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Strategic Behavior of Federal Open Market Committee Board Members: Evidence from Members' Forecasts

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Abstract

In this paper, we use panel data to test whether Federal Open Market Committee (FOMC) board members' forecasts are rational. Rationality is rejected in the sense that forecasts by members are heavily dependent on previous own forecasts and last consensus made in FOMC. Furthermore, we reveal the strategic behavior of FOMC board members. Forecasts by governors, who always have voting rights, agree much with the previous consensus of FOMC members' forecasts. On the other hand, non-governors, who rotate voting rights, exaggerate their forecasts: they aggressively deviate their forecasts from previous consensus. The former is *herding* behavior and the latter is *anti-herding* behavior. Our results imply that individual members behave strategically; governors want to present policy-consistent forecasts to the Congress and non-governors utilize their forecasts to influence decision making in FOMC.

JEL Classification: D03; E27; E43; E52

Keywords: anchoring; federal reserve; inflation forecast; herding; monetary policy

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1 Introduction

This paper aims to test the rationality of inflation forecasts by Federal Open Market Committee (FOMC) board members. In particular, we focus on the strategic behavior of individual board members using panel data on inflation forecasts submitted by FOMC members prior to the semiannual monetary policy report to the Congress.

In this paper, we use two concepts for testing the rationality of forecasting: *anchoring* and *herding*. The seminal study on *anchoring* is Tversky and Kahneman (1974), who find the possibility that decision making is not perfectly rational, and rather heuristic. Decision makers tend to use a simple rule such as anchoring, where the decision is based on some *uninformative* targets.[1] Tversky and Kahneman (1974) report that answers to such a simple but unfamiliar question as "What percentage of African countries is in the United Nations?" can be heavily influenced by an *uninformative* number suggested by the *Wheel of Fortune*. However, very little work has been done to analyze the presence of anchoring effects in real economic situations. Wansink, Kent, and Hoch (1998) study the psychological process behind the purchase quantity decision and Beggs and Graddy (2009) find anchoring effects in art auctions. Using financial data, Fujiwara et al. (2012) and Nakazono (2012) report anchoring effects of market participants in Japan.

Herding is closely related to anchoring.[2] According to Banerjee (1992), herding is defined as the behavior wherein "people will be doing what others are doing rather than using their information." For example, some economic activities such as fertility decisions and voting are heavily influenced by what other people are doing. In those cases, people deem others' decision making as *informative*, which contrasts with anti-herding to *uninformative* points. Banerjee (1992) and Zhang (1997) provide a theoretical framework for herding and point out that strong complementarity between each decision and asymmetric information can lead to herding. Recently, Park and Sabourian (2011) present a theoretical analysis on

[1] For the developments in studies on anchoring, see Chapman and Johnson (2002).

[2] For a comprehensive reference on modeling herding behavior, see Chamley (2004).

herding and contrarian behavior.[3]

There also exist many articles studying projections by the Federal Reserve, but until very recently, the aggregate data on each FOMC member's forecasts was only available for researchers. However, thanks to Romer (2010), who contributes to the compilation of individual forecasts semiannually made by each FOMC member from 1992, we are able to analyze the characteristics of these projections in light of heterogeneity among the board members. Using these new, unique data, we examine the existence of any anchoring effect and rationality in the projections by individual FOMC members. Although the literature on testing the rationality of decision-making, including forecasting, shows forecasters' "bounded rationality," early studies on forecasts by the Federal Reserve generally conclude rationality. For example, Romer and Romer (2000) and Sims (2002) examine the rationality of Federal Reserve forecasts in the "Green Book" prepared by the staff of the Board of Governors before each FOMC meeting, and conclude that the forecasts are rational. [4]

In this paper, we revisit rationality using a panel data set and find the following. First, rationality is rejected in the sense that forecasts by members are heavily dependent on previous own forecasts and last consensus made in FOMC. Individual members heavily rely on past forecasts when they submit their forecasts, while the average of projections made by the FOMC members seems to be rational. Second, we reveal strategic behavior of the FOMC board members. Estimation results from using panel data suggest that forecasts by governors, who always have voting rights, agree much with the previous consensus of FOMC members' forecasts. On the other hand, non-governors exaggerate their forecasts:

[3] Many works study herding behavior in financial markets, particularly the forecasting behavior of analysts or professional forecasters. See, for example, Bondt and Forbes (1999), Ehrbeck and Waldmann (1996), Fujiwara et al. (2012), Graham (1999), and Welch (2000).

