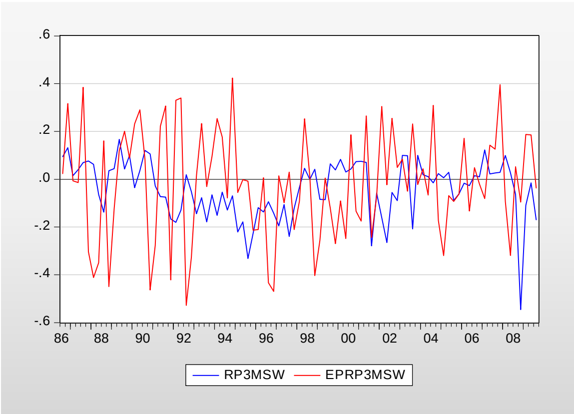
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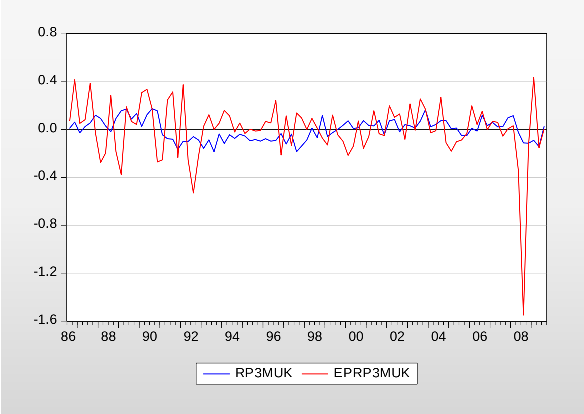
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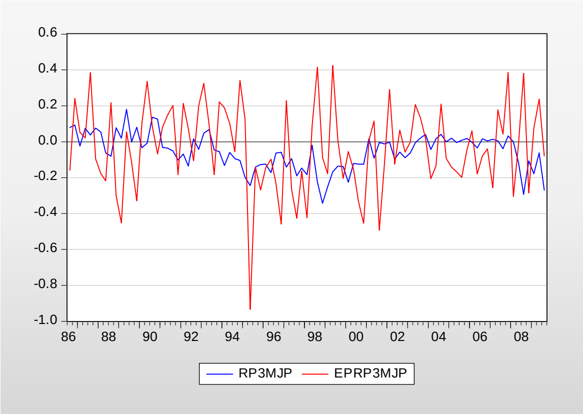
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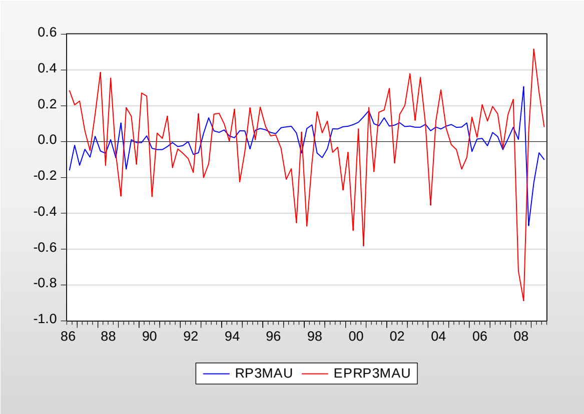
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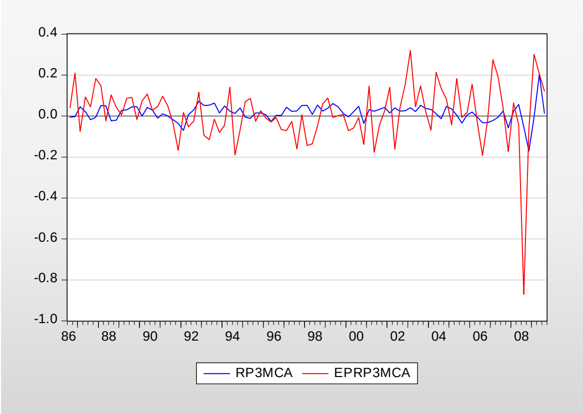
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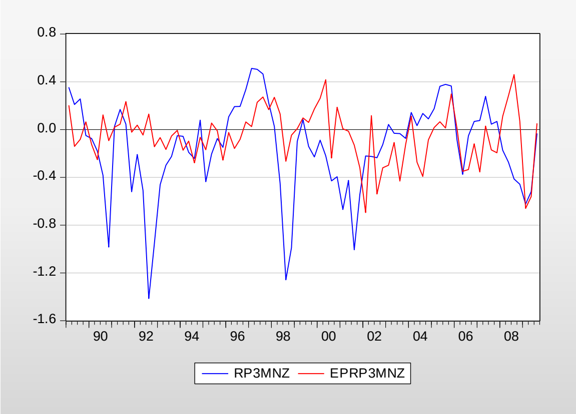
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