

Individual Forecasts of Exchange Rates

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September 8, 2022

Abstract

We study the expectations of individual forecasters in the foreign exchange market. We find that the survey risk premium is less countercyclical than the rational risk premium, primarily because it is not related to the forward premium. We also find that forecasters learn from their own forecast errors (rather than from consensus forecast errors) and that they overreact when forming expectations (as indicated by their forecast revisions). Finally, while forecasters have worse forecasting performance relative to a simple benchmark, the forecasters who emphasize the real exchange rate and do not overreact have better out-of-sample forecasting performance. Overall, our results highlight the information contained in individual (rather than consensus) exchange rate forecasts.

Keywords: Beliefs, currencies, expectations, foreign exchange rates, predictability.

JEL codes: D84, F31, F37, G12, G15.

*We greatly benefited from discussions with Nina Karnaukh at an early stage of the project. We thank Sonya Zhu for her comments and suggestions. Dahlquist gratefully acknowledges support from the Jan Wallander and Tom Hedelius Foundation. Dahlquist: Stockholm School of Economics and CEPR; e-mail: magnus.dahlquist@hhs.se. Söderlind: University of St. Gallen; e-mail: paul.soderlind@unisg.ch.

1 Introduction

Expectations are a core concern in asset pricing and for understanding exchange rates. An early literature using surveys on exchange rates found that consensus forecasts are biased and contain little information about future exchange rates (see, e.g., [Dominguez, 1986](#); [Frankel and Froot, 1987](#); [Froot and Frankel, 1989](#)). A more recent literature characterizes survey risk premia based on consensus forecasts, relates them to rational risk premia obtained from predictability regressions, and attempts to understand the formation of exchange rate expectations (see, e.g., [Bacchetta, Mertens, and van Wincoop, 2009](#); [Nagel and Xu, 2022](#)).

In this paper, we highlight the information contained in individual rather than consensus exchange rate forecasts. We study a monthly unbalanced panel containing 21 forecasters' expectations of the USD versus six currencies (AUD, CAD, CHF, EUR, GBP, and JPY) over 3- and 12-month horizons during the 1992–2019 period. We consider what information is contained in survey expectations of future exchange rates, what these expectations convey about risk premia, and the formation process of these expectations. The individual forecasts allow us to study what is learned from individual forecast errors, overreaction in individual forecast revisions, and individual forecasting ability—information otherwise hidden in consensus forecasts.

We begin by confirming that survey expectations are biased and contain little information about future exchange rates. Panel regressions of the realized depreciation rate on the survey-expected depreciation rate show no significant relationship and the hypothesis of unbiasedness can easily be rejected. Regressions of the realized depreciation rate on the forward premium (corresponding to the risk-neutral expected depreciation rate) reveal a negative relationship. The result that the forward premium negatively predicts the depreciation rate is consistent with an extensive literature on deviations from uncovered interest rate parity

(UIP) and time-varying currency risk premia (Fama, 1984). An alternative view is that this result reflects a violation of rational expectations (Froot and Frankel, 1989). Regardless, while the survey-expected depreciation is positively related to the forward premium, the results suggest significant differences in risk-neutral and survey expectations.

We then compare rational risk premia with survey risk premia. We predict future currency excess returns from the current forward premium, the current log real exchange rate (capturing long-term reversals), and the recent USD depreciation rate (capturing short-term reversals). These predictors form the basis of several trading strategies, including carry, value, and momentum/reversal strategies (see, e.g., Asness, Moskowitz, and Pedersen, 2013; Burnside, Eichenbaum, and Rebelo, 2011; Daniel, Hodrick, and Lu, 2017; Koijen, Moskowitz, Pedersen, and Vrugt, 2018; Lustig, Roussanov, and Verdelhan, 2011; Menkhoff, Sarno, Schmeling, and Schrimpf, 2012). Consistent with the literature, we find that both the forward premium and the real exchange rate predict future currency excess returns (see, e.g., Chernov and Creal, 2021; Dahlquist and Penasse, 2022). The fitted values in the predictability regressions are a measure of rational risk premia and they are countercyclical.

When we characterize the survey risk premia with the same variables, we find that the survey risk premium is less countercyclical than is the rational risk premium, primarily because it does not relate to the forward premium; moreover, the survey risk premium relates to short-term reversals. Our results hold for the consensus forecast as well as individual forecasts. That the survey risk premium is not related to the forward premium mimics the findings of Bacchetta, Mertens, and van Wincoop (2009) and Nagel and Xu (2022), who use consensus survey data. However, they do not consider the real exchange rate when concluding that survey risk premia are acyclical. The real exchange rate is also important for understanding the cross-section of forecasting ability among the forecasters.

We finally explore the individual forecasts in more detail, obtaining three main findings. First, panel regressions suggest that survey expectations relate negatively to recent individual, but not consensus, forecast errors; hence, forecasters seem to learn from their own, but not others', forecast errors. This learning subsumes the relationship between survey expectations and short-term reversals. Second, individual forecast errors relate negatively to revisions in individual forecasts. According to the framework of [Coibion and Gorodnichenko \(2015\)](#), this indicates “expectations stickiness”—individual forecasters tend to overreact to news and revise their forecasts too much. This result is not present in consensus forecasts, which, if anything, tend to underreact to news. Third, forecasters underperform simple benchmarks (average and panel regressions) in out-of-sample forecasting. However, forecasters who rely more on the real exchange rate and overreact to a lesser extent in forecast revisions tend to perform better. With these findings, we contribute to the literature by highlighting the information regarding individual expectations and the formation of these expectations.

This paper relates to a vast literature that asks whether foreign exchange forecasts are unbiased and/or rational; see [Dominguez \(1986\)](#), [Frankel and Froot \(1987\)](#), [Froot and Frankel \(1989\)](#), [Ito \(1990\)](#), and [Chinn and Frankel \(1994\)](#) for early contributions, and [Ince and Molodtsova \(2017\)](#) for a more recent analysis. These scholars predominantly consider consensus forecasts. An exception is [Ito \(1990\)](#), who analyzes individual forecasters of the USD–JPY exchange rate over two years. Interestingly, he finds that there are time-invariant individual effects. In our panel regressions, we allow for such heterogeneity via currency and forecaster fixed effects. We also consider individual forecasting ability.

This paper also relates to the literature on survey expectations and risk premia; see, for example, [Cieslak \(2018\)](#), [Giacoletti, Laursen, and Singleton \(2021\)](#), [Piazzesi, Salomao, and Schneider \(2015\)](#), and [Singleton \(2021\)](#) on bonds; [Adam, Matveev, and Nagel \(2021\)](#), [Dahlquist](#)

and Ibert (2022), and Greenwood and Shleifer (2014) on stocks; and Bacchetta, Mertens, and van Wincoop (2009) and Nagel and Xu (2022) on several asset classes including foreign exchange rates. In contemporaneous work to us, Nagel and Xu (2022) find that the consensus survey risk premium on a portfolio of developed market currencies is acyclical, in sharp contrast to the rational risk premium obtained from predictive regressions using the currencies' average forward premium (following Lustig, Roussanov, and Verdelhan, 2014) or various business cycle variables as predictors. Relatedly, Gourinchas and Tornell (2004) and Valente, Vasudevan, and Wu (2021) consider how interest rate expectations may matter for currency risk premia and puzzling features of exchange rates.

Finally, this paper relates to the literature on expectation formation in finance and macro. We apply the approach of Coibion and Gorodnichenko (2015) to measure expectation stickiness and deviations from rational expectations through the link between forecast errors and past forecast revisions. Coibion and Gorodnichenko (2015) study consensus forecasts of inflation and other macroeconomic variables and find evidence of underreaction to information relative to rational expectations (consistent with information rigidities). Bordalo, Gennaioli, Ma, and Shleifer (2020) study the rationality of individual and consensus forecasts of similar variables, but not foreign exchange rates. They find that individual forecasters typically overreact to news, while consensus forecasts underreact to news relative to rational expectations. Our analysis extends the findings of Bordalo, Gennaioli, Ma, and Shleifer (2020) to encompass exchange rates.

The paper proceeds as follows. Section 2 presents and summarizes the data. Section 3 presents the empirical results, more specifically concerning rational and survey risk premia and individual forecasters' learning, overreaction, and forecasting performance. Finally, Section 4 concludes.

