# Do central banks' forecasts take into account public opinion and views?*

Ricardo Nunes
Federal Reserve Board

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**Abstract**

Modern central banks are mandated by democratic societies to devote considerable resources to producing and presenting forecasts to the public and its political representatives. This paper aims at understanding the determinants of these forecasts as they provide a strong pillar for transparent and accountable central banking. In particular, two forecasts are compared, both of which are produced by the Federal Reserve but which differ in whether they are revealed to the public or remain private in the short run. The paper shows that the Fed forecast revealed to the public reflects public opinion and views over and above the private forecast. Public opinion and views appear overweighted from a mean squared error objective perspective.

JEL *classification*: E52, E58, E31.

## 1 Introduction

Economic projections are often presented to the public and its political representatives by central banks as part of their mandates. The public disclosure of forecasts is

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Contact Information: Federal Reserve Board, 20th and C Streets NW, Washington, D.C., 20551, USA. Telephone: 202-452-2337. Email: ricardo.p.nunes@frb.gov.

a common practice as central banks are designed to be transparent and accountable to the democratic societies they represent. These forecasts help society understand the likely evolution of the economy and the trade-offs that the society faces as well as the policy choices that best represent its interests.

More specifically in the United States, the Federal Reserve regularly discloses to the public the forecasts produced by the Federal Open Market Committee (FOMC) – the body that sets the Federal Funds rate. The FOMC meetings devote a substantial amount of time preparing these forecasts and they draw on considerable expertise and resources. The FOMC forecast is then heavily discussed and scrutinized in the U.S. Congress and the media.

Romer and Romer (2008) show a puzzling result concerning the quality of the FOMC forecast. In terms of prediction accuracy, this forecast appears to be inferior to the so-called Greenbook forecast prepared internally by the Federal Reserve staff.[1] The Greenbook forecast is prepared specifically for and one week prior to the FOMC meetings. This forecast constitutes a key input into the FOMC forecast, and the FOMC could simply adopt it without changes. The FOMC has an informational advantage as it releases its forecast later and also has insider knowledge of their own preferences regarding the interest rate setting. Romer and Romer (2008) find that despite these advantages, the FOMC forecast is not more accurate than the Greenbook forecast. Optimal prediction of inflation and unemployment place almost full weight on the Greenbook forecast and zero weight on the FOMC forecast.

This paper tries to ascertain the factors that affect central banks' forecasts in general and the FOMC forecasts in particular. It is worthwhile to do so for several reasons. First, such forecasts are by law part of an accountable and transparent policy-making process of democratic societal choice. Second, central banks' forecasts are a part of

[1]The Greenbook has recently been merged with the Bluebook and relabeled "Tealbook". For convenience, I will continue to use the term Greenbook throughout this paper.

monetary policy, both as an input into the interest rate decision and as as a tool of expectations management and forward guidance. Third, a non-negligible amount of resources are devoted into producing such forecasts and all relevant information should be released to the public. Improving these forecasts, or at least understanding its determinants and limitations, should contribute to better economic outcomes and more informed economic decisions.

In order to examine the determinants of the FOMC forecast, it is critical to use the Greenbook forecast as a control because it is prepared just before and specifically for the FOMC. A key characteristic of the FOMC forecast that I explore is its public exposure and the institutional role of its issuing body. The Greenbook forecast remains private for five years and is not mandated to fulfil any public role. I find that the FOMC forecast seems to reflect or incorporate other publicly available forecasts and information. Namely, I shed light on the role of private sector and White House forecasts, as well as public opinion expressed in newspaper articles. I also find that the weights on public opinion and views are larger than the optimal weights from a mean squared error perspective.

The results in this paper reveal that the forecasts disclosed to the public (FOMC forecasts) do not rely solely on the internal forecasts (Greenbook forecasts), and that public opinion and views are taken into account. Overall, the model can capture very well the behavior and relative performance of the FOMC forecasts. More specifically, the results can explain the puzzle of Romer and Romer (2008) regarding the low accuracy of the FOMC inflation forecast and its performance relative to the Greenbook.

The White House forecast data are obtained from the Budget of the United States Government and the Mid-Session Review. Private sector forecast data are available through the Survey of Professional Forecasters. Because all the variables in our regressions are forecasts, the statistical framework is straightforward and interpretable.

Finally, I also use a narrative approach to complement the results of my analysis. I explain the difference in the FOMC and the Greenbook forecasts by an index based on Wall Street Journal articles documenting public views and concerns regarding the policy outlook of the Federal Reserve.

Several papers have compared different forecasts by examining their similarity and by ranking their forecasting performance (Romer and Romer (2000) and Reifschneider and Tulip (2007) among many others). Many studies focus on the inflation forecast because it is the variable most related to the mission of central banks and for which they have specific expertise. Consistent with these arguments, there is a consensus that the Greenbook inflation forecast seems to be the most efficient. Other papers have examined the effects of the public opinion (Tootell (1999)) and regional factors (Meade and Sheets (2005)) on the FOMC members' policy votes. None of these papers, however, provides an explanation for the difference between the FOMC and Greenbook forecasts; to the best of my knowledge the present paper is the first to empirically address this issue.

Ellison and Sargent (2012) present an objective function that justifies the FOMC forecasts. The authors argue that the FOMC is a robust policymaker, as in Hansen and Sargent (2008). Unlike the Greenbook, the FOMC forecasts follow the probabilities of robust policy rather than aim to be optimal in terms of prediction accuracy. The current paper unveils new empirical patterns and the mechanisms pointed out here and in Ellison and Sargent (2012) are complementary. For instance, the results found here could also be justified by claiming that the FOMC did not follow a purely mean squared error (MSE) forecasting perspective. A later section discusses the insights that can be gained from both papers.[2]

[2]Interestingly, a quote used by Ellison and Sargent (2012) also supports the mechanisms suggested in this paper. On 4th January 2008 Forbes Magazine reports on a discussion of Romer and Romer (2008) given by former Federal Reserve Monetary Affairs Director Vincent Reinhart. Forbes wrote: "However, former Fed staffer Vincent Reinhart said while it may look as if 'the FOMC's contribution

The paper is organized as follows: Section 2 describes the forecasts and key statistics. Section 3 provides the main results and Section 4 addresses their implications. Section 5 presents robustness analysis, including the use of individual level forecasts of the FOMC participants. Section 6 concludes.

# 2 The forecasts

*The FOMC forecast:* The course of monetary policy in the US is decided at the FOMC meetings. The Humphrey-Hawkins Full Employment and Balanced Growth Act requires the Federal Reserve to submit to Congress twice a year a document – the Monetary Policy Report (MPR) – discussing the conduct of monetary policy and the outlook on the economy. To this effect, preceding the MPR submission and in conjunction with FOMC meetings, each Federal Reserve Bank president plus seven members of the Federal Reserve Board submit their forecasts.

The range and central tendency of these forecasts are released to the public as part of the MPR and are discussed in a congressional hearing. I use the midpoint of the central tendency and, if not available, the midpoint of the range. A later section examines the individual responses of the FOMC members.

Starting in July 1979 the FOMC forecasts are prepared in February and July of each year. The forecasts in February are for the current year; the forecasts in July are for both the current year and next year. The forecasts for inflation and real growth are for fourth quarter over fourth quarter. The forecasts for unemployment are for the fourth quarter level. The definitions of the forecasted variables changed overtime, which poses an extra difficulty in matching definitions across sources.[3]

to the monetary policy process is to reduce forecast accuracy,' they are not there primarily to be forecasters. Instead, they exist in a political system and have to be held accountable for the outcomes of their decisions."

[3]The initial inflation definition was GNP inflation, in February 1989 changed to CPI, in February 2000 changed to personal consumption expenditures (PCE), in July 2004 changed to core PCE, and

*The Fed staff forecast (Greenbook):* The staff of the Board of Governors of the Federal Reserve System produces these forecasts one week before each FOMC meeting. All FOMC participants have access to the Greenbook before producing the FOMC forecast. The Greenbook takes five years to become available to the public and the data sample in this paper observes that condition. All variables forecasted by the FOMC are forecasted by the staff.

*The White House forecast:* The forecasts of the White House and the Administration are interconnected with the Administration policies and goals. The Administration opinion on the evolution of the economy are disclosed to the public in a variety of formats: speeches, interviews, debates, articles, press releases, and so on. Even though all of these sources are important for this paper, one needs to rely on a systematic process to record the White House forecasts.

The data-set was constructed by manually collecting the forecasts from the Budget of the United States Government and the Mid-Session Review.[4] Around January or February of each year, the budget for the subsequent fiscal year is presented. The forecasts for several years are contained in the chapter "Economic Assumptions". The table with forecasts also contains a note usually indicating that information only up to November of the previous year is used.

For the corresponding July forecasts of the FOMC, I use the Mid-Session Review of the Budget, which is available around June or July of each year. The "Economic Assumptions" table also contains a note usually indicating that information only up to May or June is used. The timing of the forecasts is addressed later in the analysis.

The number of variables being forecasted is less than those in the Greenbook but

after February 2008 changed to both PCE and core PCE. The initial real growth definition was GNP, in February 1992 changed to GDP. The unemployment definition did not change.

