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# Survey Based Expectations and Uncovered Interest Rate Parity

by

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October 7, 2009

**Abstract:** Survey based measures of exchange rate expectations are used to test the uncovered interest rate parity hypothesis, namely that interest differentials or the forward discount equals expected depreciation. The Deutsche Mark and the Japanese Yen (against the US dollar) are examined, in a sample extending from 1986M08 to 1998M11. UIP can be rejected for the DEM at 12 months and the JPY at 3 months.

**Acknowledgements:** I thank faculty research funds of the University of Wisconsin for financial support.

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## 1. INTRODUCTION

It is widely believed that uncovered interest parity (UIP) is a useful theoretical concept, but an empirically irrelevant construct. This belief is understandable, given the widespread failure to find evidence that ex post changes in exchange rates should be positively related to interest differentials with a coefficient of unity. However, as has been pointed out in careful analyses, this finding is at variance with the joint null hypothesis that UIP – which pertains to expected exchange rate changes – and unbiased expectations both hold. Frankel has termed this composite the "unbiasedness hypothesis", and it is this proposition that has been widely violated in the empirical literature.

This paper extends earlier tests for uncovered interest parity, but dropping the assumption of rational expectations, by relying upon survey-based expectations of future exchange rates.[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 extending for approximately 20 years.

This paper is organized in the following fashion. In section 2, I discuss uncovered interest parity, and in section 3, UIP is evaluated empirically. Concluding remarks follow.

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1 Early contributions were Dominguez (1986), Frankel and Froot (1987), and Froot and Frankel (1989). Takagi (1991) reviewed the early literature. Chinn and Frankel (1994), and Frankel and Chinn (1993) use this data source.

## 2. Uncovered Interest Parity

If the conditions for risk-free arbitrage exist, the log ratio of the forward to the spot exchange rate will equal the interest differential between assets with otherwise similar characteristics measured in local currencies,

$$f_{t,t+k} - s_t = (i_{t,k} - i^*_{t,k}). \tag{1}$$

where $s_t$ is 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), $i_{t,k}$ is the $k$-period yield on the domestic instrument, and $i^*_{t,k}$ is the corresponding yield on the foreign instrument. The left hand side of (1) is often called the forward discount.

Equation (1) is a risk-free arbitrage condition that holds regardless of investor preferences. To the extent that investors are risk averse, however, the forward rate can differ from the expected future spot rate by a premium that compensates for the perceived riskiness of holding domestic versus foreign assets. The risk premium, η, is defined as:

$$f_{t,t+k} = s^e_{t,t+k} + \eta_{t,t+k}. \tag{2}$$

Substituting equation (2) into (1) then allows the expected change in the exchange rate from period $t$ to period $t+k$ be expressed as a function of the interest differential and the risk premium:

$$\Delta s^e_{t,t+k} = (i_{t,k} - i^*_{t,k}) - \eta_{t,t+k}, \tag{3}$$

Narrowly defined, UIP refers to the proposition embodied in equation (3) when the risk premium is zero. UIP would hold if investors are risk-neutral investors, or the underlying bonds are perfect substitutes.2 In this case, the expected exchange rate change equals the current interest differential. Equation (3) is not directly testable, however, in the absence of observations on market expectations of future exchange rate movements. To make UIP 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 $\xi_{t,t+k}$ that is uncorrelated with all information known at *t*, including the interest differential and the spot exchange rate:

$$s_{t+k} = s^{re}_{t,t+k} + \xi_{t,t+k} , \qquad (4)$$

Then, one obtains what is commonly, if somewhat misleadingly, known as the UIP regression,

$$\Delta s_{t,t+k} = (i_{t,k} - i^{*}_{t,k}) - \eta_{t,t+k} + \xi_{t,t+k} , \qquad (5)$$

where the left-hand side of equation (5) is the realized change in the exchange rate from t to t+k.

