Where is the Fed (in the distribution of Forecasters)?

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Previous researchers have found that the Fed's forecasts are more accurate than the private sector's. Those researchers typically compare the Fed's Greenbook forecasts with the mean or median forecast of a group of private-sector forecasters (Survey of Professor Forecasts and Blue Chip economic indicators). Although these comparisons are informative, they potentially miss interesting and informative information that is contained in the entire distribution of forecast errors. For example, Gamber, Smith and Weiss (2009) argue that changes in forecaster behavior in response to the Great Moderation can only be identified by looking at the change in the distribution of forecast errors rather than the mean or median forecast error. In this study we look at the Fed's forecast errors compared to the entire distribution of private sector forecast errors using the Survey of Professional Forecasters as our measure of private sector forecasts. We ask whether any part of the distribution is consistently as good as or better than the Fed at forecasting real growth and inflation. An additional goal of this project is to determine whether there is an identifiable group of forecasters who systematically forecast as well as, or better than, the Fed.

Where is the Fed (in the Distribution of Forecasters)?

1. Introduction

Previous researchers have compared the accuracy of the Federal Reserve Greenbook forecasts with that of private-sector forecasters.[1] In general, those studies find that the Fed's Greenbook forecasts for real growth and inflation are significantly better (have smaller RMSEs) than private sector forecasts.[2] Most often, private-sector forecasts are represented by the mean or median of a group of forecasters such as the Survey of Professional Forecasters (SPF) or Blue Chip (BC). In this paper, we look at other parts of the distribution of private sector forecasts in order to assess whether there is some part of that distribution that is consistently as good as, or better than, the Fed.

For each period in our sample we divide the SPF forecast errors into quartiles and we measure the Fed's forecast accuracy relative to the upper and lower quartiles in the distribution. We find that the Fed consistently beats the forecasters who produce errors in the upper quartile. But forecasters who produce errors in the lower quartile are as good as, or better than, the Fed over the entire sample (1968:4 through 2004) as well as various sample splits and various horizons. Our next step (most likely to be completed after the conference) is to determine whether any of the forecasters in the lower quartile are identifiable. In other words, is there a consistent group of forecasters, based on their identification numbers or some other characteristic, who beat the Fed?

[1] See Romer and Romer (2000), Joutz and Stekler (2000), Sims (2002), D'Agostino, et al. (2006), Faust and Wright (2007), Reifschneider, D. and P. Tulip (2007). Sinclair, Stekler, and L Kitzinger (2008), Gamber and Smith (2009).

[2] In Gamber and Smith (2009) we found that the RMSE's of inflation forecasts of the Fed and the private sector have moved closer to each other since the mid-1990s but the Fed RMSE's are still significantly smaller.

This paper is organized as follows. Section 2 briefly reviews related literature. Section 3 discusses the difference between ex-post and ex-ante accuracy. Section 4 describes the data. Section 5 presents the empirical results and Section 6 concludes.

2. Related Literature

Romer and Romer (2000) compared the Fed's Greenbook forecasts with several private sector forecasts. They find that for both inflation and output growth, the Fed's forecasts are superior to private sector forecasts. By superior they mean that given a Fed forecast, there is no additional information provided by private sector forecasts. Their main goal was to explain why a rise in the federal funds target is typically accompanied by a rise in long-term interest rates. Their explanation is that when the Fed raises the federal funds rate target, it implicitly reveals information about its forecast for inflation (namely, it is higher than previously thought) and this additional information leads to higher long-term rates through the standard Fisher effect.

Several papers have re-examined Romer and Romer's results. Faust, Swanson and Wright (2004) directly investigated 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. 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.

A related strand of literature looks at changes in the overall forecastability of the economy. Atkeson and Ohanian (2001) show that the Philips curve does a poorer job of forecasting inflation than the naïve model after the mid-1980s. Stock and Watson (2007) delve a little deeper into why this has happened and they find that the reduction in volatility of inflation after the mid-1980s (the onset of the Great Moderation) is best characterized as a reduction in the volatility of the predictable component of inflation. Consequently, forecasters have lost their relative advantage over the naïve model.