[4]These forecasts gather inputs from the Council of Economic Advisors, Department of the Treasury, Office of Management and Budget, and also from the Department of Commerce (Bureau of Economic Analysis and Economics and Statistics Administration), and the Department of Labor (Bureau of Labor Statistics).

more than those in the FOMC. For inflation, one can match the forecasts of inflation until July 1999.[5] A later section extends the sample for the inflation results. For real growth and unemployment, one can match the definitions in the entire sample.

*The private sector forecast:* I use the Survey of Professional Forecasters (SPF) because of several reasons. First, it is the oldest survey of macroeconomic forecasts in the United States conducted at a quarterly frequency. Second, the respondents produce regular forecasts of economic variables as part of their routine tasks in the business world and Wall Street. Third, this survey contains forecasts for several variables at different horizons that allow us to match the FOMC definitions. A later section shows results with the Blue Chip forecasts.

Nunes (2010) showed through a microfounded structural approach that SPF inflation forecasts have an impact on inflation dynamics. Even though private sector forecasts may have an impact on the economy, Greenbook forecasts could perfectly anticipate those. Therefore it is not clear that from a pure forecasting perspective the FOMC should take into account private forecasts in addition to the Greenbook.

For inflation, one can match the FOMC inflation forecast until July 1999.[6] For real growth and unemployment the entire sample of FOMC forecasts is matched. The SPF forecasts from the fourth quarter of the preceding year and the second quarter of the corresponding year match the February and July FOMC forecasts, respectively. The professional forecasters need to submit their responses at late in the second or third week of the middle month of each quarter.[7] The results of the survey are released to the public around the fourth week of the middle month of the quarter.

[5]Unfortunately, the budget documents do not contain PCE inflation, the definition of the FOMC after 2000 as explained in footnote 3.

[6]In the SPF, PCE and core PCE inflation are only available after 2007, which does not allow to match the definitions of the FOMC immediately after 2000 as explained in footnote 3.

[7]This timing always allows the participants to have access to the advance report of the Bureau of Economic Analysis.

*Outcomes:* For actual outcomes, I try to match what the staff and the FOMC were trying to forecast. For NIPA variables I use the final estimates released after three months and for non-NIPA I use the data as originally released.

*Statistics:* Table 1 shows the Mean Squared Errors (MSE). The Greenbook performs quite well in this dimension. With respect to inflation, the Greenbook outperforms the others. With respect to unemployment and real growth, Table 1 does not dictate a clear winner. The forecasts are similar and none is found to perform much better. Unlike inflation, real growth and unemployment depend to a greater extent on policies and factors outside the Fed's control. Unsurprisingly, others can forecast those two variables equally well.

Table 1: Mean Squared Errors

*White House*

| | MSE | | | | | |
|---|---|---|---|---|---|---|
| | G | F | W | $\hat{F}$ | rank{G,F,$\hat{F}$} | rank{W,F,$\hat{F}$} |
| Inflation | 0.7570 | 0.9331 | 1.2649 | 0.8609 | ✓ | ✓ |
| Unemp. | 0.4539 | 0.4744 | 0.6109 | 0.4787 | ✓ | ✓ |
| Real growth | 1.7870 | 1.6884 | 2.4482 | 1.8374 | | ✓ |

*SPF*

| | MSE | | | | | |
|---|---|---|---|---|---|---|
| | G | F | S | $\hat{F}$ | rank{G,F,$\hat{F}$} | rank{S,F,$\hat{F}$} |
| Inflation | 0.6658 | 0.8157 | 1.3629 | 0.7748 | ✓ | ✓ |
| Unemp. | 0.4015 | 0.3895 | 0.5087 | 0.3943 | ✓ | ✓ |
| Real growth | 1.7901 | 1.6181 | 1.8501 | 1.6907 | ✓ | ✓ |

Notes: The table reports Mean Squared Errors for Greenbook (G), FOMC (F), White House (W), SPF (S), and FOMC predicted by the model in section 3 ($\hat{F}$). The sample is the same for all variables in each panel. The upper and lower panel display different values even for common series because the sample does not coincide as some values for the SPF forecasts cannot be constructed in the earlier part of the sample. The fourth column displays a checkmark if the MSE ranking of F and G is replicated by $\hat{F}$ and G; the fifth column is analogous to the fourth but considers the MSE ranking relative to public forecasts rather than G.

The MSEs are a useful statistic but do not immediately determine whether a certain forecast contains useful information.[8] To perform that analysis, one can estimate the

[8]Ericsson (1992) shows that MSE dominance is necessary but not sufficient for forecast-

regression:

$$X_t = a + bG_t + cF_t + e_t, \tag{1}$$

where $X$ is the realized value and the variables on the right-hand side are the FOMC (F) and Greenbook (G) forecasts. If the FOMC forecast contains useful information relative to the Greenbook then the coefficient $c$ will be statistically significant. Table 2 shows that for inflation the coefficient on the Greenbook forecast is close to unity and the coefficient on the FOMC forecast is close to zero and is statistically insignificant. This result is the main finding of Romer and Romer (2008), the FOMC inflation forecast does not add useful information to the Greenbook forecast and there is a relevant information loss by not disclosing the Greenbook. The same conclusion holds for the unemployment forecast, while for real growth none of the forecasts seems to encompass the information in the other.[9]

The finding that the Greenbook outperforms the FOMC is stronger for inflation rather than for unemployment and real growth, and it should be noted that inflation is the most relevant variable. First, the Fed has specific expertise in monitoring and forecasting inflation – unlike real growth and unemployment, which are affected to a greater extent by other policies and institutions. Second, as shown in Svensson (1997, 1999), the modern framework of inflation targeting can be implemented and depends crucially on the evolution and monitoring of the inflation forecast.

Because the Greenbook inflation forecast seems to be quite accurate and the FOMC does not seem to properly incorporate this information, the results in this paper are particularly relevant for the inflation forecast. For the completeness of the analysis we present results for all the variables. As the paper will show, the main conclusions and results hold for all variables.

encompassing.

[9] In a later section and Table 14 in the appendix, more forecasts and different estimation methods are presented than those in Table 2.

Table 2: Role in predicting outcomes

| | constant | | G | | F | | $R^2$ |
|---|---|---|---|---|---|---|---|
| Inflation | -0.1822 | (0.2501) | 1.0548 | (0.4173) | -0.0668 | (0.3986) | 0.8500 |
| Unemp. | 0.1356 | (0.335) | 0.9136 | (0.3306) | 0.0390 | (0.339) | 0.8048 |
| Real Growth | 0.4970 | (0.3235) | 0.2649 | (0.4004) | 0.5728 | (0.4316) | 0.4488 |

Notes: The table reports the estimates of equation (1). The regressions include as dependent variable the actual outcome and as independent variables the Greenbook ($G$) and FOMC ($F$) forecasts. Standard deviations are reported in parenthesis.

# 3 Results

This section shows that the FOMC forecasts reflect public opinion and views over and above the Greenbook forecast.

## 3.1 Preliminary analysis

*Average Forecast:* I first show that the average FOMC forecast is in between the Greenbook and publicly available forecasts. The upper panel of Table 3 shows the averages of the Greenbook ($G_t$), FOMC ($F_t$), and White House forecasts ($W_t$), and the outcome of the variables being forecasted. The fourth column displays a checkmark if the FOMC forecast is in between the Greenbook and the White House. The FOMC average forecast is always in between the other two. This pattern is present even when disaggregating the forecasts by date and horizon. The lower panel of Table 3 performs the same analysis comparing the Greenbook, FOMC, and SPF forecasts ($S_t$). The same patterns are present.

*Sign Predictions:* The average forecast of F, S, and W are similar. Table 13 in the appendix shows that the standard deviations of the difference between two forecasts is large. For instance, for real growth $\sigma(W_t - G_t)$ is equal to 0.8. This shows that there is variability over time that can be used in the analysis.

Table 4 examines whether having access to the Greenbook and either the SPF or the White House forecasts would help predict whether the FOMC forecast would be

Table 3: Average Forecast Comparison

*White House*

| | Average | | | | |
|---|---|---|---|---|---|
| | G | F | W | In between? | Outcome |
| **Overall** | | | | | |
| Inflation | 4.1731 | 4.3054 | 4.3887 | ✓ | 3.9319 |
| Unemp. | 6.2318 | 6.1685 | 6.0965 | ✓ | 6.0694 |
| Real Growth | 2.6178 | 2.6882 | 2.8553 | ✓ | 2.7303 |
| **Inflation** | | | | | |
| Jan. Cur. | 4.1295 | 4.2312 | 4.3550 | ✓ | 3.8712 |
| Jul. Cur. | 4.2093 | 4.3512 | 4.4000 | ✓ | 4.1093 |
| Jul. Nex | 4.1785 | 4.3304 | 4.4095 | ✓ | 3.8121 |
| **Unemp.** | | | | | |
| Jan. Cur. | 6.3000 | 6.2231 | 6.2222 | ✓ | 6.1222 |
| Jul. Cur. | 6.2393 | 6.2228 | 6.1571 | ✓ | 6.1143 |
| Jul. Nex | 6.2393 | 6.1451 | 5.9893 | ✓ | 6.0750 |
| **Real Growth** | | | | | |
| Jan. Cur. | 2.5416 | 2.6389 | 2.6741 | ✓ | 2.7552 |
| Jul. Cur. | 2.5400 | 2.5804 | 2.6357 | ✓ | 2.6911 |
| Jul. Nex | 2.7202 | 2.7946 | 3.2250 | ✓ | 2.7410 |

