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Strategic Bias and Professional Affiliations of Macroeconomic Forecasters

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This paper investigates strategic motives of macroeconomic forecasters and the effect of their professional affiliations. The "wishful expectations hypothesis" suggests that a forecaster predicts what his employer wishes. The "publicity hypothesis" argues that forecasters are evaluated by both accuracy and ability to generate publicity, and that forecasters in industries that emphasize publicity most will make most extreme and least accurate predictions. The "signaling hypothesis" asserts that an extreme forecast signals confidence in own ability, because incompetent forecasters would mimic others to avoid public notice. Empirical evidence from a 26-year panel of annual GDP forecasts is consistent with the publicity hypothesis. This indicates that conventional tests of rationality are biased toward rejecting the rational expectations hypothesis.

JEL Classification Codes: E37; C53; D84.

Keywords: forecast evaluation; rational expectations hypothesis; herd behavior; reputation.

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1. Introduction

Over the last few decades, rationality of macroeconomic forecasts has been the subject of controversy. The empirical evidence of panel data is totally mixed: while some studies find bias and inefficiency,[1] others do not.[2] The conclusions of these analyses, however, rely on the crucial assumption that forecasters aim to minimize expected squared forecast errors. This assumption might be at variance with the reality, because there are various reasons for rational forecasters to announce forecasts different from the conditional expected value. Ito (1990) analyzes yen-dollar exchange rate forecasts and finds industry-specific bias in the direction that would benefit the forecaster's employer ("wishful expectations hypothesis"). Laster, Bennett, and Geoum (1999) develop a model of rational forecast bias in which forecasters compromise accuracy to gain publicity for their firms. The model predicts that, the more the forecaster's wage depends on publicity, the more extreme and the less accurate the forecast is ("publicity hypothesis"). Ashiya and Doi (2001) argue that incompetent forecasters try to reduce the risk of an extremely low reputation by mimicking other forecasters, and hence a person whose forecast is different from others must have confidence in his own ability ("signaling hypothesis").[3]

Little is known, however, about the validity of these hypotheses. Pons-Novell (2003) finds industry-specific bias in the U.S. unemployment rate forecasts, but this result is difficult to interpret as evidence for the wishful expectations hypothesis.[4] Furthermore, Laster et al. fail to find evidence for the wishful expectations hypothesis in the growth rate forecasts. As for the publicity hypothesis, the empirical test of Laster et al. is incomplete,[5] and there is no other empirical study on it. As for the signaling hypothesis, Ashiya and Doi do not provide any empirical evidence.

This paper evaluates these three hypotheses using a 26-year panel of annual GDP forecasts. Section 2 explains the data, and Section 3 shows the results. Section 3-1 examines the wishful expectations hypothesis, but we do not find positive evidence. Section 3-2 employs an improved method of Laster et al. and confirms the publicity hypothesis. This result indicates that, by neglecting the effect of professional affiliations of forecasters, conventional rationality tests might reject the rational expectations hypothesis falsely. Section 3-3 tests the signaling hypothesis. We carefully control the publicity effect, and find that the regression result is inconsistent with the signaling hypothesis. Section 4 concludes the paper.

2. Data

Toyo Keizai Inc. has published the forecasts of about 70 Japanese institutions (banks, securities firms, trading companies, insurance companies, and research institutions) in the February or March issue of "Monthly Statistics (Tokei Geppo)" since the 1970s. In every December, institution *i* releases forecasts of the Japanese real GDP growth rate for the ongoing fiscal year and for the next fiscal year. We call the former $f_{t,t}^{i}$ and the latter $f_{t,t+1}^{i}$. For example, the February 2006 issue contains forecasts for fiscal year 2005 (from April 2005 to March 2006) and for fiscal year 2006 (from April 2006 to March 2007). We treat the former as $f_{2005,2005}^{i}$ and the latter as $f_{2005,2006}^{i}$.