D'Agosino et al. (2006) extend Stock and Watson's study to include several additional macroeconomic time series. They find that both the Fed's and the SPF's forecasts lost ground relative to the naïve benchmark forecast after the mid-1980s. They show that models that rely on cross correlations (which presumably the Fed and SPF's models do) performed worse after the mid-1980s because those correlations diminished significantly with the Great Moderation.

Gamber and Smith (2009) follow up on Stock and Watson (2007) by looking at the relative forecasting accuracy of the Fed and the private sector (represented by the Blue Chip and the SPF). Stock and Watson's results suggest that it has become harder for forecasters to provide value-added over the naïve model. Thus, the superior forecasting abilities of the Fed that were identified by Romer and Romer (2000) would be expected to diminish as well. Gamber and Smith find that the Fed's forecasting advantage over the private sector did diminish after the Great Moderation and again after the Fed took steps to increase its transparency in the mid-1990s. Although the gap between the accuracy of the Fed and the private sector has narrowed, the Fed's errors still remain significantly smaller.

3. Ex-post versus Ex-Ante Accuracy

The above brief review suggests that there has been an ongoing interest in measuring the Fed's forecast accuracy, the private-sector's forecast accuracy and the accuracy of both relative to each other and relative to a naïve benchmark. Part of the interest in these comparisons stems from the fact that the Fed's monetary policy decisions rely on forecasts and so a general assessment of the accuracy of those forecast provides important feedback to staff forecasters. But another closely-related issue is that the Fed's Greenbook forecasts are not available to the public, except with a 5-year lag. To the extent that the Fed is more accurate, their forecast could potentially provide valuable information to private forecasters as well as consumers of forecasts, both public and private. The Fed has moved toward greater transparency since 1994, and in late 2007 they began releasing FOMC forecasts. But the staff, or Greenbook forecasts, are still kept secret.

Thus, our first goal is to determine whether there is a group of forecasters who are consistently as good as or better at forecasting than the Fed. And if so, our second goal is to see whether it possible to use that group's forecasts to proxy the Fed's Greenbook forecasts in real time.

To address our first goal we compare the relative forecast abilities of the Fed and the representative best and worst forecasters from the SPF in each time period. We draw the best forecaster from the lower quartile of forecast errors and the worst forecaster from the upper quartile of forecast errors (the details are explained below). The best and worst forecasters are identified ex-post, that is, after the actual (real-time) value of the variable being forecasted has been observed.

To address our second goal we must determine whether the best forecasters in the SPF are somehow ex-ante identifiable, either by their forecaster identification numbers, or some other identifiable characteristic such as recent forecast performance, number of times participating in the sample, etc.

4. Data

In the empirical work that follows we compare the forecast errors from the Fed's Greenbook to the forecast errors generated by two measures of the distribution of forecasts from the SPF for both inflation and real output growth. We examine the forecast errors at the boundary of the upper quartile and the lower quartile. Specifically, at each forecast date we arranged the absolute value of the forecast errors, divided the arranged sample by 4 and took the forecast at the boundaries of the third and fourth quartile (known as high quart) and the first and second quartile (known as low quart).

The Greenbook forecasts are available monthly from 1968:11 through 1980:12 and eight times a year from 1981:01 through 2002:12 for a total of 325 observations. The SPF data are quarterly beginning in 1968:04 and continuing through the end of the Greenbook sample 2002:04 for a total of 137 observations. In addition, the Philadelphia Fed has made a quarterly Greenbook dataset, where the Greenbook that is closest to the middle of each quarter is matched with the SPF data. In this quarterly sample there are 137 observations for the Fed.

All forecast errors are defined as "actual" minus the forecasted value where actual is either the second release of the relevant measure or the third release of the relevant measure.[3] We use both actuals to examine if there is a difference in forecast accuracy based on which release is used as the actual. We consider forecast horizons 0 through 4 quarters.

In all of our forecast error comparisons we are interested in comparing the errors generated by different forecasters for identical quarters.[4] For example, in comparing the SPF with the Fed we consider only the forecasted quarters for which both sets of forecasts exist. In the monthly matched data, the common sample for the SPF and the Fed spans 1968.11 through 2002.12 and contains 110 observations.