*SPF*

| | Average | | | | |
|---|---|---|---|---|---|
| | G | F | S | In between? | Outcome |
| **Overall** | | | | | |
| Inflation | 3.9657 | 4.0900 | 4.2877 | ✓ | 3.7416 |
| Unemp. | 6.1825 | 6.1291 | 6.1153 | ✓ | 6.0000 |
| Real Growth | 2.6431 | 2.7094 | 2.7414 | ✓ | 2.8354 |
| **Inflation** | | | | | |
| Jan. Cur. | 4.1295 | 4.2312 | 4.4549 | ✓ | 3.8712 |
| Jul. Cur. | 4.2093 | 4.3512 | 4.3983 | ✓ | 4.1093 |
| Jul. Nex | 3.4996 | 3.6285 | 3.9728 | ✓ | 3.1686 |
| **Unemp.** | | | | | |
| Jan. Cur. | 6.3000 | 6.2231 | 6.2146 | ✓ | 6.1222 |
| Jul. Cur. | 6.2393 | 6.2228 | 6.1641 | ✓ | 6.1143 |
| Jul. Nex | 5.9920 | 5.9225 | 5.9534 | | 5.7400 |
| **Real Growth** | | | | | |
| Jan. Cur. | 2.5416 | 2.6389 | 2.6774 | ✓ | 2.7552 |
| Jul. Cur. | 2.5400 | 2.5804 | 2.7183 | ✓ | 2.6911 |
| Jul. Nex | 2.8680 | 2.9300 | 2.8363 | | 3.0835 |

Notes: The table reports the average forecast of the Greenbook (G), FOMC (F), White House (W), SPF (S), and the outcome. The fourth column displays a check if the FOMC forecast is in between the other two. The sample is the same for all variables in each panel. The upper and lower panel display different values even for common series because the sample does not coincide as some values for the SPF forecasts cannot be constructed in the earlier part of the sample.

higher or lower than the Greenbook. If the FOMC bases its forecast on the Greenbook but also attaches some weight to the SPF, one would think that $(S_t - G_t) > 0$ should imply $(F_t - G_t) > 0$, and $(S_t - G_t) < 0$ should imply $(F_t - G_t) < 0$. Even with such a direct approach, Table 4 shows that the success rate is above 75% when predicting the direction of the FOMC forecast relative to the Greenbook.

The remaining columns in the table show that the results are robust to only incorporating predictions in which $(S_t - G_t)$ are above or below a certain threshold. Taking as an example the unemployment forecast, the last column shows that when $(S_t - G_t)$ is below the 25th or above the 75th percentile, in 92% of all observations one can correctly predict the direction of the FOMC forecast relative to the Greenbook.

Table 4: Percentage of Correct Sign Predictions

| | Predicting Sign | | Predicting Sign percentiles (40-60) | | Predicting Sign percentiles (25-75) | |
|---|---|---|---|---|---|---|
| | W | S | W | S | W | S |
| Inflation | 75.9259 | 75.4717 | 73.4694 | 73.3333 | 76.6667 | 75.0000 |
| Unemp. | 81.0811 | 83.7838 | 85.0000 | 83.8710 | 92.3077 | 88.3721 |
| Real Growth | 76.7123 | 76.9231 | 78.9474 | 77.4194 | 78.5714 | 82.0513 |

Notes: The table reports the percentage of correct predictions of the sign of $(F_t - G_t)$. The first column plots the percentage of correct predictions $(W_t - G_t) > 0$ and $(W_t - G_t) < 0$ implying $(F_t - G_t) > 0$ and $(F - G) < 0$, respectively. The third column computes the percentage of correct predictions with $(W_t - G_t) > (W_t - G_t)_{60thpercentile}$ and $(W_t - G_t) < (W_t - G_t)_{40thpercentile}$ implying $(F_t - G_t) > 0$ and $(F_t - G_t) < 0$, respectively. The fifth column does the analysis with the 25th and 75th percentile. The second, fourth, and sixth column make the same analysis for the SPF forecast.

*Narrative Evidence:* If the FOMC forecasts take into account public opinion and views, it would be informative to show narrative or factual evidence for such observation. Currently, the MPR does not explicitly mention other forecasts. But a thorough investigation uncovered a very interesting finding. The MPRs from their inception until 2000 discussed the White House forecasts, either directly in the document or during the congressional hearings. Explicit comparisons in the MPR only stopped after 2000 when the FOMC and the White House started forecasting different definitions of

inflation.[10]

Comparisons with private sector forecasts are never present in the MPR but occasionally appear during the testimony and hearings. For instance, testifying at the Senate Banking Committee on 14 February 2008 Chairman Bernanke referred that the forecasts to be released in the following weeks were "reasonably consistent" with private-sector forecasts.[11] This evidence – especially the systematic presence of the White House forecasts in the MPR – suggests that the FOMC cared about how its forecast compared with other publicly available forecasts.

## 3.2 Main analysis

This subsection performs a more formal econometric evaluation. The main specification examines if deviations of the FOMC from the Greenbook forecast $(F_t - G_t)$ reflect public opinion and views. To this effect, the two equations below are estimated separately:

$$(F_t - G_t) = a + b(W_t - G_t), \tag{2}$$

$$(F_t - G_t) = a + b(S_t - G_t). \tag{3}$$

Table 5 presents the results. The equations are estimated with ordinary and weighted least squares. The WLS regression captures the different timings of the forecasts. Newey-West standard errors with three lags are reported when using WLS. A constant is included in the regressions because the average forecast was already examined in Table 3. Here, a crucial and stricter point is being tested, whether time-variations in the FOMC forecast reflect time-variations in public forecasts.

[10]The MPRs are available at http://fraser.stlouisfed.org/historicaldocs/680/. After 2000 explicit comparisons are no longer present, as the definitions of variables being forecasted by the White House and FOMC no longer coincides exactly. A later section shows that the results still hold after 2000.

[11]The corresponding MPR is dated 27 February 2008; the reader is referred to The Wall Street Journal article Reddy (2008).

Table 5: Regression results

| | | constant | | W | | S | | $R^2$ of (F-G) | $R^2$ of F |
|---|---|---|---|---|---|---|---|---|---|
| *Inflation* | | | | | | | | | |
| W | OLS | 0.0791 | (0.0333) | 0.2466 | (0.0527) | - | | 0.2673 | 0.9878 |
| | WLS | 0.0783 | (0.0484) | 0.2519 | (0.0677) | - | | 0.2608 | 0.9878 |
| S | OLS | 0.0569 | (0.0382) | - | | 0.2093 | (0.0574) | 0.1892 | 0.9856 |
| | WLS | 0.0443 | (0.0722) | - | | 0.2420 | (0.1136) | 0.2526 | 0.9856 |
| *Unemp.* | | | | | | | | | |
| W | OLS | -0.0076 | (0.018) | 0.4114 | (0.0454) | - | | 0.4971 | 0.9874 |
| | WLS | -0.0005 | (0.0225) | 0.4026 | (0.063) | - | | 0.4748 | 0.9873 |
| S | OLS | -0.0272 | (0.0165) | - | | 0.3897 | (0.0397) | 0.5530 | 0.9888 |
| | WLS | -0.0256 | (0.0191) | - | | 0.3882 | (0.0656) | 0.5408 | 0.9888 |
| *Real Growth* | | | | | | | | | |
| W | OLS | 0.0005 | (0.031) | 0.2945 | (0.0372) | - | | 0.4307 | 0.9605 |
| | WLS | -0.0021 | (0.0412) | 0.2942 | (0.0333) | - | | 0.4226 | 0.9605 |
| S | OLS | 0.0417 | (0.0312) | - | | 0.2505 | (0.0423) | 0.3100 | 0.9602 |
| | WLS | 0.0367 | (0.0419) | - | | 0.2409 | (0.0715) | 0.2920 | 0.9602 |

Notes: The table reports the estimates of equations (2) - (3). W and S denote White House and SPF forecasts, respectively. The equations are estimated both with OLS and WLS. Newey-West standard errors with three lags are reported in the WLS regression (reported in parenthesis).

The results show that indeed the difference between the FOMC and the Greenbook can be explained by, or is correlated with, the White House and the SPF. In the inflation forecast the weight put on the non-Greenbook forecast is roughly 0.25. The weight goes up slightly for real growth, and regarding unemployment the weight goes up to roughly 0.40. In all specifications the coefficients are statistically significant. Two $R^2$ measures are reported, the first related to explaining $(F_t - G_t)$, the second in explaining $F_t$. Obviously, explaining $(F_t - G_t)$ is a daunting task as the two forecasts are formulated within a one week interval. The $R^2$ of explaining $F_t$ is notoriously higher.

## 3.3 Discussion of results

It is not the claim of this paper that the results in Table 5 are causal. Causality and correlation may lead to observationally equivalent FOMC forecasts. For instance, the FOMC has a mandate of representing the public, which may lead the FOMC to actively want to understand some public views regarding the evolution of the economy, and to incorporate the views that it agrees with.[12] But it could also be that the FOMC already had shared views with other forecasters. Reverse causality seems less plausible given our results. Below I discuss the timings of the forecasts and I present additional evidence on this issue.

