

A systematic comparison of professional exchange rate forecasts with the judgemental forecasts of novices

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Abstract

Professional forecasters in foreign exchange markets are not able to beat naive forecasts. In order to find reasons for this phenomenon we compare the empirical forecasts of experts with the experimentally generated forecasts of novices of the EUR/USD exchange rate in three different forecast horizons. Although the subjects are only provided with the realizations of the exchange rate and are not supported by any statistical procedures they outperform experts in accuracy. Professionals consistently expect a reversal of forgoing exchange rate changes whereas novices extrapolate trends. The judgemental forecasts appear to be unbiased and professionals appear to be biased. We demonstrate that professionals are influenced by the fundamental value - an irrelevant anchor in speculative exchange markets. The poor performance of the experts is not a common failure of human decision-making in market environments but caused by misleading information.

Key words: Foreign Exchange Market, Forecasting, Behavioral Finance, Expertise, Judgment, Expectation Formation.

1 Introduction

In various professional domains the judgement of experts was compared to novices and experts were found to be superior. However, this result is domain-specific [10]. In domains with static stimuli, e.g. weather forecasts, experts perform well, but they perform poorly with domains of dynamic stimuli and human behavior, e.g. clinical psychology [35]. With its characteristics of volatile prices and exogenous uncertainties financial markets fit well into the latter category. This might be an explanation for the poor performance of experts which was found in studies, especially in the context

of the earnings forecasts of financial analysts (see [2] for a concise review). In the context of foreign exchange rates, studies dealing with forecasting accuracy are rather rare. The focus of studies related to exchange rate expectations tends to be the question of whether expectations are rational (see e.g. [3]). It is our hypothesis that in foreign exchange markets professionals base their forecasts on irrelevant information. The empirical failure of standard economic exchange rate models has been proved at least since the seminal work of Meese and Rogoff [24, 25]. Rogoff [32] describes the current status very accurately when he states: *"To make a long story short not only have a subsequent twenty years of data and research failed to overturn the Meese-Rogoff result, they have cemented it ..."*. According to the standard macroeconomic exchange rate models, expectations play a decisive role for the determination of exchange rates. It is usually assumed that expectations are formed rationally, i.e. market participants process all available information on the basis of the "correct" exchange rate model. Thereby the considered information set typically consists of macroeconomic fundamentals like money supplies, interest rates, inflation rates.

We compare point forecasts of the EUR/USD exchange rate surveyed from professional analysts and forecasts from participants of a laboratory experiment. We try to find differences and similarities in the expectation formation that allow us to derive possible explanations for the poor forecasting accuracy of the professional exchange rate forecasters. Hence, we combine two different research approaches, namely empirical studies on survey expectations collected by suppliers of financial data and experimental studies on forecasts collected from subjects. The subjects will be confronted in the experiment with the task of judgementally forecasting the real exchange rate without any other information than the realizations of the time series itself. They are not supported by statistical procedures and they are not given any background information. This allows the comparison of the forecasts in an environment of minimum information to the forecasts in reality. We investigate forecasts for three different forecasting horizons: one step ahead, three step ahead and six step ahead forecasts. Our analysis is focused on the aggregated level of consensus forecasts. Thus we compare average behavior and neglect the behavior of individuals.

In the next section we describe the data base of our analysis: the professional exchange rate forecasts and the experimental design for the forecasts of novices. In section 3, the forecasting accuracy of novices and professionals is compared. In section 4, we analyze the nature of expectations in more detail and test for rational, adaptive and extrapolative expectations. Finally, we discuss our results and provide a possible explanation for the poor forecasting performance of professionals.