[4] Chamley (2004) also concludes that a negative bias in the forecasts (systematic over-prediction) is rational if the central bank is cautious in the sense that inflation above the target is considered more costly than inflation below the target. This type of forecas behavior is called asymmetric loss. Empirical evidence on asymmetric loss has been found in inflation forecasts and in forecasts of other economic variables. See, Chamley (2004), Ito (1990), Elliott and Komunjer, and Timmermann (2008), and Patton and Timmermann (2007).

non-governors deviate their forecasts aggressively from the previous consensus. The former is *herding* behavior and the latter is *anti-herding* behavior. Our results imply that individual members behave strategically in the sense that governors want to present policy-consistent forecasts to the Congress and non-governors utilize their forecasts to influence decision-making in FOMC.

This paper is structured as follows. In Section 2, we explain the data and estimation strategy. Section 3 provides estimation results, and Section 4 discusses the implications of these results. Section 5 concludes.

2 Data and estimation strategy

2.1 Data

The data we use are based on those submitted for the semiannual monetary policy report to the Congress made in January/February and June/July of each year and now available for the period 1992–2001; the individual projections are open to the public after a lag of 10 years.[5] Each member of FOMC makes macroeconomic forecasts containing end-of-year nominal and real GDP growth rate, inflation[6], and the unemployment rate, which are denoted as percent changes from the same quarter in the previous year.[7] The board members make forecast on nominal and real GDP, consumer price index, unemployment rate, and personal consumption expenditure regularly twice a year.

Forecasts made in January/February are the point forecasts for the current calendar year, while two sets of forecasts are submitted in June/July: one set contains updated forecasts

[5]The data we use are available as “Projections for the Semiannual Monetary Policy Report to the Congress” in the Federal Reserve Bank of Philadelphia’s website: http://www.philadelphiafed.org/research-and-data/real-time-center/monetary-policy-projections/.

[6]Forecasts of inflation rate are available for the period 1992–1999.

[7]According to the Federal Reserve Bank of Philadelphia’s website, the data set will be updated annually and the projections do not include those of the Chairman because there is no record of those projections.

for the current calendar year and the other provides forecasts for the next calendar year. For simplicity, we refer to these projections as forecasts for the 12-month, 6-month, and 18-month horizons, respectively.

The data are vital because these represent the panel data of forecasts made by FOMC members, and allows analysts to examine individual members' behavior. Because this dataset provides each member's forecasts, one can identify members who made relatively higher forecasts of inflation rates, observe governors' records of forecasts, and observe heterogeneity among the members. In fact, there exist several empirical studies suggesting dissonance and strategic behavior among FOMC members. Tillmann (2011) and Banterng-hansa and McCracken (2009) find systematic differences in individual inflation forecasts submitted by voting and non-voting members. Rülke and Tillmann (2011) show that the inflation forecasts show strong evidence of anti-herding and that anti-herding is more important for non-voting members than for voters.

Table 1 shows the statistics of the panel data from all members, governors, non-governors,[8] voting members, and non-voting members. Table 1 reveals an interesting point about dispersion of data: non-governors' forecasts are more dispersed than those of governors. The values of maximum and minimum are given by non-governors and these result in higher standard deviations. The same is the case with non-voting members. When you compare the standard deviations of data from voting members with those from non-voting members, you find a similar tendency in governors' and non-governors'.

Figures 1 and 2 support the tendencies; Figures 1 and 2 illustrate governors' and non-governors' forecasts on consumer price index in the 18-month horizon, respectively. It is easy to see which figure covers whose forecasts: Figure 1 covers the governors'. The data in Figure 1 are closely-spaced, and this shows that forecasts by governors seem to be well consolidated. Meanwhile, the data from non-governors in Figure 2 are widely spread partic-

[8] In what follows, governors consist of each governor (excluding the chairman) and the president of the Federal Reserve Bank of New York: they all have voting rights on monetary policy. Non-Governors cover the other eleven regional bank presidents who rotate voting rights on monetary policy.

ularly in the first half of the 1990s. The shows the large disagreement on inflation forecasts among non-governors.

2.2 Estimation strategy

Do FOMC members determine their own forecasts rationally or behaviorally by relying on past forecasts? In response to this question, we use panel data to examine behavioral patterns of FOMC board members.

