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Market Participants or the Random Walk – Who Forecasts Better? Evidence from Micro-Level Survey Data*

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Abstract

We analyse micro-level data concerning four financial variables in Sveriges Riksbank's *Prospera Survey* to evaluate the accuracy of forecasts provided by professionals active in the Swedish fixed-income market. Our results indicate that for the SEK/EUR and SEK/USD exchange rates, and the five-year government bond yield, none of the market participants that frequently participate in the survey manage to significantly outperform the random-walk forecast. For the central bank's policy rate, the market participants typically have a statistically significant higher forecast accuracy than the random-walk forecast at the three-month horizon; however, at the two- and five-year horizons, the random-walk forecast typically outperform the market participants.

JEL Classification: E47, G17

Keywords: Out-of-sample forecasts, Exchange rates, Interest rates

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1. Introduction

It is a stylised fact that financial variables, such as interest rates and exchange rates, are difficult to forecast. Early contributions – such as Elliott and Baier (1979) and Meese and Rogoff (1983a, 1983b) – established that it was challenging to outperform a random-walk forecast in terms of forecast precision. Since then, the random-walk forecast has been the benchmark to beat in many studies concerned with forecasting interest rates and exchange rates; see, for example, Engel *et al.* (2015), Ferraro *et al.* (2015), Ren *et al.* (2019), Kunze (2020), Pinchera-Brown and Neumann (2020) and Kladívko and Österholm (2021) for a few fairly recent contributions.

One category of forecasts that one might expect would have reasonably high forecast precision are those provided by professionals working in financial markets. The purpose of this paper is to investigate whether financial-market professionals do indeed have a high ability to forecast financial-market variables. We do this by evaluating micro-level data on forecasts concerning four financial variables in Sveriges Riksbank's *Prospera Survey*. Using these data, we can follow each respondent over time, assess the precision related to their forecasts and compare that to the precision of a random-walk forecast.

In conducting this analysis, we add empirical evidence to the literature studying survey expectations of financial variables. The overwhelming majority of this literature – see, for example, Mitchell and Pearce (2007), Baghestani *et al.* (2015), Ince and Molodtsova (2017) and Kladívko and Österholm (2021) – have, however, used data that is aggregated over individual forecasters, typically evaluating the mean of the individual forecasts. Using aggregated data means that potentially interesting heterogeneity among the respondents might be hidden. By employing micro-level data instead, we can conduct a richer analysis. For example, we can investigate whether there are respondents who systematically outperform the random-walk forecast even if the mean forecast does not. Our study can be seen as an extension of that conducted by Kladívko and Österholm (2021) on aggregated data from the *Prospera Survey*, where it should be noted that this is the first time that data from this survey are studied at the micro level. We accordingly follow a much narrower path in the literature where micro-level survey expectation data have been evaluated. Examples of such studies include MacDonald and Marsh (1994, 1996), Marsh and Power (1996), Mitchell and Pearce (2007) and Bordalo *et al.* (2020).

2. Data

We use monthly data on the four financial variables in Sveriges Riksbank's *Prospera Survey*: *i)* the SEK/USD exchange rate, *ii)* the SEK/EUR exchange rate, *iii)* the central bank's policy rate and *iv)* the five-year government bond yield. All survey data start in September 2009; this is the first time that the respondents active in the Swedish fixed-income market – in the survey denoted *money-market players* – got to answer the survey on a

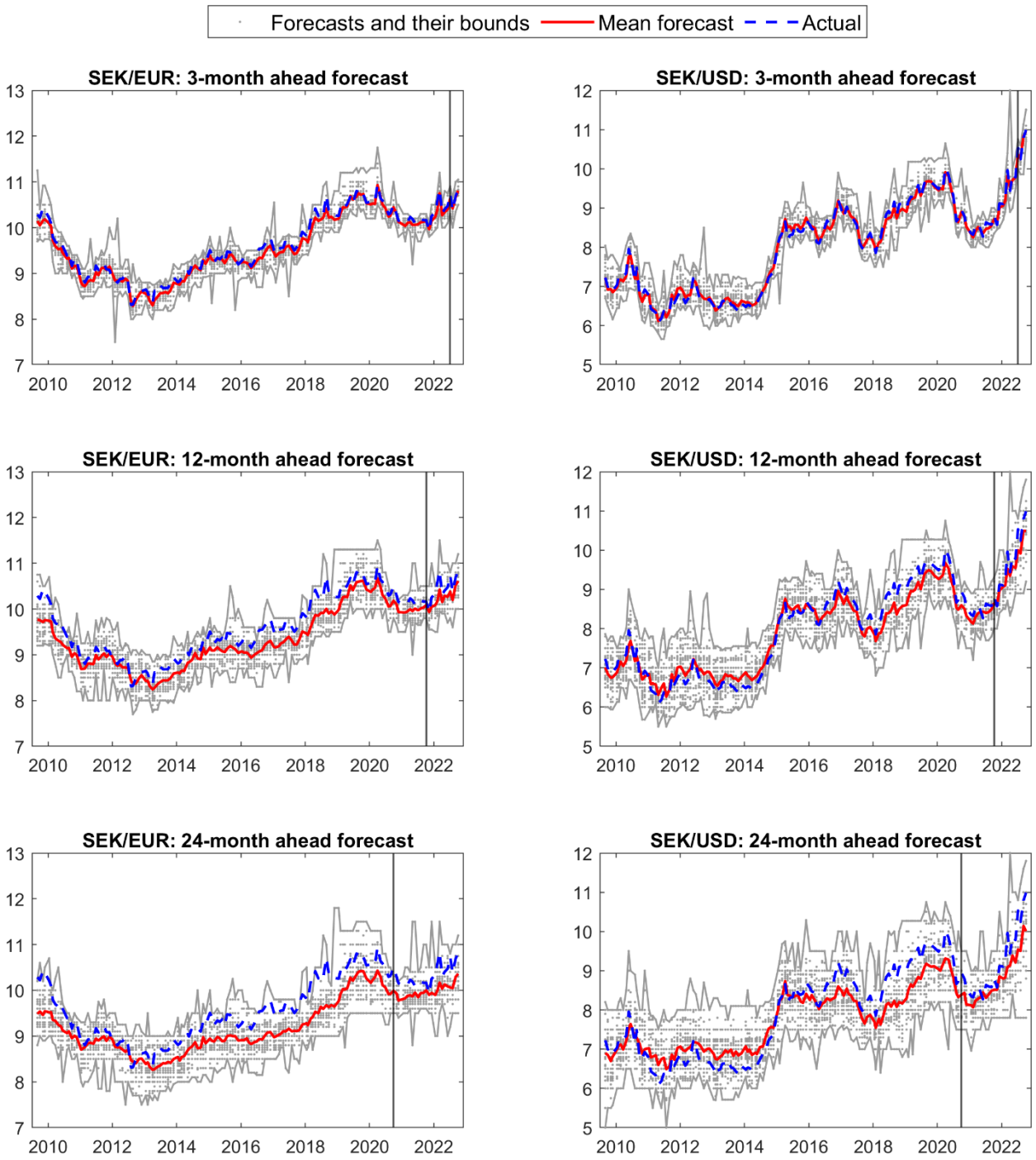
monthly frequency.[1] The last survey data to be evaluated vary depending on the forecast horizon. For the exchange rates, forecasts are made for three different horizons: 3, 12 and 24 months. For the central bank's policy rate and the five-year government bond yield, the expectations are in addition recorded for the 60-month horizon. The last survey data to be evaluated are accordingly July 2022 for the 3-month horizon, October 2021 for the 12-month horizon, October 2020 for the 24-month horizon and October 2017 for the 60-month horizon.