2 Data Sources

2.1 Professional exchange rate forecasts

The analysis of professional forecasts is based on survey data provided by three different suppliers of financial data: Reuters, Consensus Economics and ZEW Finanzmarkttest from the Centre for European Economic Research (ZEW)¹. The period under consideration starts in January 1999 and ends in March 2003. The available forecast horizons vary depending on the supplier: Consensus Economics provides 3-month forecasts (1999/1-2002/12), Reuters 1, 3 and 6-month forecasts (1999/1-2003/2) and ZEW-Finanzmarkttest 6-month forecasts (1999/1-2002/12). These data are hereafter Reuters₁, Reuters₃, Reuters₆, Consensus₃ and ZEW₆. The spot EUR/USD exchange rate (S_t) is taken from the IFS CD-ROM of the International Monetary Fund (IMF). Here we use the end-of-month values of the preceding month since the market forecasts are given at the end or the beginning of a month: for instance, the December one-month forecast for January is typically made at the end of November/beginning of December. Thus, we compare this value with the actual end of this December spot rate.

2.2 Experimental design

The experiment was run in three versions with a total of 106 undergraduate students. The subject's task comprised the prediction of the EUR/USD exchange rate one period ahead (46 subjects), three periods ahead (30 subjects) and six periods ahead (30 subjects). The sample size is comparable to the samples of professional forecasters. The presented time series was identical to S_t in the preceding section. The only difference between the three versions is the forecasting horizon.

For the forecast of period $t + 1$, the realisations of S_t, S_{t-1}, \dots, S_1 and the subject's own forecasts were graphed on the computer screen. The value S_1 was graphed before the subjects made their initial forecast but no history of past values was presented. The time series S_t was unlabelled and the subjects were not given any contextual or background information. The axes were neutrally labelled and no indication of monthly intervals was given. The forecasts were completely judgemental, no support from statistical models was provided. Hence the forecasting situation of the subjects is reduced to only one source of information, namely the realizations of the real EUR/USD exchange rate S_t . This allows the analysis of forecasting behavior without potentially misleading factors.

In order to provide appropriate incentives, subjects received payments (in Euro cents) based on their absolute forecast errors: $\sum_{t=2}^{51} \max\{40 - |_{t-h}f_t^i - S_t|; 0\}$ where $_{t-h}f_t^i$ denotes the forecast of subject i made in period $t - h$ for the exchange rate S_t and $h \in \{1, 3, 6\}$. The average payment across the

¹Information about the suppliers of the survey data can be found on www.consensuseconomics.com, www.reuters.com and www.zew.de.

three versions of the experiment was approximately 5 Euros for an average duration of about 25 minutes.

The individual forecasts of the novices in each version of the experiment are aggregated by their arithmetic mean: $f_{t,avg}^h = \frac{1}{N} \sum_{i=1}^N f_t^i$. Hence, three consensus forecasts are generated by the same simple procedure that is applied to compute professional consensus forecasts. Hereafter, the experimental forecasts are denoted as Subjects₁, Subjects₃ and Subjects₆.

3 Comparison of forecasting accuracy

The evaluation of the forecasting accuracy is performed with the relative mean error (ME), the relative mean squared error (MSE) and the relative mean absolute error (MAE). The mean error is defined as $ME = \frac{1}{T} \sum_{t=1}^T (\hat{x}_t - x_t)$ with the relative errors $\hat{x}_t = \frac{t-h f_t - S_{t-h}}{S_{t-h}}$ and $x_t = \frac{S_t - S_{t-h}}{S_{t-h}}$. The MAE and MSE are defined analogously. Theil's inequality coefficient is applied for a direct comparison of the forecasting performance with naive random walk forecasts [27]. The ability of professionals and novices to forecast the direction of change, i.e. the the signum of the exchange rate, is evaluated by a simple Chi-square test of independence [13].

Table 1 summarizes the results for all accuracy measures. Since for all market forecasts mean errors are positive, professionals tend to overestimate the future development of the Euro against the US-dollar in the considered time period. The naive random walk outperforms the experts in all accuracy measures. This is also approved by Theil's inequality coefficient, which is clearly above one for all market forecasts. In contrast, the forecast errors of the novices are very close to the errors of the naive model. Applying a Wilcoxon's Signed-Rank test (see [14]) to test for the significance of forecast performance affirms that the novices do not differ significantly from the naive forecasts and that experts are significantly worse than the naive model.