5. RMSE Comparison

Our purpose in this section is to compare the RMSEs for the Fed, the high quart SPF (representative worst forecaster) and low quart SPF (representative best forecaster) forecasters over various sub-samples. The tests presented in this section address whether the Fed has a forecasting advantage relative to these comparison forecasts in any of the sub-samples.

Tables 1 through 8 show the RMSEs for the Fed, high quart SPF and low quart SPF, over various sub-samples for inflation and real GDP growth for the quarterly data

[3] We use the GNP price deflator prior to 1992. Between 1992 and 1996 we use the GDP implicit price deflator and after 1996 we use the GDP price index. We use real GNP prior to 1992. Between 1992 and 1996 we use real GDP and after 1996 we use chain-weighted real GDP. All real time data were obtained from the St. Louis Federal Reserve Web-site (http://alfred.stlouisfed.org/).

[4] We arrange our forecast data as described in Romer and Romer (2000), pp. 431-33. The Greenbook forecasts are aligned with the month that each is published. The SPF forecasts are aligned with the middle month of each quarter.

and monthly matched data, respectively. The full sample is 1968-2002 for the SPF[5]. We calculated the RMSE for sample splits at 1974:09 (the date at which the BEA switched from releasing two GDP estimates (15- and 45-day) to three GDP estimate (15-, 45- and 75-day) after the end of each quarter) and 1988:06 (the date at which the BEA switched from releasing the GDP estimates at 15-, 45-, and 75-day intervals to later in the month).[6] We employed the modified Diebold-Mariano test statistic to test whether the forecast errors (RMSE) were different across forecasters.[7]

In Tables 1 and 2 (quarterly) the results for inflation are presented. There is little difference between using the 2nd release of the actual and the 3rd release of actual to calculate the forecast errors. The Fed is a superior forecaster to the representative worst forecaster (high quart) at all horizons and the Fed is equivalent or slightly worse forecaster than the representative best forecaster (low quart).

For real output growth, the results in Tables 3 and 4 (quarterly) suggest that the representative best forecaster (low quart) is superior to the Fed at most time horizons. The exception is the 1968-1974 time period when the sample is extremely small. The representative worst forecaster (high quart) is worse than the Fed at all time horizons.

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[5] All samples end at 2002 because the Greenbook forecasts are available with a 5-year lag.
[6] See Young(1993) for more details on how the BEA's releases have changed over time.

[7] 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.

Overall the inflation and growth results indicate that there are some forecasters who are as good as the Fed ex post.

In the quarterly data, the Fed's Greenbook that is closest to the middle of each quarter is aligned with each SPF forecast. This dataset was originally constructed by the Philadelphia Fed to provide researchers with a sample of data on Greenbook forecasts that could be directly compared to the quarterly SPF forecasts. But because FOMC meetings occur at various times during the quarter, the Philly Fed had to move the FOMC forecasts either forward of backward in time in order to align them with the middle of the middle month of each quarter. As a result, a researcher using these data might mistakenly infer that the Fed had either more, or less information than they actually had at the time they prepared their Greenbook forecasts. To avoid such mistaken inferences, researchers use the monthly-matched data, which contain forecasts based on nearly identical information sets.

The apparent disadvantage of the quarterly data, however, is actually an advantage from the perspective of trying to determine whether the Fed's forecasting superiority stems from an informational advantage. We exploit this advantage by testing whether the number of days the Fed forecast was moved can explain the difference in the size of the forecast errors and second, we examine the RMSEs using the monthly matched data.