2 Data

2.1 Data description

Our main dataset consists of monthly 3-, 6-, and 12-month exchange rate survey forecasts from Blue Chip Financial Forecasts (BCFF) from January 1993 to December 2018 for the USD versus six currencies: AUD, CAD, CHF, EUR (DEM before 1999), GBP, and JPY. The survey contains exchange rate forecasts from 21 large financial institutions and rating agencies.¹ Similar to [Bordalo, Gennaioli, Ma, and Shleifer \(2020\)](#), who use the BCFF survey forecasts of interest rates, we digitize individual forecasts from PDF publications. When needed, we transform the survey data so that the exchange rates are defined as the number of USD per one foreign currency unit—that is, an increase in the spot exchange rate corresponds to a USD depreciation relative to the foreign currency.

The forecasts are collected over the last days of the month and the survey is published on the first day of the next month. We assume that the forecasts are based on information available on the last day of the month. This assumption implies that the first forecasts in the sample were made at the end of December 1992 and refer to the spot exchange rates at the end of March, July, and December 1993 (3-, 6-, and 12-month forecasts). Similarly, the last forecasts in the sample were made at the end of November 2018 and refer to spot exchange rates at the end of February, June, and November 2019. (In a robustness analysis, we report that the results are little affected by assuming that the forecasts were made earlier than the end of a month.)

Figure 1 shows the number of active forecasters over time. The total number is 21, but many

¹ScotiaBank, The Industrial Bank of Japan, ING Financial Markets, Deutsche Bank, Merrill Lynch & Co., Moody’s Analytics, Moody’s Capital Markets, Nomura Securities, BMO Capital Markets, WestLB, Barclays Capital, Oxford Economics, Wells Fargo, HSBC Markets, BNP Paribas Americas, IHSMarkit, UBS, Moody’s Economy.com, AIG, TS Lombard, and Société Générale.

forecasters contribute to the survey for only parts of the sample period. In the 1990s and 2000s, 3–5 forecasts are available for each currency; in the 2010s, the number increases to 10–12. In our analyses, each observation has the same weight, which implies that a month with fewer forecasters in the survey has a lower effective weight than does a month with many forecasters. (In a robustness analysis, we report that the results are little affected by giving every month equal weight.)

We retrieve daily spot and forward exchange rates for the January 1976–December 2019 period from *Datastream*, and consumer price indices (CPIs) and industrial production from the Organisation for Economic Co-operation and Development (OECD); see [Chernov, Dahlquist, and Lochstoer \(2022\)](#) for more details. We let s_t and $f_{k,t}$ denote the log spot exchange rate and k -period forward exchange rate at date t , respectively. Note that the forward exchange rate is the risk-neutral expectation at t of the future exchange rate at $t + k$. We refer to $f_{k,t} - s_t$ as the forward premium. We define the real exchange rate as the spot exchange rate times the foreign CPI level divided by the US CPI level. We let q_t denote the log real exchange rate at t . To keep the notation simple, we suppress a specific notation for a currency i .

Two key variables in the analysis are the depreciation of the USD relative to the foreign currency, $s_{t+k} - s_t$, and the currency excess return, $r_{t,t+k} = s_{t+k} - f_{k,t}$. The excess return is a scaled payoff from entering a k -period forward contract at t and selling the currency at $t + k$. If covered interest rate parity (CIP) holds, this is the same as borrowing at a USD interest rate at t , then buying the foreign currency and lending at the foreign interest rate, and finally selling the foreign currency at $t + k$.

From the survey we calculate the expected depreciation by a forecaster, $F_t s_{t+k} - s_t$. Under full-information rationality, the forecast would correspond to the conditional expectation,

$E_t s_{t+k} - s_t$. We use forecasts and survey expectations interchangeably but distinguish them from rational expectations. We also calculate the corresponding survey-expected excess return, that is, the survey risk premium, $F_t r_{t,t+k} = F_t s_{t+k} - f_{k,t}$. These definitions assume that current spot and forward exchange rates are known by the forecasters. We assume that the logarithm of the expected spot rate approximates the expected log spot rate (i.e., we disregard a Jensen's inequality term), but none of our results is sensitive to this assumption. Again to keep the notation simple, we suppress a specific notation for an individual forecaster j .

Two other key variables in the analyses are the forecast error, $FE_{t,t+k} = s_{t+k} - F_t s_{t+k}$, and the forecast revision, $FR_{t-k,t} = F_t s_{t+k} - F_{t-k} s_{t+k}$, of an individual forecaster. The forecast error is simply the difference between the log spot exchange rate and a previous survey forecast, and the forecast revision is the update of the forecast of the same future exchange rate. Finally, note that as the forward exchange rate is known at t , the forecast error of the exchange rate is the same as that of the excess return.

For some regressions we consider consensus forecasts/errors, which we calculate as the cross-sectional averages of the available individual forecasts/errors.

2.2 Summary statistics

Table 1 reports summary statistics of some of the variables. Panel A is for the 3-month horizon ($k = 3$) and Panel B is for the 12-month horizon ($k = 12$). All statistics are cross-sectional averages; for example, the minimum survey risk premium is calculated by first finding the minimum for each forecaster and currency, and then averaging across forecasters and currencies. The samples are matched so that the realized depreciations refer to only those dates for which we have survey expectations. For instance, the last depreciation is at

the end of February 2019 for the 3-month horizon, but at the end of November 2019 for the 12-month horizon.

For the 3-month horizon, the means of the realized depreciations and excess returns are close to zero, whereas the means of the expected depreciations are significantly negative. This carries over to the survey risk premium and forecast error. For the 12-month horizon, the means are further from zero, which is reasonable since the statistics are not annualized, but none is statistically significant.

The statistics that describe the volatility and shape of the distribution (skewness, kurtosis, minimum, and maximum) all suggest that the survey expectations are more stable than the realized data—as would be the case of rational expectations (according to which the realized data equal the expected data plus noise, with these two parts being uncorrelated). The autocorrelations display a similar pattern, but with much stronger persistence in the survey expectations.

2.3 Unbiasedness tests

To further characterize the data and to link them to the existing literature, we evaluate whether the forward exchange rate and survey expectations are unbiased forecasts of future change in the exchange rate.

We run the following panel regressions of the USD depreciation on either the forward premium or the survey-expected depreciation rate:

$$s_{t+k} - s_t = a + b(f_{k,t} - s_t) + \varepsilon_{t+k}, \quad (1)$$

$$s_{t+k} - s_t = c + d(F_t s_{t+k} - s_t) + \epsilon_{t+k}. \quad (2)$$

While we suppress currency i and forecaster j in the notation, regression (1) is a two-dimensional (time and currency) panel with currency fixed effects, and regression (2) is a three-dimensional (time, currency, and forecaster) panel with currency and forecaster fixed effects. There are six currencies and 21 forecasters.

Regression (1) is a so-called [Fama \(1984\)](#) regression and regression (2) is a standard regression used to test for forecast rationality. In both regressions, unbiasedness implies that the slope coefficient is equal to one (i.e., $b = 1$ and $d = 1$). Unbiasedness thus means that the depreciation rate moves one to one with either the forward premium or the survey-expected depreciation rate. We focus on the slope coefficients and not on the fixed effects as we are mainly interested in the dynamics of rational and survey risk premia.

The data are overlapping (monthly observations of depreciations over three and twelve months), which creates serial correlation; there are also likely cross-sectional correlations. We therefore use standard errors that are robust to both serial and cross-sectional correlation ([Driscoll and Kraay, 1998](#), with [Hansen and Hodrick, 1980](#), weights up to k lags).

Table 2 reports the results of the regressions. Specification I shows that the estimates of the slope coefficients for the forward premium are negative and significantly different from one. That is, the forward exchange rate is not an unbiased predictor of the future exchange rate. This result indicates deviations from the UIP and, under rational expectations, it translates into a currency risk premium. To interpret this further, recall that the forward premium equals the interest rate differential (USD minus foreign) if CIP holds. The negative slope coefficient then suggests that currencies with high interest rates tend to appreciate, which is the basis of the forward premium puzzle as well as the carry trade (see, e.g., [Fama, 1984](#); [Bansal and Dahlquist, 2000](#); [Hassan and Mano, 2019](#)). Specification II shows the results for the survey expectations. The estimates of the slope coefficients for the survey-

expected depreciation rate are close to zero and significantly different from one (i.e., the survey expectations are not unbiased, either). Moreover, the survey expectations have lower predictive power than does the forward premium.