The Chi-square tests show that professional forecasts are poor predictors for the future direction of exchange rate changes. Only the 6-month forecasts of the ZEW show a hit rate slightly above 50%. However, this result is not significant. For all other market forecasts the hit rate is well below 50%. The novices achieve a statistically significant hit rate of 70% in the one span forecasting task. The hit rate in the other forecast horizons is lower and comparable to the professionals.

In conclusion, professional exchange rate forecasters perform significantly worse than naive forecasts. The participants of our experiment perform at least as well as the naive model. This outcome is astonishing. On the one hand, novices did not possess any contextual information concerning the evolution of the time series. On the other hand, the performance of novices is evaluated over all periods, although the subjects did not know any history of the time series which makes the forecasting task very difficult in the first periods.

| Forecasts | ME | MSE | MAE | Theil's U | Hit rate |
|------------------------|-------|-------|-------|-----------|---------------|
| Reuters ₁ | 0.006 | 0.001 | 0.027 | 1.10 | 44.00% [0.54] |
| Reuters ₃ | 0.022 | 0.005 | 0.059 | 1.17 | 47.92% [1.62] |
| Consensus ₃ | 0.031 | 0.005 | 0.063 | 1.25 | 47.92% [1.62] |
| Reuters ₆ | 0.049 | 0.010 | 0.086 | 1.35 | 48.89% [0.89] |
| ZEW ₆ | 0.033 | 0.007 | 0.072 | 1.16 | 51.11% [1.83] |
| Subjects ₁ | 0.002 | 0.001 | 0.023 | 0.97 | 70.00% [7.94] |
| Subjects ₃ | 0.009 | 0.003 | 0.049 | 1.01 | 56.25% [1.53] |
| Subjects ₆ | 0.003 | 0.005 | 0.062 | 1.01 | 46.67% [0.33] |
| Naive ₁ | 0.001 | 0.001 | 0.023 | 1 | - |
| Naive ₃ | 0.002 | 0.003 | 0.049 | 1 | - |
| Naive ₆ | 0.006 | 0.005 | 0.061 | 1 | - |

Table 1: Accuracy of professional and judgemental forecasts

4 The nature of expectations

In order to find explanations for the differences in forecasting performance between professionals and novices we investigate the nature of the expectations with standard economic expectation formation models.

4.1 The Rational Expectations Hypothesis

With respect to expectations the economic literature highlights the prominence of the concept of rational expectations. According to the rational expectations hypothesis (REH), rational subjects produce unbiased forecasts by using all available information. Three requirements of rational forecasts are tested: unbiasedness, absence of serial correlation in the forecast errors and efficient use of information.

The forecast errors ξ_{t+1} of rational subjects conditioned on the available information set Ω_t should be completely random: $\xi_{t+1} = S_{t+1} - E(S_{t+1}|\Omega_t)$ with $\xi_{t+1} \sim (0, \sigma^2)$ where S denotes the nominal exchange rate and E is the rational expectations operator. Forecast errors are expected to be zero, i.e. they fluctuate randomly so that ex post no systematic deviations of the actual spot rate from the expected rate should be observed. The unbiasedness hypothesis can be tested econometrically by regressing the actual change in the spot exchange rate on the expected change. The null hypothesis implies that it is possible to decompose $s_{t+h} - s_t$ as

$$s_{t+h} - s_t = \alpha + \beta({}_t f_{t+h} - s_t) + \epsilon_{t+h} \quad (1)$$

where s is the logarithm of the nominal spot exchange rate, $\alpha = 0$, $\beta = 1$ and ϵ_{t+h} has a mean of zero and is uncorrelated with ${}_t f_{t+h} - s_t$. Another implication of the REH is that forecast errors of rational subjects are serially uncorrelated. This condition can be tested directly by estimating

$$\xi_t = \alpha + \beta_1 \xi_{t-1} + \beta_2 \xi_{t-2} + \dots + \beta_n \xi_{t-n} + \epsilon_t \quad (2)$$