Since the participation rate was very low throughout the 1970s (on average 13.8 institutions per year), we use the forecasts published from February 1981 on. That is, we use $f_{t,t}^{i}$ for the fiscal years 1980 through 2005 and $f_{t,t+1}^{i}$ for the fiscal years 1981 through 2005. We exclude institutions that participated in fewer than 10 surveys, leaving 53 institutions. The average number of observations per institution is 19.42 for current-year forecasts ($f_{t,t}^{i}$) and 19.19 for year-ahead forecasts ($f_{t,t+1}^{i}$). We divide these 53 institutions into five industry categories: banks (19 institutions), securities firms (12), trading companies (8), insurance companies (7), and research institutions (7). Let $Bank^{i}$, $Security^{i}$, $Trading^{i}$, $Insurance^{i}$, and $Research^{i}$ be the industry dummies.

As for the actual growth rate g_t, Keane and Runkle (1990) argue that the revised data introduce a systematic bias because the extent of revision is unpredictable for the forecasters (see also Stark and Croushore (2002)). For this reason, we use the initial announcement of the Japanese government usually released in June. (We obtain the same results by using the revised data of g_t released in June of year $t+2$.) The Japanese economy experienced four business cycles in our sample period: the peaks were 1984, 1990, 1996, and 2000, and the troughs were 1981, 1986, 1993, 1998, and 2001.

3. Results

3-1. Wishful expectations hypothesis

Ito (1990) analyzes a survey data of yen-dollar exchange rate expectations, and finds that there are "wishful expectations" among forecasters: Japanese exporters expect a yen depreciation (relative to others), and Japanese importers expect a yen appreciation.

As for the GDP forecast, banks, security firms, trading companies, and insurance companies desire strong growth, because it stimulates their sales. On the other hand, research institutions are relatively indifferent to the strength of the economy. Therefore the wishful expectations hypothesis implies that forecasters in banks, security firms, trading companies, and insurance companies will make optimistic forecasts. In other words, the hypothesis implies that forecasters in research industry make pessimistic forecasts relative to others. We test this implication by regressing the deviation of individual forecasts from the consensus (i.e. the mean forecast) on industry dummies. Let $\bar{f}_{t,t}^{-i} \equiv \frac{1}{52}\sum_{j\neq i} f_{t,t}^{j}$ be the average of the current-year forecasts excluding institution *i*. Then $DEV_{t,t}^{i} \equiv f_{t,t}^{i} - \bar{f}_{t,t}^{-i}$, the forecast deviation, indicates the degree of *i*'s optimism relative to the mean forecast in year *t*. $DEV_{t,t}^{i} > 0$ ($DEV_{t,t}^{i} < 0$) indicates forecaster *i* is relatively optimistic (pessimistic) in year *t*. The regressions we consider are

$$DEV_{t,t}^{i} = \alpha + \beta_B \cdot Bank^i + \sum_{s=1980}^{2004} \gamma_s \cdot dum_t(s) + u_{t,t}^{i}, \tag{1B}$$

$$DEV_{t,t}^{i} = \alpha + \beta_S \cdot Security^i + \sum_{s=1980}^{2004} \gamma_s \cdot dum_t(s) + u_{t,t}^{i}, \tag{1S}$$

$$DEV_{t,t}^{i} = \alpha + \beta_T \cdot Trading^i + \sum_{s=1980}^{2004} \gamma_s \cdot dum_t(s) + u_{t,t}^{i}, \tag{1T}$$

$$DEV_{t,t}^{i} = \alpha + \beta_I \cdot Insurance^i + \sum_{s=1980}^{2004} \gamma_s \cdot dum_t(s) + u_{t,t}^{i}, \text{ and} \tag{1I}$$

$$DEV_{t,t}^{i} = \alpha + \beta_R \cdot Research^i + \sum_{s=1980}^{2004} \gamma_s \cdot dum_t(s) + u_{t,t}^{i}, \tag{1R}$$

where $dum_t(s)$ ($s = 1980, \cdots, 2004$) denotes the year dummy and

$$dum_t(s) = \begin{cases} 1 & \text{if} \quad s = t \\ 0 & \text{o t h e r w} \end{cases}.$$

We add the year dummies to control on specific factors in each year. (We obtain the same result for all regressions without the year dummies.) If β_j is positive, forecasters in industry *j* tend to be more optimistic than those in other industries. The wishful expectations hypothesis predicts β_R to be significantly *negative*. The same regression is also considered for the year-ahead forecasts.