The results of the unbiasedness regressions suggest significant differences between risk-neutral expectations (driving forward premia) and survey expectations (driving the expected depreciation rate). Figure 2 shows the 12-month forward premium, the consensus 12-month survey-expected depreciation rate, and a shaded band indicating the minimum and maximum of the individual survey-expected depreciation rate by currency. The figure highlights that the survey-expected depreciation rate tends to move in the same direction as does the forward premium, but that most of the movements in the survey expectations are unrelated to the forward premium. The figure also highlights considerable cross-sectional dispersion of the survey-expected depreciation rate. In the next section we relate these differences to important currency market variables (e.g., the real exchange rate and recent currency movements) as well as commonly applied measures of learning and overreaction. We also investigate how differences across forecasters affect their forecasting performance.

3 Empirical results

3.1 Risk premia

To study rational and survey risk premia, we estimate the following panel regressions of the realized and survey-expected excess return:

$$r_{t,t+k} = a + b'x_t + \varepsilon_{t+k}, \tag{3}$$

$$F_t r_{t,t+k} = c + d'x_t + \epsilon_t, \tag{4}$$

as well as the difference between the two regressions. We let x_t capture the forward premium, the log real exchange rate, and the recent USD depreciation rate. These variables are common predictors in the literature and form the basis of so-called carry, value, and momentum/reversal strategies. Notably, the three variables are only weakly correlated. For example, on the 3-month horizon, the forward premium has an average correlation of -0.17 with the real exchange rate (where the average is across the six currencies) and -0.11 with the recent depreciation rate. The real exchange rate and the recent depreciation rate have an average correlation of 0.18 .

Table 3 presents the results, based on the same estimation approach and calculation of the standard errors as in the regressions for the unbiasedness tests. Three results for specifications I and II stand out. First, the realized excess return is negatively related to the forward premium, while the survey-expected excess return is not (the forecasters seem to have expectations more in line with UIP). Second, the realized excess return and the survey-expected excess return both relate to the real exchange rate, which captures long-term reversals in exchange rates. Third, there is little persistence in the realized excess return (as measured by the coefficient of the recent depreciation rate), while the survey-expected excess return indicates strong expectations of short-term reversals. These results carry over to the survey expectations error in specification III. The differences in rational and survey risk premia are statistically significant.

Figure 3 illustrates the cyclical movements in risk premia by currency for the 12-month horizon. The figure shows the fitted values from regressions of (3) and (4), in which we include the forward premium and the real exchange rate as predictors. We exclude the recent depreciation rate as it adds high-frequency movements that otherwise cloud the cyclical movements. The fitted value of the realized excess return measures the rational risk premium. The correlation between the rational and fitted survey risk premia is low, averaging around

0.3. The figure also shows correlations with annual growth in US industrial production and with annual inflation in consumer prices. Overall, the correlations tend to be negative for industrial production growth, whereas the evidence is mixed for inflation. These correlations hold also for recursively estimated rational risk premia (considered later in an out-of-sample analysis). Moreover, both rational and survey risk premia tend to increase in recessions (as dated by the NBER). Taken together, the results suggest that the rational risk premium is countercyclical but that the survey risk premium is less countercyclical than is the rational risk premium, primarily because it is not related to the forward premium.

In a later robustness analysis, we also present the evidence for consensus survey risk premia. The estimation results are similar to the above results. We conclude that both individual and consensus survey risk premia are weakly countercyclical but deviate from the rational risk premium.

It is well known that predictability regressions raise econometric concerns in small samples. First, high persistence in regressors and correlations between regressor innovations and excess return innovations causes biases in point estimates (Stambaugh, 1999), typically towards finding predictability. Second, standard errors from commonly used overlapping data estimators are often too small (see Boudoukh, Israel, and Richardson, 2021, for a recent analysis). Taken together, there is a risk of exaggerating the magnitude of predictability. We therefore investigate by simulations the estimator properties in our panel setting.

The simulations use the following data-generating processes for each currency. The predictors in x_t follow a vector autoregression. The realized excess return, the survey-expected excess return, and the expectations error are linear in the predictors. We use the estimated coefficients in a system including the consensus forecasts (not the individual forecasts) for 3- as well as 12-month horizons. Residuals of the system are block bootstrapped to preserve

the correlation structure across (a) variables, (b) currencies, and (c) time. We use 10,000 simulations. Appendix A provides more details.

We indeed find biases in point estimates and standard errors in our simulations, but they do not overturn any of the reported results. For the excess return (the standard predictability regression), the coefficients of the forward premium are less than 15% closer to zero and the coefficients of the real exchange rate are less than 30% closer to zero. (The larger bias for the real exchange rate is expected given that its persistence is greater than that of the forward premium.) The standard errors for the coefficients are 1–5% larger on the 3-month horizon and around 15% larger on the 12-month horizon. The well-known small sample bias in the predictability regression does not carry over to the survey risk premium regression. The explanation is that while the regressors are serially correlated, the regressor innovations and the survey-expected excess return innovations are only weakly correlated. Hence, we confirm a negative relationship with the real exchange rate and a negative relationship with the recent depreciation rate. However, the standard errors are up to 40% larger in the simulations. Despite that, the relationships remain statistically significant. Taken together, we conclude that the difference between the rational risk premium and the survey risk premium is that the survey risk premium is not related to the forward premium but instead relates negatively to the recent depreciation rate.

We want to further explore the negative relationship with the recent trend in exchange rates (the negative coefficient of the recent depreciation rate), which leads us to analyses of learning and overreaction, below.

3.2 Learning

Table 4 presents results of panel regressions of the survey-expected depreciation rate on the recent individual forecast error, the recent consensus forecast error (denoted $\overline{\text{FE}}$), and the control variables in x_t :

$$F_t s_{t+k} - s_t = a + b\text{FE}_{t-k,t} + c\overline{\text{FE}}_{t-k,t} + d'x_t + \varepsilon_{t+k}.$$

Recall that we consider the panel regression for a currency i and an individual forecaster j . To sharpen the interpretation of these regressions, the consensus forecast excludes forecaster j , which means that the consensus forecast error is different for each forecaster. In other words, the first term on the right-hand side of the regression is the recent forecast error of forecaster j , while the second term captures the recent consensus (excluding forecaster j) forecast error. The three regressors from Table 3 are used as control variables in x_t .

Table 4 presents the results. We introduce the variables sequentially and then add the three control variables. We note two specific results. First, forecasters seem to adjust their expectations based on their own forecast error and not on the consensus forecast error. Second, the previous result concerning the short-term reversal seems to be driven by the forecast error. We conclude that part of the expectation formation is that the forecasters learn from their own mistakes. In a later subsection, we study whether this learning helps in making better forecasts.

3.3 Overreaction

Rational expectations suggest that forecast errors are serially uncorrelated. To evaluate this, we run the following panel regression of the forecast error on its lagged forecast error:

$$FE_{t,t+k} = a + bFE_{t-k,t} + c'x_t + \varepsilon_{t+k}, \quad (5)$$

where we allow for the inclusion of control variables in x_t . Importantly, the forecast errors on the left- and right-hand sides are not overlapping. Under rational expectations, the forecast error should not be predictable by information (including the forecast error) known at t . The null hypothesis is therefore that there is no serial correlation (i.e., $b = 0$).

Table 5 reports the results. Specification I shows that the forecast error exhibits significant serial correlation; specification II shows that this is also the case when controlling for the forward premium, the real exchange rate, and the recent depreciation rate.

We next use the framework of [Coibion and Gorodnichenko \(2015\)](#) and study the predictability of forecast errors from forecast revisions. We run panel regressions of the future individual forecast error on the individual forecast revision:

$$FE_{t,t+k} = a + bFR_{t-k,t} + c'x_t + \varepsilon_{t+k}, \quad (6)$$

where we again allow for the inclusion of control variables in x_t . The framework is motivated by information rigidities ([Mankiw and Reis, 2002](#)): If the forecast revision predicts the forecast error with a positive coefficient, this implies underreaction in the expectations; if the forecast revision predicts the forecast error with a negative coefficient, this implies overreaction in the expectations. To calculate the revision over the 3-month horizon, we compare the current 3-month forecast with the 6-month forecast made 3 months before.

In the absence of 24-month forecasts, we proxy the revision of the 12-month forecast by the revision of the 6-month forecast (i.e., the current 6-month forecast compared with the 12-month forecast made six months before).

Table 5 presents the results. In specification III, the forecast revision negatively predicts the forecast error. For the 3-month horizon, the estimated coefficient is -0.062 and statistically significant at the 5% level; for the 12-month horizon, the estimated coefficient is -0.041 but imprecisely estimated. The coefficients are more negative and statistically significant when including the control variables in specification IV. The negative coefficients suggest that there is overreaction in the individual forecasts: An increase in an individual forecaster's revision predicts a lower forecast error, suggesting that individuals revise their forecasts too much and that this contributes to the predictability of the individual forecasting error.

