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Does The Erosion of the Fed's Forecasting Advantage Explain the Yield Curve  
Conundrum?

By

Edward N. Gamber  
Department of Economics  
Lafayette College  
Easton, PA 18042  
[gambere@lafayette.edu](mailto:gambere@lafayette.edu)

And

Julie K. Smith  
Department of Economics  
Lafayette College  
Easton, PA 18042  
[smithjk@lafayette.edu](mailto:smithjk@lafayette.edu)

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## Does The Erosion of the Fed's Forecasting Advantage Explain the Yield Curve Conundrum?

**Abstract:** In this paper, we examine the relative improvement in forecasting accuracy of the Federal Reserve (Greenbook forecasts) and private-sector forecasts (the Survey of Professional Forecasters and Blue Chip Economic Indicators) for inflation (output deflator). Previous research by Romer and Romer (2000) indicates that the Fed has an informational advantage over private forecasters. We will study several questions in this paper. Have forecast errors become smaller for the Fed and private forecasters since the Great Moderation? Has this informational advantage continued for the Fed or in other words, are the forecast errors for the Fed smaller than the errors of the private-sector forecasters? Have private forecasters gained on the Fed? Finally, we will consider what the results to these previous questions imply about today's yield curve and the conundrum that the response of long-term interest rates to changes in short-term interest rates has declined in recent years.

## **I. From Puzzle to Conundrum**

According to Christina Romer and David Romer (2000) standard theories of the term structure predict that tighter monetary policy raises short-term rates and lowers long-term rates by reducing inflation. At the time that they published their paper, these standard theories of the term structure were contradicted by the data—long-term interest rates typically rose in response to tighter monetary policy. Romer and Romer hypothesized that the reason for the puzzling response of long-term interest rates to tighter monetary policy was that when the Fed tightens monetary policy, it reveals information that causes market participants to revise their estimates of future inflation upwards thus leading to an upward revision in long-term interest rates. They further argue that in order for the Fed to reveal information with its policy changes, it must be the case that they possess superior information (relative to the private sector) about the future path of the economy. Romer and Romer present evidence in support of their hypothesis using data from the 1970s through 1991.

Since the publication of Romer and Romer (2000), the response of long-term interest rates to changes in Fed policy has changed. Figure 1 shows the coefficients obtained by regressing changes in the 10-year constant maturity Treasury-Bond rate on changes in the federal funds rate over various sub-samples. Prior to 1993 (especially during the period 1984-1993) long-term rates responded positively to changes in the federal funds rate. Since that time, the positive correlation between long-term rates and short-term rates has disappeared. It appears that the puzzling response of long-term interest rates to changes in Fed policy, has weakened considerably and maybe even disappeared altogether.

During his July 2005 testimony before Congress, Alan Greenspan noted:

“The drop in long-term rates is especially surprising given the increase in the federal funds rate over the same period. Such a pattern is clearly without precedent in our recent experience.”<sup>1</sup>

Greenspan coined the term “yield curve conundrum” to describe reduction in the response of long-term interest rates to changes in the federal funds rate.

In this paper we investigate whether the disappearance of the puzzle (and the emergence of the conundrum) coincides with a loss in the Fed’s informational advantage about the future path of the economy. If Romer and Romer’s explanation for the positive response of long term interest rates to changes in Fed policy (the puzzle) is valid, then the disappearance of that positive response (the conundrum) may imply that the Romer and Romer’s explanation (the Fed’s informational advantage) has disappeared as well.<sup>2</sup>

We investigate this question by comparing the accuracy of the Fed’s Greenbook forecasts to the accuracy of two sets of professional forecast: the Survey of Professional Forecasters (SPF) and the Blue Chip Economic Indicators (BC). Both sets of forecasts are derived from surveys of professional forecasters. We find that both the Fed and professional forecasters have become more accurate at forecasting inflation since the mid-1990s.<sup>3</sup> For example, at the one-quarter horizon, the RMSE for the inflation forecasts of the Fed, the SPF and the BC dropped by a third to one-half since the mid-1990s.

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<sup>1</sup> Testimony of Chairman Alan Greenspan *Federal Reserve Board's semiannual Monetary Policy Report to the Congress* before the Committee on Financial Services, U.S. House of Representatives July 20, 2005 <http://www.federalreserve.gov/boarddocs/hh/2005/july/testimony.htm>

<sup>2</sup> There are likely other explanations as well. In this paper, our aim is to measure the extent to which the erosion of informational advantage explains the conundrum. We are not directly comparing our explanation with others.

<sup>3</sup> An earlier version of this paper looked at forecast errors for real growth as well. The results for real output growth were similar.

But the pertinent question is whether the Fed is still *relatively* more accurate than professional forecasters. We investigate this question by updating the Romer and Romer tests and by employing tests of our own. Our results are mixed. Relative to the SPF, the Fed appears to have lost its informational advantage. The Fed's RMSE is no longer significantly lower than the SPF's in the post 1994 period. In addition, the encompassing regressions indicate that the Fed's forecasts no longer encompass the SPF's forecasts at all forecast horizons. The results for the BC muddy the picture considerably. Although the gap between the RMSEs for the Fed and the BC has narrowed since the mid-1990s, relative to the BC, the Fed does not appear to have lost its informational advantage. The Fed's RMSE are still significantly lower than the BC's in the post 1994 period. The encompassing regressions indicate that the Fed's forecasts encompass the BC's forecasts at some, but not all forecast horizons.

To directly test whether the Fed still possess superior information about the future path of the economy, we update the Romer and Romer regressions measuring the marginal contribution of monetary policy changes to the Fed's Greenbook forecasts. Again, our results are mixed. For all quarters combined, using the SPF as a control, a monetary policy tightening raises the Fed's forecast of inflation by 20 basis points in the period prior to 1994. After 1994, monetary policy changes are uncorrelated with changes in the Fed's inflation forecast. Thus, for all quarters combined, the evidence appears to support the notion that the Fed's informational advantage has disappeared and that monetary policy no longer reveals such information relative to the private sector forecast. But when we use the change in the federal funds target as our monetary policy indicator,

the results are reversed—the private sector revised its forecasts by more in the post-1994 period.<sup>4</sup>

This paper is organized as follows. In the next section (section II) we present a brief review of relevant literature. In section III we describe our data. In section IV we compare the Fed’s forecast errors with private sector forecast errors (SPF and BC) over various sub-samples. Section V presents the results from our encompassing regressions, section VI tests whether the Fed policy contains superior information and section VII explores some of the possible reasons for the different results for the SPF and the Blue Chip. Section VIII concludes.

## **II. Relevant Literature**

Faust, Swanson and Wright (2004) followed up Romer and Romer (2000) by testing whether the private sector revises its forecasts in response to Fed policy surprises. With the exception of Industrial Production, their answer is no, private sector forecasters do not appear to systematically incorporate monetary policy surprises into their forecasts. They take this as evidence that Fed forecasts do not contain superior information. Their methodology differs slightly from the Romer and Romer methodology in that they use monetary policy surprises rather than the change in monetary policy and their sample period includes data through 1997. Faust, Swanson and Wright (2004) suggest that Fed forecasts may have contained superior information in the early 1980s but that informational advantage appears to have disappeared.<sup>5</sup>

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<sup>4</sup> One way to possibly reconcile this result is to use monetary policy surprises (Faust, Swanson, Wright (2004)).

<sup>5</sup> We plan to use the Faust, Swanson, Wright methodology in a future iteration of this research to see whether it is methodology or sample period that accounts for the difference in results.