We calculate the number of days between each Greenbook and the middle of each quarter (variable name: days_shifted).[8] For example, the first Greenbook is dated November 20, 1968 so the days_shifted variable is 20-15 = 5. We regress the difference

[8] The middle of each quarter defined is February 15th, May 15th, August 15th and November 15th.

in the absolute value of the forecast error of the Fed and either the high quart or low quart SPF on days_shifted,

$$Fed_t^i - x_t^i = \alpha + \beta * days\_shifted + \varepsilon_t$$

where *i* is the horizon, *Fed* is the absolute value of the Greenbook forecast and *x* is either the absolute value of either the high quart or low quart forecast error. The results from this regression show that by moving the Fed to the middle of each quarter does not increase or decrease the Fed's forecasting advantage. Therefore, we must examine other avenues to find how the low quart forecasters are performing as well as or better than the Fed. Ideally, we would like to replace the "*days_shifted*" variable with a variable, or set of variables, measuring the difference between number and type of data releases that the Fed and SPF have available when they make their forecasts.

The results for the monthly matched data are presented in Tables 5-8. For inflation and output growth, the results are similar to those we obtained using the quarterly data. The Fed is better than the representative worst forecaster (high quart) and equivalent or worse that the representative best forecaster (low quart). These results demonstrate that there are forecasters in the SPF that are better at forecasting than the Fed.

6. Conclusion.

This paper addresses two questions: 1) is there a group of forecasters that is as good or better than the Fed at forecasting inflation and real output growth and 2) is there a way to identify who these forecasters are? In answer to the first question, from both the quarterly and monthly matched results, we see that the representative best forecaster is as good as the Fed for both inflation and real output growth. In addition, based on the regression that tests whether the Fed has an information advantage or disadvantage we find that information is not the reason that the representative best forecaster is equivalent or better than the Fed although more extensive analysis will be undertaken. To answer the second question, we will examine if there is a way to identify which forecasters are better than the Fed by examining both the ID numbers or some other metric.

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Table 1:Inflation (Quarterly) 2nd month prep

sample	horizon	Fed	RMSE High quart	RMSE Low quart	Ratio(High/Fed)	Ratio(Low/Fed)	Modified DM (High=Fed)		Modified DM (Low=Fed)		N
1968:11-2002:12	0	1.09	1.84	0.92	1.68	0.84	11.66	***	-2.62	***	137
	1	1.41	2.10	1.31	1.48	0.93	10.00	***	-2.73	***	137
	2	1.66	2.37	1.61	1.43	0.97	10.48	***	-1.68	*	137
	3	1.67	2.52	1.76	1.51	1.06	9.70	***	-0.41		131
	4	1.74	2.72	1.91	1.56	1.10	10.91	***	0.96		120
1968:11-1974:09	0	1.49	2.55	1.42	1.72	0.96	9.92	***	-0.07		24
	1	2.47	3.32	2.40	1.35	0.97	9.07	***	0.05		24
	2	2.99	3.89	3.13	1.30	1.05	5.68	***	0.57		24
	3	3.37	4.20	3.40	1.25	1.01	4.12	***	-0.29		18
	4	4.42	5.00	4.11	1.13	0.93	4.20	***	0.51		7
1974:10-1988:06	0	1.28	2.02	0.97	1.58	0.76	8.16	***	-2.97	***	55
	1	1.27	2.13	1.14	1.67	0.90	9.66	***	-1.53		55
	2	1.53	2.36	1.30	1.55	0.85	7.59	***	-1.67		55
	3	1.49	2.51	1.46	1.68	0.98	8.53	***	0.20		55
	4	1.67	2.76	1.64	1.65	0.98	10.18	***	0.56		55
1988:07-2002:12	0	0.59	1.18	0.53	1.98	0.89	8.27	***	-1.05		58
	1	0.82	1.23	0.67	1.49	0.81	7.45	***	-3.74	***	58
	2	0.76	1.30	0.70	1.70	0.92	10.22	***	-2.01	**	58
	3	0.80	1.32	0.75	1.65	0.93	9.14	***	-0.84		58
	4	0.84	1.44	0.83	1.72	0.99	10.56	***	0.87		58