Individual forecasts of the exchange rates at the 3-, 12- and 24-month horizons for all money-market players who participated in the survey are shown in Figure 1. Forecasts for the five-year government bond yield and the central bank's policy rate at the 3-, 12-, 24- and 60-months horizons are presented in Figure 2. The forecasts for each respondent are shown as grey dots. The minimum and maximum values are shown by solid grey lines and the mean forecast is given by a solid red line. To put these forecasts into a context, the actual value for the variables is also provided; this is given by the dashed blue line.

Looking at Figures 1 and 2, we can observe that forecasts – not surprisingly – become more dispersed with an increasing forecast horizon. It is also worth noting that respondents on average have expected the Swedish krona to appreciate relative to the euro at the 24-month horizon during most of the sample; the trend in the SEK/EUR exchange rate has typically been the opposite though. In a similar manner, it is evident that respondents on average tend to have predicted an increase in the two interest rates; for a non-negligible part of the sample, this did not materialise.

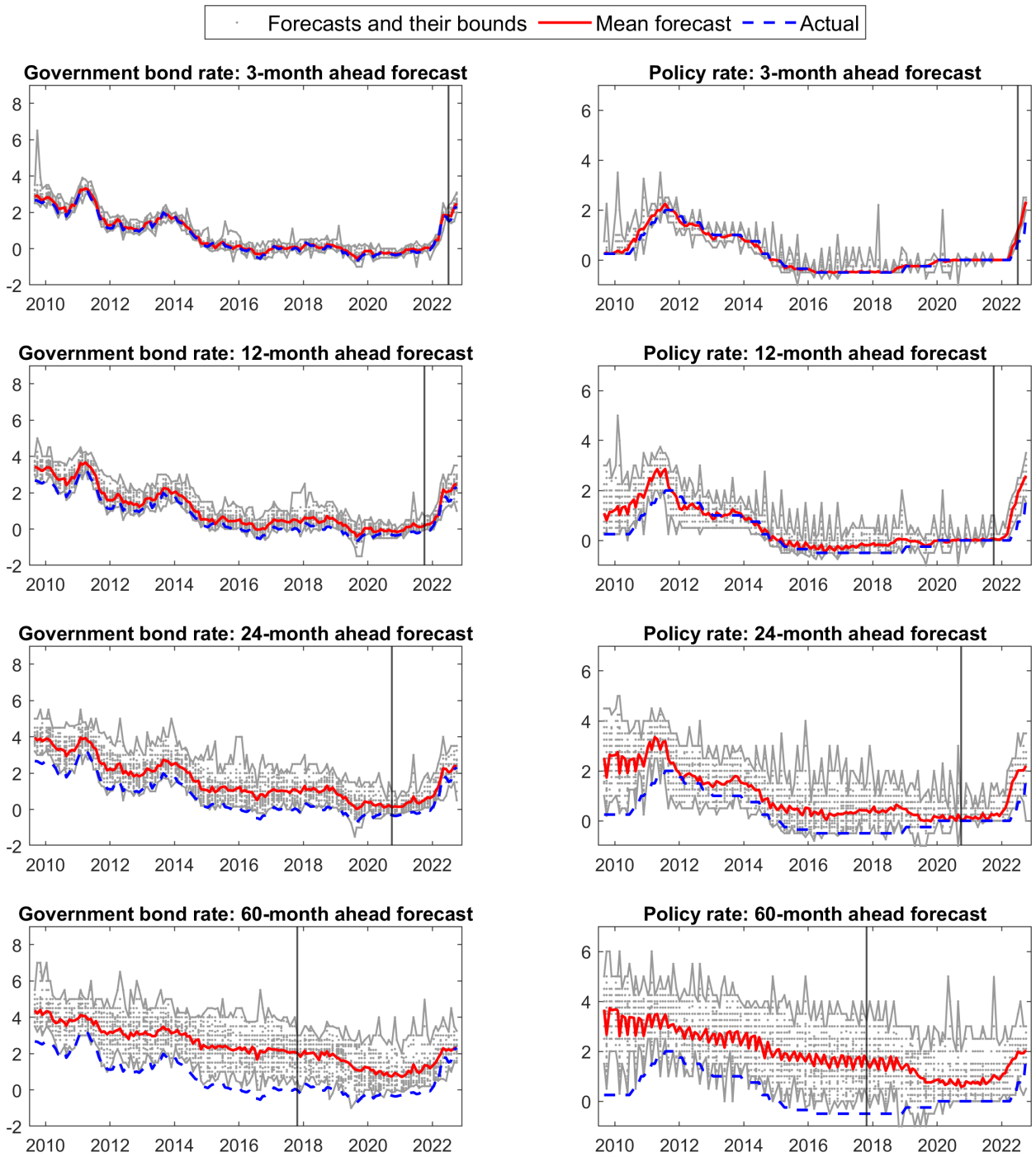
[1] The survey began in 1995 and was then conducted purely on a quarterly frequency. There are five categories of respondents in the survey: money-market players, employee organisations, employer organisations, manufacturing companies and trade companies. Since September 2009, the survey is monthly for money-market players. The other respondents – who do not answer the questions regarding financial variables – still participate in the survey on a quarterly frequency.

Figure 1. Forecasts of the SEK/EUR and SEK/USD exchange rates for each money-market player.



Note: "Actual" shows variable value at the dates when forecasts were made. Black vertical line indicates the last forecast that has been evaluated.

Figure 2. Forecasts of the five-year government bond yield and policy rate for each money-market player.



Note: Percent on vertical axes for both variables. "Actual" shows variable value at the dates when forecasts were made. Black vertical line indicates the last forecast that has been evaluated.

3. Empirical analysis

In order to evaluate the forecast precision of the money-market players, we denote the forecasts as $\hat{y}_{t+h|t}^{x}$ for each respondent x that participated in the survey at time t, where h is the forecast horizon in months, $h \in \{3, 12, 24\}$ for the SEK/EUR and SEK/USD exchange rates and $h \in \{3, 12, 24, 60\}$ for the five-year government bond yield and the central bank's policy rate.