Various authors have documented the yield curve conundrum. Kozicki and Sellon (2005) find that the conundrum is a recent phenomenon, but they also note that the relationship between monetary policy and the yield curve is “quite complex and highly variable over time.” Berument and Froyen (2004) consider the response of long-term interest rates to changes in monetary policy over different Fed chairman’s tenure. They find that the responsiveness of long-term interest rates to monetary policy changes dropped after 1979 when the Fed began placing more emphasis on inflation targeting.

Rudebusch, Swanson and Wu (2006) find that macro-finance models of the term structure of interest rates fail to explain the conundrum. They find that the recent drop in long-term bond volatility may explain a portion of the conundrum.

### **III. Data**

In the empirical work that follows we compare the forecast errors from the Fed’s Greenbook to the forecast errors generated by the median forecast from the SPF and the mean forecast from the BC<sup>6</sup>. The Greenbook forecasts are available monthly from 1968.11 through 1980.12 and eight times a year from 1981.01 through 2001.12 for a total of 317 observations. The SPF data are quarterly beginning in 1968.04 and continuing through the end of the Greenbook sample 2001.04 for a total of 133 observations. The BC data are available monthly from 1980.01 through 2001.12 for a total of 264 observations. All forecast errors are defined as “actual” minus the forecasted value

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<sup>6</sup> Ideally we would like to use the median from both the SPF and the BC but the BC data that we purchased from Aspen publishing only provided the consensus (mean) for the quarterly forecasts. We were able to replicate exactly the results of Romer and Romer over their sample period (through the end of 1991) even though the Romers claim to have used the median of the BC which means that either the mean and the median are nearly identical or the Romers mis-reported that they used the median of the BC when in fact they used the mean.

where actual is first “final” estimate of the GDP price index released at the end of the third month following the end of the quarter that is being measured.<sup>7</sup> We consider forecast horizon 0 through 4 quarters ahead.

In all of our forecast error comparisons we are interested in comparing the errors generated by different forecasters for identical quarters. For example, in comparing the BC with the Fed, we consider only those forecasted quarters for which both sets of forecasts exist. The common sample for the BC and the Fed is from 1980.01 through 2001.12 and contains 168 observations. Similarly, in comparing the SPF with the Fed we consider only the forecasted quarters for which both sets of forecasts exist. The common sample for the SPF and the Fed spans 1968.11 through 2001.12 and contains 108 observations.

#### **IV. Forecast Errors**

Tables 1 and 2 show the RMSEs for Fed, SPF and BC forecasts of inflation over various sub-samples. The full sample is 1968-2000 for the SPF and 1980-2000 for the BC. We calculated the RMSE for sample splits at 1984 (pre and post the Great Moderation, as identified by McConnell and Perez-Quiros (2000)) and 1994 (the date at which the Fed began announcing its policy changes immediately following FOMC meetings). We employed the modified Diebold-Mariano test statistic to test whether the

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<sup>7</sup> All forecast errors are computed using real-time data (see Croushore and Stark (2001)).

forecast errors (RMSE and absolute value) were different across forecasters and across sample splits.<sup>8</sup>

Comparing inflation forecast errors of the Fed with the SPF, Table 1, we see that the Fed’s RMSEs were significantly smaller than the SPFs in all samples except for the post-announce sample for the zero, one and two quarter-ahead forecast horizons. For the three and four-quarter ahead the differences between the Fed’s RMSE and the SPF’s RMSE are only marginally significant. The ratio of the SPF’s RMSE to the Fed’s RMSE declined by 6.9% at the zero horizon and 8.5% at the one-quarter horizon. But the ratio increased by 6% at the two quarter horizon and 1.7% at the three-quarter horizon. RMSEs declined by roughly 50-60% for both the Fed and the SPF after the onset of the Great Moderation in 1984 but the Fed’s RMSEs remained significantly smaller than the SPFs until the mid-1990s. This result suggests that it was not simply the fact that the economy became easier to forecast for all forecasters that led to an erosion of the Fed’s forecasting advantage relative to the SPF. Rather, the erosion of the Fed’s forecasting advantage occurred well after the onset of the GM which suggests that the Fed’s movement toward greater transparency may have contributed to the erosion.

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<sup>8</sup> According to Harvey, Leybourne and Newbold (1997), the unmodified Diebold-Mariano test statistic is “quite seriously oversized for moderate number of observations.” They suggest the following modification which results in an improvement in the behavior of the test statistic for moderately-sized samples:

$$S_1^* = S_1 \left( \frac{T+1-2(h+1)+h(h+1)/T}{T} \right)^{-\frac{1}{2}}, \quad S_1 = \frac{\bar{d}}{[\hat{V}(\bar{d})]^{1/2}}$$

where  $\bar{d}$  is the mean difference of the prediction errors and  $\hat{V}(\bar{d})$  is the estimated variance. The modified Diebold-Mariano test statistic is estimated with Newey-West corrected standard errors that allow for heteroskedastic autocorrelated errors.

Table 2 compares the RMSEs for the Fed and the Blue Chip for various samples at horizons zero through four. The RMSEs for both the Fed and the BC dropped following the Great Moderation. The declines were similar in magnitude to the declines for the SPF (30-50%). The Fed's RMSEs remained significantly lower than the BC's at horizon zero (marginally so) and two through four. Only at the one-quarter ahead horizon did the Fed lose its significant forecasting edge. The ratio of BC's RMSE to the Fed's RMSE increased by 10% at the zero horizon, declined by 12% at the one and four quarter horizon and 8% at the three quarter horizon. The ratio of RMSEs remained virtually unchanged at the two-quarter ahead horizon.

Figures 2 and 3 present a summary of the evidence presented in Tables 1 and 2 for the pre and post-announce (1994) periods. It is clear from these figures that inflation forecast errors fell sharply and the gap between the Fed's forecast errors and the private-sector forecast errors (both the SPF and the BC) narrowed as well.

In addition to comparing the RMSEs, we also compared the absolute value of forecast errors between the Fed and the private sector over various sub-samples. These results are shown in Table 3 (SPF versus Fed) and 4 (BC versus Fed). We report the difference between the absolute value of the private sector forecast error and the Fed forecast error for each sub sample. The t-statistic is for the null hypothesis that the differences were unchanged across sub-samples.

The evidence presented in Table 3 suggests that the decline in the gap between the SPF inflation forecast errors and the Fed forecast errors is slightly larger after 1994, compared to the post-1984 period. For example, at the one-quarter ahead horizon, the gap between the absolute value of the SPFs forecast error and the Fed's forecast error fell

from .39 to .15 across the sample split at the Great Moderation. Over the sample split at the start of the Fed’s policy announcements in 1994, the difference fell from .33 to .08. On average, the drop in the difference in absolute forecast errors was .19 across the Great Moderation sample split and .23 across the announcement sample split. It appears that a significant portion of the drop in forecast errors occurred after 1994. This suggests that the relative improvement of the SPF was not simply due to the drop in inflation volatility that coincided with the Great Moderation.