Table 1 summarizes the result. (We obtain the same result when we put all industry dummies except $Insurance^i$ into the regression. See Table A1 in the Appendix.) The parentheses indicate the heteroskedasticity-consistent standard errors of White (1980). The coefficients of the year dummies are not reported. The dummies for research institutions are significantly *positive*. Moreover, the dummy for banks in the year-ahead forecasts is significantly negative. According to the wishful expectations hypothesis, this result indicates that forecasters in banks desire a stagnant economy, which is contrary to our common sense. Therefore the wishful expectations hypothesis is not supported by our data.

3.2 Publicity hypothesis

Laster et al. (1999) assume that forecasters' wages are based on both their accuracy and their ability to generate publicity for their firms. The most accurate forecaster in a given period gains media exposure, which is more effective than a paid advertisement in attracting new clients to the firm. The chance of winning extensive publicity, however, decreases as the number of similar forecasts increases. Each forecaster thus has an incentive to differentiate his forecast from others at the price of forecast accuracy.

In equilibrium, forecasters whose wages do not depend on publicity will minimize the expected forecast error. Let us name them Type *A* forecasters. Those whose wages depend heavily on publicity, in contrast, will differentiate themselves from the Type A forecasters. Let us name them Type *P* forecasters. Then, by definition, the expected forecast errors of Type *P* forecasters are larger than those of Type *A* forecasters. If there are more than two types of forecasters, forecasters working in industries that offer greater relative reward for publicity will make predictions that are more extreme and less accurate.

To sum up, the model of Laster et al. (1999) indicates that

(H1) reward for publicity and extremeness of forecasts are positively correlated; and

(H2) reward for publicity and accuracy of forecasts are negatively correlated.

To establish this "publicity hypothesis", both (H1) and (H2) must be confirmed. Since Laster et al. have tested only (H1), their empirical method is imperfect and unsatisfactory. This paper examines both hypotheses in order.

First we examine (H1) by the following regressions:

$$\left|DEV_{t,t}^{i}\right| = \alpha + \beta_B \cdot Bank^i + \sum_{s=1980}^{2004} \gamma_s \cdot dum_t(s) + u_{t,t}^{i}\,, \tag{2B}$$

$$\left|DEV_{t,t}^{i}\right| = \alpha + \beta_S \cdot Security^i + \sum_{s=1980}^{2004} \gamma_s \cdot dum_t(s) + u_{t,t}^{i}\,, \tag{2S}$$

$$\left|DEV_{t,t}^{i}\right| = \alpha + \beta_T \cdot Trading^i + \sum_{s=1980}^{2004} \gamma_s \cdot dum_t(s) + u_{t,t}^{i}\,, \tag{2T}$$

$$\left|DEV_{t,t}^{i}\right| = \alpha + \beta_I \cdot Insurance^i + \sum_{s=1980}^{2004} \gamma_s \cdot dum_t(s) + u_{t,t}^{i}\,, \text{ and} \tag{2I}$$

$$\left|DEV_{t,t}^{i}\right| = \alpha + \beta_R \cdot Research^i + \sum_{s=1980}^{2004} \gamma_s \cdot dum_t(s) + u_{t,t}^{i}\,. \tag{2R}$$

$\left|DEV_{t,t}^{i}\right| \equiv \left|f_{t,t}^{i} - \bar{f}_{t,t}^{-i}\right|$ is the absolute forecast deviation from the mean forecast. If β_j is positive, forecasters in industry *j* tend to make forecasts more different from the consensus than those in other industries do. In Japan, forecasters who work for research institutions benefit relatively most from favorable publicity. Therefore they are expected to produce the most extreme and the least accurate forecasts. On the other hand, trading companies will emphasize accuracy because they use economic forecasts for internal planning purpose only. Banks, securities firms, and insurance companies will occupy intermediate positions. Consequently, we expect β_R to be significantly positive and larger than any other β_j. We also expect β_T to be significantly negative and smaller than any other β_j. Furthermore, we expect to find these publicity effects mainly in the year-ahead forecasts for the following two reasons. Firstly, all forecasters know the actual growth rate of the first half of the current fiscal year when they release the forecasts. Hence there is little room to make a differentiated current-year forecast. Secondly, since the current-year forecasts tend to be similar, the year-ahead forecasts draw the attention of the mass media much more than the current-year forecasts do.

