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. In contrast, 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; E52
Keywords: anchoring; Federal Reserve; inflation forecast; herding; monetary policy

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, but rather heuristic. Decision makers tend to use a simple rule such as anchoring, where the decision is based on some *uninformative* targets.

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.

Herding is closely related to anchoring.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 such cases, people deem others' decision making as *informative*, which contrasts with anti-herding to *uninformative* points.

There exist many articles on 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 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 ra-

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Table 1: Test of dependence on previous consensus on aggregate data basis

Horizon	β	ρ	Standard Error	p-value	Observations
$(n,k)=(6,6)$	0.268	0.212	(0.127)	0.146	7
$(n,k)=(12,6)$	0.121	0.108	(0.228)	0.652	7

Note: Standard errors of the deeper parameters, ρ in parenthesis are computed by the Delta Method using the Newey and West (1987) estimator.

tional.

2 Data

The data we use are based on that submitted for the semi-annual monetary policy report made to the Congress in January/February and June/July of each year, and that are now available for the period 1992–2001; the individual projections are open to the public after a lag of 10 years.Each member of FOMC makes macroeconomic forecasts containing end-of-year nominal and real GDP growth rate, inflation, and the unemployment rate, which are denoted as percent changes from the same quarter in the previous year.The board members make forecasts 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 June/July sees two sets of forecasts being submitted: one set contains updated forecasts 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 members. In fact, there exist several empirical studies suggesting dissonance and strategic behavior among FOMC members. Tillmann (2011) and Banternghansa and McCracken (2009) find systematic differences in individual inflation forecasts submitted by voting and non-voting members. Rülke and Tillmann (2011) show that inflation forecasts exhibit strong evidence of anti-herding and that anti-herding is more important for non-voters than for voters.

3 Estimation strategy and results

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 the behavioral patterns of FOMC board members.

3.1 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):

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

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, $0 \le \rho < 1$ 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 previous consensus, which suggests anti-herding or bold behavior.By using the definition of forecast errors, equation (1) can be further rewritten as

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

where $\beta = \rho/(1-\rho)$, 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).

We estimate equation (2) to test whether forecasters weigh more heavily on past forecasts on aggregate data basis. Table 1 shows the estimation results for the test of dependence on past forecasts on aggregate data basis. According to Table 1, there is no anchoring effect in aggregate data. Average forecasts on shorter and longer

Table 2: Test of anchoring or herding in all members

Horizon	ρ^A	β^A	ρ^H	β^H	observations
$(n,k)=(6,6)$	0.205	0.222	-0.128	-0.139	109
	(0.194)		(0.213)		
$(n,k)=(12,6)$	0.356*	0.306	-0.520*	-0.447	115
	(0.195)		(0.283)		

Note: Results from pooled least-squares estimation. Standard errors of the deeper parameters, ρ^A and ρ^H in parenthesis are computed by the Delta Method using the robust variance matrix estimator proposed by Arellano (1987) and * denotes significance at the 10% level.

forecast horizons seem to weakly rely on past consensus forecasts, as the extent of dependence, $\rho = \beta/(1+\beta)$, varies from 10.8% to 21.2%. However, ρ is not significantly different from zero at the 10% significance level.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.

3.2 Anchoring and herding on panel data basis

Second, in order to further test rationality 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:

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

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

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

where$\beta^A = \rho^A/(1-\rho^A-\rho^H)$ and $\beta^H = \rho^H/(1-\rho^A-\rho^H)$. 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, 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.

We estimate equation (4) with individual forecast data. Table 2 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 anchoring and herding is measured by $\rho^A = \beta^A/(1+\beta^A+\beta^H)$ and $\rho^H = \beta^H/(1+\beta^A+\beta^H)$, respectively. Table 2 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 forecasts because ρ^H is significantly negative for the longer horizon.

To further examine the behavior of board members, we divide the data into two: data from governors and that from non-governors. Table 3 reports the results using only the data from governors and Table 4 shows the results using only the data from non-governors. We can say that the two tables give contrasting results. Table 3 shows a negative ρ^A and a positive ρ^H. Taking into consideration that ρ^Hs are significant in both horizons, these results suggest that governors rely heavily on past consensus. In contrast, Table 4 shows a positive ρ^A and a negative ρ^H with both being significant for the longer horizon. These results show that non-governors' forecasts are partly dependent on own past forecasts.[1] At the same time, forecasts for the longer horizon by non-governors deviate from consensus forecasts. These results imply the complex behavior of FOMC members.

[1]The p-value of ρ^A for the shorter horizon is 0.107.

Table 3: 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
	(0.261)		(0.211)		
$(n,k)=(12,6)$	-0.455**	-0.451	0.446***	0.442	38
	(0.191)		(0.104)		

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

Table 4: Test of anchoring or herding in non-governors

Horizon	ρ^A	β^A	ρ^H	β^H	observations
$(n,k)=(6,6)$	0.369	0.393	-0.309	-0.329	77
	(0.226)		(0.264)		
$(n,k)=(12,6)$	0.601***	0.496	-0.813**	-0.671	77
	(0.224)		(0.358)		

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

3.3 Discussion

The complicated behavior of FOMC members suggests that forecasting by governors and non-governors exhibits strategic behavior particularly for the longer horizon with uncertainty. Governors, who always have voting rights on monetary policy rely heavily on the previous consensus, while non-governors exhibit the opposite behavior.

For the governors' case, the estimation results show excessive agreement by governors with previous consensus. As shown in Table 3, *ex ante* forecasts are modified to be close to the previous consensus of FOMC members. This can be called as governors' herding behavior.

As for the herding of governors, who always have voting rights, one can interpret this as a strategic behavior. 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.

In contrast, the non-governor is likely to exaggerate its forecast for the longer horizon. This non-governor submits a forecast, which deviates much from the previous consensus. Table 4 shows that *ex ante* forecasts are exaggerated by the *anti-herding* behavior by non-governors, who rotate voting rights. The non-governors' case captures the effects of both anchoring and anti-herding from a positive ρ^A and a negative ρ^H particularly for the longer-term horizon; the dependence of current forecast, $S^i_{t\to t+n}$, on own past forecast, $S^i_{t-k\to t+n}$, reflects anchoring, and the deviation of current forecast from previous consensus, $\bar{S}_{t-k\to t+n}$, indicates anti-herding.

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 increase interest rates.

Anti-herding behavior is clearer for the longer term horizon. It seems natural to show anti-herding behavior in longer-term forecasting rather than in shorter-term forecasting because longer-term decision-making includes uncertainty. Under great uncertainty about the longer-term future, non-governors may exaggerate their forecasts to affect policy-making in FOMC without losing credibility in forecasting. This can be deemed as

non-governors' strategic behavior.

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