The forecast precision is assessed based on the root mean squared forecast error (RMSE). For a given variable, horizon h and money-market player x, the RMSE is given by

$$\mathrm{RMSE}_h^x = \sqrt{\frac{1}{N_h^x}\sum_{t \in S_h^x}\left(e_{t+h|t}^{x}\right)^2}, \qquad (1)$$

where $e_{t+h|t}^{x} = y_{t+h} - \hat{y}_{t+h|t}^{x}$ is the forecast error, S_h^x denotes the set of survey rounds when money-market player x has made an h-month ahead forecast and N_h^x denotes the number of these forecasts. The set S_h^x is a subset of all forecast rounds evaluated, since no respondent has participated in all survey rounds (see the values of N_h^x in Tables 1 to 4).

The precision of each money-market player's forecast is compared to the precision of a *random-walk forecast* on the corresponding set S_h^x. The random-walk forecast is given as $\hat{y}_{t+h|t}^{\mathrm{RW}} = y_t$, where y_t is the value of the variables in question observed on the close of the business day when the survey was conducted. The RMSE of the random-walk forecast is calculated by using equation (1), with the random-walk forecast error given by $e_{t+h|t}^{\mathrm{RW}} = y_{t+h} - y_t$. We also evaluate forecast precision of a *mean forecast*. The mean forecast at time *t* is calculated as a simple arithmetic mean over all respondents' forecasts at that point in time. The RMSEs of the mean forecast and its random-walk counterpart is calculated according to equation (1); for this analysis, all forecast rounds are evaluated.

In order to facilitate easy comparisons between the survey forecasts and the random-walk forecast, the relative RMSE (RRMSE) is used. This measure is defined as the ratio of the RMSE of a respondent's forecast and the corresponding random-walk forecast, so that values smaller than unity indicate that the RMSE of the survey data is lower than that of the random-walk forecast.

The RMSEs and RRMSEs for each respondent and horizon are presented in Tables 1 to 4. The tables are organized to show respondents who participated at least 70 percent of the times that the survey was conducted in section A, and respondents who participated between 30 percent and 70 percent of the times in section B. We argue that less weight should be given to the results in section B since they are more likely to be influenced by randomness – that is, a low (high) relative RMSE might be due to being lucky (unlucky) rather than reflecting

forecasting skills. Results for respondents that participated less than 30 percent of the time are not reported at all.[2] The tables are sorted from lowest to highest relative RMSE in each section.

In the tables, we also present results from the Diebold-Mariano test (Diebold and Mariano, 1995) which has been performed to assess if differences in RMSEs between the survey data and the random-walk forecast are statistically significant. The test statistics have been calculated using Newey-West standard errors (Newey and West, 1987) to account for serial correlation (and heteroskedasticity). A sufficiently negative test statistic indicates that the survey respondent significantly outperforms the random walk; large positive values indicate the opposite.

Turning first to the SEK/EUR exchange rate, it can be seen from section A of Table 1 that none of the individual relative RMSEs is less than one for any of the three horizons. The fact that no respondent has managed to outperform the random walk points to a widespread inability to forecast this exchange rate. In line with relative RMSEs larger than one, all Diebold-Mariano test-statistics are positive; most of them are also significant for the 12- and 24-month horizons, indicating that the random-walk forecast systematically outperforms most survey respondents. For participants that forecasted between 30 and 70 percent of the time – shown in section B – there are three relative RMSEs smaller than one; in these cases, the survey respondents' RMSEs are between 5 and 17 percent lower than those of the random-walk. However, none of them are found to be significantly lower according to the Diebold-Mariano test.

The results for the SEK/USD exchange rate – shown in Table 2 – are qualitatively similar to those for the SEK/EUR exchange rate but with a slightly better performance of the survey respondents. Looking at section A of the table, over all three forecast horizons, a relative RMSE less than one can only be found in seven cases, but none of these is statistically significant. (The largest improvement relative to the random walk is a modest four percent – that is, the relative RMSE is 0.96). However, it is not uncommon that the random walk significantly outperforms the money-market players. Turning to section B of Table 2, there are quite a few respondents that have a relative RMSE lower than one, particularly at the 12- and 24-month horizons, and three of these cases – all at the 24-month horizon – are also statistically significant. As was pointed out above though, these results tend to be based on substantially fewer observations than the results in section A and should accordingly be interpreted with a bit more caution. And we again find that at all horizons, the majority of the relative RMSEs are larger than one.

Concerning the five-year government bond yield in Table 3, it can be noted that there is only one entry in the entire table where the relative RMSE is less than unity (and the difference is insignificant according to the

[2] Using only a subset of respondents – which are judged to have provided a "sufficient" number of answers – is in line with previous work, such as MacDonald and Marsh (1994), Mitchell and Pearce (2007) and Fritsche *et al.* (2014).

Diebold-Mariano test). Instead, we reject the null hypothesis of equal predictive ability in favour of the random-walk forecast for the majority of respondents at the 3- and 12-month horizon and for all respondents at the two longest horizons. Looking at the time series in Figure 2 suggests that the underperformance of the money-market players is at least partly because they did not foresee the downward trend in the government bond yield that prevailed during the sample.

Finally, turning to the central bank's policy rate in Table 4, we find evidence in favour of the survey respondents. In fact, looking at section A of the table, it can be seen that all money-market players have a relative RMSE smaller than one at the 3-month horizon. The money-market players perform very well relative to the random walk, with improvements as big as 40 percent. In all but three of these cases the difference in forecast performance is also statistically significant according to the Diebold-Mariano test. At the 12-month horizon most respondents also have a relative RMSE less than one but despite some quite low values (with 0.75 being the lowest), none of these are found statistically significant. At the two longest horizons, it seems to be harder to beat the random-walk forecast. All relative RMSEs are larger than one, with results being significant in most cases at the 24-month horizon and in all cases at the 60-month horizon. The results in section B of the table are qualitatively very similar.

Summing up, we find that the money-market players can generate accurate forecasts for the central bank's policy rate in the short run – a result indicating that they have a fairly good understanding of how the Riksbank determines the policy rate at shorter horizons. This is perhaps not particularly surprising given that the Riksbank is one of the most transparent central banks in the world – see, for example, Dincer *et al.* (2022) – and communicates its policy deliberations in quite some detail. Overall though, our results indicate that the money-market players in the *Prospera Survey* have difficulties in outperforming the random walk for most variables and horizons.

At a general level our results echo those of Kladívko and Österholm (2021) who based their analysis on aggregated data from the *Prospera Survey* and found that the mean expectation of the money-market players only beat the random-walk forecast at the 3-month horizon for the central bank's policy rate. Similar results to ours can also be found in Mitchell and Pearce (2007) who established that the respondents in the Wall Street Journal's panel of economists largely were on par with the random-walk forecast when it came to forecasting the Treasury bill rate but that they tended to be outperformed by the random-walk forecast when forecasting the Treasury bond rate. Our findings are also in line with those of Baghestani *et al.* (2015), whose results indicate that some of the short-horizon Blue Chip forecasts of short-term interest rates outperformed the random-walk forecast; forecasts of long-term interest rates, however, did not.