2.2.1 Test of dependency on past forecasts using aggregate data

First, we test the rationality of FOMC members using aggregate data. To do this, we consider a partial adjustment model of survey forecasts as in Ichiue and Yuyama (2009):

$$\bar{S}_{t \to t+n} = \rho \bar{S}_{t-k \to t+n} + (1-\rho) E_t[\pi_{t+n}], \tag{1}$$

where $\bar{S}_{t \to t+n}$ and π_{t+n} denote the current consensus of FOMC members aggregated in period t with consumer price index as in period $t+n$ and the ex-post realized value in period $t+n$, respectively and ρ measures the degree of inertia in the expectation. Naturally, if $\rho = 0$, the current survey forecasts $\bar{S}_{t \to t+n}$ are equal to the market expectations conditional on the information available at time t, namely $E_t[\pi_{t+n}]$. Here, $0 \leq \rho < 1$ implies that the current survey forecasts are influenced by previous surveys, while $\rho < 0$ implies that forecasters have a tendency to rather boldly revise their forecasts away from the previous consensus, which suggests anti-herding or bold behavior.[9] By using the definition of forecast errors, equation (1) can be further rewritten as

$$\pi_{t+n} - \bar{S}_{t \to t+n} = \beta(\bar{S}_{t \to t+n} - \bar{S}_{t-k \to t+n}) + \eta_{t \to t+n}, \tag{2}$$

where

$$\beta = \frac{\rho}{1-\rho},$$

[9]This tendency is considered as *anti-herding* or *bold* behavior. For an intuitive explanation of anti-herding and bold behavior, please refer to Rülke and Tillmann (2011) and Tillmann (2011), and Figure 1 in Clement and Tse (2005), respectively.

and

$$\eta_{t\to t+n} \equiv \pi_{t+n} - E_t[\pi_{t+n}].$$

Here, $\eta_{t\to t+n}$ denotes the forecast errors of market expectations, which are not predictable from the information known in period t under rational expectations. Thus, $\eta_{t\to t+n}$ should be considered white noise. As a result, we can test whether the degree of inertia ρ is nonzero (null hypothesis: $\beta = 0$), by regressing equation (2)[10].

2.3 Anchoring and herding on panel data basis

Second, in order to examine strategic behavior using panel data, we include both members' own past forecasts and past consensus forecasts as independent variables, and therefore, the estimation equation is given as follows:

$$S^i_{t\to t+n} = \rho^A S^i_{t-k\to t+n} + \rho^H \bar{S}_{t-k\to t+n} + (1-\rho^A-\rho^H)E_t[\pi_{t+n}]. \tag{3}$$

Here, ρ^A and ρ^H measure the degree of anchoring to i's own past forecast ($S^i_{t-k\to t+n}$), and the degree of herding to consensus forecasts ($\bar{S}_{t-k\to t+n}$), respectively. Equation (3) can be rewritten as

$$\pi_{t+n} - S^i_{t\to t+n} = \beta^A(S^i_{t\to t+n} - S^i_{t-k\to t+n}) + \beta^H(S^i_{t\to t+n} - \bar{S}_{t-k\to t+n}) + \eta_{t\to t+n}, \tag{4}$$

where

$$\beta^A = \frac{\rho^A}{1-\rho^A-\rho^H}$$

and

$$\beta^H = \frac{\rho^H}{1-\rho^A-\rho^H}.$$

[10]Note that a constant term is not included in the regression as in Nordhaus (1987). This is because the forecast errors of market expectations $\eta_{t\to t+n}$ should be unbiased at least ex ante. Thus if the estimated forecast errors are biased, we interpret the biases as a sample artifact.

Here, $\eta_{t\to t+n}$ also denotes the forecast errors of market expectations, which are not predictable from information known in period t under rational expectations and should be considered white noise. When $\beta \neq 0$, forecasts are not rational. In particular, we have the following. When $\beta^A > 0$, forecasts are affected by own past forecasts, and therefore, are considered anchoring. When $\beta^H > 0$, forecasts are affected by past consensus forecasts and thus are considered herding. When $\beta^A < 0$, the current forecast tends to be more widely revised than the changes in rational expectations, and away from own past forecasts. When $\beta^H < 0$, forecasts are labeled anti-herding with such forecasters submitting forecasts that deviate from previous consensus forecasts.

3 Estimation results

3.1 Test of dependence on past forecasts using aggregate data

We estimate equation (2) to test whether forecasters weigh more heavily on past forecasts on aggregate data basis.

Table 2 shows the estimation results for the test of dependence on past forecasts on aggregate data basis. According to Table 2, there is no anchoring effect in aggregate data. Average forecasts on shorter and longer forecast horizons seem to weakly rely on past consensus forecasts, as the extent of dependence,

$$\rho = \frac{\beta}{1+\beta},$$

varies from 10.8% to 24.4%. However, β is not significant at the 10% significance level.[11] Thus, ρ is not significantly different from zero. Even though the number of observations is very limited in the aggregate case, it is indicated that FOMC members make forecasts on consumer price index rationally on the basis of aggregate data in the sense that their forecasts are not dependent on past forecasts.

[11] Standard errors are computed using the Newey and West (1987) estimator. Because samples are overlapped when $k \neq 1$, it is natural to have serial correlation in residuals at least when $k \neq 1$.