The hypothesis implies that $\alpha = \beta_1 = \beta_2 = \dots = \beta_n = 0$. Furthermore, rational subjects are assumed to generate their forecasts by using all available information efficiently. According to this orthogonality hypothesis, rational forecasts incorporate all available information so that their predictive power cannot be improved by the inclusion of any variable that is known at the time of the forecast. Consequently, forecast errors must be uncorrelated with any variable in the available information set. The orthogonality hypothesis can be tested by regressing the ex post forecast errors against an information set X_t that is available when forecasts are made. In our regression approach, X_t contains lagged exchange rates so that the regression equation is given as

$$s_{t+h} - f_{t+h} = \alpha + \beta_1 s_t + \beta_2 s_{t-1} + \dots + \beta_n s_{t-n-1} + \epsilon_{t+h} \quad (3)$$

and the orthogonality hypothesis holds if $\alpha = \beta_1 = \beta_2 = \dots = \beta_n = 0$. Table 2 reports the summarized results of estimating equations (1)-(3) for each professional and judgemental consensus forecast via ordinary least squares (OLS). The standard errors for the estimation of the 3 and 6-month forecasts stem from applying the Newey and West [30] estimation procedure that allows for heteroscedasticity in the error terms.² For an evaluation of the null hypotheses defined above, we carry out Wald Tests.³

For all expert forecasts the hypothesis of unbiasedness must be rejected. The intercept coefficients do not differ significantly from 0 in all cases, but the same is true for the slope coefficients. For the 3-month Reuters forecast the coefficient is even significantly lower than 0. In contrast, all judgemental average forecasts are unbiased. The joint hypothesis of $\alpha = 0$ and $\beta = 1$ holds for all forecasting horizons.

Since professional forecasts are biased, rationality must be rejected and stronger requirements of the REH need not to be tested. However, the results of the test for serial correlation of forecast errors and the orthogonality hypothesis are summarized in Table 2. The time lags n in equations (2) and (3) were increased stepwise from $n = 1$ until the first significant slope coefficient β_n was detected. These crucial time lags i of β_i for $i = 1, \dots, n$ are reported in Table 2. The results show clearly that all judgemental and professional forecasts of horizons 3 and 6 show significant correlation of forecast errors and make inefficient use of information at time lags of 1 and 2, respectively. The Reuters one month forecasts use information more efficiently but show significant correlation at time lag 11. The result of the one period judgemental forecasts is astonishing. They are not only unbiased,

²Hansen and Hodrick [20] demonstrate that, when the forecast horizon is larger than the observational frequency, the forecast error ξ_{t+k} will be serially correlated. This can be corrected by using the Newey and West [30] estimation procedure (see [4], p.327). We also run all regressions by explicitly modeling the autocorrelation structure of residuals. Overall, these results coincide with the results obtained by using the Newey and West [30] estimation procedure.

³However, it must be noted that the results of the Wald Tests should be interpreted with caution as the standard assumptions with respect to the F-test are rather demanding and may not be fulfilled.

the forecast errors are serially uncorrelated and the available information is efficiently used to the maximum tested time lag of 20. Hence, the subjects of the one-period forecasting experiment are the only group which meets all tested requirements of rationality. The REH for all other forecasts must be rejected.

| Forecasts | Unbiasedness | | Serial Correlation <i>i</i> of the first significant β_i | Orthogonality |
|------------------------|-----------------------|------------------|---|---------------|
| | Intercept(α) | Slope(β) | | |
| Reuters ₁ | 0 | 0 | 1 | 11 |
| Reuters ₃ | 0 | < 0 | 1 | 1 |
| Consensus ₃ | 0 | 0 | 1 | 1 |
| Reuters ₆ | 0 | 0 | 1 | 1 |
| ZEW ₆ | 0 | 0 | 1 | 1 |
| Subjects ₁ | 0 | 1 | 20 | 20 |
| Subjects ₃ | 0 | 1 | 1 | 2 |
| Subjects ₆ | 0 | 1 | 1 | 1 |