Table 1. RMSEs and Relative RMSEs for the exchange rate SEK/EUR as well as results from Diebold-Mariano tests.

3-month ahead Forecast					12-month ahead Forecast					24-month ahead Forecast				
ID	RMSE	RRMSE	DM	N	ID	RMSE	RRMSE	DM	N	ID	RMSE	RRMSE	DM	N
Mean	0.26	1.07	1.45	155	Mean	0.56	1.20	1.77[c]	146	Mean	0.86	1.30	2.57[a]	134
A. Individuals participated at least 70 % of the times														
234	0.26	1.05	0.92	135	237	0.50	1.07	0.57	130	235	0.70	1.08	1.06	108
241	0.26	1.05	0.97	125	235	0.48	1.10	1.19	118	237	0.78	1.19	1.35	118
229	0.26	1.06	1.82[c]	140	209	0.56	1.16	1.15	118	248	0.79	1.21	1.73[c]	118
235	0.24	1.08	1.46	126	227	0.56	1.17	1.74[c]	137	247	0.84	1.24	1.98[b]	115
244	0.27	1.08	2.10[b]	140	248	0.56	1.18	1.38	129	241	0.85	1.25	2.53[b]	108
237	0.27	1.10	2.12[b]	139	241	0.56	1.19	1.69[c]	120	227	0.86	1.29	2.51[b]	126
248	0.27	1.12	1.86[c]	137	247	0.57	1.21	1.69[c]	124	215	0.87	1.31	2.57[b]	123
601	0.26	1.12	2.24[b]	109	234	0.60	1.24	1.86[c]	129	228	0.88	1.34	2.61[a]	127
227	0.28	1.13	2.81[a]	146	229	0.60	1.25	2.73[a]	132	211	0.94	1.36	3.19[a]	99
209	0.29	1.14	1.67[c]	127	239	0.60	1.25	1.68[c]	112	229	0.92	1.37	3.38[a]	123
224	0.27	1.14	2.53[b]	126	228	0.62	1.31	2.26[b]	140	221	0.93	1.38	3.22[a]	113
228	0.28	1.15	2.10[b]	147	215	0.62	1.32	2.41[b]	135	209	0.92	1.40	2.94[a]	105
247	0.27	1.16	2.34[b]	130	221	0.66	1.38	2.76[a]	122	224	0.91	1.41	3.21[a]	105
201	0.28	1.17	2.99[a]	108	244	0.66	1.38	3.20[a]	132	234	0.97	1.44	3.19[a]	120
239	0.31	1.25	2.47[b]	119	224	0.58	1.40	3.84[a]	119	239	0.96	1.48	2.94[a]	104
245	0.31	1.29	3.07[a]	145	245	0.69	1.45	4.00[a]	136	244	1.04	1.56	3.75[a]	120
215	0.32	1.30	3.62[a]	144	238	0.75	1.55	3.18[a]	124	217	1.06	1.57	3.64[a]	106
221	0.32	1.34	3.99[a]	128	217	0.77	1.59	3.76[a]	117	245	1.07	1.59	4.56[a]	124
217	0.33	1.38	3.24[a]	126	601	0.69	1.66	4.39[a]	104	238	1.19	1.75	4.51[a]	118
238	0.37	1.54	4.27[a]	127	259	0.77	1.77	3.88[a]	110					
259	0.46	2.01	5.35[a]	112										
B. Individuals participated between 30 and 70 % of the times														
233	0.24	1.01	0.06	65	233	0.44	0.83	-1.01	64	208	0.66	0.95	-0.38	42
242	0.27	1.08	0.90	70	203	0.48	0.95	-0.23	60	242	0.77	1.03	0.25	68
232	0.26	1.09	1.13	94	246	0.54	1.03	0.23	54	233	0.70	1.05	0.32	63
204	0.30	1.12	1.82[c]	80	226	0.50	1.06	0.54	72	226	0.71	1.09	0.62	64
246	0.26	1.13	1.63	63	201	0.51	1.07	0.55	101	266	0.72	1.09	0.43	55
203	0.27	1.14	1.23	60	266	0.56	1.07	0.34	55	203	0.69	1.11	0.55	60
230	0.28	1.14	1.48	91	230	0.54	1.09	0.82	89	230	0.81	1.15	1.28	88
211	0.28	1.15	1.85[c]	99	232	0.55	1.11	0.94	89	246	0.76	1.16	1.04	43
226	0.27	1.16	1.64	72	202	0.53	1.13	0.84	89	252	0.86	1.17	1.53	67
236	0.28	1.18	1.35	94	204	0.58	1.14	1.28	80	607	0.73	1.21	2.35[b]	87
252	0.27	1.18	0.95	67	242	0.60	1.14	0.94	70	204	0.90	1.22	1.97[b]	80
266	0.31	1.19	1.48	55	252	0.54	1.15	0.92	70	201	0.81	1.23	1.70[c]	91
202	0.31	1.22	2.98[a]	89	240	0.58	1.19	1.69[c]	92	236	0.84	1.28	1.92[c]	76
218	0.32	1.23	2.37[b]	73	607	0.48	1.23	2.24[b]	98	232	0.88	1.29	3.10[a]	82
240	0.31	1.27	2.76[a]	98	218	0.62	1.24	1.74[c]	71	240	0.87	1.29	2.08[b]	84
608	0.30	1.28	3.96[a]	64	236	0.55	1.24	2.03[b]	86	218	0.93	1.31	2.75[a]	70
207	0.33	1.29	2.77[a]	88	211	0.60	1.28	2.17[b]	99	202	0.88	1.37	1.92[c]	89
607	0.31	1.32	2.71[a]	103	604	0.53	1.33	2.29[b]	67	207	0.97	1.37	2.77[a]	86
604	0.29	1.34	2.23[b]	70	207	0.73	1.44	3.36[a]	88	205	0.96	1.43	2.24[b]	88
602	0.32	1.36	4.58[a]	81	258	0.71	1.60	3.07[a]	77	602	1.02	1.55	3.53[a]	81
606	0.32	1.37	2.77[a]	79	205	0.73	1.62	2.61[a]	94	604	0.85	1.56	4.71[a]	60
258	0.34	1.38	2.78[a]	77	606	0.73	1.71	4.13[a]	79	259	1.04	1.61	3.48[a]	64
205	0.37	1.53	3.56[a]	97	608	0.72	1.71	7.20[a]	63	608	1.10	1.73	5.29[a]	61
256	0.41	1.83	2.68[a]	73	256	0.80	1.72	3.24[a]	73	606	1.11	1.78	4.77[a]	79
					602	0.72	1.72	4.29[a]	81	601	1.13	1.97	5.79[a]	92
										258	1.30	2.05	5.87[a]	42
										256	1.47	2.14	6.48[a]	55

Note: The row for Mean corresponds to the performance of the mean forecast over all individuals. The numbers in the ID column are identifications of money-market players as used by Prospera. Relative RMSE (RRMSE) is given as the RMSE for each respondent (or the mean forecast) divided by the RMSE of the corresponding random-walk forecast. The Diebold-Mariano test (DM) provides the test's t-statistic calculated using Newey-West standard errors. a, b and c indicate significance of a two-tailed test at 1, 5 and 10 % level, respectively. N denotes the number of forecast errors evaluated.