The differences in absolute forecasts errors between the BC and the Fed reported in Table 4 tells a slightly different story--the gap appears to have dropped significantly after the Great Moderation. Across the sample split at the Great Moderation, the gap dropped an average of .28. Across the sample split at the announcement date, the gap dropped .17. The erosion in the Fed’s forecasting accuracy relative to the SPF appears to have taken place after 1994. The erosion in the Fed’s forecasting accuracy relative to the BC appears to have taken place after 1984.<sup>9</sup>

## V. Encompassing results

The Romer’s hypothesis is that the Fed’s Greenbook forecasts contain more information about the future path of the economy than private sector forecasts. In other words, the Fed’s forecasts encompass the private sector’s forecasts. To test this hypothesis Romer and Romer estimated the following regression (Romer and Romer (2000), equation 2, page 435):

$$\pi_{ht} = \delta + \gamma_C \pi_{ht}^C + \gamma_F \pi_{ht}^F + v_{ht} \quad (1)$$

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<sup>9</sup> A factor that may account for this difference is that the SPF changed hands (moving from the ASA-NBER to the Philadelphia Fed) in 1990. Around that time the sample of professional forecasters participating in the survey dwindled significantly. We also plan to look at the sample between 1984 and 1994 separately.

Under the null hypothesis that the Fed's forecasts of inflation ( $\pi_{ht}^F$ ) contribute no additional information over and above the private-sector's forecasts of inflation ( $\pi_{ht}^C$ ),  $\gamma_F = 0$ . In Tables 5 and 6 we present the results of our estimations of this equation over various sub-samples. The results for the SPF suggest an erosion of the Fed's forecasting advantage with respect to inflation. As was the case in our earlier tests, the erosion appears to have taken place well after the onset of the Great Moderation. The estimates reported at the bottom of Table 5 show that the Fed's forecasts did not encompass the SPF's forecasts of inflation after 1994.

The results reported in Table 6 for the Blue Chip are less clear. The Fed apparently has lost an edge at horizons 3 and 4 and overall (horizons 0-4 combined<sup>10</sup>) but still retains an advantage at the short horizons (0-2).

## VI. Information revelation results

The above results indicate that the Fed has lost some of its relative forecasting accuracy. Our final task is to relate this loss of relative forecast accuracy to the conundrum. To investigate this question we re-estimated the Romer's equation (Romer and Romer (2000), p. 444, equation 4) which measures whether monetary policy changes reveal any information over and above what is contained in the private sector forecasts, that are already contained in the Fed's forecasts. That equation is:

$$\hat{\pi}_{ht}^F = \psi + \theta M_t + \phi \pi_{ht}^C + \omega_{ht} \quad (2)$$

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<sup>10</sup> To estimate the 0-4 regressions we averaged the forecast at horizons 0 through 4. The left hand side variable  $\pi_{ht}$  in this case is constructed similarly by averaging the actual observations for horizons 0-4.

where  $M_t$  is the Federal Reserve's change in monetary policy measured by either the change in the federal funds interest rate target or a dummy variable (1 for a rate increase, 0 for no change in policy and -1 for a rate decrease). Under the null hypothesis that the Fed's forecasts do not contain superior information that is correlated with its monetary policy changes,  $\theta = 0$ .

Tables 7 through 9 present the results of these estimations for the full sample as well as for the two sub-samples: pre and post 1994. These results show no consistent pattern. Focusing only on the using the dummy variable for changes in monetary policy, using BC as a control, nothing is statistically significant. For the regressions using the SPF as a control there is some evidence at the amount of information revealed by Fed policy changes diminished over the pre- and post-announcement sample split at the three-quarter and four-quarter horizon as well as for the average across all horizons. In the pre-announce period, a Fed rate hike revealed an increase in expected inflation of 20 basis points at the zero horizon using the BC as a control and 17 to 24 basis points at the 3 to 4 quarter horizon using the SPF as a control. In the post-announce period, Fed rate hikes (and symmetrically, Fed rate reductions) were not correlated with changes in inflation expectations.

The results using the dummy variable indicator of monetary policy are contradicted by the results using the change in the federal funds rate (examining the bottom portions of Tables 8 and 9). In the BC regressions, monetary policy appeared to reveal more information after 1994 at the one and two-quarter horizons and less information after 1994 at the zero, three and four-quarter horizons. In the SPF regressions, monetary policy revealed more information at the one, three, and four-

quarter horizons as well as for the average over all horizons (0-4). Overall, the information revelation regressions do not appear to reveal any consistent information about the change in information conveyed by monetary policy across the sample split at 1994.

## **VII. Differences Between the BC and the SPF**

Our results differ in the post-announce period for the BC and the SPF. There are three possible explanations for these differences: different samples, different measures of central tendency (mean versus median) and different degrees of forecast accuracy. In this section we look at each of these three explanations for possible clues to why our results differ for the BC and the SPF in the post-announce period.

First we consider the difference in the samples. In the period 1994.01-2001.12 there are 62 Greenbook forecasts, 32 SPF forecasts and 96 BC forecasts. The overlap between the Greenbook and the SPF yields only 23 observations because the SPF forecasts are produced in February, May, August and November. The Fed typically produces Greenbook forecasts in May, August and November (as well as other months that do not overlap with the SPF). The overlap between the Greenbook and the BC yields 62 observations. In the comparisons of the Fed versus the SPF we use only the overlapping observations, which means that our post-1994 sample contains only 23 observations. In the comparisons of the Fed and the BC, the overlap yields a sample of nearly three times the number of observations. Thus, the difference in results could be due to the fact that there are so few observations in the post-1994 sample for the SPF.

To see whether the difference in sample sizes matters for our results we re-calculate the RMSE's for the BC using only the 23 forecasts that correspond to the overlap between the SPF and the Greenbook. In Figure 4 we compare the RMSE for the BC using only the common sample of 23 observations to the RMSE for the SPF using the same 23 observations as well as the BC using all 62, post-1994 observations. The BC and SPF RMSEs using the same 23 observations are more similar to each other than the RMSE for the BC using the 62 observations is to either (especially at horizons one, two and three).

We next look at whether the difference in measures of central tendency matters. The BC reports only the mean forecast<sup>11</sup> while the SPF reports both the mean and the median. To completely investigate this question we need access to both the mean and the median forecasts for both surveys. But since those data are not available we compared the RMSE calculated from both the mean and median for the SPF for the full sample as well as the post-1994 sample. These results, which are reported in Table 10, suggest that at least for the SPF, there is no difference in the RMSEs calculated using the mean or median.

Finally, we investigate whether there is a significant difference between the forecast accuracy of the SPF and the BC. It is common to lump these forecasters together as private-sector forecasts. But are they really the same? To investigate this question we calculated the RMSE for the SPF and the BC for the entire sample using only those data points for which there are forecasts for both the SPF and the BC. Table 11 shows