3.2 Anchoring and herding on panel data basis

In order to further test rationality, we use equation (4) with individual forecast data. If each member has an *anchoring* bias toward its own past forecasts, the null hypothesis that $\beta^A = 0$ is rejected. If forecasters *herd* to past FOMC consensus, the null hypothesis that $\beta^H = 0$ is rejected.

Table 3 reports the results of testing rationality on panel data basis, wherein we examine whether the cause of irrationality is anchoring or herding. The extent of dependence, anchoring, and herding is measured by

$$\rho^A = \frac{\beta^A}{1 + \beta^A + \beta^H}$$

and

$$\rho^H = \frac{\beta^H}{1 + \beta^A + \beta^H},$$

respectively. Table 3 suggests the following two points. First, for board members' forecasts of inflation rate, the weight of own past forecasts is around one-third. Second, members overreact to past consensus forecast because ρ^H is significantly negative for both shorter and longer horizons.

To further examine the behavior of board members, we divide the data into two: data from governors and that from non-governors. Table 4 reports the results using only the data from governors and Table 5 shows the results using only the data from non-governors. We can say that the two tables give contrasting results. Table 4 shows a negative ρ^A and a positive ρ^H. Taking into consideration that β^Hs are significant in both horizons, these results suggest that governors rely heavily on past consensus. On the other hand, Table 5 shows a positive ρ^A and a negative ρ^H with both being significant. These results show that non-governors' forecasts are partly dependent on own past forecasts. At the same time, forecasts by non-governors deviate from consensus forecasts. As we discuss in the next section, these results imply that forecasting by governors and non-governors exhibits strategic behavior.

3.3 Robustness Check

To check for robustness, we re-estimate equation (4) using data only from voting and non-voting members. Tables 6 to 8 report the results from all voting members, voting members who are non-governors, and non-voting members, respectively. Table 6 shows no dependence on past forecasts in all voting members, who consist of governors and non-governors with voting rights. However, Tables 7 and 8 show the same patterns of signs in both horizons as in Table 5. For non-governors with or without voting rights, ρ^As are significantly positive and ρ^Hs are significantly negative.

This robustness check clarifies that the classification of members into governors and non-governors matters, and that classification into voting and non-voting members does not. Although the results from all voting members including some non-governors show no dependence on past forecasts, we find strong evidence of anti-herding behavior of non-governors in spite of having voting rights. These support our main results in the previous subsection.

4 Discussion

In the previous sections, we revealed the complex behavior of FOMC members. Governors, who always have voting rights on monetary policy rely heavily on the previous consensus, while non-governors exhibit the opposite behavior. To clarify this complex behavior, we consider hypothetical cases as summarized in Tables 9 to 10 and provide graphical images as illustrated in Figures 3 to 4.

4.1 Governors' Case

4.1.1 Case (A)

First, suppose that $\bar{S}_{t-6\to t+12} = 3.0$, $S^i_{t-6\to t+12} = 3.4$ in $t-6$, and a governor forecasts $E_t[\pi_{t+12}]$ as 3.2, which is summarized in the first row of Table 9. In this case, the forecast $E_t[\pi_{t+12}]$ is larger than the past consensus of FOMC members but less than own previous forecast. If $\rho^A = -0.455$ and $\rho^H = 0.446$ as Table 4 suggests, the original forecast is lowered: $E_t[\pi_{t+12}] = 3.2$ is going to be modified to $S^i_{t\to t+12} = 3.02$. Although the voting governor's *ex ante* forecast is 3.2, which is revised from the previous forecast $S^i_{t-6\to t+12} = 3.4$, it decides to keep its forecast close to the previous consensus by board members $\bar{S}_{t-6\to t+12} = 3.0$. As such, this herding forecaster sets the current forecast $S^i_{t\to t+12}$ as 3.02, which is less than the *ex ante* forecast $E_t[\pi_{t+12}]$.

4.1.2 Case (B)

Second, suppose that $\bar{S}_{t-6\to t+12} = 3.0$, $S^i_{t-6\to t+12} = 3.4$ in $t-6$, and a governor forecasts $E_t[\pi_{t+12}]$ as 3.6, which is summarized in the second row of Table 9. In this case, the forecast $E_t[\pi_{t+12}]$ is larger than the past consensus of FOMC members and own previous forecast. If $\rho^A = -0.455$ and $\rho^H = 0.446$ as Table 4 suggests, this herding forecaster lowers the original forecast: $E_t[\pi_{t+12}] = 3.6$ is going to be modified to $S^i_{t\to t+12} = 3.42$. Although the voting governor's *ex ante* forecast is 3.6, which is revised from the previous forecast $S^i_{t-6\to t+12} = 3.4$, it decides to keep its forecast close to the previous consensus by board members $\bar{S}_{t-6\to t+12} = 3.0$. As such, this herding forecaster sets the current forecast $S^i_{t\to t+12}$ as 3.42, which is less than the *ex ante* forecast $E_t[\pi_{t+12}]$.