Table 2. RMSEs and Relative RMSEs for the exchange rate SEK/USD as well as results from Diebold-Mariano tests.

3-month ahead Forecast					12-month ahead Forecast					24-month ahead Forecast				
ID	RMSE	RRMSE	DM	N	ID	RMSE	RRMSE	DM	N	ID	RMSE	RRMSE	DM	N
Mean	0.40	1.00	0.08	155	Mean	0.85	0.99	-0.19	146	Mean	1.02	0.98	-0.33	134
A. Individuals participated at least 70 % of the times														
245	0.39	0.97	-0.51	145	245	0.85	0.98	-0.34	136	235	1.00	0.96	-0.36	108
234	0.40	0.99	-0.25	135	227	0.86	0.99	-0.30	137	244	1.02	0.98	-0.33	120
228	0.40	1.01	0.30	147	244	0.87	1.01	0.17	132	211	1.06	0.99	-0.25	99
235	0.41	1.02	0.60	126	248	0.87	1.01	0.14	129	217	1.07	1.00	-0.01	106
227	0.42	1.03	0.66	146	241	0.91	1.02	0.53	120	229	1.08	1.00	0.04	123
229	0.43	1.03	1.12	140	237	0.89	1.03	0.41	130	245	1.08	1.01	0.17	124
244	0.42	1.03	1.08	140	229	0.90	1.05	0.91	132	224	1.14	1.02	0.21	105
224	0.44	1.04	0.89	125	235	0.90	1.06	0.79	118	239	1.12	1.05	0.93	104
201	0.46	1.07	1.13	108	239	0.89	1.06	1.13	112	248	1.09	1.06	1.16	118
241	0.42	1.07	1.92[c]	125	234	0.93	1.07	1.41	129	241	1.18	1.07	1.51	108
248	0.42	1.07	1.35	137	247	0.93	1.07	1.42	124	227	1.10	1.08	1.09	126
247	0.45	1.12	2.15[b]	130	209	0.93	1.08	0.94	118	247	1.09	1.09	1.65[c]	115
239	0.48	1.14	1.29	119	601	1.01	1.09	0.93	104	237	1.09	1.10	0.97	118
209	0.47	1.15	2.70[a]	126	215	0.98	1.11	1.40	135	215	1.20	1.13	1.79[c]	123
221	0.46	1.16	1.51	128	217	1.01	1.12	0.98	117	234	1.26	1.19	2.18[b]	120
601	0.48	1.17	1.51	109	224	1.01	1.12	1.43	119	228	1.27	1.20	1.88[c]	126
217	0.49	1.18	2.51[b]	126	228	0.99	1.13	1.78[c]	140	221	1.26	1.24	1.80[c]	113
238	0.47	1.22	2.39[b]	127	221	1.01	1.19	1.81[c]	122	209	1.26	1.27	2.64[a]	104
237	0.50	1.23	2.85[a]	139	238	1.01	1.23	2.23[b]	124	238	1.37	1.29	3.77[a]	118
215	0.52	1.28	2.69[a]	144	259	1.06	1.31	3.04[a]	109					
259	0.63	1.65	4.97[a]	111										
B. Individuals participated between 30 and 70 % of the times														
230	0.37	1.01	0.13	91	203	0.68	0.83	-1.32	60	203	0.69	0.61	-2.58[a]	60
233	0.41	1.01	0.18	65	266	0.67	0.89	-1.44	55	208	1.01	0.83	-0.99	42
236	0.43	1.03	0.58	94	606	0.76	0.91	-1.06	79	606	0.99	0.83	-1.94[c]	79
606	0.39	1.04	0.82	79	211	0.74	0.92	-1.17	99	232	0.95	0.85	-2.35[b]	82
218	0.44	1.05	1.05	73	230	0.75	0.93	-1.49	89	256	1.05	0.88	-1.13	54
232	0.40	1.06	1.57	94	233	0.80	0.93	-1.24	64	226	0.93	0.90	-0.64	64
242	0.42	1.06	1.15	70	232	0.76	0.94	-1.36	88	607	1.02	0.90	-1.49	87
607	0.43	1.07	1.54	103	604	0.89	0.96	-0.63	67	266	1.06	0.93	-0.89	55
211	0.40	1.09	1.61	99	226	0.86	0.99	-0.15	72	230	0.98	0.94	-0.92	88
246	0.45	1.10	1.61	63	201	0.84	1.00	0.03	101	602	1.04	0.94	-0.69	81
203	0.42	1.11	1.25	59	607	0.93	1.00	0.01	98	233	0.97	0.95	-0.43	63
240	0.47	1.12	2.11[b]	98	218	0.91	1.02	0.48	71	201	0.97	0.98	-0.25	91
266	0.42	1.12	1.18	55	236	0.92	1.04	0.42	86	246	1.08	1.03	0.65	43
226	0.45	1.15	1.83[c]	72	240	0.91	1.05	0.72	92	604	1.29	1.07	1.61	60
204	0.46	1.16	2.72[a]	80	256	0.81	1.05	0.46	73	236	1.14	1.09	0.52	76
604	0.46	1.17	1.14	70	608	0.86	1.06	0.85	63	242	1.02	1.10	0.77	68
608	0.43	1.17	4.06[a]	64	242	0.98	1.11	1.25	70	218	1.06	1.12	1.96[c]	70
205	0.47	1.19	2.42[b]	97	202	0.95	1.14	2.00[b]	84	608	1.13	1.14	1.64	60
252	0.46	1.23	2.35[b]	67	602	0.87	1.15	1.22	81	240	1.25	1.16	1.60	84
202	0.47	1.24	3.18[a]	84	252	0.86	1.16	1.43	70	205	1.23	1.20	1.27	89
602	0.47	1.32	3.55[a]	81	246	1.03	1.18	1.64	54	252	1.09	1.20	1.79[c]	66
207	0.48	1.33	2.79[a]	88	204	0.90	1.21	3.10[a]	80	202	1.19	1.22	2.43[b]	84
256	0.50	1.35	2.21[b]	73	207	1.03	1.34	2.17[b]	88	601	1.37	1.22	1.70[c]	92
258	0.52	1.43	3.25[a]	77	205	1.14	1.35	2.35[b]	94	204	1.30	1.26	3.96[a]	80
					258	1.11	1.35	2.93[a]	77	207	1.33	1.27	2.39[b]	87
										258	1.89	1.37	3.32[a]	42
										259	1.35	1.50	4.16[a]	63

Note: The row for Mean corresponds to the performance of the mean forecast over all individuals. The numbers in the ID column are identifications of money-market players as used by Prospera. Relative RMSE (RRMSE) is given as the RMSE for each respondent (or the mean forecast) divided by the RMSE of the corresponding random-walk forecast. The Diebold-Mariano test (DM) provides the test's t-statistic calculated using Newey-West standard errors. a, b and c indicate significance of a two-tailed test at 1, 5 and 10 % level, respectively. N denotes the number of forecast errors evaluated.