Table 2: Rationality of professional and judgemental forecasts

Overall, our results on the rationality of professional forecasts are in line with other studies (see e.g. [1], [3], [4], [9], [15], [21], [36]). A comparison to other experimental studies is difficult because the REH was tested in one-period forecasting tasks only. In an experiment by Dwyer et al. [16] subjects had to forecast a pure random walk, which seems to be comparable to our situation. Their setting allows the straightforward analysis of rational expectations because rationality implies that subjects make naive forecasts. The forecasts were found to be unbiased and the subjects made efficient use of the available information.

4.2 Adaptive and Extrapolative Expectations

The adaptive expectations hypothesis - or error-learning model - describes the change of the forecast as an adjustment depending on the error between the actual exchange rate and the last forecast:

$${}_t f_{t+h} - {}_{t-h} f_t = \alpha + \beta(s_t - {}_{t-h} f_t) + \epsilon_t \quad (4)$$

The adaptive expectation hypothesis requires that $\alpha = 0$ and $0 \leq \beta \leq 1$. The case $\beta = 1$ represents the naive forecast ${}_t f_{t+h} = s_t$. According to the extrapolative model, expectations are affected solely by past realizations:

$${}_t f_{t+h} - s_t = \alpha + \beta(s_t - s_{t-h}) + \epsilon_t \quad (5)$$

Crucial for the interpretation of the model is the sign of the coefficient β . If $\beta < 0$, expectations are stabilizing in the sense that a recent movement

in the exchange rate gives rise to the expectation of a reserve change in the future. If $\beta > 0$, forecasters expect that current exchange rate movements will recur in the future (bandwagon expectations). For $\beta = 0$, forecasters have naive expectations.

The results of estimating equation (4) are summarized in Table 3. The β coefficients of all professional forecasts are significantly smaller than one except for the 1-month Reuters forecasts. The joint hypothesis of $\alpha = 0$ and $\beta = 1$ has to be rejected for all forecasts although the hypothesis $\alpha = 0$ cannot be rejected for all professional forecasts. The participants of the experiment behave significantly different. They make naive forecasts in the long run of 6 months ($\beta = 0$) and overreact to forecast errors in the short run ($\beta > 0$).

The results of estimating equation (5) show that professional exchange rate forecasts for the one month Reuters forecasts and the 6-month ZEW forecasts (considering the past one month exchange rate changes) appear to be static. However, for all other expectations the regression analysis reveals that the slope coefficients are statistically significantly negative, so that the hypothesis of static expectations is rejected in favor of stabilizing expectations. Consequently, professional exchange rate forecasters expect on average that the current exchange rate movement will be reversed in the future. The opposite is true for the participants of the experiment. The slope coefficients indicate naive expectations in the long run (6 months) but they are significantly positive in the short run. The subjects' behavior can be classified as bandwagon expectations.

| Forecasts | Adaptive Expectations | | Extrapolative Expectations | |
|------------------------|-----------------------|------------------|-----------------------------------|------------------|
| | Intercept(α) | Slope(β) | h in $s_t - s_{t-h}$ in eq. (5) | Slope(β) |
| Reuters ₁ | > 0 | 1 | 1 | 0 |
| Reuters ₃ | > 0 | < 1 | 3 | < 0 |
| | | | 1 | < 0 |
| Consensus ₃ | > 0 | < 1 | 3 | < 0 |
| | | | 1 | < 0 |
| Reuters ₆ | > 0 | < 1 | 6 | < 0 |
| | | | 1 | < 0 |
| ZEW ₆ | > 0 | < 1 | 6 | < 0 |
| | | | 1 | 0 |
| Subjects ₁ | 0 | > 1 | 1 | > 0 |
| Subjects ₃ | > 0 | > 1 | 3 | > 0 |
| | | | 1 | > 0 |
| Subjects ₆ | 0 | 1 | 6 | 0 |
| | | | 1 | 0 |