The results in Table 2 support (H1). (We obtain the same results when we put all industry dummies except $Insurance^i$ into the regression. See Table A2 in the Appendix.) In both the current-year and the year-ahead forecasts, the coefficient for the research institutions dummy is significantly positive and is larger than any other coefficients. This indicates that the research institutions on average release the most extreme forecasts. The coefficient for the trading-companies dummy is significantly negative and is smaller than any other coefficients in the year-ahead forecasts. The trading companies dummy in the current-year forecasts turns out to be insignificant. This result indicates that the media pays so little attention to the current-year forecasts that forecasters in banks, securities firms, and insurance companies do not have an incentive to differentiate their current-year forecasts from the consensus.

Next we examine (H2) by the following regressions:

$$\left|FE_{t,t}^{i}\right| = \alpha + \beta_B \cdot Bank^i + \sum_{s=1980}^{2004} \gamma_s \cdot dum_t(s) + u_{t,t}^{i}, \tag{3B}$$

$$\left|FE_{t,t}^{i}\right| = \alpha + \beta_S \cdot Securities^i + \sum_{s=1980}^{2004} \gamma_s \cdot dum_t(s) + u_{t,t}^{i}, \tag{3S}$$

$$\left|FE_{t,t}^{i}\right| = \alpha + \beta_T \cdot Trading^i + \sum_{s=1980}^{2004} \gamma_s \cdot dum_t(s) + u_{t,t}^{i}, \tag{3T}$$

$$\left|FE_{t,t}^{i}\right| = \alpha + \beta_I \cdot Insurance^i + \sum_{s=1980}^{2004} \gamma_s \cdot dum_t(s) + u_{t,t}^{i}, \text{ and} \tag{3I}$$

$$\left|FE_{t,t}^{i}\right| = \alpha + \beta_R \cdot Research^i + \sum_{s=1980}^{2004} \gamma_s \cdot dum_t(s) + u_{t,t}^{i}, \tag{3R}$$

where $\left|FE_{t,t}^{i}\right| \equiv \left|f_{t,t}^{i} - g_t\right|$ is the absolute forecast error of the current-year forecast made by institution i in year t. If β_j is positive, forecasters in industry j tend to make forecasts less accurate than those in other industries do. The publicity hypothesis indicates that those who seek publicity by making extreme forecasts tend to be less accurate. Therefore, from the results of Table 2, we expect β_R to be significantly positive and larger than any other β_j. We also expect β_T in the year-ahead forecasts to be significantly negative and smaller than any other β_j. (We do not expect β_T in the current-year forecasts to be significant because the forecast extremeness of the trading companies is similar to other industries in the current-year forecasts.)

Table 3 presents the results. (We obtain the same results when we put all industry dummies except $Insurance^i$ into the regression. See Table A3 in the Appendix.) As for β_R, although it is not statistically significant, it is larger than any other coefficients in both the current-year and the year-ahead forecasts. As for β_T in the year-ahead forecasts, it is significantly negative and smaller than any other coefficients. These results offer considerable support for (H2).

Since (H1) and (H2) both are supported, our empirical results are consistent with the publicity hypothesis.

3-3. Signaling hypothesis

Ashiya and Doi (2001) generalize the model of Scharfstein and Stein (1990) and consider the following situation. Each forecaster receives a private signal of the economy. Those with high ability obtain accurate signals that are correlated with other competent forecasters. Those with low ability obtain inaccurate signals that are uncorrelated with other forecasters. Forecasters and their clients do not know the true ability of each forecaster (including themselves). The clients revise the belief about each forecaster's ability using past forecast records, and the forecasters revise the belief about their own ability using the accuracy of their own past signals.