Table 3. RMSEs and relative RMSEs for the government bond rate as well as results from Diebold-Mariano tests.

3-month ahead Forecast					12-month ahead Forecast					24-month ahead Forecast					60-month ahead Forecast				
ID	RMSE	RRMSE	DM	N	ID	RMSE	RRMSE	DM	N	ID	RMSE	RRMSE	DM	N	ID	RMSE	RRMSE	DM	N
Mean	0.40	1.07	1.42	155	Mean	0.96	1.23	2.77[a]	146	Mean	1.63	1.68	6.08[a]	134	Mean	3.07	1.88	9.28[a]	99
A. Individuals participated at least 70 % of the times																			
235	0.37	0.99	-0.28	127	235	0.80	1.10	1.41	119	235	1.32	1.45	4.05[a]	109	221	2.74	1.62	7.79[a]	90
241	0.37	1.03	0.67	125	238	0.84	1.16	3.07[a]	124	239	1.55	1.47	5.07[a]	105	227	2.69	1.65	6.89[a]	96
227	0.39	1.04	1.46	146	227	0.92	1.19	2.81[a]	137	227	1.49	1.55	4.82[a]	126	244	2.75	1.65	6.94[a]	91
244	0.39	1.04	1.81[c]	142	244	0.96	1.19	3.18[a]	133	211	1.45	1.58	4.57[a]	98	235	2.56	1.70	5.10[a]	81
201	0.37	1.06	1.33	108	209	0.96	1.22	1.99[b]	130	238	1.52	1.62	7.01[a]	118	238	2.76	1.70	7.40[a]	88
229	0.40	1.07	1.53	139	239	0.95	1.22	3.04[a]	113	244	1.58	1.62	6.32[a]	121	207	3.04	1.78	5.32[a]	70
245	0.40	1.07	1.15	145	224	0.99	1.23	3.24[a]	124	229	1.62	1.63	6.09[a]	123	248	3.03	1.78	6.46[a]	85
238	0.36	1.08	1.67[c]	127	245	0.98	1.23	2.19[b]	136	217	1.66	1.66	4.70[a]	106	229	2.91	1.79	7.98[a]	92
234	0.40	1.09	1.45	135	215	0.97	1.25	2.88[a]	135	234	1.69	1.69	6.18[a]	120	211	2.91	1.82	7.92[a]	88
215	0.41	1.15	1.96[c]	144	229	0.96	1.27	3.35[a]	131	224	1.69	1.70	6.08[a]	110	234	3.17	1.95	10.76[a]	90
209	0.42	1.17	1.58	135	234	1.00	1.28	2.97[a]	129	215	1.74	1.79	5.43[a]	123	230	3.25	1.96	11.91[a]	88
217	0.46	1.18	2.39[b]	124	221	1.08	1.34	3.34[a]	124	221	1.65	1.80	6.55[a]	115	247	3.32	2.03	6.68[a]	84
224	0.42	1.20	3.44[a]	130	247	1.00	1.34	2.55[b]	123	247	1.72	1.84	4.59[a]	114	215	3.26	2.06	6.99[a]	90
247	0.43	1.21	2.31[b]	129	248	1.07	1.34	2.68[a]	129	248	1.83	1.84	5.29[a]	118	241	3.19	2.08	8.79[a]	79
248	0.46	1.21	2.88[a]	137	241	1.01	1.36	3.03[a]	120	228	1.91	1.93	5.59[a]	127	228	3.53	2.12	9.09[a]	94
239	0.43	1.22	2.69[a]	120	217	1.10	1.40	2.89[a]	116	241	1.85	1.93	6.45[a]	109	245	3.74	2.27	9.14[a]	93
228	0.46	1.24	2.07[b]	147	228	1.14	1.44	3.23[a]	140	245	1.93	1.97	6.34[a]	124	237	4.30	2.63	14.12[a]	84
221	0.49	1.25	4.41[a]	131	601	1.19	1.55	3.05[a]	104	601	2.06	2.23	5.91[a]	93					
237	0.50	1.32	2.30[b]	139	237	1.32	1.67	3.52[a]	130	237	2.41	2.48	6.32[a]	118					
601	0.46	1.36	2.92[a]	109															
B. Individuals participated between 30 and 70 % of the times																			
232	0.38	1.05	1.13	92	201	0.81	1.11	1.68[c]	101	201	1.34	1.35	3.25[a]	91	205	2.28	1.48	5.58[a]	65
246	0.48	1.05	1.46	62	240	0.91	1.11	1.19	88	202	1.35	1.45	2.40[b]	61	218	2.56	1.57	3.88[a]	63
205	0.37	1.07	1.37	97	205	0.84	1.17	2.18[b]	94	240	1.59	1.46	3.01[a]	80	249	3.12	1.57	9.91[a]	32
230	0.44	1.08	1.47	91	246	1.15	1.17	1.84[c]	53	246	1.84	1.50	2.35[b]	42	201	2.51	1.60	5.55[a]	64
203	0.44	1.09	1.24	60	607	0.90	1.21	2.36[b]	98	205	1.30	1.51	3.51[a]	89	240	2.86	1.66	4.14[a]	66
204	0.38	1.10	1.20	71	202	0.66	1.24	1.42	67	218	1.34	1.56	3.52[a]	84	202	2.38	1.67	3.63[a]	35
240	0.42	1.13	2.00[b]	94	230	1.03	1.26	2.99[a]	89	607	1.44	1.58	4.30[a]	87	204	2.51	1.69	2.90[a]	64
218	0.42	1.16	1.60	87	204	0.88	1.27	2.91[a]	71	204	1.55	1.63	3.50[a]	70	239	2.30	1.69	4.60[a]	41
202	0.33	1.17	1.52	68	232	0.93	1.27	3.28[a]	87	230	1.65	1.64	7.70[a]	88	217	3.18	1.70	6.43[a]	54
242	0.35	1.18	2.03[b]	69	211	0.97	1.29	3.83[a]	98	203	1.82	1.67	5.39[a]	60	203	3.17	1.78	10.18[a]	60
226	0.49	1.19	2.37[b]	54	218	0.85	1.29	3.01[a]	85	232	1.62	1.74	6.71[a]	81	233	3.21	1.78	6.56[a]	58
211	0.44	1.20	2.79[a]	98	203	1.21	1.36	2.96[a]	60	266	1.89	1.79	6.29[a]	55	607	2.27	1.78	4.89[a]	55
606	0.42	1.20	2.75[a]	79	226	1.13	1.36	2.85[a]	54	604	1.70	1.79	4.77[a]	60	263	3.81	1.79	10.70[a]	30
233	0.46	1.21	2.76[a]	67	604	1.15	1.36	3.19[a]	67	233	1.98	1.85	5.16[a]	64	246	3.58	1.90	2.98[a]	38
207	0.43	1.25	2.79[a]	88	266	1.16	1.39	2.92[a]	55	207	1.68	1.88	7.00[a]	87	266	3.36	1.91	9.19[a]	49
266	0.48	1.25	1.24	55	233	1.17	1.42	3.78[a]	65	226	1.96	1.90	5.29[a]	54	226	3.33	1.92	10.99[a]	51
602	0.40	1.25	2.19[b]	81	602	0.84	1.42	4.88[a]	81	208	2.34	1.93	7.39[a]	42	210	4.15	1.96	4.35[a]	36
236	0.45	1.31	2.12[b]	61	207	0.99	1.44	4.15[a]	88	608	1.57	2.09	6.95[a]	63	608	2.42	2.04	3.53[a]	36
607	0.44	1.32	2.59[a]	103	236	1.16	1.48	3.63[a]	61	236	2.09	2.19	9.90[a]	61	208	3.99	2.10	24.80[a]	42
608	0.42	1.33	3.34[a]	64	606	1.03	1.48	3.41[a]	79	606	1.94	2.31	5.93[a]	79	232	3.24	2.10	7.83[a]	68
604	0.51	1.56	3.91[a]	67	608	1.00	1.58	4.87[a]	64	225	2.64	2.42	5.27[a]	45	242	3.66	2.17	4.65[a]	45
					225	1.51	1.66	3.47[a]	45	242	2.11	2.46	5.29[a]	69	236	3.51	2.21	13.26[a]	59
					242	1.20	2.06	3.27[a]	69	602	1.81	2.48	5.61[a]	81	225	4.04	2.30	13.37[a]	45
															604	3.30	2.47	15.43[a]	49
															602	3.49	2.48	5.59[a]	57
															606	3.71	2.48	8.20[a]	65
															224	3.35	2.50	6.89[a]	67
															601	3.78	2.81	9.86[a]	63