Table 3: Tests of the adaptive and extrapolative expectations hypotheses

Professional exchange rate forecasters predominantly expect that cur-

rent exchange rate movements will be reversed in the future. Judgemental forecasts of novices exhibit a structure which is consistent with the phenomena of mean reversion which is often observed in financial time series [11]. Our results are in line with the findings of [4] who also report negative β coefficients for professional exchange rate forecasts. They also correspond to the existing empirical evidence on adaptive expectations in the context of foreign exchange markets [9]. The results coincide with the results of De Bondt [12] who studied probabilistic forecasts of students in several experimental settings. He found evidence that novices expect a continuation of past trends, while experts expect a reversal.

5 Discussion of the results

In section 3 we found that the novices significantly outperform professionals in accuracy. We decided to analyze the expectations of professional forecasters and novices in more detail to extract important differences in their expectations. Overall, we found two remarkable differences in the expectations of professional forecasters and novices. First, professional forecasters form predominantly regressive expectations whereas novices show a tendency to extrapolate recent trends in the short-run (one step ahead forecasts) and expect a reversal in the long-run (six step ahead forecasts). Second, the tests of unbiasedness arrive at the conclusion that professional forecasts are biased predictors of future exchange rates over all forecast horizons, whereas the judgemental forecasts of novices appear to be unbiased. These results may serve as an explanation for the inferior forecasting accuracy of market forecasts compared to judgemental forecasts. Professional exchange rate forecasts seem to be biased by fundamental considerations as these forecasts are oriented towards the fundamental equilibrium exchange rate. Figure 1 clearly shows that professional forecasters expected for the whole period that the EUR/USD rate would appreciate towards its fundamental value in the future. Here, the fundamental value is measured by the purchasing power parity using consumer price indices. The corresponding PPP level is around 1.20 EUR/USD and coincides largely with other estimates for the EUR/USD fundamental equilibrium rate (see [17],[34]). Overall, the phenomenon of an expected convergence towards the fundamental exchange rate is more distinctive the longer the forecast horizon is. However, Figure 1 also reveals that forecasters do not expect an immediate adjustment of the actual exchange rate to its fundamental level. Professional forecasters tend to assume that current exchange rates only move gradually towards the PPP level. The sluggishness in the expected exchange rate movements, although it seems reasonable at first glance, clearly contradicts the predictions of the efficient market hypothesis. According to the efficient market hypothesis, deviations of the actual exchange rate from its fundamental justified level evoke speculative trading activities of rational market participants that bring the actual exchange rate directly towards its

fundamental value [18].

Rationales for expecting a sluggish adjustment to the fundamental rate expectations can be found in the reasons for the rejection of the efficient market hypothesis. Contrary to the efficient market hypothesis, foreign exchange markets are dominated by heterogeneous traders which follow - at least partially - irrational trading practices such as technical analysis, bandwagon expectations and herding (see [6], [19], [26]). These trading practices may be responsible for long-lasting deviations of the actual exchange rate from its fundamental level and may mean that adjustments towards that level occur - if at all - only gradually. Thus, it is quite reasonable for professional forecasters to expect that the adjustment to the fundamental level does not occur in an abrupt manner but sluggishly. A further explanation for sluggish expectations with respect to the adjustment to PPP levels can be found in the representativeness heuristic [22]. According to this heuristic, subjects tend to believe that past movements of exchange rates are representative for the data generating process of the exchange rate itself and it is likely that similar movements will recur in the future. Thus, professional forecasters assume that the speed of adjustment towards the fundamental level is limited by the usually observable exchange rate movements.