[Bordalo, Gennaioli, Ma, and Shleifer \(2020\)](#) study several macroeconomic forecasts, but not exchange rates. They find that individual forecasters typically overreact to news, whereas consensus forecasts typically underreact. We re-estimate the panel regression of forecast error on the forecast revision of consensus forecasts using fixed currency effects. We find no significant coefficients for the consensus forecasts (untabulated results). Hence, we find that individual forecasters tend to overreact to news and revise their forecasts too much, but this result is not present in consensus forecasts.

Figure 4 shows coefficients and 90% confidence bands for the regressions of individual and consensus forecast errors for each currency. The figure also shows the inter-quartile boxes with median lines and 90% whiskers of estimates from individual expectations regressions (forecaster by forecaster). The overall pattern is that the estimated coefficients for consensus forecasts are higher than the estimated coefficients for the individual forecasters. The test of equality in slope coefficients for the consensus and individual forecasts is rejected for

every currency at the 5% significance level. This analysis extends the findings of [Bordalo, Gennaioli, Ma, and Shleifer \(2020\)](#) to encompass exchange rates.

3.4 Forecasting performance

In this section we evaluate the out-of-sample forecasting performance by comparing mean-squared forecast errors (MSEs) across models and forecasters. Table 6 reports the results.

Panel A compares the performance of the consensus forecast with out-of-sample forecasts from a panel regression such as (3), but recursively estimated. We use the sample period January 1976 to December 1992 as the first training sample and make forecasts for the 3- and 12-month horizons. Then, we add January 1993 to the training sample and make new out-of-sample forecasts, and so forth. The panel reports the ratio of the MSEs aggregated across all currencies, with a ratio above one indicating that the survey forecast performs worse than the forecast from the recursive panel regression. We use a [Diebold and Mariano \(1995\)](#) test, based on a robust variance-covariance estimator, to evaluate whether the MSEs are the same. The main result is that the survey forecasts are significantly worse than forecasts from the recursive panel regression, especially for the 3-month horizon. We have also compared the survey forecasts with simpler forecast benchmarks, such as the historical average and the forecast from a regression with only the forward premium. We found that the survey forecasts are also worse than these benchmarks (untabulated results).

Panel B compares the performance of different forecasters. That is, we re-estimate the regressions in Tables 3–5, but now allow for different slope coefficients for different forecasters. We then classify the forecasters as “high” and “low” according to those coefficients. The panel shows the MSEs of forecasters with high (above median) coefficients divided by the MSEs of those with low (below median) coefficients. Several results stand out. First, forecasters

with expectations that correlate positively with the forward premium make worse forecasts than do others; in other words, expectations following UIP seem like a bad idea (at least on the 3-month horizon). Second, forecasters who do not believe in long-term reversal (a negative coefficient of the real exchange rate) also make worse forecasts. Third, forecasters who overreact (more negative coefficient of the revision term) make worse forecasts. We also notice that the degree of learning from mistakes (based on the lagged forecast error) makes little difference in the out-of-sample forecasting performance.

Finally, Panel C compares the panel regression forecasts with currency-specific regression forecasts. Similar to the stock returns application in [Pesaran, Pick, and Timmermann \(2022\)](#), we find that the panel regression outperforms the currency-specific regressions in out-of-sample predictions.

3.5 Robustness analyses

This section reports various robustness analyses to investigate the importance of the data handling, weighting of time periods, and fixed effects. We also comment on regime-dependent expectations.

We first re-estimate regression specification II in Table 3, but using a different data handling or estimation approach. Table 7 presents the results. Specification I assumes that the forecasts are made five days before the end of the month instead of on the last day of the month. All data are adjusted accordingly using daily spot and forward exchange rates. This is intended to address the uncertainty about the exact date of the forecasts, which could potentially have been made a week before the end of month. However, the results are very similar to those reported before. The only noticeable difference is that the coefficient estimates for the recent depreciation rate are somewhat less negative (-0.166 instead of

-0.214 on the 3-month horizon and -0.178 instead of -0.209 on the 12-month horizon).

Specification II uses weighted least squares (WLS), effectively giving the same weight to each month, irrespective of the number of available forecasts in a month. This is similar to using the consensus forecasts, as reported in specification III, with the only difference being that the WLS does not adjust for cross-sectional differences in the number of available forecasts. Again, the results are very similar.

The empirical results reported thus far are based on panel regressions with currency and forecaster fixed effects, which capture the dynamics (time series patterns). As a further robustness analysis, we now rerun some of the key regressions, but with time fixed effects only. This will capture the cross-sectional patterns.

Specification I in Table 8 is the same regression as in Table 3 specification III, in which we regress the survey forecast error on the forward premium, log real exchange rate, and the recent USD depreciation. In contrast to the time series results, the cross-sectional results suggest that neither the forward premium nor the real exchange rate is important. However, the strong effect of the recent USD depreciation (due to expectations of reversals) is also found in the cross-sectional results. Specification II suggests a similar learning from the forecaster's own forecast errors as in the time series results (compare with Table 4 specification III). Finally, specification III results in the same kind of short-term overreaction as evident in the time series results (compare with Table 5 specification III).

Finally, we have extended the key regressions in Tables 3–5 by allowing for different coefficients in time periods of market stress – defined as periods where the Foreign Exchange Volatility Index (FXVIX) is above quantile 0.75. The (untabulated) results indicate little regime dependence of the belief formation, with one exception: in times of market stress (high FXVIX), the forecasters adjust their expectations less based on their own forecast

errors.

4 Conclusion

We study a panel of exchange rate forecasters (large financial institutions and rating agencies) for the 1992–2019 period. We find that the expectations of the forecasters differ from both forward premia and rational (regression-based) predictions. While being influenced by the long-term reversal of the real exchange rate, the survey expectations are more in line with UIP and relate negatively to recent depreciation rates. The expectations also relate negatively to the forecasters' own recent forecast errors, and this learning tends to result in a short-term reversal of the forecasts. These patterns imply that forecast errors exhibit positive serial correlation and that they relate negatively to forecasters' recent revisions of their own forecasts (i.e., the forecasters overreact). The out-of-sample forecasting performance is inferior to recursive regressions and other simple benchmarks. However, we notice that some forecasters perform better than others. In particular, better forecasting performance correlates with expectations that put less emphasis on UIP, more emphasis on long-term reversal, and involve less overreaction.

Overall, our results highlight the information contained in individual (rather than consensus) exchange rate forecasts.

A Simulation experiments

This appendix contains more details of the simulation experiments to assess the properties of the panel estimators used in Section 3.1.

The data-generating process (DGP) for currency i is:

$$x_{t+k} = Ax_t + \eta_{t+k}, \quad (\text{A.1})$$

$$r_{t+k} = b'x_t + \varepsilon_{t+k}, \quad (\text{A.2})$$

$$F_t r_{t+k} = d'x_t + \epsilon_t, \quad (\text{A.3})$$

where, for notational simplicity, we have suppressed currency fixed effects. In (A.1) the vector x_t contains three variables (the forward premium, the log real exchange rate, and the recent USD depreciation rate), and we model it as a VAR system in which x_{t+k} is driven by x_t ; in (A.2) the realized currency excess return, r_{t+k} , is regressed on the x_t vector; and in (A.3) the current survey-expected excess return, $F_t r_{t+k}$, is regressed on the current x_t vector. The DGP is similar to those of [Amihud, Hurvich, and Wang \(2009\)](#) and [Boudoukh, Israel, and Richardson \(2021\)](#), except that it involves multi-period predictions with a vector of predictors.

The parameter values in the simulations are from estimations based on our monthly data during the 1992–2019 period for horizons of three and twelve months ($k = 3$ and $k = 12$): the A matrices are estimated independently for each currency, while the b and d vectors are from panel regressions (with currency fixed effects) and are thus the same across currencies.

In the simulations, we bootstrap the errors ($\eta_t, \varepsilon_t, \epsilon_t$) from the residuals, drawing blocks of $2k$ consecutive months. To preserve the correlation across the variables and currencies, the blocks are the same for all variables and currencies. For example, if U is a $T \times 5 \times 6$ array with T periods, five variables (related to η_t, ε_t , and ϵ_t), and six currencies, then we effectively draw $U[s, :, :]$, where s selects a block of $2k$ months (e.g., s may be equal to $[11, 12, 13, 14, 15, 16]$).