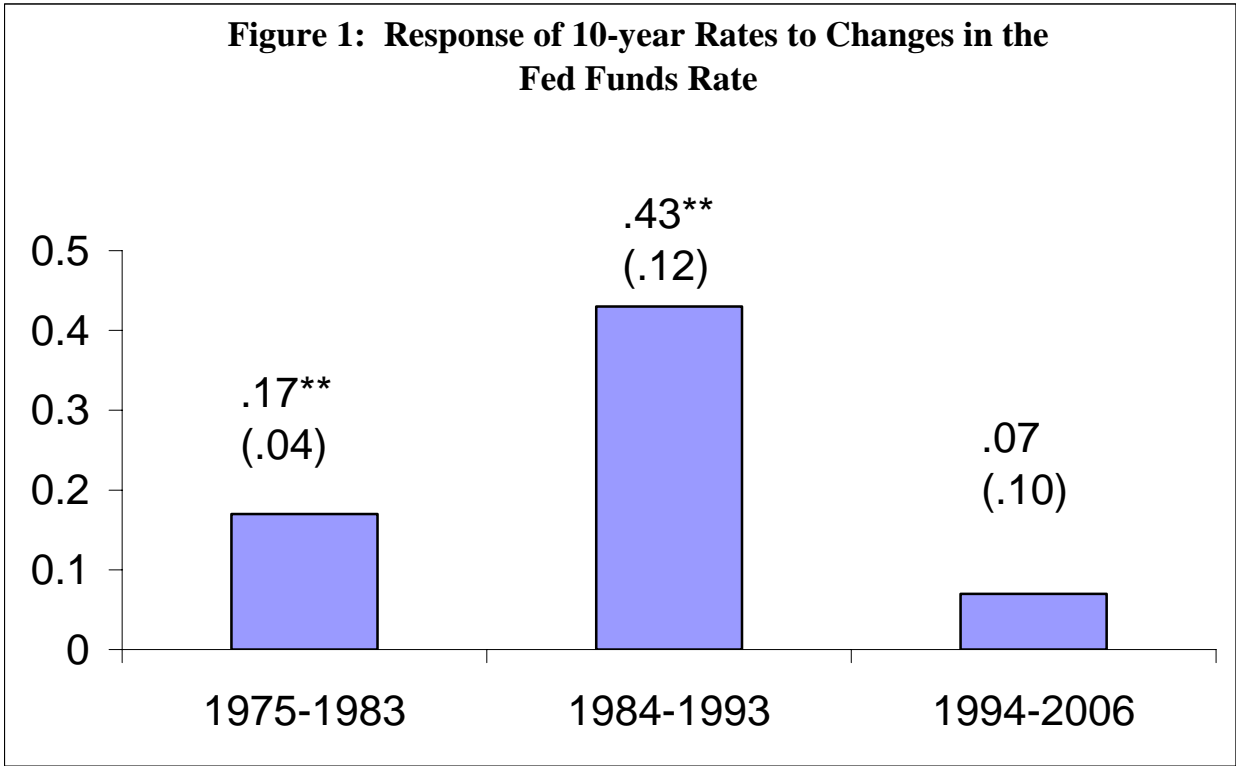
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<sup>11</sup> Only the mean or “consensus” is reported for the quarterly forecasts. Individual forecasts are reported for the annual forecasts.

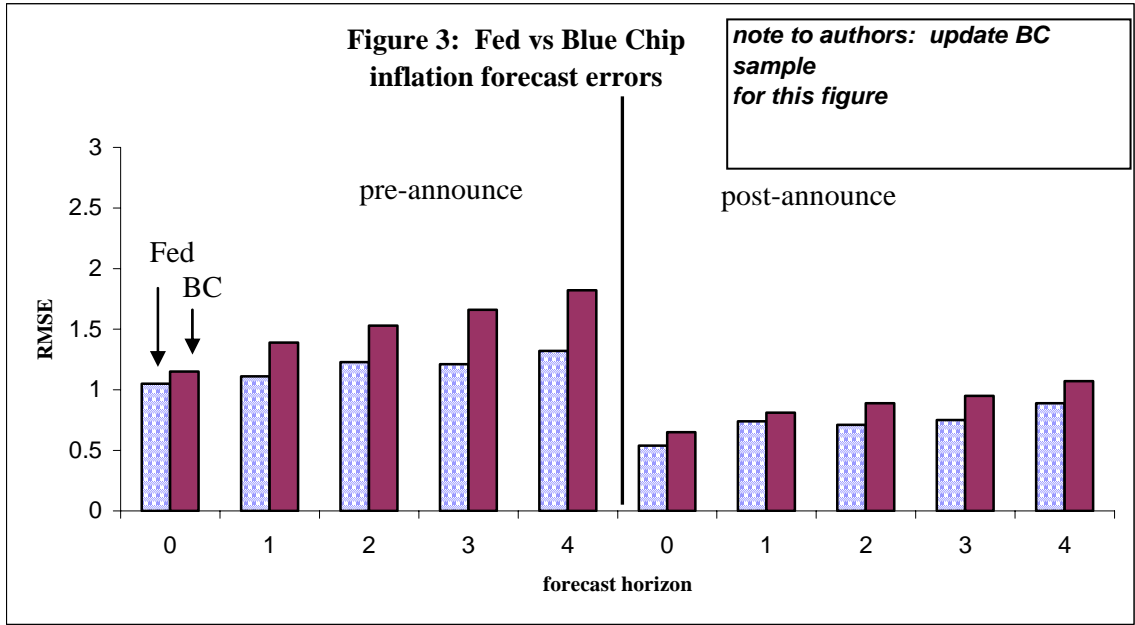
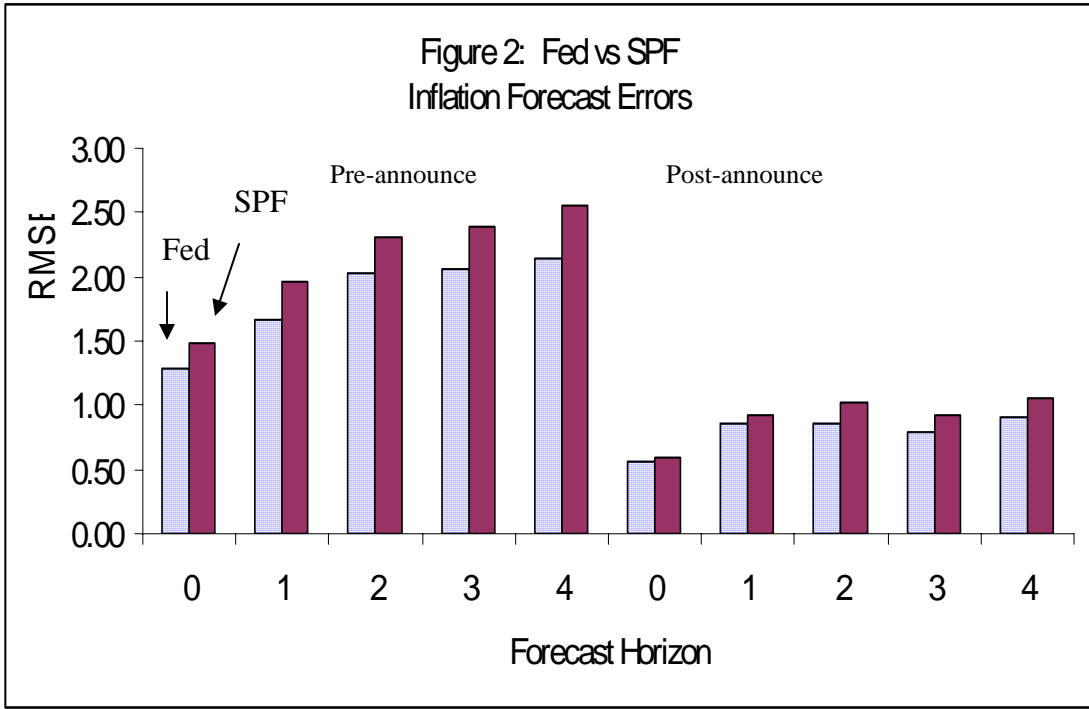
these results. The modified Diebold-Mariono test statistics indicate that the differences between these two sets of private sector forecasters are insignificant.