Note: The row for Mean corresponds to the performance of the mean forecast over all individuals. The numbers in the ID column are identifications of money-market players as used by Prospera. Relative RMSE (RRMSE) is given as the RMSE for each respondent (or the mean forecast) divided by the RMSE of the corresponding random-walk forecast. The Diebold-Mariano test (DM) provides the test's t-statistic calculated using Newey-West standard errors. a, b and c indicate significance of a two-tailed test at 1, 5 and 10 % level, respectively. N denotes the number of forecast errors evaluated.

Table 4. RMSEs and relative RMSEs for the central bank's policy rate as well as results from Diebold-Mariano tests.

3-month ahead Forecast					12-month ahead Forecast					24-month ahead Forecast					60-month ahead Forecast				
ID	RMSE	RRMSE	DM	N	ID	RMSE	RRMSE	DM	N	ID	RMSE	RRMSE	DM	N	ID	RMSE	RRMSE	DM	N
Mean	0.12	0.57	-2.81[a]	155	Mean	0.47	0.85	-0.89	146	Mean	1.15	1.42	2.83[a]	134	Mean	2.89	2.22	8.03[a]	99
A. Individuals participated at least 70 % of the times																			
215	0.12	0.60	-2.31[b]	144	238	0.41	0.75	-1.23	124	239	0.95	1.09	0.68	106	235	2.08	1.63	5.29[a]	81
229	0.12	0.60	-2.48[b]	140	209	0.47	0.82	-1.02	135	209	0.96	1.25	1.43	100	244	2.54	1.95	6.68[a]	94
234	0.12	0.62	-2.51[b]	135	237	0.47	0.84	-0.90	130	238	1.02	1.27	1.80[c]	118	218	2.46	1.97	4.03[a]	71
217	0.13	0.63	-2.05[b]	127	224	0.47	0.87	-0.90	124	235	0.97	1.29	1.67[c]	109	238	2.48	2.00	6.92[a]	88
237	0.14	0.63	-2.55[b]	139	234	0.51	0.87	-0.65	129	244	1.14	1.39	2.39[b]	124	229	2.69	2.05	7.71[a]	92
228	0.12	0.64	-2.45[b]	147	239	0.51	0.88	-0.72	114	221	1.18	1.41	3.43[a]	115	227	2.72	2.08	6.70[a]	97
248	0.13	0.65	-2.73[a]	137	241	0.49	0.88	-0.73	120	234	1.20	1.45	2.38[b]	121	221	2.84	2.09	8.02[a]	90
224	0.13	0.66	-2.56[b]	130	235	0.50	0.89	-0.91	119	224	1.12	1.47	2.67[a]	112	240	2.97	2.14	4.69[a]	69
201	0.14	0.67	-2.25[b]	108	221	0.54	0.91	-0.57	124	229	1.22	1.47	3.38[a]	123	211	2.85	2.16	8.16[a]	90
238	0.14	0.68	-2.09[b]	129	229	0.50	0.92	-0.42	132	215	1.22	1.51	3.05[a]	123	248	2.95	2.21	7.59[a]	85
209	0.14	0.69	-2.27[b]	140	215	0.51	0.94	-0.41	135	228	1.26	1.53	3.08[a]	127	228	2.89	2.22	6.18[a]	94
241	0.13	0.69	-2.05[b]	125	227	0.54	0.94	-0.33	137	227	1.26	1.54	3.07[a]	126	234	3.00	2.31	7.85[a]	93
244	0.15	0.71	-2.29[b]	144	244	0.55	0.96	-0.27	136	211	1.34	1.57	3.74[a]	99	241	2.94	2.36	9.30[a]	80
239	0.15	0.73	-1.89[c]	121	228	0.56	0.98	-0.09	140	217	1.26	1.57	3.37[a]	107	230	3.19	2.41	8.67[a]	88
227	0.16	0.74	-2.43[b]	146	247	0.54	0.98	-0.14	124	241	1.33	1.59	4.02[a]	109	224	2.91	2.43	6.73[a]	70
247	0.13	0.74	-2.21[b]	130	217	0.57	0.99	-0.04	118	237	1.32	1.66	3.28[a]	118	215	3.05	2.44	5.93[a]	90
221	0.16	0.75	-2.06[b]	131	259	0.47	1.05	0.21	114	247	1.30	1.67	2.77[a]	115	247	3.10	2.46	6.25[a]	85
235	0.15	0.75	-1.68[c]	127	248	0.64	1.10	0.52	129	248	1.52	1.81	4.41[a]	118	245	3.64	2.77	8.08[a]	92
601	0.14	0.75	-1.51	109	245	0.65	1.24	1.23	136	245	1.68	2.06	5.44[a]	124	237	3.77	2.90	16.10[a]	85
245	0.18	0.88	-0.55	145	601	0.57	1.26	1.83[c]	104	601	1.59	2.15	6.90[a]	93					
259	0.14	0.93	-0.68	113															
B. Individuals participated between 30 and 70 % of the times																			
252	0.09	0.46	-2.50[b]	67	204	0.48	0.74	-1.31	71	202	0.78	0.97	-0.20	89	607	1.97	1.67	5.50[a]	54
233	0.15	0.58	-2.43[b]	67	252	0.45	0.82	-0.68	71	205	0.79	1.05	0.30	89	608	1.94	1.75	2.87[a]	34
202	0.13	0.60	-2.41[b]	89	202	0.50	0.83	-0.98	89	204	1.07	1.23	1.41	71	205	2.09	1.81	4.27[a]	66
207	0.12	0.62	-2.73[a]	88	226	0.51	0.85	-0.79	72	259	0.73	1.25	0.88	81	604	2.90	1.90	12.15[a]	50
211	0.13	0.63	-2.32[b]	99	207	0.48	0.87	-0.69	88	226	1.16	1.29	1.77[c]	64	249	3.12	1.91	4.96[a]	32
230	0.14	0.65	-2.28[b]	91	233	0.61	0.87	-0.69	65	207	1.10	1.32	1.88[c]	88	203	2.71	1.95	12.48[a]	60
240	0.16	0.65	-2.12[b]	98	254	0.61	0.87	-0.75	52	246	1.38	1.33	1.53	42	207	2.61	1.99	4.32[a]	68
608	0.11	0.65	-2.28[b]	63	240	0.57	0.89	-0.54	92	604	1.17	1.33	2.87[a]	61	202	2.78	2.03	4.39[a]	63