In this model, it is risky to make a forecast different from others because a forecaster acquires a bad reputation when only his forecast proves inaccurate. (Note that competent forecasters receive similar signals.) Hence, a person who has no confidence in his own ability mimics others in order to avoid a low evaluation. An experienced forecaster, on the other hand, stops herding if his past signals were accurate enough. The reason is that he can demonstrate his confidence in his own ability by making a forecast different from others.

If this argument were correct, then we would observe a *negative* correlation between $\left|DEV_{t,t}^{i}\right|$ (the absolute forecast deviation from the mean forecast) and $\left|FE_{t,t}^{i}\right|$ (the absolute forecast error). Table 4 presents the result of the following regression:

$$\left|FE_{t,t}^{i}\right| = \alpha + \beta \cdot \left|DEV_{t,t}^{i}\right| + \sum_{s=1980}^{2004} \gamma_s \cdot dum_t(s) + u_{t,t}^{i}. \qquad (4)$$

β turns out to be significantly positive for both the current-year and the year-ahead forecasts, which is in contradiction to the "signaling hypothesis".

One might argue that the "publicity effect" has blurred out the "signaling effect" in the above regression. As we saw in Section 3-2, the publicity hypothesis implies that reward for publicity is positively correlated with extremeness of forecasts and negatively correlated with accuracy of forecasts. In other words, the publicity hypothesis implies negative correlation between forecast extremeness and forecast accuracy. That is, $\left|DEV_{t,t}^{i}\right|$ and $\left|FE_{t,t}^{i}\right|$ must be *positively* correlated across industries under the publicity hypothesis. Therefore the joint effect of the publicity hypothesis and the signaling hypothesis on the coefficient of $\left|DEV_{t,t}^{i}\right|$ is indeterminate.

We address this problem by estimating the intra-industry effect of $\left|DEV_{t,t}^{i}\right|$ on $\left|FE_{t,t}^{i}\right|$. The publicity hypothesis predicts that those whose wages depend heavily on publicity will make more extreme and less accurate forecasts. The reward for publicity will differ among different companies, but similar reward structures will be applied within the same industry. Thus forecasters in the same industry will choose similar combinations of accuracy and publicity. Namely, the publicity effect will be insignificant *within* industries.

The modified regression we consider is

$$\begin{aligned}\left|FE_{t,t}^{i}\right| &= \alpha + \beta_B \cdot \left|DEV_{t,t}^{i}\right| \cdot Bank^i + \beta_S \cdot \left|DEV_{t,t}^{i}\right| \cdot Security^i + \beta_T \cdot \left|DEV_{t,t}^{i}\right| \cdot Trading^i \\ &+ \beta_I \cdot \left|DEV_{t,t}^{i}\right| \cdot Insurance^i + \beta_R \cdot \left|DEV_{t,t}^{i}\right| \cdot Research^i + \sum_{s=1980}^{2004} \gamma_s \cdot dum_t(s) + u_{t,t}^{i}\end{aligned} \quad . (5)$$

If relative reward for publicity is similar within industry *j*, then the publicity effect must be negligible within industry *j*, and the signaling effect must prevail. Therefore we expect every β_j to be significantly negative.

Table 5 shows the result, which is opposite to the prediction: no β_j is negative. The signaling hypothesis of Ashiya and Doi (2001) is rejected even after eliminating the publicity effect.

4. Conclusions

This paper has evaluated three strategic motives of macroeconomic forecasters by a 26-year panel of annual GDP forecasts. The "wishful expectations hypothesis" suggests that forecasters distort their predictions in the direction that would benefit their employers, but we have not found such tendencies. The "signaling hypothesis" argues that competent forecasters signal confidence in their own ability by differentiating their forecasts from others, and that we would observe a negative correlation between the absolute forecast error and the degree of forecast extremeness. This assertion, however, is not consistent with the data.

The “publicity hypothesis” predicts that, since forecasters’ wages are based on both their accuracy and their ability to generate publicity for their firms, forecasters in industries that emphasize publicity will make more extreme and less accurate forecasts. We have made a thorough investigation into this hypothesis, and have obtained supportive evidence.