### **VIII. Conclusion and Plan for Future Work**

Our goal in this paper was to compare the size of forecast errors of the Fed and private-sector forecasters to determine whether the Fed has lost its forecasting advantage. Our results suggest that the Fed has lost some, but not all of its forecasting advantage relative to the SPF and the BC. The Fed's RMSEs are still significantly smaller in the most recent sample, especially for the BC. Moreover, the BC results are based on a significantly larger sample in the post-1994 period (62 observations compared to 23 observations for the SPF). Our comparison of the RMSEs of the BC versus the SPF indicates that over the longer sample, the forecasting accuracy of these two surveys is nearly identical. It is therefore probably safe to assume that the BC results are more indicative of the forecasting accuracy of private sector forecasters in the post 1994 period than are the results for the SPF.



Notes: The bars are the estimated  $\beta$  from the regression  $\Delta i_t^{10year} = \alpha + \beta \Delta i_t^{fedfunds}$ . Newey-West standard errors are reported in parentheses below the estimates and \*\* indicates significance at the 0.01 level.



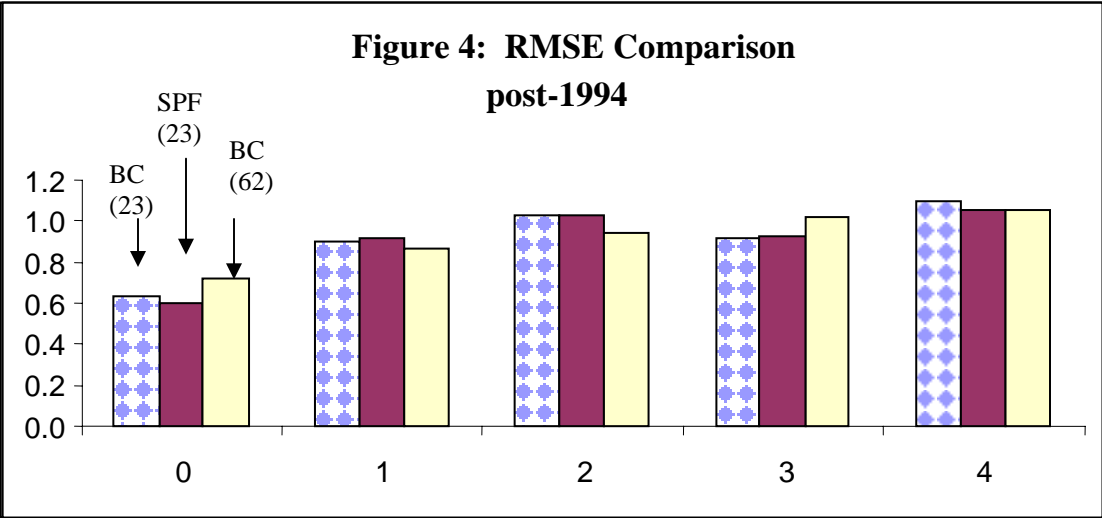


Table 1

| Inflation Forecast RMSE Comparison<br>Fed vs SPF |         |             |             |                    |                                       |     |
|--|---------|-------------|-------------|--------------------|---------------------------------------|-----|
|  | horizon | RMSE<br>Fed | RMSE<br>SPF | Ratio<br>(SPF/Fed) | Diebold-Mariano<br>Modified<br>t-stat | N   |
| Full sample<br>1968-2001                         | 0       | 1.17        | 1.35        | 1.15               | 2.37*                                 | 108 |
|  | 1       | 1.53        | 1.79        | 1.17               | 4.93**                                | 108 |
|  | 2       | 1.83        | 2.10        | 1.15               | 4.28**                                | 107 |
|  | 3       | 1.85        | 2.15        | 1.16               | 4.55**                                | 102 |
|  | 4       | 1.92        | 2.28        | 1.19               | 5.73**                                | 93  |
| Pre-GM<br>1968-1983                              | 0       | 1.45        | 1.67        | 1.15               | 1.73H                                 | 56  |
|  | 1       | 1.94        | 2.28        | 1.17               | 4.86**                                | 56  |
|  | 2       | 2.38        | 2.71        | 1.14               | 3.53**                                | 55  |
|  | 3       | 2.47        | 2.82        | 1.14               | 3.35**                                | 50  |
|  | 4       | 2.65        | 3.12        | 1.18               | 4.11**                                | 41  |
| Post-GM<br>1984-2001                             | 0       | 0.77        | 0.88        | 1.15               | 1.91H                                 | 52  |
|  | 1       | 0.91        | 1.05        | 1.15               | 2.02*                                 | 52  |
|  | 2       | 0.96        | 1.15        | 1.20               | 2.47*                                 | 52  |
|  | 3       | 0.92        | 1.19        | 1.28               | 3.35**                                | 52  |
|  | 4       | 1.03        | 1.29        | 1.26               | 4.58**                                | 52  |
| Pre-<br>announce<br>1968-1993                    | 0       | 1.29        | 1.49        | 1.16               | 2.56*                                 | 85  |
|  | 1       | 1.67        | 1.96        | 1.18               | 5.17**                                | 85  |
|  | 2       | 2.02        | 2.31        | 1.14               | 4.13**                                | 84  |
|  | 3       | 2.06        | 2.39        | 1.16               | 4.35**                                | 79  |
|  | 4       | 2.15        | 2.56        | 1.19               | 5.52**                                | 70  |
| post-<br>announce<br>1994-2001                   | 0       | 0.56        | 0.60        | 1.08               | -0.03                                 | 23  |
|  | 1       | 0.85        | 0.92        | 1.08               | 0.68                                  | 23  |
|  | 2       | 0.85        | 1.02        | 1.21               | 1.30                                  | 23  |
|  | 3       | 0.79        | 0.93        | 1.18               | 1.92H                                 | 23  |
|  | 4       | 0.91        | 1.05        | 1.15               | 1.90H                                 | 23  |

\*\* denotes significant at the 0.01 level, \* denotes significant at the 0.05 level, H denotes significant at the 0.10 level.

Table 2

| Inflation Forecast RMSE Comparison<br>Fed vs BC |         |      |      |          |                    |     |
|---|---------|------|------|----------|--------------------|-----|
|   | horizon | RMSE | RMSE | Ratio    | Diebold-Mariano    | N   |
|   |         | Fed  | BC   | (BC/Fed) | Modified<br>t-stat |     |
| Full sample                                     | 0       | 0.92 | 1.02 | 1.1      | 2.26H              | 168 |
| 1980-2001                                       | 1       | 1    | 1.23 | 1.23     | 5.13**             | 168 |
|   | 2       | 1.09 | 1.36 | 1.25     | 4.8**              | 168 |
|   | 3       | 1.08 | 1.47 | 1.36     | 5.44**             | 168 |
|   | 4       | 1.19 | 1.62 | 1.35     | 6.28**             | 164 |
| Pre-GM  | 0       | 1.44 | 1.32 | 0.92     | -0.83              | 34  |
| 1980-1983                                       | 1       | 1.35 | 1.75 | 1.29     | 4.38**             | 34  |
|   | 2       | 1.6  | 2.08 | 1.3      | 3.78**             | 34  |
|   | 3       | 1.47 | 2.18 | 1.48     | 4.12**             | 34  |
|   | 4       | 1.78 | 2.55 | 1.43     | 4.63**             | 30  |
| Post-GM   | 0       | 0.73 | 0.92 | 1.26     | 3.98**             | 134 |
| 1984-2001                                       | 1       | 0.89 | 1.07 | 1.19     | 3.65**             | 134 |
|   | 2       | 0.92 | 1.11 | 1.21     | 3.66**             | 134 |
|   | 3       | 0.96 | 1.23 | 1.29     | 4.3**              | 134 |
|   | 4       | 1.02 | 1.32 | 1.3      | 5.44**             | 134 |
| Pre-announce                                    | 0       | 1.05 | 1.15 | 1.09     | 1.69H              | 114 |
| 1980-1993                                       | 1       | 1.11 | 1.39 | 1.25     | 5.24**             | 114 |
|   | 2       | 1.23 | 1.53 | 1.25     | 4.19**             | 114 |
|   | 3       | 1.21 | 1.66 | 1.38     | 4.92**             | 114 |
|   | 4       | 1.32 | 1.82 | 1.38     | 5.86**             | 110 |
| Post-announce                                   | 0       | 0.54 | 0.65 | 1.2      | 1.98H              | 54  |
| 1994-2001                                       | 1       | 0.74 | 0.81 | 1.1      | 1.55               | 54  |
|   | 2       | 0.71 | 0.89 | 1.25     | 2.62*              | 54  |
|   | 3       | 0.75 | 0.95 | 1.27     | 2.72**             | 54  |
|   | 4       | 0.89 | 1.07 | 1.21     | 3.00**             | 54  |