Table 2:Inflation (Quarterly) 3rd month prep

sample	horizon	Fed	RMSE High quart	RMSE Low quart	Ratio(High/Fed)	Ratio(Low/Fed)	Modified DM (High=Fed)		Modified DM (Low=Fed)		N
1968:11-2002:12	0	1.13	1.87	0.95	1.65	0.84	12.37	***	-2.88	***	137
	1	1.46	2.13	1.35	1.46	0.92	10.32	***	-2.70	***	137
	2	1.69	2.38	1.64	1.41	0.97	10.90	***	-1.77	*	137
	3	1.70	2.55	1.79	1.50	1.05	10.13	***	-0.33		131
	4	1.77	2.75	1.94	1.55	1.10	10.58	***	0.97		120
1968:11-1974:09	0	1.49	2.55	1.42	1.72	0.96	9.92	***	-0.07		24
	1	2.49	3.35	2.42	1.34	0.97	9.07	***	0.05		24
	2	3.02	3.91	3.15	1.30	1.05	5.68	***	0.57		24
	3	3.40	4.23	3.42	1.24	1.01	4.12	***	-0.29		18
	4	4.46	5.03	4.14	1.13	0.93	4.20	***	0.51		7
1974:10-1988:06	0	1.34	2.08	1.03	1.55	0.77	8.73	***	-3.11	***	55
	1	1.38	2.19	1.21	1.59	0.88	9.56	***	-1.87	*	55
	2	1.60	2.40	1.36	1.50	0.85	7.98	***	-2.10	**	55
	3	1.57	2.56	1.52	1.63	0.97	8.56	***	-0.02		55
	4	1.74	2.80	1.71	1.61	0.98	9.42	***	0.61		55
1988:07-2002:12	0	0.63	1.20	0.54	1.90	0.85	9.05	***	-1.38		58
	1	0.82	1.24	0.68	1.52	0.83	7.59	***	-3.04	***	58
	2	0.75	1.29	0.71	1.72	0.95	9.66	***	-1.60		58
	3	0.79	1.33	0.75	1.68	0.95	9.42	***	-0.39		58
	4	0.81	1.44	0.83	1.78	1.03	9.91	***	0.79		58

Table 3: Output (Quarterly) actual is 2nd month prep

sample	horizon	Fed	RMSE High quart	RMSE Low quart	Ratio(High/Fed)	Ratio(Low/Fed)	Modified DM (High=Fed)		Modified DM (Low=Fed)		N
1968:11-2002:12	0	2.19	3.25	1.76	1.49	0.81	9.17	***	-5.27	***	137
	1	3.04	3.82	2.39	1.26	0.79	8.12	***	-7.23	***	137
	2	3.13	4.04	2.68	1.29	0.86	6.99	***	-6.11	***	137
	3	3.39	4.28	3.00	1.26	0.88	7.11	***	-4.24	***	131
	4	3.20	4.16	2.85	1.30	0.89	6.83	***	-3.60	***	119
1968:11-1974:09	0	1.69	2.90	1.11	1.72	0.66	8.27	***	-2.14	**	24
	1	3.34	4.14	2.67	1.24	0.80	4.92	***	-2.81	***	24
	2	4.25	5.70	4.21	1.34	0.99	5.23	***	-1.02		24
	3	4.90	6.23	4.63	1.27	0.94	6.78	***	-0.88		18
	4	6.71	6.66	5.12	0.99	0.76	2.74	**	0.28		6
1974:10-1988:06	0	2.77	4.21	2.29	1.52	0.83	7.77	***	-3.50	***	55
	1	3.72	4.78	2.95	1.28	0.79	6.76	***	-4.81	***	55
	2	3.37	4.49	2.74	1.33	0.81	6.70	***	-3.92	***	55
	3	3.72	4.61	3.06	1.24	0.82	5.33	***	-2.33	**	55
	4	3.23	4.43	2.72	1.37	0.84	7.36	***	-2.11	**	55
1988:07-2002:12	0	1.70	2.17	1.36	1.28	0.80	6.46	***	-3.66	***	58
	1	2.01	2.41	1.53	1.20	0.76	5.07	***	-4.51	***	58
	2	2.21	2.43	1.58	1.10	0.71	3.70	***	-4.78	***	58
	3	2.32	2.66	1.85	1.15	0.80	4.92	***	-4.77	***	58
	4	2.31	2.69	1.86	1.16	0.81	4.91	***	-4.13	***	58