4.2 Non-Governors' Case

4.2.1 Case (C)

Next, suppose that $\bar{S}_{t-6\to t+12} = 3.0$, $S^i_{t-6\to t+12} = 3.4$ in $t-6$ period and a non-governor forecasts $E_t[\pi_{t+12}]$ as 3.2, which is summarized in the first row of Table 10. In this case, the forecast $E_t[\pi_{t+12}]$ is larger than the past consensus of FOMC members but less than own previous forecast. If $\rho^A = 0.601$ and $\rho^H = -0.814$ as Table 5 suggests, this anti-herding forecaster increases its original forecast: $E_t[\pi_{t+12}] = 3.2$ is going to be modified to $S^i_{t\to t+12} = 3.48$. Although the non-governor's *ex ante* forecast is 3.2, which is revised from the previous forecast $S^i_{t-6\to t+12} = 3.4$, it decides to deviate its forecast from previous consensus by board members $\bar{S}_{t-6\to t+12} = 3.0$. As such, this anti-herding member sets the current forecast $S^i_{t\to t+12}$ as 3.48, which is larger than the *ex ante* forecast $E_t[\pi_{t+12}]$.

4.2.2 Case (D)

Finally, suppose that $\bar{S}_{t-6\to t+12} = 3.0$, $S^i_{t-6\to t+12} = 3.4$ in $t-6$, and a non-governor forecasts $E_t[\pi_{t+12}]$ as 3.6, which is summarized in the second row of Table 10. In this case, the forecast $E_t[\pi_{t+12}]$ is larger than the past consensus of FOMC members and own previous forecast. If $\rho^A = 0.601$ and $\rho^H = -0.814$ as Table 5 suggests, this anti-herding forecaster increases its original forecast: $E_t[\pi_{t+12}] = 3.6$ is going to be modified to $S^i_{t\to t+12} = 3.97$. Although this non-governor's *ex ante* forecast is 3.6, which is revised from the previous forecast $S^i_{t-6\to t+12} = 3.4$, it decides to deviate its forecast from the previous consensus by board members $\bar{S}_{t-6\to t+12} = 3.0$. As such, this anti-herding member sets the current forecast $S^i_{t\to t+12}$ as 3.97, which is larger than the *ex ante* forecast $E_t[\pi_{t+12}]$.

Figures 3 and 4 provide graphical images for this interesting phenomenon. Figure 3 illustrates excessive agreement[12] by governors with previous consensus. In Cases (A) and (B), *ex ante* forecasts are modified to be close to the previous consensus of FOMC members.[13]

On the other hand, Figure 4 shows that the non-governor is likely to exaggerate its forecast in Cases (C) and (D). This non-governor submits a forecast, which deviates much from the previous consensus. In Cases (C) and (D), *ex ante* forecasts are exaggerated by *anti-herding* behavior by non-governors, who rotate voting rights.[14]

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[12] Bondt and Forbes (1999) define herding as "excessive agreement" among analyst predictions; that is, a surprising degree of consensus relative to the predictability of corporate earnings.

[13] Here, we do not directly mention the effect from the negative sign of ρ^A because it is slightly hard to simultaneously consider the effects of both anchoring and herding. However, Case (A) clearly shows the combined effects of the negative and positive signs of ρ^A and ρ^H, respectively.

[14] Again, we do not directly mention the effect from the positive sign of ρ^A. However, Case (C) captures the effects of both anchoring and anti-herding from a positive ρ^A and a negative ρ^H, respectively because $S^i_{t\to t+12}$ is set close to $S^i_{t-6\to t+12}$ but away from $\bar{S}_{t-6\to t+12}$. The dependence on $S^i_{t-6\to t+12}$ reflects anchoring, and the

As for the herding of governors, who always have voting rights, one can interpret this as a strategic behavior. As shown in Table 4 and Figure 3, governors' forecasts tend to be close to the previous average of FOMC members' forecasts. This phenomenon is strategic because if projections are split into "hawkish" and "dovish" views, uncertainty may arise over the next decision and cause financial markets to fluctuate. If policy makers want to avoid market swings, they may exhibit herding to build a strategic consensus on inflation forecasts.

One interpretation of anti-herding behavior is that FOMC members use their forecasts strategically to influence policy decision making, as in Tillmann (2011) and Rülke and Tillmann (2011). Tillmann (2011) focuses on non-voting members and argues that non-voters will make more use of their semiannual inflation forecast in order to influence policy deliberation. Because non-voters do not affect policy decisions by voting, using the inflation forecast to influence policy deliberations is more attractive for non-voting members than for voting members. If non-voters believe that a "hawkish" policy is needed in FOMC, they have some incentive to deviate their forecasts from the consensus forecasts in order to encourage voters to implement an increase in interest rates. This can be deemed as non-voters' strategic behavior.