\*\* denotes significant at the 0.01 level, \* denotes significant at the 0.05 level, H denotes significant at the 0.10 level.

Table 3

Difference Between the Absolute Forecast Errors  
SPF minus Fed, Inflation

| Horizon | Pre-GM    | Post-GM   | Diebold-Mariano |
|---------|-----------|-----------|-----------------|
|         | 1968-1983 | 1984-2001 | Modified t-stat |
| 0       | 0.18      | 0.14      | 0.39            |
| 1       | 0.39      | 0.15      | 2.28*           |
| 2       | 0.35      | 0.15      | 1.71H           |
| 3       | 0.36      | 0.22      | 1.10            |
| 4       | 0.60      | 0.28      | 2.04*           |

| Horizon | Pre-Announce | Post-Announce | Diebold-Mariano |
|---------|--------------|---------------|-----------------|
|         | 1968-1993    | 1994-2001     | t-stat          |
| 0       | 0.19         | 0.05          | 1.33            |
| 1       | 0.33         | 0.08          | 2.58*           |
| 2       | 0.30         | 0.07          | 2.37*           |
| 3       | 0.33         | 0.14          | 1.68H           |
| 4       | 0.50         | 0.17          | 2.45*           |

\*\* denotes significant at the 0.01 level, \* denotes significant at the 0.05 level, H denotes significant at the 0.10 level.

Table 4

Difference Between the Absolute Forecast Errors  
Blue Chip minus Fed, Inflation

| Horizon | Pre-GM    | Post-GM   | t-stat |
|---------|-----------|-----------|--------|
|         | 1968-1983 | 1984-2001 |        |
| 0       | -0.13     | 0.18      | -1.96H |
| 1       | 0.41      | 0.17      | 2.37*  |
| 2       | 0.53      | 0.17      | 2.47*  |
| 3       | 0.71      | 0.25      | 2.63** |
| 4       | 0.97      | 0.33      | 3.05** |

|   | Pre-Announce | Post-Announce | t-stat |
|---|--------------|---------------|--------|
|   | 1968-1993    | 1994-2001     |        |
| 0 | 0.13         | 0.11          | 0.2    |
| 1 | 0.28         | 0.08          | 2.71** |
| 2 | 0.29         | 0.15          | 1.66H  |
| 3 | 0.41         | 0.2           | 1.97H  |
| 4 | 0.55         | 0.25          | 2.46** |

\*\* denotes significant at the 0.01 level, \* denotes significant at the 0.05 level, H denotes significant at the 0.10 level.

Table 5  
**Tests of Federal Reserve Additional Information for Inflation  
 Fed vs SPF**

| <b>Sample</b>                      | <b>Horizon</b> | <b>Fed</b>   | <b>SPF</b>    | <b>R<sup>2</sup></b> | <b>N</b> |
|------------------------------------|----------------|--------------|---------------|----------------------|----------|
| <b>Full<br/>1968-2001</b>          | <b>0</b>       | .86** (.17)  | .20 (.18)     | .84                  | 108      |
|                                    | <b>1</b>       | 1.43** (.22) | -.36 (.21)    | .74                  | 108      |
|                                    | <b>2</b>       | 1.59** (.40) | -.63 (.42)    | .62                  | 107      |
|                                    | <b>3</b>       | 1.64** (.29) | -.64** (.28)  | .60                  | 102      |
|                                    | <b>4</b>       | 1.84** (.29) | -.77** (.30)  | .63                  | 93       |
|                                    | <b>0-4</b>     | 1.78** (.33) | -.79* (.34)   | .83                  | 93       |
| <b>Pre-GM<br/>1968-1983</b>        | <b>0</b>       | .84** (.21)  | .19 (.22)     | .73                  | 56       |
|                                    | <b>1</b>       | 1.47** (.27) | -.61* (.25)   | .57                  | 56       |
|                                    | <b>2</b>       | 1.56** (.46) | -.94 (.50)    | .40                  | 55       |
|                                    | <b>3</b>       | 1.52** (.31) | -.84* (.37)   | .36                  | 50       |
|                                    | <b>4</b>       | 1.81** (.30) | -1.27** (.42) | .42                  | 41       |
|                                    | <b>0-4</b>     | 2.01** (.30) | -1.42** (.37) | .66                  | 41       |
| <b>Post-GM<br/>1984-2001</b>       | <b>0</b>       | .72** (.25)  | .25 (.22)     | .60                  | 52       |
|                                    | <b>1</b>       | .87** (.24)  | .16 (.21)     | .55                  | 52       |
|                                    | <b>2</b>       | .82** (.25)  | .16 (.25)     | .50                  | 52       |
|                                    | <b>3</b>       | 1.09** (.26) | -.18 (.31)    | .53                  | 52       |
|                                    | <b>4</b>       | 1.14** (.26) | -.36 (.31)    | .48                  | 52       |
|                                    | <b>0-4</b>     | .92* (.28)   | .01 (.27)     | .76                  | 52       |
| <b>Pre-Announce<br/>1968-1993</b>  | <b>0</b>       | .89** (.18)  | .16 (.19)     | .79                  | 85       |
|                                    | <b>1</b>       | 1.45** (.22) | -.45* (.21)   | .67                  | 85       |
|                                    | <b>2</b>       | 1.61** (.39) | -.79 (.44)    | .53                  | 84       |
|                                    | <b>3</b>       | 1.66** (.29) | -.76* (.30)   | .50                  | 79       |
|                                    | <b>4</b>       | 1.92** (.29) | -.94** (.32)  | .54                  | 70       |
|                                    | <b>0-4</b>     | 1.96** (.34) | -1.08** (.37) | .78                  | 70       |
| <b>Post-Announce<br/>1994-2001</b> | <b>0</b>       | .30 (.21)    | .48 (.29)     | .41                  | 23       |
|                                    | <b>1</b>       | .65H (.38)   | .18 (.40)     | .16                  | 23       |
|                                    | <b>2</b>       | .93 (.61)    | -.62 (.70)    | .15                  | 23       |
|                                    | <b>3</b>       | .13 (.38)    | .20 (.43)     | .04                  | 23       |
|                                    | <b>4</b>       | -.45 (.26)   | .58 (.38)     | .10                  | 23       |
|                                    | <b>0-4</b>     | .22 (.23)    | .15 (.25)     | .09                  | 23       |

Notes: “GM” denotes the Great Moderation which we date as beginning in 1984.01 based on McConnell and Perez-Quiros (2000). “Announce” denotes the date at which the Federal Reserve began announcing their policy changes immediately after FOMC meetings, \*\* denotes significant at the 0.01 level, \* denotes significant at the 0.05 level, H denotes significant at the 0.10 level.