232	0.15	0.66	-2.61[a]	95	201	0.44	0.90	-0.56	101	252	1.07	1.42	1.29	70	246	3.21	2.05	2.61[a]	37
225	0.14	0.69	-2.26[b]	47	205	0.44	0.90	-0.67	94	254	1.35	1.42	3.08[a]	40	225	3.39	2.11	10.87[a]	47
258	0.13	0.69	-1.82[c]	67	211	0.57	0.94	-0.33	99	208	1.57	1.43	2.70[a]	42	233	3.05	2.14	8.47[a]	58
203	0.16	0.71	-2.51[b]	60	232	0.53	0.94	-0.39	90	240	1.34	1.46	2.61[a]	84	204	2.30	2.18	3.23[a]	66
607	0.11	0.71	-2.04[b]	102	230	0.64	0.95	-0.24	89	203	1.51	1.50	3.08[a]	60	252	2.55	2.20	3.12[a]	50
204	0.15	0.72	-1.53	71	242	0.54	0.95	-0.27	71	230	1.44	1.53	3.01[a]	88	602	3.04	2.23	6.90[a]	58
266	0.15	0.72	-2.58[a]	55	236	0.62	1.01	0.06	86	233	1.52	1.56	3.50[a]	64	210	3.73	2.27	8.55[a]	36
218	0.14	0.73	-1.83[c]	95	607	0.42	1.03	0.34	97	607	1.09	1.56	4.71[a]	86	217	3.05	2.28	6.81[a]	56
254	0.15	0.74	-1.48	52	266	0.68	1.04	0.19	55	242	1.21	1.57	2.73[a]	69	208	3.73	2.38	15.58[a]	42
226	0.15	0.77	-1.69[c]	72	203	0.75	1.05	0.33	60	608	1.14	1.64	3.84[a]	62	232	3.19	2.41	8.54[a]	68
205	0.15	0.84	-1.51	97	256	0.64	1.07	0.38	73	218	1.23	1.65	2.67[a]	92	242	3.16	2.42	4.89[a]	45
602	0.13	0.90	-1.09	82	258	0.64	1.09	0.38	67	256	1.40	1.68	3.62[a]	55	266	3.49	2.44	8.52[a]	49
236	0.19	0.91	-0.69	94	608	0.48	1.09	0.64	63	232	1.44	1.71	4.28[a]	86	263	3.59	2.46	9.03[a]	35
606	0.15	0.92	-0.52	79	218	0.60	1.14	0.66	93	266	1.70	1.71	3.31[a]	55	239	1.94	2.50	4.15[a]	43
256	0.20	0.95	-0.79	73	604	0.60	1.14	1.21	68	201	1.36	1.73	4.10[a]	91	601	3.48	2.53	16.74[a]	63
604	0.19	0.95	-0.63	71	225	0.75	1.24	1.52	47	225	1.83	1.75	3.76[a]	47	226	3.34	2.57	10.39[a]	51
242	0.19	1.04	0.34	71	606	0.64	1.37	1.18	79	258	1.30	1.77	4.64[a]	51	606	4.00	2.78	11.00[a]	65
246	0.54	2.09	0.95	62	246	0.86	1.44	1.25	53	602	1.31	1.92	5.42[a]	81	201	3.41	2.81	7.87[a]	64
					602	0.57	1.55	3.02[a]	81	236	1.73	2.08	6.12[a]	76	236	3.60	2.82	19.49[a]	59
										606	1.72	2.17	4.76[a]	79					

Note: The row for Mean corresponds to the performance of the mean forecast over all individuals. The numbers in the ID column are identifications of money-market players as used by Prospera. Relative RMSE (RRMSE) is given as the RMSE for each respondent (or the mean forecast) divided by the RMSE of the corresponding random-walk forecast. The Diebold-Mariano test (DM) provides the test's t-statistic calculated using Newey-West standard errors. a, b and c indicate significance of a two-tailed test at 1, 5 and 10 % level, respectively. N denotes the number of forecast errors evaluated.

4. Conclusions

The analysis conducted in this paper suggests a general inability of market participants to outperform the random-walk forecast for the exchange rate variables and the five-year government bond yield, where none of the money-market players that frequently participate in the survey manage to significantly outperform the random-walk forecast at any horizon. The only variable and horizon where the money-market players succeed in significantly outperforming the random walk is the central bank's policy rate at the 3-month horizon.

At a general level our results hence echo those of Kladívko and Österholm (2021) who based their analysis on aggregated data. Using micro-level data in this paper does, however, show that the inability to outperform the random-walk forecast is not only found at the aggregate level – it is clear that no respondent is forecasting well. Accordingly, the weak performance of survey-based forecasts is not a by-product of aggregation, but a feature of the underlying micro-level data. Similarly, where the money-market players succeed at an aggregate level, it also applies widely across respondents. It seems that the general conclusion from the literature concerned with forecasting interest rates and exchange rates – namely that it is difficult to consistently outperform the random walk (Rossi, 2013; Bauer, 2017) – is something that basically all money-market players in the *Prospera Survey* experience.

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