To assess the suggestion of fundamentally biased professional exchange rate forecasts, we compare these forecasts with artificial fundamentally oriented forecasts. We decided to approximate the fundamental value of the EUR/USD exchange rate by the purchasing power parity condition (PPP) as it is an adequate long-run equilibrium exchange rate model [33]. Furthermore, we incorporate an inertia factor that accounts for the sluggishness of expectations. We assume that the artificial fundamentally oriented forecasts predict an appreciation of the EUR/USD rate if the current rate is below its fundamental value and a depreciation if the current rate is above its fundamental value:

$$f_t^{fund} = \begin{cases} S_t(1 + \alpha_h) & \text{for } S_t < \bar{S}_t \\ S_t(1 - \alpha_h) & \text{for } S_t > \bar{S}_t \end{cases} \quad (6)$$

where \bar{S}_t is the fundamental equilibrium exchange rate measured by the purchasing power parity and α_h denotes an inertia factor. The values for the inertia factor α_h vary with the forecast horizon and are deduced from the mean absolute exchange rate changes over the three different forecast horizons; i.e. $\alpha_1 = 0.02$, $\alpha_3 = 0.05$ and $\alpha_6 = 0.06$.

Professional exchange rate forecasts and the corresponding artificial fundamentally oriented forecasts show similar characteristics. This is assured by the correlation between the professional forecasts and the artificial fundamentally oriented forecasts (see Table 4). It is in our opinion therefore accurate to claim that professional exchange rate forecasts are biased towards a fundamental value. This finding is also supported by the results of a recent survey conducted by the Centre for European Economic Research (ZEW). According to this survey, the financial analysts interviewed state that they base their forecasts to about 60% on fundamental considerations

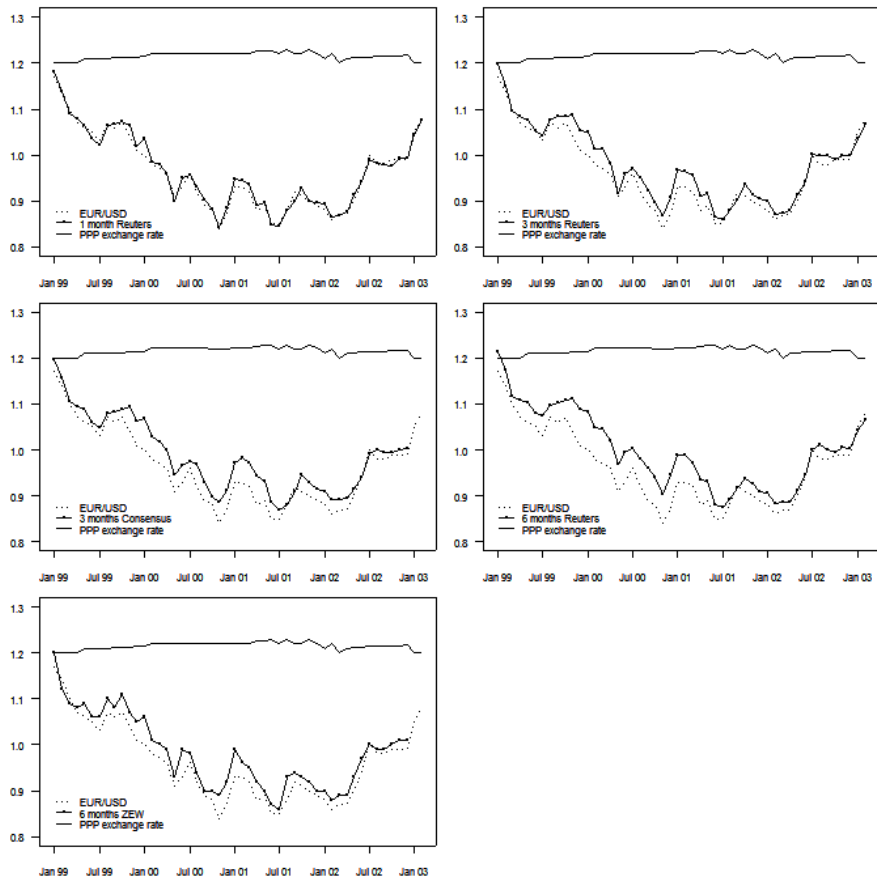


Figure 1: Professional forecasts and fundamental exchange rates shifted left by the forecasting horizon h