Our result indicates that rational forecasters compromise accuracy in order to gain publicity for their firms. Since they have objectives other than minimizing expected forecast errors, predictable bias in forecasts may not be a sign of irrationality. Therefore the unbiasedness test and the efficiency test, which are common in the literature, are biased toward rejecting the rational expectations hypothesis.

To eliminate this contamination of the publicity effect from the rationality test, we must give proper consideration to the professional affiliations of the survey participants. Whether the publicity effect is observed in other forecasts is an important topic for future research.

Notes

1. Batchelor and Dua (1992), Davies and Lahiri (1995), Jansen and Kishan (1996), Pons (1999), Loungani (2001), and Ashiya (2006).
2. Holden and Peel (1985), Keane and Runkle (1990), Batchelor and Dua (1991), Joutz and Stekler (2000), Oller and Barot (2000), and Ashiya (2005).
3. Ehrbeck and Waldmann (1996) present various signaling models that might explain biases in forecast revisions (i.e. new forecasts minus previous forecasts for the same period). However, their models are empirically rejected by Ehrbeck and Waldmann (1996), Loffler (1998), and Ashiya (2003).
4. More specifically, Pons-Novell (2003) finds (1) the dummy for miscellaneous institutions is significantly positive and (2) the dummy for the investment banking is significantly negative. However, the first result is difficult to interpret because all of the government, Federal Reserve, insurance companies, and labor organizations are classified into this category. The relevance of the second result to the wishful expectations hypothesis is also unclear because we do not know whether the investment banks benefit from low unemployment rates more than the government or the commercial banks do.
5. We will discuss this issue in Section 3-2.

References

Ashiya, Masahiro, and Doi, Takero, 2001, "Herd Behavior of Japanese Economists," Journal of Economic Behavior and Organization, 46, 343-346.

Ashiya, Masahiro, 2003, "Testing the Rationality of Japanese GDP Forecasts: the Sign of Forecast Revision matters," Journal of Economic Behavior and Organization, 50, 263-269.

Ashiya, Masahiro, 2005. "Twenty-two Years of Japanese Institutional Forecasts." Applied Financial Economics Letters, 1, 79-84.

Ashiya, Masahiro, 2006. "Testing the Rationality of Forecast Revisions Made by the IMF and the OECD." Journal of Forecasting, 25, 25-36.

Batchelor, Roy, and Dua, Pami, 1991, "Blue Chip Rationality Tests," Journal of Money, Credit, and Banking, 23, 692-705.

Batchelor, Roy, and Dua, Pami, 1992, "Conservatism and Consensus-seeking among Economic Forecasters," Journal of Forecasting, 11, 169-181.

Davies, A. and Lahiri, K., 1995, "A New Framework for Analyzing Three-dimensional Panel Data," Journal of Econometrics, 68, 205-227.

Ehrbeck, T., Waldmann, R., 1996, "Why Are Professional Forecasters Biased? Agency versus Behavioral Explanations." Quarterly Journal of Economics, 111, 21-40.

Holden, K., and Peel, D.A., 1985, "An Evaluation of Quarterly National Institute Forecasts," Journal of Forecasting, 4, 227-234.

Ito, Takatoshi, 1990, "Foreign Exchange Rate Expectations: Micro Survey Data," American Economic Review, 80, 434-449.

Jansen, D.W., and Kishan, R.P., 1996, "An Evaluation of Federal Reserve Forecasting," Journal of Macroeconomics, 18, 89-109.

Joutz, F., and Stekler, H.O., 2000, "An Evaluation of Predictions of Federal Reserve," International Journal of Forecasting, 16, 17-38.

Keane, M.P., Runkle, D.E., 1990. "Testing the Rationality of Price Forecasts: New Evidence from Panel Data." American Economic Review, 80, 714-735.

Laster, David, Bennett, Paul, and Geoum, In Sun, 1999, "Rational Bias in Macroeconomic Forecasts," Quarterly Journal of Economics, 114, 293-318.

Loffler, Gunter, 1998, "Biases in Analyst Forecasts: Cognitive, Strategic, or

Second-Best?" International Journal of Forecasting, 14, 261-275.