*Discussion of timings:*

It is always the case that the Greenbook is completed roughly one week before the FOMC meetings. The SPF is a quarterly survey forecasting several periods ahead. I chose the quarter in which the forecast is completed such that the SPF forecast is finished and publicly available before the Greenbook and the FOMC forecasts.[13]

[12]See the Federal Reserve Act, Section 4, Article 10, 11, 12 and Section 10, Article 1.

[13]The studies examining the accuracy of different forecasts try to use forecasts formed at roughly the same time period. That treatment of timings can be problematic for the current study. Taking as an example the February FOMC meetings, if I used the SPF forecasts formed in the first quarter

This timing helps to establish that it is the variable $(F_t - G_t)$ reflecting information in $(S_t - G_t)$ instead of the opposite.[14] Also, this choice of timing for the SPF puts this forecast at an informational disadvantage, making it harder to obtain the result claimed here because the FOMC should put even more weight on the Greenbook.

Regarding the White House forecast, the dates of the documents indicate that it is completed before the Greenbook. Namely, the Economic Assumptions tables in the budget documents have a footnote indicating that only information up to a certain date is incorporated. That date is before the Greenbook. This timing helps to establish that it is the variable $(F_t - G_t)$ reflecting information in $(W_t - G_t)$ instead of the opposite.

The results also suggest that reverse causality is much less likely. For instance, the FOMC mean forecast is in between the White House and the Greenbook mean (Table 3). Such evidence is at odds with the explanation that it is the White House incorporating the other two forecasts. The same pattern can be found in the results of Table 5. If one postulates that the variable $(W_t - G_t)$ reacts to $(F_t - G_t)$ then it does so with a coefficient larger than one. Such reasoning is implausible because it would imply that if, for instance, the Greenbook forecasts inflation to be 3% and the FOMC forecasts 3.5%, then the White House would extrapolate and forecast 4%. While extrapolative models of inflation are not necessarily wrong, it is hard to argue that such behavior is likely or optimal for the US inflation time series. The timings and statistical evidence do not seem to suggest reverse causality.

*Further evidence:*

Even if the White House forecast is completed before the Greenbook, it may happen that it is only published after. For that reason one cannot undoubtedly prove that the FOMC had knowledge of the forecast in the Budget. Also, in some years the dates

of the year rather than the last quarter of the previous year, the SPF participants could already have access to the FOMC forecasts and blur the results.

[14]This result is still consistent with the FOMC forecasts (and monetary policy actions) influencing the SPF forecasts at a later date.

in the Economic Assumptions tables are missing or are indicative only. This issue is in fact not problematic. The forecasts and views of the Administration are discussed widely in the media and in policymaking circles. A strong evidence of this claim is that the MPR makes reference to the White House forecasts even in times when they were not publicly available through the Budget, as they were available through the media and other sources.

For instance, the MPR dated 20th of July 1983 specifically shows the White House forecast even though the Mid-Session Review of the Budget was only released on the 25th of July 1983. Another example is contained in the MPR of July 1993, "The Administration has not yet released the midyear update to its economic and budgetary projections. However, statements by Administration officials suggest that the revised forecasts for real growth and inflation in 1993 and 1994 are not likely to differ significantly from those of the Federal Reserve."

In addition to this evidence, further analysis is presented to clarify the results. One may be concerned that the FOMC may not know exactly and in every period the White House forecast contained in the Budget. This issue translates in econometric terms into a problem of measurement error. Also one would like to observe perfectly the perception of the FOMC regarding the White House forecasts as well as the FOMC perception of other Administration signals. Instead, one observes only the White House forecasts contained in the US budget. As it is well known, measurement error creates a downward bias in the estimates. The fact that the estimates in Table 5 are significant is, therefore, supportive of the channels proposed in this paper.

Table 6 presents further evidence. I use a known correction for measurement error in regressions with one variable. The method of group averages was first advocated by Wald (1940) and is described, for instance, in Greene (2000). This method uses an instrumental variable based on groups of the original variable. For example, with three

groups one creates the instrumental variable -1,0,1 if the variable is below the 33th percentile, in between, or above the 67th percentile, respectively. The table reports the results when two and three groups are used, in both cases the instruments are not weak.[15] The main results still hold.

*Further evidence – results with the SAFER index:*

Finally, I take a completely different route. Havrilesky (1995) constructed an index of Signals from the Administration to the Federal Reserve (SAFER). The SAFER index is based on articles in the Wall Street Journal. Articles are coded as plus one and minus one if the Administration signals for monetary easing or tightening, respectively. I use this index as it may signal periods where the views of the Federal Reserve may have differed from those of the public or its political representatives. The SAFER index was compiled until 1994 only. Despite updating the SAFER index being a very labor intensive task, this paper uses an extended sample until 2006.

The SAFER index is not free of problems. Articles must be coded in a subjective fashion, and the press coverage of certain events is far from perfect. The advantages are twofold. First, using the SAFER index is a different route that can shed light on the robustness of the mechanisms advocated in this paper. Second, the SAFER provides very clear timings because the date of the article is always known. The independent variable is the sum of the SAFER index articles dated between the current meeting Greenbook and the previous FOMC meeting.

The results are presented in the lower panel of Table 6. The estimates for inflation and unemployment are significant. All the coefficients have the correct sign as expected from an interest rate rule specification. A loosening signal is associated with forecasting lower inflation, lower real growth, and higher unemployment.

[15]The results are also robust to running the regression when the number of groups equals the number of observations, in which case the instrumental variable is the ranking of the observations.

Table 6: Further Evidence

| | | constant | | W | | First st. F-stat. |
|---|---|---|---|---|---|---|
| *Inflation* | | | | | | |
| IV | 2 groups | 0.0651 | (0.0354) | 0.3119 | (0.0776) | 50.7000 |
| | 3 groups | 0.0748 | (0.034) | 0.2669 | (0.0664) | 94.1480 |
| *Unemployment* | | | | | | |
| IV | 2 groups | -0.0044 | (0.0186) | 0.4350 | (0.0589) | 115.6200 |
| | 3 groups | 0.0004 | (0.0183) | 0.4702 | (0.0523) | 250.6580 |
| *Real Growth* | | | | | | |
| IV | 2 groups | 0.0038 | (0.032) | 0.2806 | (0.0533) | 74.9500 |
| | 3 groups | 0.0065 | (0.0314) | 0.2695 | (0.0463) | 143.1370 |

| | | constant | | SAFER | | $R^2$ of (F-G) | $R^2$ of F |
|---|---|---|---|---|---|---|---|
| *Inflation* | | | | | | | |
| SAFER | OLS | 0.1764 | (0.0332) | -0.0333 | (0.0074) | 0.2501 | 0.9866 |
| | WLS | 0.1756 | (0.0406) | -0.0323 | (0.0087) | 0.2399 | 0.9867 |
| *Unemployment* | | | | | | | |
| SAFER | OLS | -0.0797 | (0.0239) | 0.0161 | (0.0062) | 0.0740 | 0.9770 |
| | WLS | -0.0551 | (0.0248) | 0.0143 | (0.0071) | 0.0817 | 0.9770 |
| *Real Growth* | | | | | | | |
| SAFER | OLS | 0.0795 | (0.0406) | -0.0089 | (0.0106) | 0.0083 | 0.9414 |
| | WLS | 0.0651 | (0.046) | -0.0038 | (0.0102) | 0.0018 | 0.9416 |

Notes: The table reports the estimates of equations (2) - (3). The first panel uses instrumental variables with the method of group averages. The second panel uses the SAFER index as an independent variable and estimates the equations with OLS and WLS. Standard errors are reported in parenthesis.

*Summary:*

Given that the data is not a pure time-series, it is impossible to use Granger causality and similar tests. Such tests are also subjective once forward looking variables are involved, as is the case here. Having said that, the results do not suggest that the causality runs in the opposite direction for three reasons. First, the timings of forecasts are such that the non-Fed forecasts are completed before the FOMC meetings. Second, the estimated coefficients also confirm the claims in the paper, otherwise one would need to appeal to extrapolative forecasting in the US. Third, the instrumental variables regressions strengthen the results. Fourth, the regressions with the SAFER index corroborates the results with very clear timings.

With this evidence at hand one should also clarify that the results do not dismiss the explanations of Ellison and Sargent (2012). One can argue that the forecasts are independent and the regression coefficient $b$ is capturing the similarity between the robustness degree of the agents producing the forecasts.

If this is the explanation, then this paper is still surprising. First, the White House would also have to behave as a robust policymaker, instead of trying to be more optimistic in order to win the elections or push certain political agendas. Second, a crucial observation is that the private sector does not decide on monetary policy and has no incentive to publish policymaking robust forecasts. Third, one could claim that robust forecasting is the norm for all agents; if that is so it would be interesting to examine what determines different degrees of robustness for different groups.

# 4 Additional Results

## 4.1 Replicating MSE

I now examine whether the statistical model can account for the observed patterns of the MSEs. To examine this issue, one can first compute the FOMC forecast implied

by the model, denoted as $\hat{F}$. In other words, $\hat{F}$ is the fitted values of $F$ based on the OLS estimates of equations (2) and (3).

The MSE of $\hat{F}$ can gauge the improvement or deterioration in the MSE caused by the channels modeled in this paper. The model is successful along this dimension. For all cases except one, Table 1 shows that the ranking of MSEs of $F$ relative to $G$ is replicated by the ranking of MSEs of $\hat{F}$ relative to $G$ (described in second to last column in Table 1). For instance, the MSE of the inflation forecast $\hat{F}$ is always worse than the Greenbook. This result suggests that the model is capturing the channels explaining the decrease in performance of the FOMC inflation forecast pointed out in Romer and Romer (2008). The model can also explain cases in which the FOMC performs better than the Greenbook; also the last column in Table 1 shows that the model can capture the better accuracy of the FOMC relative to the other public forecasts.