We run 10,000 simulations of 312 months (using an extra 50 “burn-in” months) and re-estimate the panel regressions on each generated sample (\hat{b}_l and \hat{d}_l for an l that runs from one to 10,000). We assess the bias by comparing the average simulation results with estimates based on a simulated long sample of 100,000 months. We assess the standard errors by comparing the output from the panel regressions on data with the standard deviations across the 10,000 simulations.

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Table 1: Summary statistics of realized and survey-expected variables

	Realized		Survey		
	Depreciation	Excess return	Expected depreciation	Risk premium	Expectations error
<u>Panel A: 3-month horizon</u>					
Mean	0.052	-0.042	-0.335	-0.430	0.388
Standard deviation	4.949	4.993	2.843	2.781	5.851
Skewness	-0.287	-0.258	-0.055	-0.053	-0.289
Excess kurtosis	2.227	1.988	0.940	1.068	2.249
Minimum	-20.442	-20.533	-10.449	-10.480	-23.731
Maximum	16.633	16.467	8.506	8.634	20.224
AR(3)	0.041	0.060	0.255	0.229	0.256
<u>Panel B: 12-month horizon</u>					
Mean	0.125	-0.323	0.051	-0.397	0.073
Standard deviation	9.857	10.178	4.848	4.448	10.693
Skewness	-0.234	-0.177	0.035	-0.013	-0.050
Excess kurtosis	0.324	0.100	0.962	1.108	0.024
Minimum	-28.522	-28.492	-15.471	-15.161	-28.271
Maximum	25.105	24.850	13.393	11.712	28.511
AR(12)	-0.019	0.045	0.454	0.435	0.083

The table shows summary statistics (in %) for averages of the following variables: currency depreciation rate, $s_{t+k} - s_t$; currency excess return, $r_{t,t+k}$; survey-expected depreciation, $F_t s_{t+k} - s_t$; survey risk premium, $F_t r_{t,t+k}$; and survey expectations error, $s_{t+k} - F_t s_{t+k}$. The averages of the variables are taken over currencies, and over forecasters for survey expectations, for a monthly unbalanced panel with 21 forecasters' expectations of the USD versus six currencies during the 1992–2019 period. Panels A and B report results for horizons of three and twelve months ($k = 3$ and $k = 12$), respectively. The numbers of time-series observations in Panels A and B are 310 and 300, respectively.

Table 2: Unbiasedness in risk-neutral and survey expectations

	Risk-neutral expectations I	Survey expectations II
<u>Panel A: 3-month horizon</u>		
\hat{b}	-0.998** (0.824)	-0.020*** (0.039)
Fixed effects	Currency	Currency & Forecaster
R^2	0.006	0.000
N	1872	10664
<u>Panel B: 12-month horizon</u>		
\hat{b}	-1.242*** (0.784)	0.044*** (0.088)
Fixed effects	Currency	Currency & Forecaster
R^2	0.034	0.001
N	1872	10270

The table shows results of regressions of the future depreciation rate on either the current forward premium or the current survey-expected depreciation rate:

$$s_{t+k} - s_t = a + b(f_{k,t} - s_t) + \varepsilon_{t+k}, \quad (\text{I})$$

$$s_{t+k} - s_t = c + d(F_t s_{t+k} - s_t) + \epsilon_{t+k}, \quad (\text{II})$$

for either a monthly panel with exchange rates of the USD versus six currencies during the 1992–2019 period or a monthly unbalanced panel with 21 forecasters’ expectations of the USD versus the six currencies during the 1992–2019 period. Specification I uses the forward exchange rate (the risk-neutral expectations) and allows for currency fixed effects; specification II uses individual forecasters’ expectations and allows for currency and forecaster fixed effects. Panels A and B report results for horizons of three and twelve months ($k = 3$ and $k = 12$), respectively. R^2 is a within R -squared value. N is the number of currency-forecaster-month observations. Standard errors (within parentheses) are calculated using the spatial estimator of [Driscoll and Kraay \(1998\)](#), which allows for both cross-sectional and serial correlations up to k lags in the errors, as in [Hansen and Hodrick \(1980\)](#), as well as for heteroskedasticity in the errors. *, **, and *** denote 10%, 5%, and 1% significance levels, respectively, for the null hypothesis of a coefficient equal to one.

Table 3: Rational expectations test

	Realized I	Survey II	Error III
<u>Panel A: 3-month horizon</u>			
Forward premium	-2.298*** (0.772)	0.093 (0.298)	-2.319*** (0.790)
Real exchange rate	-0.060*** (0.020)	-0.030*** (0.007)	-0.025 (0.021)
Recent depreciation rate	0.060 (0.050)	-0.214*** (0.026)	0.249*** (0.056)
Fixed effects	Currency	Currency & Forecaster	Currency & Forecaster
R^2	0.036	0.120	0.059
N	1872	10664	10664
Wald			[0.000]
<u>Panel B: 12-month horizon</u>			
Forward premium	-2.563*** (0.656)	0.140 (0.209)	-2.607*** (0.550)
Real exchange rate	-0.236*** (0.060)	-0.108*** (0.024)	-0.114** (0.057)
Recent depreciation rate	0.030 (0.120)	-0.209*** (0.037)	0.285*** (0.101)
Fixed effects	Currency	Currency & Forecaster	Currency & Forecaster
R^2	0.151	0.194	0.140
N	1872	10270	10270
Wald			[0.000]

The table shows results of regressions of the realized excess return and survey-expected excess return on the forward premium, the real exchange rate, and the recent depreciation rate for a monthly unbalanced panel with 21 individual forecasters' expectations of the dollar versus six currencies during the 1992–2019 period:

$$r_{t,t+k} = a + b'x_t + \varepsilon_{t+k}, \quad (\text{I})$$

$$F_t r_{t,t+k} = c + d'x_t + \epsilon_t, \quad (\text{II})$$

where x_t contains $f_{k,t} - s_t$, q_t , and $s_t - s_{t-k}$. The table also shows a regression of the survey expectations error, that is, the realized minus expected excess returns (III). Specification I uses currency fixed effects; specifications II and III use currency and forecaster fixed effects. Panels A and B report results for horizons of three and twelve months ($k = 3$ and $k = 12$), respectively. R^2 is a within R -squared value. N is the number of currency-forecaster-month observations. Standard errors (within parentheses) are calculated using the spatial estimator of [Driscoll and Kraay \(1998\)](#), which allows for both cross-sectional and serial correlations up to k lags in the errors, as in [Hansen and Hodrick \(1980\)](#), as well as for heteroskedasticity in the errors. *, **, and *** denote 10%, 5%, and 1% significance levels, respectively, for the null hypothesis of a coefficient equal to zero. The Wald statistic reports p -values from a joint test of the null hypothesis of zero coefficients.

Table 4: Learning

	Survey-expected depreciation rate			
	I	II	III	IV
<u>Panel A: 3-month horizon</u>				
Recent forecast error (individual)	-0.241*** (0.023)		-0.254*** (0.021)	-0.245*** (0.024)
Recent forecast error (consensus)		-0.223*** (0.024)	0.017 (0.027)	0.064** (0.029)
Forward premium				0.843*** (0.292)
Real exchange rate				-0.023*** (0.007)
Recent depreciation rate				-0.038 (0.039)
R^2	0.157	0.112	0.157	0.172
N	9909	10581	9909	9909
<u>Panel B: 12-month horizon</u>				
Recent forecast error (individual)	-0.398*** (0.058)		-0.437*** (0.048)	-0.441*** (0.049)
Recent forecast error (consensus)		-0.359*** (0.062)	0.048 (0.060)	0.055 (0.070)
Forward premium				1.041*** (0.195)
Real exchange rate				-0.096*** (0.020)
Recent depreciation rate				0.165** (0.071)
R^2	0.153	0.107	0.154	0.263
N	9533	10187	9533	9533

The table shows results of regressions of the survey-expected depreciation rate on the recent individual forecast error, the recent consensus forecast error, the forward premium, the real exchange rate, and the recent depreciation rate for a monthly unbalanced panel with 21 forecasters' expectations of the dollar versus six currencies during the 1992–2019 period:

$$F_t s_{t+k} - s_t = a + bFE_{t-k,t} + c\overline{FE}_{t-k,t} + d'x_t + \varepsilon_{t+k},$$

where $FE_{t-k,t} = s_t - F_{t-k} s_t$ is the recent individual forecast error, $\overline{FE}_{t-k,t}$ is the corresponding recent consensus forecast error, and x_t contains $f_{k,t} - s_t$, q_t , and $s_t - s_{t-k}$. The consensus forecast for a specific forecaster is an average of all forecasters but the specific forecaster. All specifications use currency and forecaster fixed effects. Panels A and B report results for horizons of three and twelve months ($k = 3$ and $k = 12$), respectively. R^2 is a within R -squared value. N is the number of currency-forecaster-month observations. Standard errors (within parentheses) are calculated using the spatial estimator of [Driscoll and Kraay \(1998\)](#), which allows for both cross-sectional and serial correlations up to k lags in the errors, as in [Hansen and Hodrick \(1980\)](#), as well as for heteroskedasticity in the errors. *, **, and *** denote 10%, 5%, and 1% significance levels, respectively, for the null hypothesis of a coefficient equal to zero.