Table 4: Output (Quarterly) actual is 3rd month prep

sample	horizon	Fed	RMSE High quart	RMSE Low quart	Ratio(High/Fed)	Ratio(Low/Fed)	Modified DM (High=Fed)		Modified DM (Low=Fed)		N
1968:11-2002:12	0	2.24	3.25	1.76	1.45	0.79	9.52	***	-5.48	***	137
	1	3.08	3.83	2.41	1.24	0.78	8.85	***	-7.50	***	137
	2	3.14	4.04	2.68	1.28	0.85	7.16	***	-5.72	***	137
	3	3.39	4.27	2.98	1.26	0.88	7.32	***	-4.78	***	131
	4	3.20	4.14	2.83	1.29	0.88	7.09	***	-3.46	***	119
1968:11-1974:09	0	1.73	2.90	1.11	1.68	0.64	7.74	***	-2.36	**	24
	1	3.33	4.12	2.65	1.24	0.80	4.55	***	-2.89	**	24
	2	4.29	5.70	4.21	1.33	0.98	4.63	***	-1.10		24
	3	4.94	6.26	4.65	1.27	0.94	6.38	***	-1.08		18
	4	6.72	6.70	5.14	1.00	0.76	2.73	**	0.28		6
1974:10-1988:06	0	2.86	4.21	2.29	1.47	0.80	8.47	***	-3.53	***	55
	1	3.82	4.81	3.01	1.26	0.79	8.40	***	-5.30	***	55
	2	3.41	4.49	2.74	1.32	0.81	6.65	***	-3.65	***	55
	3	3.73	4.58	3.04	1.23	0.82	5.84	***	-2.61	**	55
	4	3.25	4.37	2.69	1.35	0.83	7.71	***	-1.96		55
1988:07-2002:12	0	1.69	2.17	1.36	1.28	0.81	7.40	***	-4.48	***	58
	1	2.01	2.39	1.50	1.19	0.75	5.03	***	-4.45	***	58
	2	2.18	2.43	1.58	1.12	0.72	4.32	***	-4.82	***	58
	3	2.29	2.63	1.82	1.15	0.80	4.79	***	-5.44	***	58
	4	2.28	2.66	1.84	1.17	0.81	4.76	***	-3.86	***	58

Table 5: Inflation – actual is 2nd month prep (released 2nd month after the end of the previous quarter)

sample	horizon	RMSE Fed	RMSE High quart	RMSE Low quart	Ratio(High/Fed)	Ratio(Low/Fed)	Modified DM (High=Fed)		Modified DM (Low=Fed)		N
1968:11-2002:12	0	1.14	1.91	0.97	1.68	0.86	12.24	***	-2.32	**	110
	1	1.48	2.21	1.41	1.49	0.95	13.13	***	-1.13		110
	2	1.79	2.53	1.76	1.41	0.98	11.75	***	-1.02		109
	3	1.80	2.51	1.72	1.39	0.96	11.69	***	-1.28		104
	4	1.84	2.67	1.85	1.45	1.01	14.44	***	1.10		94
1968:11-1974:09	0	1.50	2.58	1.45	1.72	0.96	8.82	***	0.10		23
	1	2.51	3.38	2.45	1.35	0.98	7.95	***	0.15		23
	2	3.06	3.98	3.22	1.30	1.05	6.00	***	0.88		22
	3	3.47	4.24	3.38	1.22	0.97	4.59	***	-0.86		17
	4	4.83	5.81	4.96	1.20	1.03	4.71	***	0.59		7
1974:10-1988:06	0	1.29	2.07	0.99	1.60	0.77	7.63	***	-3.00	***	46
	1	1.20	2.12	1.14	1.76	0.95	10.30	***	-0.38		46
	2	1.61	2.44	1.38	1.52	0.86	7.89	***	-1.26		46
	3	1.54	2.50	1.45	1.63	0.95	9.83	***	-0.34		46
	4	1.64	2.71	1.59	1.65	0.97	10.92	***	0.42		46
1988:07-2002:12	0	0.58	1.13	0.52	1.95	0.89	7.63	***	-0.69		41
	1	0.87	1.30	0.73	1.49	0.83	8.17	***	-2.85	***	41
	2	0.81	1.36	0.76	1.69	0.94	9.27	***	-1.73	*	41
	3	0.76	1.21	0.66	1.58	0.86	8.39	***	-1.53		41
	4	0.87	1.51	0.89	1.73	1.02	10.28	***	1.24		41