## 4.2 Forecast accuracy and optimal weights

A natural question arises: is it optimal for the FOMC to incorporate the White House and SPF forecasts? Part of the answer can be seen in Table 1. The FOMC inflation forecast is worse than the Greenbook and therefore, if MSE forecast accuracy were the objective, the FOMC would have been better off by just adopting the Greenbook inflation forecast. However, the pooling of forecasts usually leads to an improved forecast but determining the optimal weights may not be straightforward.

An important step is to compare the weights actually used ($b$) with the optimal weights. This comparison allows one to analyze more carefully whether the FOMC reflects too much or too little the non-Greenbook forecasts. Optimality here is defined from a forecasting perspective: the weights that would minimize the MSE of the FOMC forecast.

Table 7 reports the optimal weights, which are directly comparable with the weights

$b$ in Table 5. For all cases except one, the weights on the non-Fed forecasts are larger than the optimal ones. This result shows that for all variables – inflation, unemployment, and real growth – publicly available forecasts seem to be overweighted. For instance, for inflation the weight on the White House forecast is 0.25 (see Table 7) whereas the optimal weight is almost 0.

Figure 4.2 shows the evolution over time of the optimal MSE weight – the recursive estimates using data up to the date in the horizontal axis.[16] The recursive estimates are insightful because if the Greenbook was a poor forecast at the beginning of the sample, then the FOMC could have taken substantial time to learn that the Greenbook is in fact a good forecast. Such patterns can occur in a model of learning as in Marcet and Sargent (1989) and Marcet and Nicolini (2003). The figures show that the optimal weights on public forecasts vis-à-vis the Greenbook were always low or converged quite fast to a low number.

It should be noted that the forecasting literature does not always recommend fitting MSE weights (e.g. Zarnowitz (1992), Clements and Hendry (1998, 2002) among others).[17] The literature shows here some tension between using MSE weights based on a sample that may be imperfect versus using equal weights. Whether one approach or the other ends up being more suited depends on whether a particular forecast record is reliable as a basis for inferences on how it will perform in the future. The FOMC seemed to draw on both approaches. The weights shown in Table 5 are in between the optimal MSE weights shown in Table 7 and the equal weights of 0.5.[18]

[16]The appendix shows the figures where the constant is omitted from the regressions and the weight $b$ is restricted to be between 0 and 1. The results are similar.

[17]When no model coincides with a non-constant data generation process (DGP), Clements and Hendry (2002) show that averaging may then dominate over estimated weights in the combination.

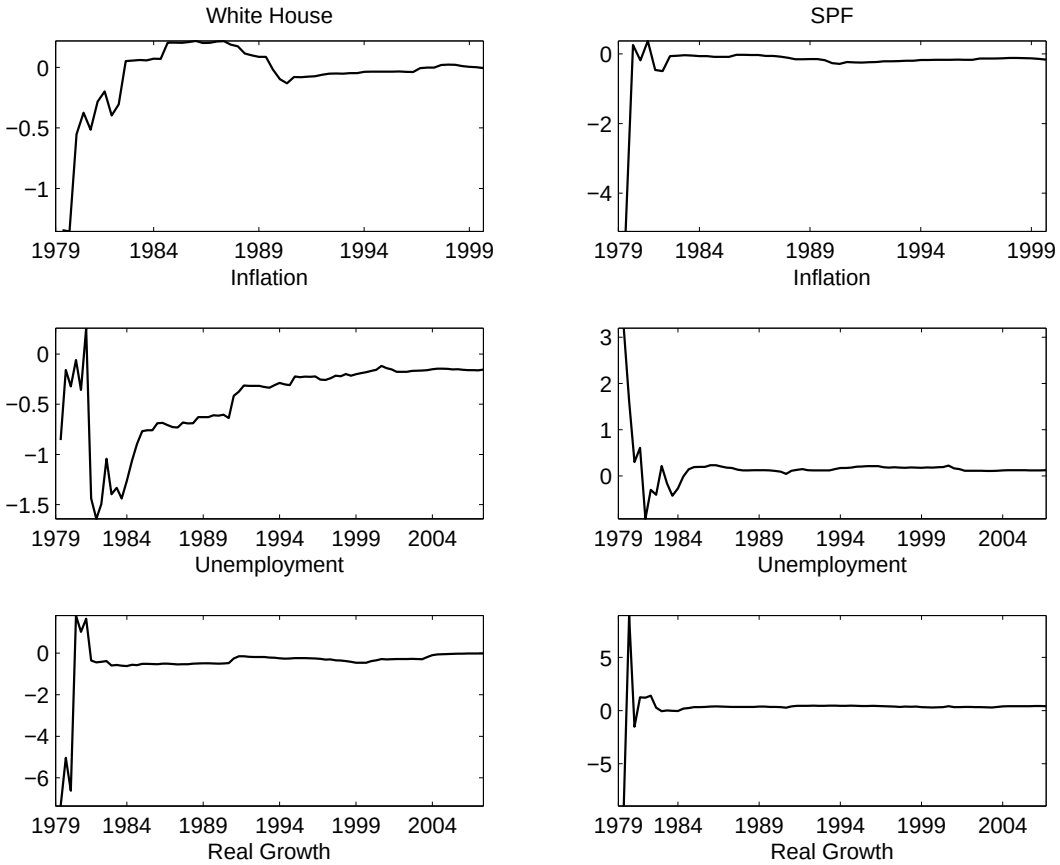
[18]A later section shows the results when combining more than two forecasts.

Table 7: Optimal Weights

| | constant | | W | | S | | $R^2$ |
|---|---|---|---|---|---|---|---|
| *Inflation* | | | | | | | |
| W | -0.2399 | (0.1148) | -0.0062 | (0.1816) | - | | 0.8499 |
| S | -0.1723 | (0.1179) | - | | -0.1611 | (0.177) | 0.8434 |
| *Unemployment* | | | | | | | |
| W | -0.1833 | (0.076) | -0.1550 | (0.1914) | - | | 0.8083 |
| S | -0.1742 | (0.0694) | - | | 0.1235 | (0.1666) | 0.8115 |
| *Real Growth* | | | | | | | |
| W | 0.1164 | (0.1525) | -0.0162 | (0.1831) | - | | 0.4382 |
| S | 0.1513 | (0.1472) | - | | 0.4176 | (0.1995) | 0.4222 |

Notes: The table reports the weights that would be optimal to use in the full sample. Standard errors are reported in parenthesis.

**Figure 1:** Optimal weights $b$.




Notes: The figure plots the optimal weights in equations (2) - (3) using OLS. The graphs on the left and right refer to the White House and SPF forecasts, respectively.

## 4.3 Replication of regressions predicting actual values

This subsection examines whether the statistical model is able to capture some stylized facts in the literature. In order to determine the forecasting power of the FOMC relative to the Greenbook, Romer and Romer (2008) estimated equation (1).

Table 8 examines whether the model can account for the findings of Romer and Romer (2008). The table displays their original regression using the updated sample of this paper (first two rows in the table). Then it substitutes the forecast $F_t$ by the forecast as predicted by the models ($\hat{F}_t$). The weights on $\hat{F}_t$ and $G_t$ broadly replicate the patterns of the weights on $F_t$ and $G_t$; namely the weight on $\hat{F}_t$ is small and lower than the weight on $G_t$.

## 4.4 Combining several forecasts

For completeness of the results Table 9 shows the results when pooling all the forecasts, i.e. estimating equation:

$$(F_t - G_t) = a + b(W_t - G_t) + c(S_t - G_t). \tag{4}$$

In addition, I also complement the results with the Blue Chip survey, which is representative of the private sector and is also highly scrutinized. I use the Blue Chip data from January and June that is published no later than the 10th of each month. To that effect, Table 9 shows the results of estimating equation:

$$(F_t - G_t) = a + b(W_t - G_t) + c(S_t - G_t) + d(B_t - G_t). \tag{5}$$

As more independent variables are added, multicollinearity makes it hard to distinguish the contribution of each variable. Distinguishing among the importance of the different public forecasts is harder to determine, and it is an unnecessary point for the message of the paper. The results in Table 9 confirm that the Greenbook still