Table 5: Overreaction

	Forecast error			
	I	II	III	IV
<u>Panel A: 3-month horizon</u>				
Lagged forecast error	0.250*** (0.035)	0.257*** (0.045)		
Forecast revision			-0.062** (0.032)	-0.312*** (0.034)
Forward premium		-1.902*** (0.827)		-2.645*** (0.807)
Real exchange rate		-0.037* (0.021)		-0.011 (0.021)
Recent depreciation rate		-0.008 (0.067)		0.473*** (0.064)
R^2	0.063	0.081	0.004	0.116
N	9909	9909	9926	9926
<u>Panel B: 12-month horizon</u>				
Lagged forecast error	0.363*** (0.118)	0.420*** (0.113)		
Forecast revision			-0.041 (0.093)	-0.209*** (0.066)
Forward premium		-2.542*** (0.554)		-2.931*** (0.580)
Real exchange rate		-0.132** (0.055)		-0.083 (0.060)
Recent depreciation rate		-0.146 (0.140)		0.383*** (0.091)
R^2	0.040	0.163	0.001	0.164
N	9533	9533	9053	9053

The table shows results of regressions of the forecast error on the lagged forecast error or the forecast revision, and on the forward premium, the real exchange rate, and the recent depreciation rate for a monthly unbalanced panel with 21 forecasters' expectations of the USD versus six currencies during the 1992–2019 period:

$$\begin{aligned}
 FE_{t,t+k} &= a + bFE_{t-k,t} + c'x_t + \varepsilon_{t+k}, & \text{(I and II)} \\
 FE_{t,t+k} &= a + bFR_{t-k,t} + c'x_t + \varepsilon_{t+k}, & \text{(III and IV)}
 \end{aligned}$$

where $FE_{t,t+k} = s_{t+k} - F_t s_{t+k}$ is the forecast error, $FR_{t-k,t} = F_t s_{t+k} - F_{t-k} s_{t+k}$ is the forecast revision, and x_t contains $f_{k,t} - s_t$, q_t , and $s_t - s_{t-k}$. All specifications use currency and forecaster fixed effects. Panels A and B report results for horizons of three and twelve months ($k = 3$ and $k = 12$), respectively. The revision of the 12-month forecast is approximated by the revision of the 6-month forecast. R^2 is a within R -squared value. N is the number of currency-forecaster-month observations. Standard errors (within parentheses) are calculated using the spatial estimator of [Driscoll and Kraay \(1998\)](#), which allows for both cross-sectional and serial correlations up to k lags in the errors, as in [Hansen and Hodrick \(1980\)](#), as well as for heteroskedasticity in the errors. *, **, and *** denote 10%, 5%, and 1% significance levels, respectively, for the null hypothesis of a coefficient equal to zero.

Table 6: Out-of-sample forecast comparisons

	3-month	12-month
<u>Panel A. Panel regression and consensus survey forecasts</u>		
Full regression model	1.415***	1.154*
<u>Panel B. Panel regression and individual survey forecasts</u>		
Forward premium	1.198***	1.167
Real exchange rate	1.245***	1.165**
Recent depreciation rate	0.887*	1.043
Lagged forecast error	1.032	1.049
Revision of forecast	0.804***	0.827*
<u>Panel C. Panel regression and currency-specific regressions</u>		
Forward premium	1.423***	1.873***

This table shows results of out-of-sample forecast comparisons of mean squared errors (MSEs). Panel A shows the ratio:

$$\frac{\text{MSE}(\text{consensus})}{\text{MSE}(\text{panel regression})},$$

where $\text{MSE}(\text{consensus})$ and $\text{MSE}(\text{panel regression})$ refer to the MSE of survey forecasts and panel regression forecasts, respectively. The panel regression is with currency fixed effects during the 1992–2019 period and estimated using an expanding window so that all forecasts are out of sample. Panel B shows the ratio:

$$\frac{\text{MSE}(\text{high coefficient})}{\text{MSE}(\text{low coefficient})},$$

where $\text{MSE}(\text{high coefficient})$ and $\text{MSE}(\text{low coefficient})$ refer to the MSEs of individual survey forecasts conditioning on high and low panel regression coefficients of a variable (the forward premium, real exchange rate, recent depreciation rate, lagged forecast error, and revision of forecast), respectively. These ratios are constructed using the following three steps. First, run a panel regression for each individual forecaster with currency fixed effects. Second, form the forecast average of those forecasters with high coefficients of a variable and another average of those with low coefficients. Third, compare the predictive performance of forecasts for the high and low coefficients. Panel C shows the ratio:

$$\frac{\text{MSE}(\text{currency-specific regressions})}{\text{MSE}(\text{panel regression})},$$

where $\text{MSE}(\text{currency-specific regressions})$ refers to the MSE of currency-specific regression forecasts. The number of time-series observations in Panel A is 310 for the 3-month horizon and 300 for the 12-month horizon. We use a [Diebold and Mariano \(1995\)](#) test, using a robust variance-covariance estimator as in [Hansen and Hodrick \(1980\)](#) (with three and twelve lags for 3-month and 12-month forecasts, respectively), to test the null hypothesis of equal MSEs between survey and panel regression forecasts. *, **, and *** denote 10%, 5%, and 1% significance levels, respectively.

Table 7: Robustness analyses

	Forecast date I	WLS II	Consensus III
<u>Panel A: 3-month horizon</u>			
Forward premium	0.031 (0.307)	0.012 (0.316)	0.162 (0.322)
Real exchange rate	-0.025*** (0.007)	-0.035*** (0.007)	-0.035*** (0.008)
Recent depreciation rate	-0.166*** (0.022)	-0.192*** (0.031)	-0.189*** (0.030)
Fixed effects	Currency & Forecaster	Currency & Forecaster	Currency
R^2	0.080	0.120	0.206
N	10664	10664	1872
<u>Panel B: 12-month horizon</u>			
Forward premium	0.100 (0.217)	0.072 (0.214)	0.161 (0.215)
Real exchange rate	-0.103*** (0.024)	-0.122*** (0.023)	-0.123*** (0.024)
Recent depreciation rate	-0.178*** (0.036)	-0.208*** (0.039)	-0.201*** (0.039)
Fixed effects	Currency & Forecaster	Currency & Forecaster	Currency
R^2	0.171	0.193	0.379
N	10270	10270	1872