Loungani, Prakash, 2001, "How Accurate Are Private Sector Forecasts? Cross-country Evidence from *Consensus Forecasts* of Output Growth," International Journal of Forecasting, 17, 419-432.

Oller, L.E., and Barot, B, 2000, "Comparing the Accuracy of European GDP Forecasts," International Journal of Forecasting, 16, 293-315.

Pons, Jordi, 1999, "Evaluating the OECD's Forecasts for Economic Growth," Applied Economics, 31, 893-902.

Ponds-Novell, Jordi, 2003, "Strategic Bias, Herding Behavior and Economic Forecasts," Journal of Forecasting, 22, 67-77.

Scharfstein, David S., and Stein, Jeremy C., 1990, "Herd Behavior and Investment," American Economic Review, 80, 464-79.

Stark, Tom, Croushore, Dean, 2002, "Forecasting with a Real-time Data Set for Macroeconomists." Journal of Macroeconomics, 24, 507-531.

White, Halbert, 1980. "A Heteroskedasticity-consistent Covariance Matrix and a Direct Test for Heteroskedasticity." Econometrica, 48, 817-838.

Table 1: Wishful expectations hypothesis

Dependent variable: $DEV^{i}_{t,t} \equiv f^{i}_{t,t} - \bar{f}^{-i}_{t,t}$

	Current year	Year-ahead
Bank	-0.006 (0.016)	-0.099 (0.026)***
Security	-0.028 (0.020)	-0.006 (0.035)
Trading	-0.000 (0.025)	-0.008 (0.031)
Insurance	-0.009 (0.023)	0.036 (0.037)
Research	0.059 (0.025)**	0.177 (0.047)***
Year dummies	Yes	Yes
Obs.	1029	1017

Notes
The heteroskedasticity-consistent standard errors of White (1980) are in parentheses.
***: Significant at the 0.01 level.
**: Significant at the 0.05 level.
*: Significant at the 0.10 level.

Table 2: Extremeness of forecasts

Dependent variable: $\left|DEV_{t,t}^{i}\right| \equiv \left|f_{t,t}^{i} - \bar{f}_{t,t}^{-i}\right|$

	Current year	Year-ahead
Bank	-0.025 (0.011)**	-0.061 (0.016)***
Security	-0.001 (0.014)	0.051 (0.022)**
Trading	0.009 (0.018)	-0.065 (0.018)***
Insurance	-0.007 (0.015)	-0.013 (0.022)
Research	0.046 (0.016)***	0.127 (0.030)***
Year dummies	Yes	Yes
Obs.	1029	1017

Notes
The heteroskedasticity-consistent standard errors of White (1980) are in parentheses.
***: Significant at the 0.01 level.
**: Significant at the 0.05 level.
*: Significant at the 0.10 level.

Table 3: Forecast accuracy

Dependent variable: $\left|FE_{t,t}^{i}\right| \equiv \left|f_{t,t}^{i} - g_{t}\right|$

	Current year	Year-ahead
Bank	0.008 (0.014)	0.026 (0.024)
Security	-0.041 (0.016)**	-0.032 (0.033)
Trading	0.025 (0.021)	-0.065 (0.028)**
Insurance	-0.014 (0.022)	0.025 (0.034)
Research	0.029 (0.023)	0.040 (0.045)
Year dummies	Yes	Yes
Obs.	1029	1017

Notes
The heteroskedasticity-consistent standard errors of White (1980) are in parentheses.
***: Significant at the 0.01 level.
**: Significant at the 0.05 level.
*: Significant at the 0.10 level.