Table 6  
**Tests of Federal Reserve Additional Information for Inflation  
Fed vs Blue Chip**

| <b>Sample</b>                      | <b>Horizon</b> | <b>Fed</b>   | <b>Blue Chip</b> | <b>R<sup>2</sup></b> | <b>N</b> |
|------------------------------------|----------------|--------------|------------------|----------------------|----------|
| <b>Full<br/>1980-2001</b>          | <b>0</b>       | .63** (.12)  | .39** (.14)      | .88                  | 176      |
|                                    | <b>1</b>       | .98** (.13)  | -.04 (.17)       | .84                  | 176      |
|                                    | <b>2</b>       | 1.04** (.18) | -.14 (.21)       | .78                  | 176      |
|                                    | <b>3</b>       | 1.15** (.19) | -.24 (.20)       | .78                  | 176      |
|                                    | <b>4</b>       | 1.03** (.25) | -.14 (.20)       | .66                  | 172      |
|                                    | <b>0-4</b>     | .98** (.17)  | -.07 (.17)       | .92                  | 172      |
| <b>Pre-GM<br/>1980-1983</b>        | <b>0</b>       | .26 (.21)    | .93** (.26)      | .83                  | 34       |
|                                    | <b>1</b>       | 1.28** (.30) | -.42 (.43)       | .81                  | 34       |
|                                    | <b>2</b>       | 1.21** (.44) | -.39 (.70)       | .74                  | 34       |
|                                    | <b>3</b>       | 1.63** (.38) | -1.04 (.63)      | .76                  | 34       |
|                                    | <b>4</b>       | 1.48** (.72) | -.81 (1.00)      | .55                  | 30       |
|                                    | <b>0-4</b>     | 1.16** (.26) | -.32 (.31)       | .92                  | 30       |
| <b>Post-GM<br/>1984-2001</b>       | <b>0</b>       | .82** (.10)  | .18 (.13)        | .68                  | 142      |
|                                    | <b>1</b>       | .82** (.16)  | .17 (.16)        | .54                  | 142      |
|                                    | <b>2</b>       | .95** (.22)  | .03 (.20)        | .53                  | 142      |
|                                    | <b>3</b>       | 1.06** (.22) | -.18 (.24)       | .50                  | 142      |
|                                    | <b>4</b>       | .97** (.25)  | -.12 (.26)       | .48                  | 142      |
|                                    | <b>0-4</b>     | .92** (.25)  | .01 (.24)        | .78                  | 142      |
| <b>Pre-Announce<br/>1968-1993</b>  | <b>0</b>       | .62** (.16)  | .39 (.20)        | .85                  | 114      |
|                                    | <b>1</b>       | 1.13** (.17) | -.23 (.23)       | .82                  | 114      |
|                                    | <b>2</b>       | 1.09** (.22) | -.25 (.27)       | .73                  | 114      |
|                                    | <b>3</b>       | 1.23** (.21) | -.35 (.25)       | .74                  | 114      |
|                                    | <b>4</b>       | 1.16** (.28) | -.31 (.25)       | .59                  | 110      |
|                                    | <b>0-4</b>     | 1.06** (.19) | -.21 (.19)       | .92                  | 110      |
| <b>Post-Announce<br/>1994-2001</b> | <b>0</b>       | .69** (.13)  | .29 (.26)        | .57                  | 62       |
|                                    | <b>1</b>       | .65** (.23)  | -.12 (.30)       | .23                  | 62       |
|                                    | <b>2</b>       | 1.01** (.35) | -.47 (.36)       | .21                  | 62       |
|                                    | <b>3</b>       | .54 (.38)    | -.06 (.40)       | .07                  | 62       |
|                                    | <b>4</b>       | .005 (.30)   | .18 (.35)        | .01                  | 62       |
|                                    | <b>0-4</b>     | .79 (.33)    | -.26 (.30)       | .22                  | 62       |

Notes: “GM” denotes the Great Moderation which we date as beginning in 1984.01 based on McConnell and Perez-Quiros (2000). “Announce” denotes the date at which the Federal Reserve began announcing their policy changes immediately after FOMC meetings, \*\* denotes significant at the 0.01 level, \* denotes significant at the 0.05 level, H denotes significant at the 0.10 level.

Table 7

Estimates of Revelation of Information About Inflation—**Full Sample**

$$\hat{\pi}_{ht}^F = \psi + \theta M_t + \phi \pi_{ht}^C + \omega_{ht}$$

## Dummy Variable

| Blue Chip                       | $\theta$    | $\phi$       | R <sup>2</sup> | N   |
|---------------------------------|-------------|--------------|----------------|-----|
| 0                               | .04 (.09)   | .95** (.06)  | .68            | 140 |
| 1                               | .02 (.08)   | .88** (.05)  | .77            | 140 |
| 2                               | .02 (.05)   | .92** (.05)  | .85            | 140 |
| 3                               | .06 (.04)   | .93** (.05)  | .85            | 140 |
| 4                               | .08 (.05)   | .92** (.05)  | .86            | 140 |
| 0-4                             | .05 (.03)   | .92** (.03)  | .92            | 140 |
| SPF                             |             |              |                |     |
| 0                               | -.001 (.13) | 1.07** (.05) | .89            | 87  |
| 1                               | .16 (.12)   | 1.04** (.05) | .90            | 87  |
| 2                               | .17 (.10)   | 1.10** (.05) | .90            | 87  |
| 3                               | .12 (.07)   | 1.06** (.03) | .93            | 87  |
| 4                               | .16* (.08)  | 1.05** (.05) | .90            | 86  |
| 0-4                             | .15** (.06) | 1.07** (.03) | .96            | 86  |
| Change in the Funds-Rate Target |             |              |                |     |
| Blue Chip                       | $\theta$    | $\phi$       | R <sup>2</sup> | N   |
| 0                               | -.04 (.22)  | .93** (.06)  | .67            | 141 |
| 1                               | -.02 (.21)  | .88** (.05)  | .77            | 141 |
| 2                               | .17 (.11)   | .91** (.05)  | .86            | 141 |
| 3                               | .19 (.11)   | .92** (.05)  | .85            | 141 |
| 4                               | .24H (.14)  | .91** (.04)  | .86            | 141 |
| 0-4                             | .11 (.09)   | .92** (.03)  | .92            | 141 |
| SPF                             |             |              |                |     |
| 0                               | -.21 (.31)  | 1.07** (.05) | .90            | 87  |
| 1                               | .15 (.29)   | 1.05** (.05) | .90            | 87  |
| 2                               | .45H (.26)  | 1.10** (.05) | .91            | 87  |
| 3                               | .22 (.18)   | 1.06** (.03) | .92            | 87  |
| 4                               | .27 (.18)   | 1.05** (.05) | .90            | 86  |
| 0-4                             | .26H (.15)  | 1.07** (.03) | .96            | 86  |

\*\* denotes significant at the 0.01 level.

\* denotes significant at the 0.05 level.

H denotes significant at the 0.10 level.