Table 8: Role in predicting actual values

| | constant | | G | | Non-Staff | | $R^2$ |
|---|---|---|---|---|---|---|---|
| Inflation | | | | | | | |
| $F$ | | | | | | | |
| OLS | -0.1822 | (0.2501) | 1.0548 | (0.4173) | -0.0668 | (0.3986) | 0.8500 |
| WLS | -0.2216 | (0.1635) | 1.3537 | (0.3926) | -0.3322 | (0.3791) | 0.8996 |
| $\hat{F} = f(G, W)$ | | | | | | | |
| OLS | -0.1792 | (0.2633) | 0.9969 | (0.7496) | -0.0114 | (0.744) | 0.8499 |
| WLS | -0.2237 | (0.1914) | 0.8828 | (0.6355) | 0.1239 | (0.6217) | 0.8956 |
| $\hat{F} = f(G, S)$ | | | | | | | |
| OLS | 0.0011 | (0.2964) | 1.8428 | (0.8637) | -0.8723 | (0.8754) | 0.8435 |
| WLS | -0.0718 | (0.222) | 1.7455 | (0.5258) | -0.7516 | (0.5386) | 0.8921 |
| Unemployment | | | | | | | |
| $F$ | | | | | | | |
| OLS | 0.1356 | (0.335) | 0.9136 | (0.3306) | 0.0390 | (0.339) | 0.8048 |
| WLS | 0.1236 | (0.5701) | 0.7373 | (0.478) | 0.2205 | (0.4394) | 0.8324 |
| $\hat{F} = f(G, W)$ | | | | | | | |
| OLS | 0.3629 | (0.3581) | 1.6987 | (0.5048) | -0.7910 | (0.5315) | 0.8099 |
| WLS | 0.3072 | (0.5299) | 1.5402 | (0.7774) | -0.6184 | (0.7782) | 0.8312 |
| $\hat{F} = f(G, S)$ | | | | | | | |
| OLS | 0.3791 | (0.3393) | 0.9312 | (0.449) | -0.0222 | (0.4706) | 0.8126 |
| WLS | 0.2801 | (0.5358) | 0.8243 | (0.5657) | 0.1039 | (0.563) | 0.8277 |
| Real Growth | | | | | | | |
| $F$ | | | | | | | |
| OLS | 0.4970 | (0.3235) | 0.2649 | (0.4004) | 0.5728 | (0.4316) | 0.4488 |
| WLS | 0.5777 | (0.4672) | 0.2432 | (0.5349) | 0.5651 | (0.5723) | 0.4829 |
| $\hat{F} = f(G, W)$ | | | | | | | |
| OLS | 0.9877 | (0.3532) | 1.7340 | (0.6494) | -1.0403 | (0.7007) | 0.4517 |
| WLS | 0.9848 | (0.5227) | 1.7001 | (0.8988) | -1.0120 | (0.9898) | 0.4833 |
| $\hat{F} = f(G, S)$ | | | | | | | |
| OLS | 0.7698 | (0.4666) | 0.4539 | (1.067) | 0.3196 | (1.1695) | 0.4291 |
| WLS | 0.7576 | (0.748) | 0.3857 | (1.461) | 0.3867 | (1.6435) | 0.4655 |

Notes: The table reports the estimates of equation (1). All the regressions include as dependent variable the actual outcome and as independent variable the Greenbook forecast. The regressions also include as independent variable either the FOMC forecast ($F$), the FOMC forecasts predicted by equations (2) and (3) ($\hat{F} = f(G, W)$ and $\hat{F} = f(G, S)$). Standard errors are reported in parenthesis.

Table 9: Several Forecasts Simultaneously

| constant | | W | | S | | B | | $R^2$ of (F-G) |
|---|---|---|---|---|---|---|---|---|
| *Inflation* | | | | | | | | |
| 0.0561 | (0.0335) | 0.2888 | (0.068) | 0.0137 | (0.0682) | - | | 0.3867 |
| 0.0283 | (0.0324) | 0.2088 | (0.0694) | 0.0318 | (0.0876) | 0.1143 | (0.0988) | 0.4469 |
| *Unemp.* | | | | | | | | |
| -0.0163 | (0.0168) | 0.1639 | (0.0732) | 0.2814 | (0.062) | - | | 0.5803 |
| -0.0151 | (0.0162) | 0.0850 | (0.075) | 0.0656 | (0.1306) | 0.3309 | (0.1553) | 0.6319 |
| *Real Growth* | | | | | | | | |
| 0.0159 | (0.0299) | 0.2074 | (0.0567) | 0.1163 | (0.0538) | - | | 0.4120 |
| 0.0311 | (0.0299) | 0.1751 | (0.0574) | 0.0353 | (0.0757) | 0.1497 | (0.0801) | 0.4518 |

Notes: The table reports the estimates of equations (4) - (5). W, S, and B denote White House, SPF forecasts, and Blue Chip forecasts, respectively. The equations are estimated with OLS. Standard errors are reported in parenthesis.

receives the largest weight, but other forecasts of the public and its representatives have a statistically significant weight.

## 4.5 Implications for monetary policy

Given the importance of expectations formation by the general public as well as the role of central banks in being accountable and transparent, understanding the determinants of the FOMC forecast is crucial per se. In addition, one may also ask if the FOMC forecasting behavior bears implications for the interest rate setting. Romer and Romer (2008) find that regressing $(F_t - G_t)$ on monetary policy innovations yields estimates with the expected sign. However, the estimates are statistically insignificant and the $R^2$ and F-statistic are low. This is not a limitation of the results because the FOMC forecasts may constitute a powerful monetary policy tool and are important per se.

When examining if one could obtain their results but using the forecasts implied by the model ($\hat{F}$), the regressions appeared to be quite sensitive. In some regressions

the results hold, in others they do not.[19] It is important to notice that the FOMC forecasts are historically only produced in the February and July meetings, but the FOMC holds eight regularly scheduled meetings during the year and other meetings as needed.

Consequently, the February and July meetings are special in terms of releasing forecasts, and possibly fine-tuning the forecasts to be in line with non-Fed forecasts. But in terms of interest rate setting, the February and July meetings are not special. The FOMC can adjust before or after the interest rate, even if it is reacting to information that will lead or already led to fine-tuning its February and July forecasts.[20] Hence, it may be hard to find evidence in movements in the interest rate setting with the February and July forecasts that do not cover all meetings.

Ideally, one would have continuous information on the public views that the FOMC may be incorporating, and have consistent information for all the meetings where the interest rate is set. Luckily, such information is partially available. Romer and Romer (2004) constructed a series of monetary policy shocks already stripping out all the systematic movements in monetary policy. In addition, the SAFER article index used previously contains information on public views. The articles have very specific dates and cover the entirety of the period for which the monetary policy shocks are available.

I use this data to examine the effects on monetary policy. The regressions use the sum of the SAFER index articles for three weeks before the meetings, as originally proposed by Havrilesky (1995). To increase the precision of the estimates, I employed the same methodology of Romer and Romer (2004) and updated the sample of the monetary policy shocks until 2006.

Table 10 first presents a regression with SAFER articles dated before the Green-

[19]The different specifications refer to OLS versus IV, including next year forecasts, and including Greenbook forecasts as controls.

[20]In agreement with this evidence, unreported regressions show that the forecasts have higher explanatory power for the lead or lag rather than the contemporaneous monetary policy shock.

book only. With this timing, the Federal Reserve staff could have had adjusted the Greenbook forecast in response to relevant information. Because the week between the Greenbook and the FOMC meeting is likely to be crucial, the Table also shows the results including articles published on that week. The estimated coefficient on the SAFER index has the correct sign and is statistically significant in both regressions.[21]

Table 10: Monetary Policy shocks and the SAFER index

| | constant | | SAFER | | $R^2$ |
|---|---|---|---|---|---|
| Before Greenbook | 0.0091 | (0.0184) | -0.0920 | (0.025) | 0.0383 |
| Before FOMC | 0.0142 | (0.0184) | -0.0810 | (0.019) | 0.0506 |

Notes: The table shows the estimates of regressing monetary policy shocks on the SAFER index. The first row considers articles only before the Greenbook date preceding the FOMC meetings. The second row considers articles before the FOMC meetings. Standard errors are reported in parenthesis.

# 5 Robustness

## 5.1 Extending the inflation regression and sub-sample analysis

Because the Greenbook inflation forecast seems to be better than the other non-Fed forecasts, the results gain extra interest with respect to this variable. However, the change in definitions of the FOMC inflation forecast limited the analysis until July 1999, while for the other variables one can use all the data up to the five year lag of Greenbook confidentiality.

This section extends the inflation forecast in the following way. Until 1999 one can use the definition of variables as before. From February 2000 until February 2004, the variable $(W_t - G_t)$ refers to CPI and the variable $(F_t - G_t)$ refers to PCE. From July

[21] Table 1 in Romer and Romer (2004) reports a $R^2$ of 0.28 in a regression of the change in the Intended Federal Funds on changes in seventeen Greenbook forecasts. Hence, the additional explanatory power of the SAFER index measured by the $R^2$ of 0.05 is non-negligible – the $R^2$ is 0.0589 if using the sample and shocks of their paper. In a different paper, I examine the implications of including the SAFER index for the impulse response functions.

2004 onwards, the variable $(W_t - G_t)$ refers to CPI and the variable $(F_t - G_t)$ refers to PCE core. The spirit of the regression is the same as before, but the definitions in the independent and dependent variables do not match exactly. Table 11 shows that the results largely hold in the extended sample, as well as from 2000 onwards only.

Table 11: Extending the inflation regression

| | | constant | | W | | S | | $R^2$ of (F-G) | $R^2$ of F |
|---|---|---|---|---|---|---|---|---|---|
| 1979- | OLS | 0.0636 | (0.0275) | 0.2358 | (0.0457) | - | | 0.2428 | 0.9896 |
| 2000- | OLS | 0.0220 | (0.0546) | 0.2190 | (0.1077) | - | | 0.1646 | 0.8752 |
| 1979- | OLS | 0.0460 | (0.0313) | - | | 0.2097 | (0.049) | 0.1902 | 0.9874 |
| 2000- | OLS | 0.0041 | (0.055) | - | | 0.2370 | (0.0986) | 0.2330 | 0.8554 |

Notes: The table reports the estimates with the inflation forecast for the extended sample. The first and third rows consider the sample from 1979 until the availability of the Greenbook. The second and fourth rows consider the sample after 2000 where the definitions of inflation do not coincide. Standard errors are reported in parenthesis.