5 Conclusion

In this paper, we use panel data to test whether Federal Open Market Committee (FOMC) board members' forecasts are rational. We find the following two points. First, we find that rationality is rejected in the sense that forecasts by members are heavily dependent on previous own forecasts and last FOMC consensus. No strategic behavior or bounded rationality is observed from aggregate data.

Second, we reveal the strategic behavior of FOMC board members. Forecasts by governors, who always have voting rights agree much with previous consensus, while those of

deviation from $\bar{S}_{t-6\to t+12}$ indicates anti-herding.

non-governors are exaggerated to create distance from previous consensus. Consequently, if non-governors believe that a higher policy rate is needed in the next meeting, they have some incentive to deviate strongly from previous consensus in order to encourage voters to implement an increase in interest rates.

Governors exhibit *herding* behavior and non-governors exhibit *anti-herding* behavior. Our results imply that individual members behave strategically in the sense that governors want to present policy-consistent forecasts to the Congress and non-governors utilize their forecasts to influence decision making in FOMC. Governors want to build a consolidated consensus because they do not want to show disagreement among FOMC members to avoid market fluctuations. However, non-governors, who rotate voting rights, make more use of their forecasts in order to influence monetary policy.

Our results suggest the possibility that each member's decision making affects the other members' move not in a collegial system but in a committee system, where all members are not entitled to have voting rights.[15] We have not investigated the structural reason underlying this strategic behavior, and have left it for the future.

[15] Tillmann (2011) suggests that a rotation scheme will result in a strategic behavior of policymakers. This argument is not essentially different from our suggestion.

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Table 1: Forecasts of consumer price index

	Horizon	Mean	Median	Maximum	Minimum	Standard Deviation	Observations	Sample
All Members	6	2.78	3.00	3.50	1.20	0.52	136	1992–1999
	12	2.73	2.80	4.00	1.50	0.50	137	1992–1999
	18	2.86	3.00	4.50	1.50	0.48	136	1992–1999
Governors	6	2.78	3.00	3.50	1.70	0.49	48	1992–1999
	12	2.69	2.80	3.30	1.60	0.44	49	1992–1999
	18	2.85	2.90	3.70	2.00	0.38	48	1992–1999
Non-governors	6	2.79	3.00	3.50	1.20	0.54	88	1992–1999
	12	2.76	2.80	4.00	1.50	0.53	88	1992–1999
	18	2.87	3.00	4.50	1.50	0.53	88	1992–1999
Voting members	6	2.77	3.00	3.50	1.70	0.51	80	1992–1999
	12	2.70	2.80	3.60	1.50	0.48	81	1992–1999
	18	2.85	2.90	4.00	1.50	0.47	80	1992–1999
Non-voting members	6	2.80	3.00	3.50	1.20	0.54	56	1992–1999
	12	2.78	2.84	4.00	1.50	0.53	56	1992–1999
	18	2.88	3.00	4.50	1.50	0.50	56	1992–1999

Table 2: Test of dependence on previous consensus on aggregate data basis

Horizon	β	Standard Error	p-value	ρ	Observations
$(n, k) = (6, 6)$	0.323	0.475	0.517	0.244	8
$(n, k) = (12, 6)$	0.121	0.286	0.687	0.108	7

Note: Standard errors are computed using the Newey and West (1987) estimator.

Table 3: Test of anchoring or herding in all members

Horizon	ρ^A	β^A	ρ^H	β^H	observations
$(n,k)=(6,6)$	0.325	0.317**	-0.354	-0.344**	133
		(0.149)		(0.168)	
$(n,k)=(12,6)$	0.356	0.306**	-0.521	-0.447**	114
		(0.156)		(0.204)	

Note: Results from pooled least-squares estimation. Standard errors in parenthesis are computed using the robust variance matrix estimator proposed by Arellano (1987) and ** denotes significance at the 5% level.

Table 4: Test of anchoring or herding in governors

Horizon	ρ^A	β^A	ρ^H	β^H	observations
$(n,k)=(6,6)$	-0.352	-0.395	0.461	0.517**	32
		(0.267)		(0.222)	
$(n,k)=(12,6)$	-0.455	-0.451***	0.446	0.442***	38
		(0.132)		(0.131)	

Note: Results from pooled least-squares estimation. Standard errors in parenthesis are computed using the robust variance matrix estimator proposed by Arellano (1987) and *** and ** denote significance at the 1% and 5% levels, respectively.