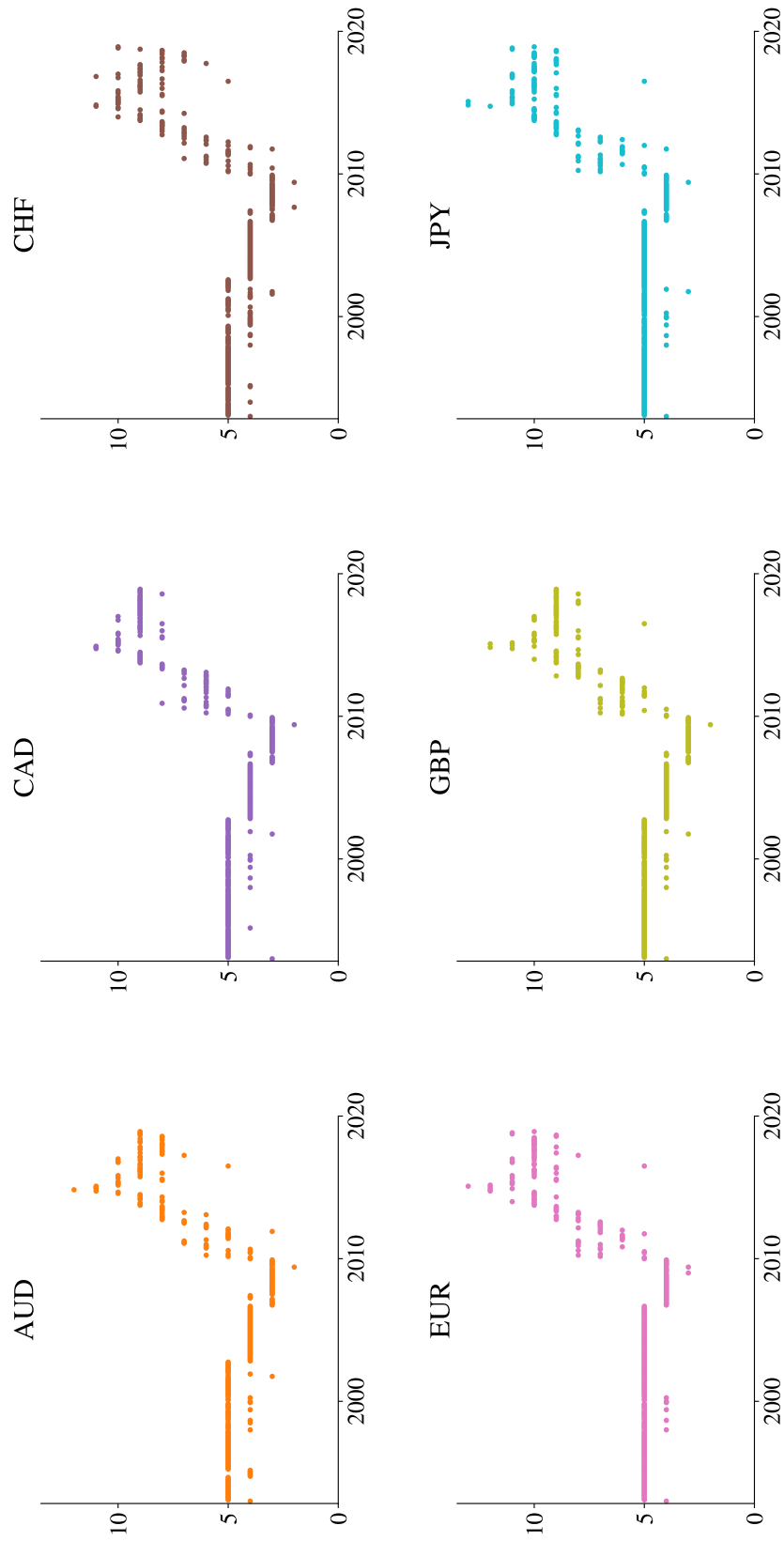
The table shows results for the same specification as specification II in Table 3, but with different treatments of the data and the estimation approach. Specification I assumes that the forecasts are made on the fifth day before the end of the month (instead of the last day of the month). Specification II uses weighted least squares (WLS), giving an equal effective weight to each month (irrespective of the number of available forecasts). Specification III uses consensus forecasts. Specifications I and II include currency and forecaster fixed effects, whereas specification III includes currency fixed effects only. See the caption of Table 3 for more detailed information.

Table 8: Time fixed effects

	Forecast error I	Expected depreciation II	Forecast error III
<u>Panel A: 3-month horizon</u>			
Forecast error (individual)		-0.273*** (0.021)	
Forecast error (consensus)		0.023 (0.030)	
Revision of forecast			-0.125*** (0.025)
Forward premium	0.412 (0.572)		
Real exchange rate	0.001 (0.001)		
Recent depreciation rate	0.211*** (0.046)		
R^2	0.024	0.137	0.017
N	10664	9909	9926
<u>Panel B: 12-month horizon</u>			
Forecast error (individual)		-0.494*** (0.051)	
Forecast error (consensus)		0.038 (0.060)	
Revision of forecast			0.021 (0.057)
Forward premium	-0.037 (0.460)		
Real exchange rate	-0.003 (0.005)		
Recent depreciation rate	0.360*** (0.101)		
R^2	0.023	0.151	0.000
N	10270	9533	9053

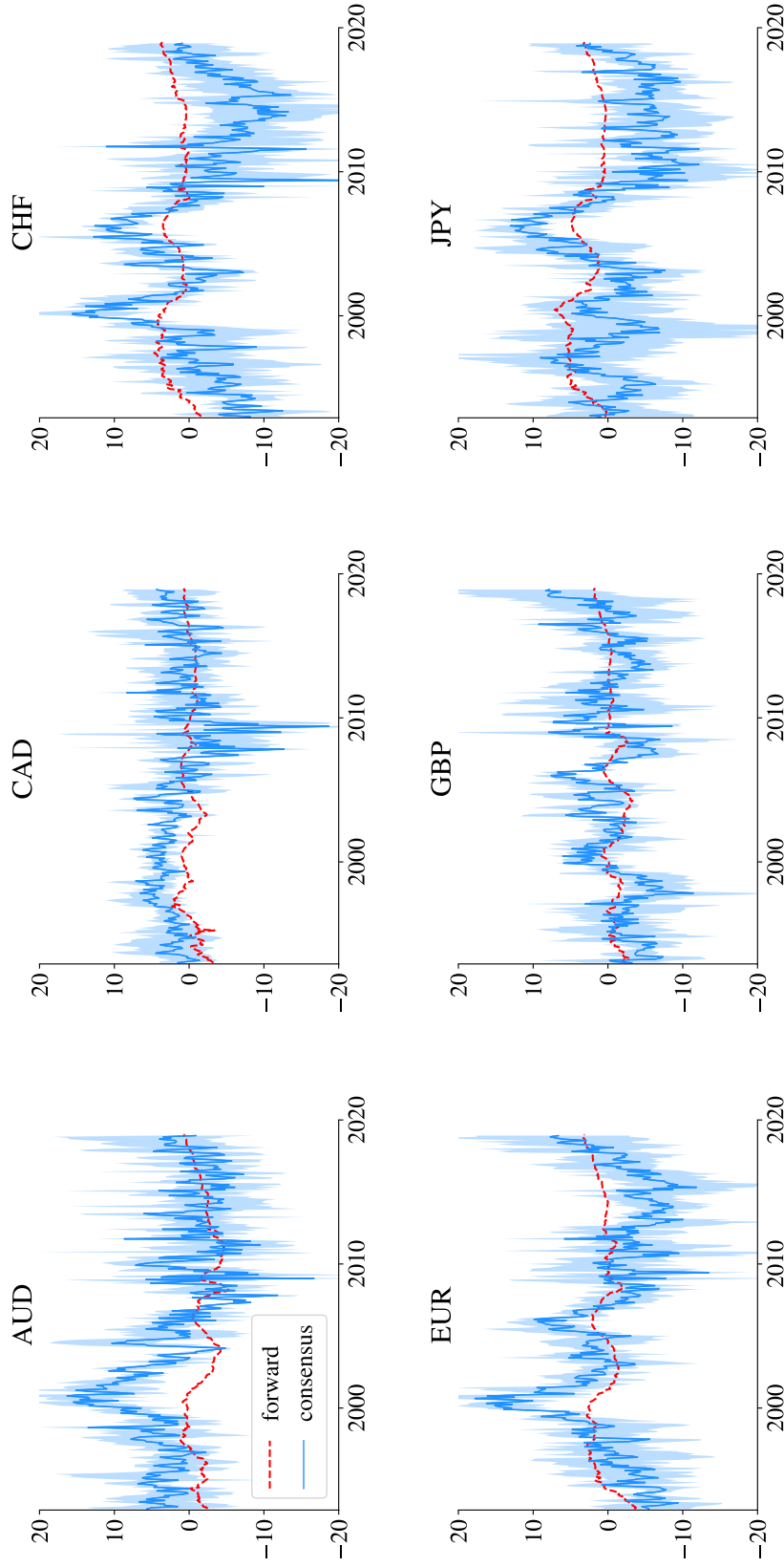
The table shows results of panel regressions with time fixed effects (and no currency or forecaster fixed effects), using the same specifications as in earlier tables. Specification I is the same regression as in Table 3 specification III; specification II is the same regression as in Table 4 specification III; and specification III is the same regression as in Table 5 specification III. See the captions of these tables for more detailed information.