Table 8

Estimates of Revelation of Information About Inflation—**Pre-Announce**

$$\hat{\pi}_{ht}^F = \psi + \theta M_t + \phi \pi_{ht}^C + \omega_{ht}$$

## Dummy Variable

| Blue Chip                       | $\theta$    | $\phi$       | R <sup>2</sup> | N  |
|---------------------------------|-------------|--------------|----------------|----|
| 0                               | .20H (.11)  | 1.02** (.11) | .60            | 78 |
| 1                               | -.13 (.13)  | .93** (.09)  | .65            | 78 |
| 2                               | .01 (.09)   | .98** (.08)  | .71            | 78 |
| 3                               | .09 (.08)   | .99** (.12)  | .70            | 78 |
| 4                               | .13 (.09)   | 1.04** (.10) | .76            | 78 |
| 0-4                             | .06 (.06)   | 1.02** (.07) | .86            | 78 |
| SPF                             |             |              |                |    |
| 0                               | .10 (.18)   | 1.1** (.07)  | .89            | 56 |
| 1                               | .09(.18)    | 1.07** (.07) | .87            | 56 |
| 2                               | .26 (.16)   | 1.1** (.08)  | .85            | 56 |
| 3                               | .17H(.10)   | 1.09** (.05) | .89            | 56 |
| 4                               | .24* (.11)  | 1.02**(.07)  | .84            | 55 |
| 0-4                             | .20H(.10)   | 1.1** (.05)  | .95            | 55 |
| Change in the Funds-Rate Target |             |              |                |    |
| Blue Chip                       | $\theta$    | $\phi$       | R <sup>2</sup> | N  |
| 0                               | .30H(.17)   | 1.0** (.11)  | .58            | 79 |
| 1                               | -0.35 (.22) | .94** (.09)  | .66            | 79 |
| 2                               | .14 (.17)   | .98** (.08)  | .72            | 79 |
| 3                               | .26H(.15)   | .99** (.10)  | .71            | 79 |
| 4                               | .38* (.17)  | 1.04** (.10) | .77            | 79 |
| 0-4                             | .14 (.11)   | 1.02** (.06) | .86            | 79 |
| SPF                             |             |              |                |    |
| 0                               | -.03 (.30)  | 1.12** (.07) | .89            | 56 |
| 1                               | -.07 (.32)  | 1.1** (.07)  | .87            | 56 |
| 2                               | .47 (.29)   | 1.13** (.08) | .85            | 56 |
| 3                               | .24 (.19)   | 1.1** (.05)  | .89            | 56 |
| 4                               | .25 (.20)   | 1.04** (.08) | .84            | 55 |
| 0-4                             | .26 (.16)   | 1.12** (.05) | .95            | 55 |

\*\* denotes significant at the 0.01 level.

\* denotes significant at the 0.05 level.

H denotes significant at the 0.10 level.

Table 9

| Estimates of Revelation of Information About Inflation— <b>Post-Announce</b> |              |             |                |    |
|--|--------------|-------------|----------------|----|
| $\hat{\pi}_{ht}^F = \psi + \theta M_t + \phi \pi_{ht}^C + \omega_{ht}$       |              |             |                |    |
| Dummy Variable   |              |             |                |    |
| Blue Chip  | $\theta$     | $\phi$      | R <sup>2</sup> | N  |
| 0  | -.13 (.13)   | .86** (.18) | .32            | 62 |
| 1  | .14 (.09)    | .97** (.11) | .55            | 62 |
| 2  | .03 (.05)    | .79** (.12) | .59            | 62 |
| 3  | .05 (.05)    | .67** (.09) | .58            | 62 |
| 4  | .04 (.05)    | .62** (.09) | .50            | 62 |
| 0-4  | .03 (.04)    | .75** (.08) | .71            | 62 |
| SPF  |              |             |                |    |
| 0  | -.22 (.21)   | .63** (.22) | .25            | 31 |
| 1  | .26H (.15)   | .97** (.15) | .53            | 31 |
| 2  | .04 (.08)    | .98** (.13) | .60            | 31 |
| 3  | .10 (.07)    | .59** (.10) | .50            | 31 |
| 4  | .11 (.08)    | .53** (.13) | .39            | 31 |
| 0-4  | .05 (.05)    | .76** (.09) | .76            | 31 |
| Change in the Funds-Rate Target  |              |             |                |    |
| Blue Chip  | $\theta$     | $\phi$      | R <sup>2</sup> | N  |
| 0  | -.80 (.44)   | .96** (.16) | .37            | 62 |
| 1  | .64* (.27)   | .89** (.11) | .58            | 62 |
| 2  | .28* (.14)   | .75** (.12) | .60            | 62 |
| 3  | .18 (.12)    | .65** (.10) | .58            | 62 |
| 4  | .08 (.13)    | .61** (.09) | .49            | 62 |
| 0-4  | .09 (.13)    | .74** (.08) | .71            | 62 |
| SPF  |              |             |                |    |
| 0  | -1.27 (.88)  | .67** (.22) | .31            | 31 |
| 1  | 1.84** (.62) | .89** (.16) | .68            | 31 |
| 2  | .37 (.29)    | .96** (.13) | .62            | 31 |
| 3  | .42H (.22)   | .57** (.10) | .51            | 31 |
| 4  | .59* (.22)   | .51** (.12) | .43            | 31 |
| 0-4  | .37* (.15)   | .74** (.08) | .78            | 31 |

\*\* denotes significant at the 0.01 level.

\* denotes significant at the 0.05 level.

H denotes significant at the 0.10 level.

**Table 10**  
**RMSE Comparison Median SPF versus Mean**  
**SPF**

| horizon | Full Sample: |        | Post-1994: |        |
|---------|--------------|--------|------------|--------|
|         | Mean         | Median | Mean       | Median |
| 0       | 1.23         | 1.24   | 0.71       | 0.69   |
| 1       | 1.62         | 1.62   | 0.80       | 0.83   |
| 2       | 1.84         | 1.87   | 0.84       | 0.85   |
| 3       | 2.00         | 2.07   | 0.89       | 0.92   |
| 4       | 2.17         | 2.21   | 0.96       | 0.95   |

**Table 11**  
**Inflation Forecast RMSE Comparison**  
**BC vs SPF**

| Sample    | horizon | RMSE<br>BC | RMSE<br>SPF | Ratio<br>(SPF/BC) | Diebold-Mariano<br>Modified |     |
|-----------|---------|------------|-------------|-------------------|-----------------------------|-----|
|           |         |            |             |                   | t-stat                      | N   |
| 1980-2006 | 0       | 0.98       | 0.97        | 0.99              | -0.14                       | 104 |
|           | 1       | 1.16       | 1.13        | 0.97              | -1.06                       | 104 |
|           | 2       | 1.27       | 1.23        | 0.97              | -1.2                        | 104 |
|           | 3       | 1.4        | 1.4         | 1                 | 0.27                        | 104 |
|           | 4       | 1.55       | 1.54        | 0.99              | -0.81                       | 101 |
| 1980-2001 | 0       | 1.01       | 1.01        | 1                 | 0.01                        | 88  |
|           | 1       | 1.21       | 1.18        | 0.98              | -0.76                       | 88  |
|           | 2       | 1.33       | 1.29        | 0.97              | -1.15                       | 88  |
|           | 3       | 1.47       | 1.47        | 1                 | 0.19                        | 88  |
|           | 4       | 1.63       | 1.63        | 1                 | -0.74                       | 86  |

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