Table 5: Test of anchoring or herding in non-governors

Horizon	ρ^A	β^A	ρ^H	β^H	Observations
$(n,k) = (6,6)$	0.516	0.511***	-0.525	-0.520***	88
		(0.132)		(0.161)	
$(n,k) = (12,6)$	0.601	0.496***	-0.814	-0.671***	77
		(0.155)		(0.216)	

Note: Results from pooled least-squares estimation. Standard errors in parenthesis are computed using the robust variance matrix estimator proposed by Arellano (1987) and *** denotes significance at the 1% level.

Table 6: Test of anchoring or herding in voting members

Horizon	ρ^A	β^A	ρ^H	β^H	Observations
$(n,k) = (6,6)$	0.169	0.161	-0.215	-0.205	77
		(0.188)		(0.232)	
$(n,k) = (12,6)$	0.179	0.163	-0.275	-0.251	66
		(0.183)		(0.173)	

Note: Results from pooled least-squares estimation. Standard errors in parenthesis are computed using the robust variance matrix estimator proposed by Arellano (1987).

Table 7: Test of anchoring or herding in voting members who are non-governors

Horizon	ρ^A	β^A	ρ^H	β^H	Observations
$(n,k)=(6,6)$	0.608	0.610***	-0.606	-0.607**	32
		(0.191)		(0.237)	
$(n,k)=(12,6)$	0.552	0.514***	-0.626	-0.583***	28
		(0.170)		(0.182)	

Note: Results from pooled least-squares estimation. Standard errors in parenthesis are computed using the robust variance matrix estimator proposed by Arellano (1987) and *** and ** denote significance at the 1% and 5% levels, respectively.

Table 8: Test of anchoring or herding in non-voting members

Horizon	ρ^A	β^A	ρ^H	β^H	Observations
$(n,k)=(6,6)$	0.469	0.463**	-0.481	-0.475**	56
		(0.229)		(0.251)	
$(n,k)=(12,6)$	0.680	0.518**	-0.994	-0.757**	49
		(0.249)		(0.352)	

Note: Results from pooled least-squares estimation. Standard errors in parenthesis are computed using the robust variance matrix estimator proposed by Arellano (1987) and ** denotes significance at the 5% level.

Table 9: Excessive agreement in governors

Governors	$\bar{S}_{t-6\to t+12}$	$S^i_{t-6\to t+12}$	$E_t[\pi_{t+12}]$	$S_{t\to t+12}$
Case (A)	3.0	3.4	3.2	3.02
Case (B)	3.0	3.4	3.6	3.42

Note: (ρ^A, ρ^H) is set to $(-0.455, 0.446)$ as in the second column of Table 4.

Table 10: Large deviation from previous consensus in non-governors

Non-Governors	$\bar{S}_{t-6\to t+12}$	$S^i_{t-6\to t+12}$	$E_t[\pi_{t+12}]$	$S_{t\to t+12}$
Case (C)	3.0	3.4	3.6	3.48
Case (D)	3.0	3.4	3.6	3.97

Note: (ρ^A, ρ^H) is set to $(0.601, -0.814)$ as in the second column of Table 5.

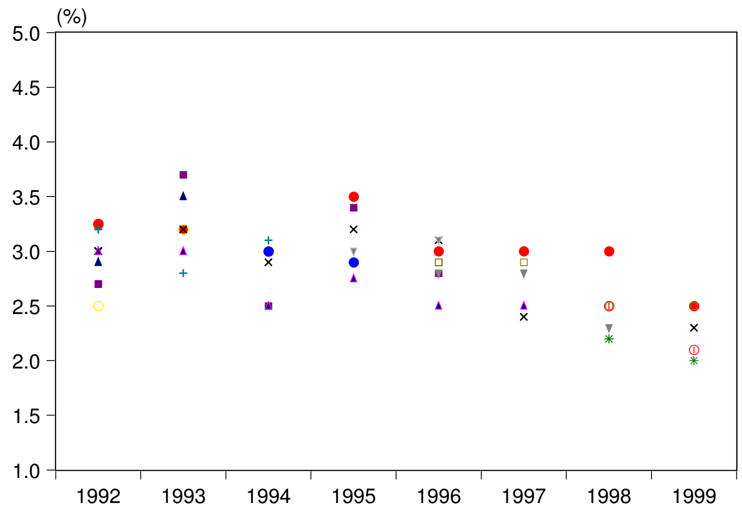


Figure 1: Governors' June/July forecasts on consumer price index for the end of the next calendar year