Table 15 in the appendix examines sub-sample analysis and shows that the results still hold.

## 5.2 Results with individual FOMC responses

The statistical analysis presented so far employed the central tendency of the FOMC forecasts. The central tendency is less prone to extreme responses that may reflect some strategic behavior by some FOMC participants. I am not discarding strategic behavior at the individual level responses, what the results presented so far suggest is that the central tendency seems to incorporate information from the White House and SPF forecasts.

This subsection uses the individual responses data described in Romer (2010). On the one hand, the individual responses are released only after a ten year lag and, therefore, are less interesting to analyze than the central tendency that is released immediately. On the other hand, the individual responses contain additional statistical information with sixteen to eighteen individual forecasts per MPR.

Table 12 reports the results of a panel data fixed effects regression where the indi-

vidual elements are the Fed regional banks and the individual governors.[22] The main results are still present. The coefficients attached with the non-Greenbook forecasts are statistically significant and are even larger than the values reported in Table 5. The larger coefficients in the panel data are largely explained by the sample period. Table 16 in the appendix reports the central tendency regressions for the same sample period where one can observe that the coefficients become quite similar to the ones obtained in the panel data.[23]

Table 12: Panel Data Regression Results

| | W | | S | | $R^2$ of (F-G) |
|---|---|---|---|---|---|
| *Inflation* | | | | | |
| W | 0.6651 | (0.0481) | - | | 0.3922 |
| S | - | | 0.4572 | (0.0352) | 0.3796 |
| *Unemployment* | | | | | |
| W | 0.4571 | (0.0308) | - | | 0.4557 |
| S | - | | 0.4492 | (0.0288) | 0.4888 |
| *Real Growth* | | | | | |
| W | 0.3789 | (0.0421) | - | | 0.3210 |
| S | - | | 0.3058 | (0.0296) | 0.3721 |

Notes: The table reports the panel data estimates of equations (2) - (3). W and S denotes White House and SPF forecasts, respectively. The equations are estimated with fixed effects. Panel data Newey-West standard errors with three lags are reported (reported in parenthesis).

# 6 Conclusion

This paper aims at contributing to a better understanding of the forecasts that central banks produce and present to the public and its representatives. The reliability

[22]This panel is unbalanced because there is turnover among governors. The results are very similar when the group of governors is treated as a cluster.

[23]The governors, voting regional banks, and non-voting regional banks could display different reactions to the non-Fed forecasts. Point estimates of unreported regressions usually but not always suggest that the weight of non-Greenbook forecasts is higher for governors than for regional banks, and is higher for voting regional banks than for non-voting regional banks. In all cases the difference in point estimates is statistically insignificant.

of these forecasts provides a strong pillar for transparent and accountable central banks as part of democratic societies.

This paper focuses on the United States due to data availability. The existence of two forecasts produced by the same institution but which differ in whether they are revealed to the public in the short run provides a valuable contrast. In particular, using the Greenbook forecast as a control is crucial for the analysis. The Greenbook forecast is produced just before the official FOMC forecast is released, but is kept private for five years. Also, for the United States one can rely on a large amount of forecasts representing other views in the economy.

The results shed light on the apparently puzzling difference between the FOMC and Greenbook forecasts. This paper shows that the difference between the FOMC and the Greenbook forecasts is not random or white noise. The difference is in fact systematic and can be explained with data. The paper shows that the FOMC forecast reflects public opinion and views over and above the Greenbook forecast. When such interactions are taken into account, the statistical model can explain several findings in the literature and can capture several characteristics of the forecasts.

In terms of forecast accuracy, the statistical model suggests that public views are overweighted and can lead to worse forecasts. But the model can also capture the cases in which the FOMC produces better forecasts than the Greenbook, as well as the cases in which it produces better forecasts than the private sector and the White House.

There are a variety of reasons for why central banks' forecasts may reflect public opinion and views over their internal forecasts. For instance, the results in this paper may reflect the role assigned in the Federal Reserve Act to the FOMC as a diverse committee institutionally designed to represent the public and a variety of views. The FOMC explicitly and publicly compared its forecasts with the ones of the White House and the private sector both in public statements and official documents, being

very transparent in doing so. Alternatively, the FOMC may be simply trying to pool information from different forecasts and doing so in real-time may be challenging. Also, the FOMC may have an incentive not to deviate too much (herd) from public forecasts against which the FOMC forecasts will be compared.

This paper opens interesting avenues for research on distinguishing alternative underlying motivations. However, no matter what specific motivations may be present in the forecaster's mind, as long as they lead to the same outcome they will be observationally equivalent and will be impossible to distinguish. Importantly, several different underlying motivations can justify the role of public opinion and give support to the findings in this paper.

Overall, these results show that central banks' forecasts do take into account public views and opinions. Some may have preferred that officially published central banks' forecasts resemble more heavily or rely on their internal forecasts and methods. Others may find comfort that public views, regardless of how perfect or imperfect they may be, play a role in institutions that are designed to represent the public.

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# A Appendix

## A.1 Standard Deviations

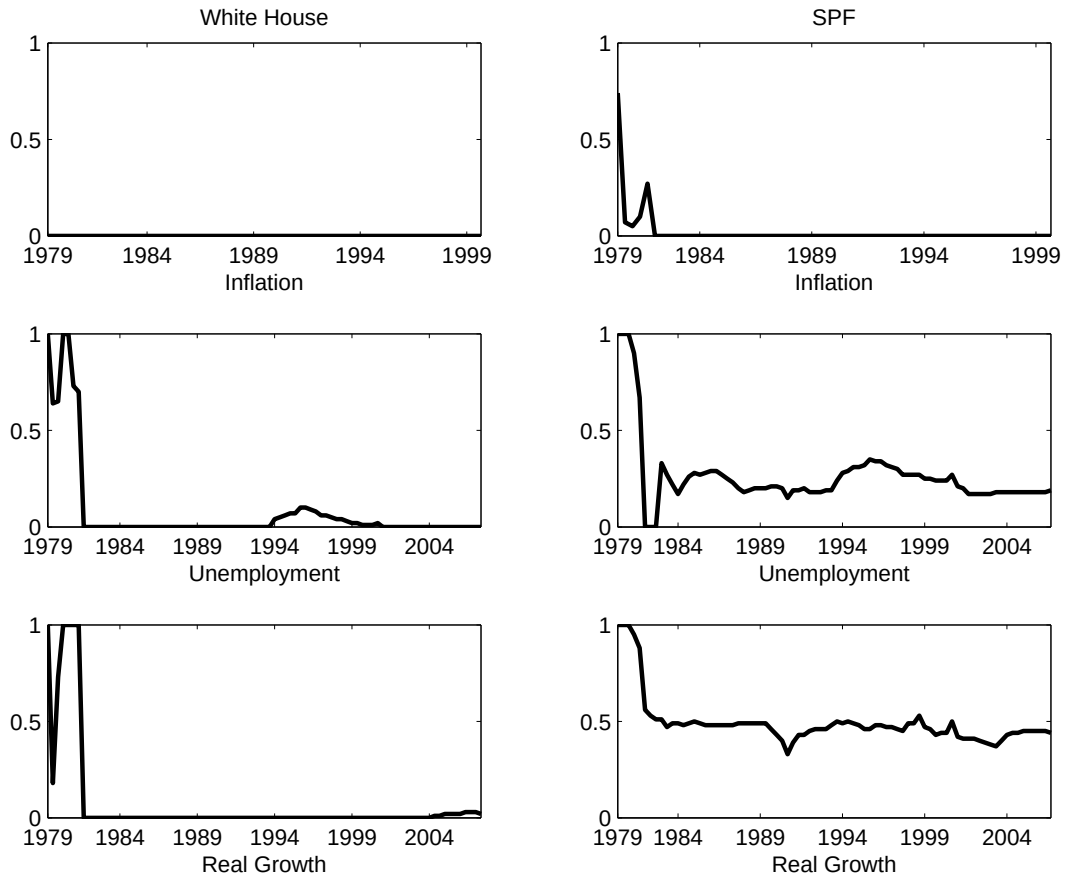
Table 13: Standard Deviations of Forecast Differences

| | $\sigma(F_t - G_t)$ | $\sigma(S_t - G_t)$ | $\sigma(W_t - G_t)$ |
|---|---|---|---|
| Inflation | 0.2858 | 0.5878 | 0.5990 |
| Unemp. | 0.2192 | 0.4136 | 0.3757 |
| Real Growth | 0.3604 | 0.7357 | 0.8032 |

Notes: The table reports the standard deviations of $(F_t - G_t)$, $(S_t - G_t)$, $(W_t - G_t)$. $F$, $W$, and $S$ denote the FOMC, White House, and SPF forecasts, respectively.

## A.2 Optimal Weights

**Figure 2:** Optimal weights $b$.




Notes: The figure plots the optimal weights in equations (2) - (3), but the constant is eliminated from the regression and the coefficient $b$ is limited to be between zero and one. The graphs on the left and right refer to the White House and SPF forecasts, respectively. Standard errors are reported in parenthesis.