Table 4: Signaling hypothesis

Model: $\left|FE_{t,t}^{i}\right| = \alpha + \beta \cdot \left|DEV_{t,t}^{i}\right| + \sum_{s=1980}^{2004} \gamma_s \cdot dum_t(s) + u_{t,t}^{i}$

	Current year	Year-ahead
β	0.442 (0.090)***	0.303 (0.087)***
Year dummies	Yes	Yes
R^2	0.749	0.856
Obs.	1029	1017

Table 5: Signaling hypothesis within industries

$$\left|FE_{t,t}^{i}\right| = \alpha + \beta_B \cdot \left|DEV_{t,t}^{i}\right| \cdot Bank^{i} + \beta_S \cdot \left|DEV_{t,t}^{i}\right| \cdot Security^{i} + \beta_T \cdot \left|DEV_{t,t}^{i}\right| \cdot Trading^{i}$$
$$+ \beta_I \cdot \left|DEV_{t,t}^{i}\right| \cdot Insurance^{i} + \beta_R \cdot \left|DEV_{t,t}^{i}\right| \cdot Research^{i} + \sum_{s=1980}^{2004} \gamma_s \cdot dum_t(s) + u_{t,t}^{i}$$

	Current year	Year-ahead
Bank	0.542 (0.104)***	0.392 (0.125)***
Security	0.150 (0.110)	0.214 (0.138)
Trading	0.582 (0.117)***	0.029 (0.153)
Insurance	0.460 (0.168)***	0.392 (0.135)***
Research	0.520 (0.111)***	0.342 (0.130)***
Year dummies	Yes	Yes
R^2	0.759	0.858
Obs.	1029	1017

Notes
The heteroskedasticity-consistent standard errors of White (1980) are in parentheses.
***: Significant at the 0.01 level.
**: Significant at the 0.05 level.
*: Significant at the 0.10 level.

Table A1: Wishful expectations hypothesis

$$DEV_{t,t}^{i} = \alpha + \beta_B \cdot Bank^i + \beta_S \cdot Security^i + \beta_T \cdot Trading^i + \beta_R \cdot Research^i + \sum_{s=1980}^{2004} \gamma_s \cdot dum_t(s) + u_{t,t}^{i}$$

	Current year	Year-ahead
Bank	0.004 (0.025)	-0.094 (0.039)**
Security	-0.014 (0.028)	-0.037 (0.047)
Trading	0.008 (0.032)	-0.040 (0.044)
Research	0.059 (0.032)*	0.120 (0.056)**
Year dummies	Yes	Yes
R^2	0.008	0.028
Obs.	1029	1017

Notes
The heteroskedasticity-consistent standard errors of White (1980) are in parentheses.
***: Significant at the 0.01 level.
**: Significant at the 0.05 level.
*: Significant at the 0.10 level.

Table A2: Extremeness of forecasts

$$\left|DEV_{t,t}^{i}\right| = \alpha + \beta_B \cdot Bank^i + \beta_S \cdot Security^i + \beta_T \cdot Trading^i$$
$$+ \beta_R \cdot Research^i + \sum_{s=1980}^{2004} \gamma_s \cdot dum_t(s) + u_{t,t}^{i}$$

	Current year	Year-ahead
Bank	-0.009 (0.015)	-0.027 (0.024)
Security	0.005 (0.018)	0.051 (0.028)*
Trading	0.014 (0.023)	-0.044 (0.026)*
Research	0.046 (0.020)**	0.120 (0.035)***
Year dummies	Yes	Yes
R^2	0.052	0.091
Obs.	1029	1017

Notes
The heteroskedasticity-consistent standard errors of White (1980) are in parentheses.
***: Significant at the 0.01 level.
**: Significant at the 0.05 level.
*: Significant at the 0.10 level.

Table A3: Forecast accuracy

$$\left|FE_{t,t}^{i}\right| = \alpha + \beta_B \cdot Bank^i + \beta_S \cdot Security^i + \beta_T \cdot Trading^i$$
$$+ \beta_R \cdot Research^i + \sum_{s=1980}^{2004} \gamma_s \cdot dum_t(s) + u_{t,t}^{i}$$

	Current year	Year-ahead
Bank	0.017 (0.024)	-0.006 (0.036)
Security	-0.019 (0.025)	-0.047 (0.043)
Trading	0.034 (0.029)	-0.078 (0.040)*
Research	0.038 (0.030)	0.013 (0.053)
Year dummies	Yes	Yes
R^2	0.718	0.851
Obs.	1029	1017

Notes
The heteroskedasticity-consistent standard errors of White (1980) are in parentheses.
***: Significant at the 0.01 level.
**: Significant at the 0.05 level.
*: Significant at the 0.10 level.