Figure 1: Number of forecasters



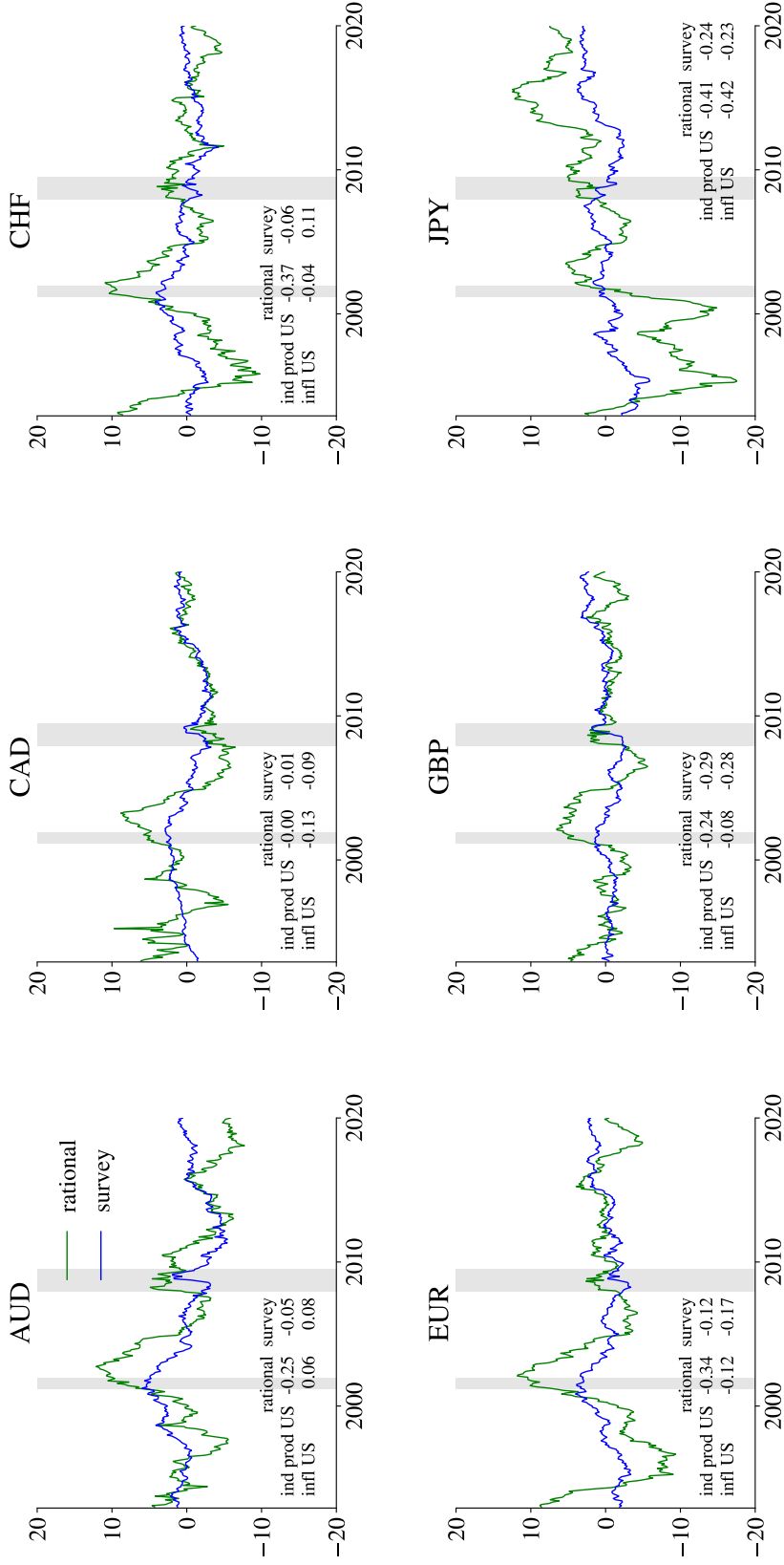
The figure shows the number of forecasters of future USD spot exchange rates (versus AUD, CAD, CHF, EUR, GBP, and JPY) over time.

Figure 2: Forward premia and survey-expected depreciation rates



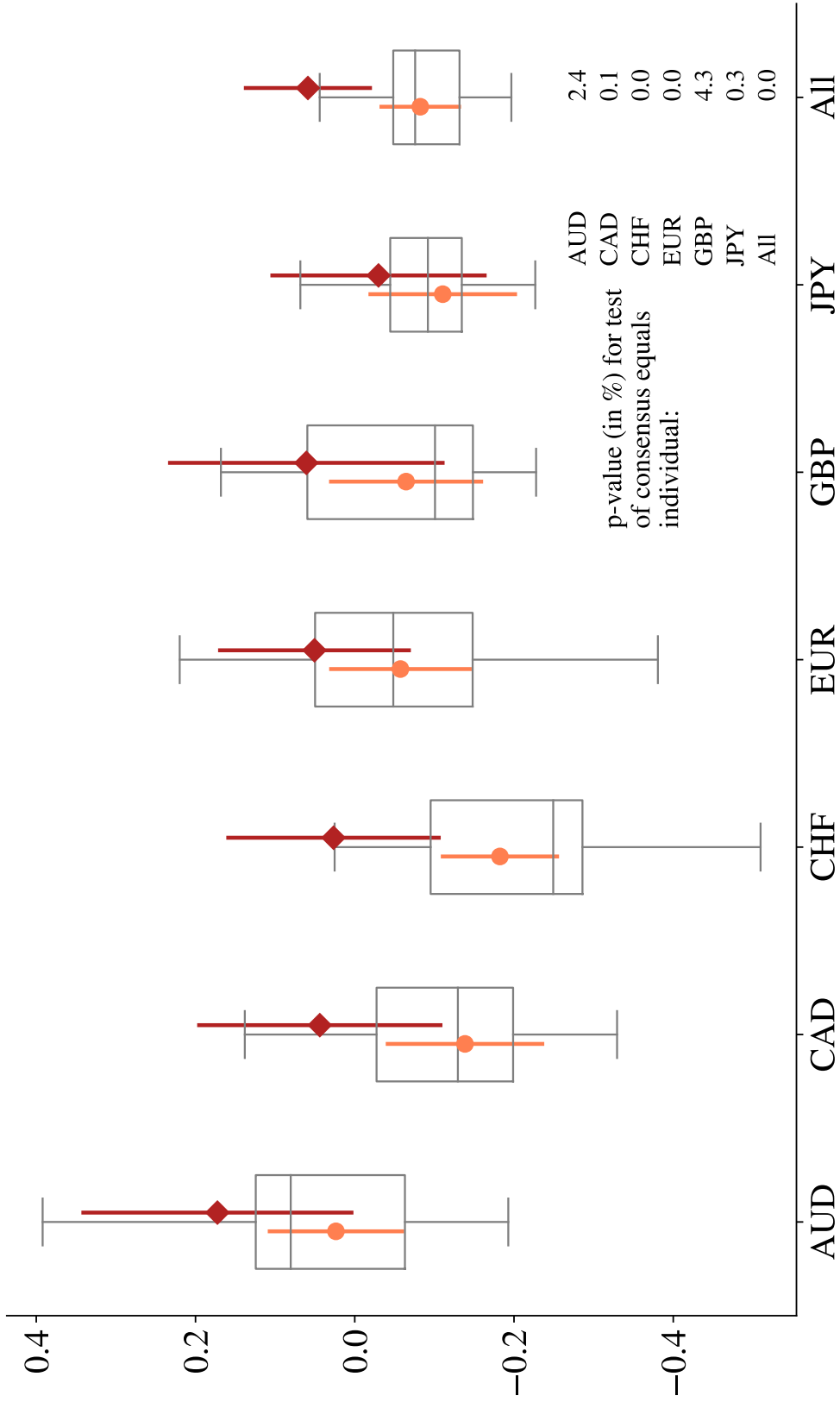
The figure shows US 12-month forward premia (versus AUD, CAD, CHF, EUR, GBP, and JPY) over time (dashed red line). The figure also shows 12-month consensus expected depreciation rates (dark blue solid lines) and min-max bands of individual forecasts (light blue areas).

Figure 3: Rational and survey risk premia



The figure shows 12-month rational (green solid lines) and survey (red solid lines) risk premia per currency (AUD, CAD, CHF, EUR, GBP, and JPY). The risk premia (in %) are demeaned fitted values from regressions on the forward premium and the real exchange rate, nested by those presented in Table 3. The shaded areas indicate US contractions (peak to trough) as dated by the National Bureau of Economic Research (NBER). Each subfigure also shows the correlation between the risk premia and the annual US industrial production growth rate and the annual US inflation rate.

Figure 4: Distribution of error-on-revision estimates



The figure shows estimates of the b -coefficient in the regression of the future expectations error on the recent expectations revision (see caption of Table 5). The light red circles (lines) denote estimates (90% confidence bands) using fixed effects for individual forecasters' expectations. The dark red diamonds (lines) denote estimates (90% confidence bands) using consensus expectations. The inter-quartile boxes with median lines and 90% whiskers show the distributions of estimates from individual expectations regressions. The figure also shows p -values for tests of the hypothesis that the consensus coefficient equals the individual coefficient; that is, $H_0: b_{\text{consensus}} = b_{\text{individual}}$.