## A.3 Role in predicting actual values

Table 14: Role in predicting actual values

| | | constant | | G | | Non-Staff | | $R^2$ |
|---|---|---|---|---|---|---|---|---|
| *Inflation* | | | | | | | | |
| F | OLS | -0.1822 | (0.2501) | 1.0548 | (0.4173) | -0.0668 | (0.3986) | 0.8500 |
| | WLS | -0.2216 | (0.1635) | 1.3537 | (0.3926) | -0.3322 | (0.3791) | 0.8996 |
| W | OLS | -0.1801 | (0.251) | 0.9883 | (0.1948) | -0.0028 | (0.1835) | 0.8499 |
| | WLS | -0.2140 | (0.1729) | 0.9755 | (0.1735) | 0.0312 | (0.1566) | 0.8956 |
| S | OLS | -0.0485 | (0.2723) | 1.1531 | (0.1789) | -0.1826 | (0.1832) | 0.8435 |
| | WLS | -0.1051 | (0.2062) | 1.1757 | (0.122) | -0.1819 | (0.1303) | 0.8921 |
| *Unemployment* | | | | | | | | |
| F | OLS | 0.1356 | (0.335) | 0.9136 | (0.3306) | 0.0390 | (0.339) | 0.8048 |
| | WLS | 0.1236 | (0.5701) | 0.7373 | (0.478) | 0.2205 | (0.4394) | 0.8324 |
| W | OLS | 0.3689 | (0.3598) | 1.2331 | (0.1962) | -0.3254 | (0.2186) | 0.8099 |
| | WLS | 0.3075 | (0.5299) | 1.1708 | (0.3205) | -0.2490 | (0.3133) | 0.8312 |
| S | OLS | 0.3797 | (0.3442) | 0.9176 | (0.1667) | -0.0087 | (0.1834) | 0.8126 |
| | WLS | 0.2774 | (0.5366) | 0.8878 | (0.2328) | 0.0403 | (0.2185) | 0.8277 |
| *Real Growth* | | | | | | | | |
| F | OLS | 0.4970 | (0.3235) | 0.2649 | (0.4004) | 0.5728 | (0.4316) | 0.4488 |
| | WLS | 0.5777 | (0.4672) | 0.2432 | (0.5349) | 0.5651 | (0.5723) | 0.4829 |
| W | OLS | 0.9872 | (0.353) | 1.0000 | (0.1766) | -0.3063 | (0.2063) | 0.4517 |
| | WLS | 0.9869 | (0.524) | 0.9859 | (0.2307) | -0.2978 | (0.2912) | 0.4833 |
| S | OLS | 0.7832 | (0.4301) | 0.6934 | (0.2101) | 0.0800 | (0.2929) | 0.4291 |
| | WLS | 0.7718 | (0.6989) | 0.6792 | (0.2438) | 0.0932 | (0.396) | 0.4655 |

Notes: The table reports the estimates of equation (1). All the regressions include as dependent variable the actual outcome and as independent variable the Greenbook forecast. The regressions also include as independent variable either the forecasts of the FOMC ($F$), the White House ($W$), or the SPF ($S$). Standard errors are reported in parenthesis.

## A.4 Sub-sample Analysis

Table 15: Regression Results: Sub-sample analysis

After 1985

| | | constant | | W | | S | | $R^2$ of (F-G) | $R^2$ of F |
|---|---|---|---|---|---|---|---|---|---|
| *Inflation* | | | | | | | | | |
| W | OLS | 0.0054 | (0.0279) | 0.3341 | (0.0771) | - | | 0.3197 | 0.9470 |
| | WLS | 0.0070 | (0.0356) | 0.3531 | (0.0993) | - | | 0.3242 | 0.9468 |
| S | OLS | -0.0577 | (0.0323) | - | | 0.3729 | (0.0837) | 0.3317 | 0.9513 |
| | WLS | -0.0632 | (0.0315) | - | | 0.3858 | (0.0807) | 0.3410 | 0.9513 |
| *Unemployment* | | | | | | | | | |
| W | OLS | -0.0155 | (0.0193) | 0.4641 | (0.0577) | - | | 0.5065 | 0.9720 |
| | WLS | -0.0110 | (0.0259) | 0.4507 | (0.0876) | - | | 0.4865 | 0.9717 |
| S | OLS | -0.0317 | (0.0178) | - | | 0.4995 | (0.0541) | 0.5827 | 0.9745 |
| | WLS | -0.0294 | (0.0227) | - | | 0.4989 | (0.0766) | 0.5780 | 0.9745 |
| *Real Growth* | | | | | | | | | |
| W | OLS | 0.0062 | (0.03) | 0.3099 | (0.0481) | - | | 0.3973 | 0.9055 |
| | WLS | 0.0064 | (0.0455) | 0.3074 | (0.0514) | - | | 0.3871 | 0.9056 |
| S | OLS | 0.0218 | (0.0273) | - | | 0.3977 | (0.0486) | 0.5228 | 0.9240 |
| | WLS | 0.0080 | (0.0335) | - | | 0.3893 | (0.0504) | 0.5431 | 0.9242 |

After 1990

| | | constant | | W | | S | | $R^2$ of (F-G) | $R^2$ of F |
|---|---|---|---|---|---|---|---|---|---|
| *Inflation* | | | | | | | | | |
| W | OLS | -0.0248 | (0.0328) | 0.4852 | (0.1334) | - | | 0.3461 | 0.9270 |
| | WLS | -0.0186 | (0.0334) | 0.4856 | (0.1307) | - | | 0.3529 | 0.9270 |
| S | OLS | -0.0628 | (0.0378) | - | | 0.2958 | (0.0887) | 0.3081 | 0.9288 |
| | WLS | -0.0708 | (0.0355) | - | | 0.2965 | (0.0883) | 0.3124 | 0.9288 |
| *Unemployment* | | | | | | | | | |
| W | OLS | -0.0289 | (0.0224) | 0.5147 | (0.0702) | - | | 0.5285 | 0.9730 |
| | WLS | -0.0249 | (0.0302) | 0.4971 | (0.0942) | - | | 0.5128 | 0.9725 |
| S | OLS | -0.0093 | (0.0205) | - | | 0.5293 | (0.0592) | 0.6347 | 0.9813 |
| | WLS | -0.0097 | (0.0279) | - | | 0.5229 | (0.086) | 0.6229 | 0.9812 |
| *Real Growth* | | | | | | | | | |
| W | OLS | 0.0690 | (0.0355) | 0.4266 | (0.0619) | - | | 0.4972 | 0.9136 |
| | WLS | 0.0763 | (0.05) | 0.4297 | (0.0587) | - | | 0.5113 | 0.9135 |
| S | OLS | 0.0306 | (0.0331) | - | | 0.4187 | (0.0541) | 0.5653 | 0.9264 |
| | WLS | 0.0182 | (0.0402) | - | | 0.4043 | (0.059) | 0.5731 | 0.9266 |

Notes: The table reports the estimates of equations (2) - (3). W and S denotes White House and SPF forecasts, respectively. The equations are estimated both with OLS and WLS. Newey-West standard errors with three lags are reported in the WLS regression (reported in parenthesis). The upper panel only includes the sample after 1985, the lower panel includes the sample after 1990.

Table 16: Regression Results: Sub-sample coinciding with Panel data

| | | constant | | W | | S | | $R^2$ of (F-G) | $R^2$ of F |
|---|---|---|---|---|---|---|---|---|---|
| *Inflation* | | | | | | | | | |
| W | OLS | -0.0045 | (0.0264) | 0.6377 | (0.1082) | - | | 0.6124 | 0.9319 |
| | WLS | -0.0076 | (0.031) | 0.6109 | (0.0798) | - | | 0.5901 | 0.9324 |
| S | OLS | -0.0498 | (0.0326) | - | | 0.4093 | (0.0865) | 0.5043 | 0.9147 |
| | WLS | -0.0705 | (0.0286) | - | | 0.4181 | (0.0824) | 0.5257 | 0.9143 |
| *Unemployment* | | | | | | | | | |
| W | OLS | -0.0673 | (0.0267) | 0.4795 | (0.0716) | - | | 0.6158 | 0.9812 |
| | WLS | -0.0663 | (0.0343) | 0.4779 | (0.0949) | - | | 0.6209 | 0.9812 |
| S | OLS | -0.0390 | (0.0243) | - | | 0.4754 | (0.0606) | 0.6875 | 0.9857 |
| | WLS | -0.0420 | (0.0301) | - | | 0.4894 | (0.087) | 0.7292 | 0.9859 |
| *Real Growth* | | | | | | | | | |
| W | OLS | 0.1249 | (0.0414) | 0.3711 | (0.1066) | - | | 0.3023 | 0.8782 |
| | WLS | 0.1366 | (0.0501) | 0.3972 | (0.0725) | - | | 0.3660 | 0.8759 |
| S | OLS | 0.0945 | (0.0401) | - | | 0.2752 | (0.0701) | 0.3550 | 0.8841 |
| | WLS | 0.0887 | (0.0436) | - | | 0.2733 | (0.0574) | 0.3494 | 0.8843 |

Notes: The table reports the estimates of equations (2) - (3). W and S denotes White House and SPF forecasts, respectively. The equations are estimated both with OLS and WLS. Newey-West standard errors with three lags are reported in the WLS regression (reported in parenthesis). The sample goes from 1992 to 2001.