[40].

| | Reuters ₁ | Reuters ₃ | Consensus ₃ | Reuters ₆ | ZEW ₆ |
|--------------|----------------------|----------------------|------------------------|----------------------|------------------|
| f_t^{fund} | 0.99 | 0.98 | 0.98 | 0.96 | 0.98 |

Table 4: Correlation between professional and artificial forecasts f_t^{fund}

We think that the strict orientation of professional exchange rate forecasts on the fundamental level of the EUR/USD rate, however, is an unwise decision. Due to the speculative nature of foreign exchange markets macroeconomic factors are judged to be more or less unimportant in the short and medium run. Dealers believe that the poor performance of fundamental exchange rate models is due to excessive speculation in foreign exchange markets (see [6], [8]).

In contrast, speculative markets tend to cause exchange rates to move in long trends. This can be explained with the widespread usage of technical analysis in foreign exchange markets. Large numbers of foreign exchange traders rest their expectations formation upon technical analysis at least in the short and medium run [37]. More recently, [6], [7] and [8] systematically analysed the British, Asian and American foreign exchange markets by using questionnaires. Their results also suggest that technical analysis is a widespread tool used in foreign exchange markets. The importance of technical analysis in foreign exchange markets has even increased in recent times [19]. Furthermore exchange markets. Okunev and White [31] analyse the profitability of momentum-based strategies in various foreign exchange markets. Their results indicate that the potential exists for investors to generate excess returns by adapting a simple moving average rule. This finding is robust to the time periods under consideration, the base currency of reference and the benchmark of comparison. Similar results for the profitability of technical analysis in foreign exchange markets are also reported by e.g. [5], [23], [28] and [29].

Thomson et al. [38] arrive at a very similar conclusion when comparing the judgemental forecasting accuracy of experts and novices using a simulated currency series. Their results indicate that novices perform better than experts throughout all experiments. They explain their results by the reluctance of experts to recognize strong trends. According to the authors, the experts' behavior is due to their "*academic leaning towards random walk theory*" that may result "*in an explicit search for randomness in the face of contradictory evidence*" ([38], p. 248). A related conclusion is also given by Van Hoek, [1992] who states that "...*analysts appear to expect some reversal in recent exchange rate movements or a return to some long-run 'normal' value*" ([39], p. 467). De Bondt [12] as well provides further evidence that novices and experts forecast trended time series differently. Experts tend to expect a reversal of trends, while novices forecast a continuation.

6 Conclusions

Our study reveals that professionals perform significantly worse than subjects who forecast the EUR/USD exchange rates in a laboratory although the subjects are only provided with the past realizations of the exchange rates, are not given any background information and are not supported by statistical procedures. For an explanation of this astonishing result, we analyze the nature of the expectations. With regard to the rationality, professional forecasts are a biased predictors for future exchange rate changes. This result holds over all forecast horizons and for all considered market forecasts. In contrast, the judgemental forecasts of the three forecast horizons are unbiased. The one-span judgemental forecasts even meet all tested requirements of rationality. Whereas professional forecasters predominately expect a revision of the most recent movements, novices believe that in the short-run past changes will repeat in the future and in the long-run current movements will be reversed.

The results clearly indicate that the poor performance of professionals in forecasting exchange rates is not caused by a common human decision-making failure. We demonstrated that the forecasts are influenced by the fundamental value which is irrelevant for the short run development of speculative markets. In order to improve the short run forecasting performance, professionals are advised to ignore the fundamental orientation.

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