According to the unbiasedness hypothesis, the last two terms in equation (5) are assumed to be orthogonal to the interest differential. Thus, in a regression context, the estimated parameter on the interest differential will have a probability limit of unity in the following regression:

$$\Delta s_{t,t+k} = \alpha + \beta\ (i_{t,k} - i^{*}_{t,k}) + \varepsilon_{t,t+k} . \qquad (6)$$

The combined assumptions of no risk premium in equation (3) (i.e. that UIP holds) and rational expectations is sometimes termed the "risk-neutral efficient-markets hypothesis"

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

(RNEMH). In this case, the disturbance in equation (6) 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 interest differential.

Unbiasedness is a weaker condition that RNEMH. All that is required is that any risk premium and/or non-rational expectations error be uncorrelated with the interest differential, while the RNEMH requires in addition that no other regressors known at time t should have explanatory power.3

Estimates of equation (6) 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 $\beta$ of -0.88.4 One rare instance of a finding in favor of unbiasedness is provided by Lothian and Simaan (1998), who use time averaged interest rate differentials and exchange rate changes in a panel regression framework over the 1974-94 period.

## 3. Empirical Testing

It is important to recall that, in fact, uncovered interest parity properly defined as relating to expected depreciation, is untestable. Estimation of the standard UIP regression equation relies upon the rational expectations methodology embodied in equation 4. Of course, reliance upon the assumption of mean zero expectational errors is by no means uncontroversial. In a number of papers, Froot and Frankel (1989) demonstrate that the

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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

standard tests for UIP yield 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, 2002) document the fact that it is difficult to reject UIP 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.

If the standard UIP results can be overturned by appealing to survey data, it is of interest to investigate whether they are also overturned at longer horizons. In order to investigate this, we estimate the following regression:

$$\Delta\hat{s}^{e}_{t,t+k} = \alpha + \beta\ (i_{t,k} - i^{*}_{t,k}) + \tilde{\varepsilon}_{t,t+k}\,. \tag{7}$$

where $\hat{s}^{e}_{t,t+k} \equiv \hat{s}^{e}_{t,t+k} - s_{t}$ is the expected depreciation implied by the geometric mean of survey data on future spot exchange rates. In this case, the error term, $\tilde{\varepsilon}_{t,t+k}$ need not be mean zero and iid.

The results for regressions estimated over the 1986M08-1998M11 period are

comparable credit ratings.

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

reported in Table 1. They indicate that, while the point estimates are not always close to unity, in only a couple of opportunities is it possible to reject the null hypothesis of unity: Deutsche mark at 12 months horizon and Japanese yen at 3 months.

While the 12 month DM result rejects the UIP null, it interesting to note that the coefficient is too large, rather than too small, as is usually the case in tests of the unbiasedness proposition.

The yen 3 month result is by far more interesting, in that this constitutes a strong economic and statistical rejection of UIP, as the coefficient is very negative.

## 4. Conclusions

Future work will extend the sample (specifically, forward rate data) up to 2009M09 (the extent of the expectations data), and extend across more currencies (in Chinn and Frankel (1993), up to 17 currencies were examined). The analysis will then also encompass the dollar/euro rate.

Panel regressions can then be implemented, with the addition of the other currencies.

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**Table 1**
**Uncovered Interest Rate Parity Regressions**
**1986M08-1998M11**

Dependent Variable: Ex post depreciation

| | DEM 3mo | DEM 12mo | JPY 3mo | JPY 12mo |
|---|---|---|---|---|
| Constant | 0.006* | 0.044*** | 0.001 | 0.040*** |
| | (0.004) | 0.006 | (0.005) | (0.009) |
| Expected Depr. | 0.740 | 1.422* | -0.705*** | 0.557 |
| | (0.300) | (0.206) | (0.544) | (0.279) |
| Adj-R2 | 0.13 | 0.42 | 0.02 | 0.04 |
| SER | 0.026 | 0.042 | 0.027 | 0.051 |
| DW | 0.38 | 0.48 | 0.43 | 0.36 |
| N | 141 | 141 | 138 | 138 |

Notes: OLS point estimates. Newey-West standard errors. *(**)[***] denotes different from 0 for constant, from 1 for slope coefficient, at 10%(5%)[1%] significance level.