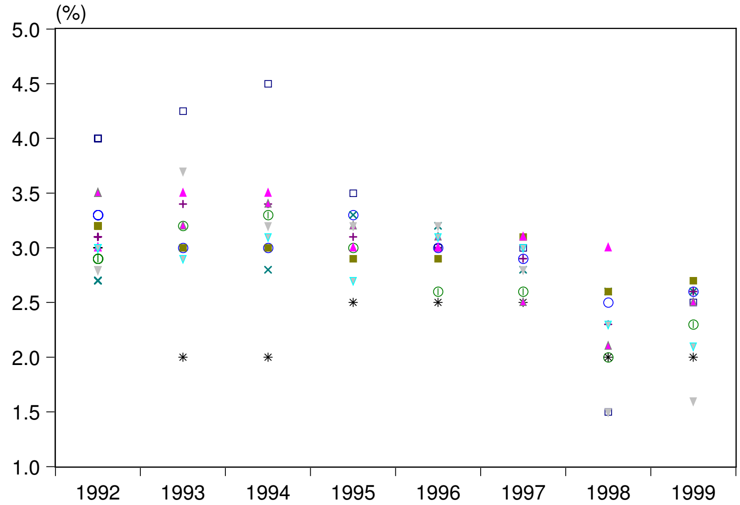


Figure 2: Non-governors' June/July forecasts on consumer price index for the end of the next calendar year

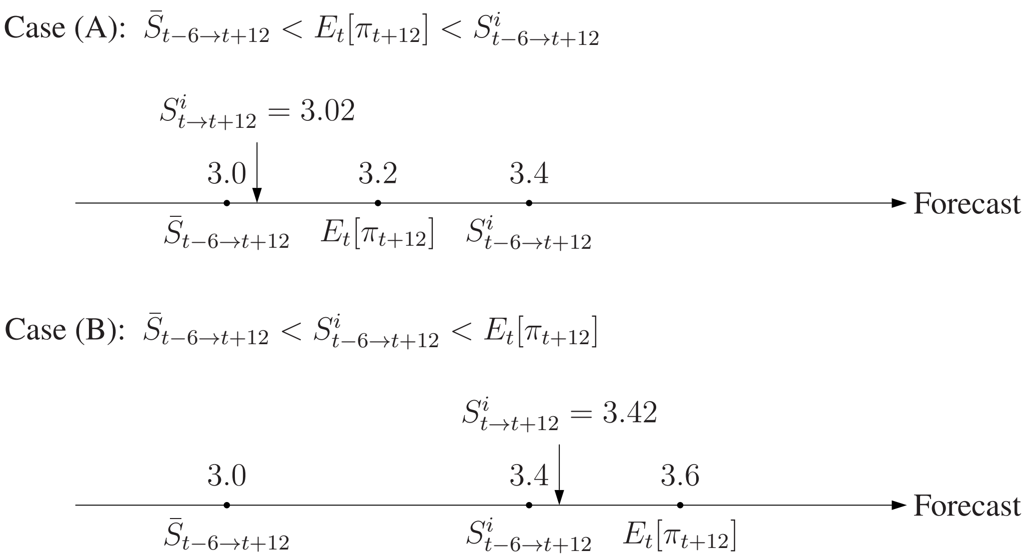
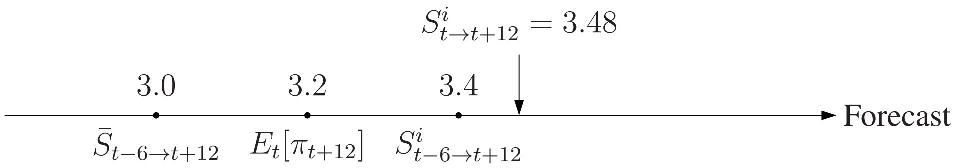


Figure 3: Herding in Governors' Case: $(n, k) = (12, 6), (\rho^A, \rho^H) = (-0.455, 0.446)$

Case (C): $\bar{S}_{t-6\to t+12} < E_t[\pi_{t+12}] < S^i_{t-6\to t+12}$



Case (D): $\bar{S}_{t-6\to t+12} < S^i_{t-6\to t+12} < E_t[\pi_{t+12}]$

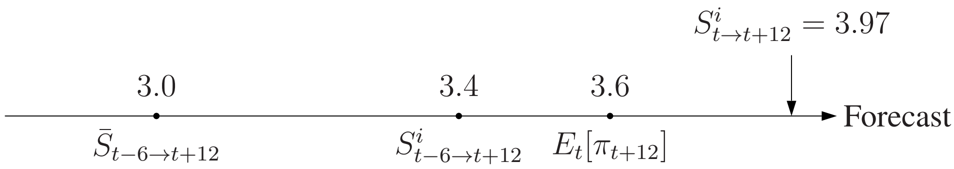


Figure 4: Anti-Herding in Non-Governors' Case: $(n, k) = (12, 6), (\rho^A, \rho^H) = (0.601, -0.814)$