Table 6:Inflation- actual is 3rd month prep (released 3rd month after end of previous quarter)

sample	horizon	RMSE Fed	RMSE High quart	RMSE Low quart	Ratio(High/Fed)	Ratio(Low/Fed)	Modified DM (High=Fed)		Modified DM (Low=Fed)		N
1968:11-2002:12	0	1.17	1.94	1.00	1.66	0.86	12.27	***	-2.54	**	110
	1	1.53	2.24	1.44	1.47	0.95	13.39	***	-1.28		110
	2	1.81	2.54	1.78	1.40	0.98	12.16	***	-0.87		109
	3	1.85	2.56	1.77	1.38	0.96	12.51	***	-1.17		104
	4	1.87	2.69	1.89	1.44	1.01	14.04	***	0.99		94
1968:11-1974:09	0	1.50	2.58	1.45	1.72	0.96	8.82	***	0.10		23
	1	2.53	3.40	2.47	1.34	0.98	7.95	***	0.15		23
	2	3.08	4.01	3.25	1.30	1.05	6.00	***	0.88		22
	3	3.50	4.27	3.41	1.22	0.97	4.59	***	-0.86		17
	4	4.90	5.88	5.03	1.20	1.03	4.71	***	0.59		7
1974:10-1988:06	0	1.32	2.10	1.04	1.59	0.79	7.69	***	-3.04	***	46
	1	1.29	2.16	1.20	1.67	0.93	10.29	***	-0.87		46
	2	1.66	2.48	1.42	1.50	0.86	8.15	***	-1.40		46
	3	1.64	2.58	1.54	1.58	0.94	10.27	***	-0.65		46
	4	1.69	2.73	1.64	1.61	0.97	10.36	***	0.40		46
1988:07-2002:12	0	0.66	1.17	0.54	1.78	0.82	7.58	***	-1.16		41
	1	0.88	1.32	0.75	1.50	0.85	8.13	***	-2.37	**	41
	2	0.75	1.31	0.72	1.75	0.96	9.73	***	-0.98		41
	3	0.77	1.25	0.70	1.63	0.91	9.27	***	-0.69		41
	4	0.86	1.53	0.90	1.78	1.05	9.92	***	1.06		41

Table 7: Output growth- actual is 2nd month prep (released 2nd month after the end of the previous quarter)

sample	horizon	Fed	RMSE High quart	RMSE Low quart	Ratio(High/Fed)	Ratio(Low/Fed)	Modified DM (High=Fed)		Modified DM (Low=Fed)		N
1968:11-2002:12	0	2.05	3.27	1.69	1.59	0.82	11.21	***	-3.72	***	110
	1	3.16	3.95	2.48	1.25	0.79	9.73	***	-6.78	***	110
	2	3.37	4.33	2.91	1.28	0.86	8.23	***	-5.38	***	109
	3	3.49	4.29	2.99	1.23	0.86	8.86	***	-4.55	***	104
	4	2.92	3.91	2.59	1.34	0.89	9.45	***	-3.49	***	94
1968:11-1974:09	0	1.65	2.93	1.12	1.78	0.68	7.89	***	-1.41		23
	1	3.37	4.18	2.72	1.24	0.81	4.84	***	-2.20	**	23
	2	4.46	5.93	4.39	1.33	0.98	5.94	***	-1.21		22
	3	5.03	6.42	4.89	1.28	0.97	6.81	***	-1.52		17
	4	4.61	6.09	4.74	1.32	1.03	2.81	***	0.05		7
1974:10-1988:06	0	2.59	4.19	2.19	1.62	0.85	7.87	***	-2.58	**	46
	1	3.80	4.82	2.97	1.27	0.78	7.12	***	-5.23	***	46
	2	3.50	4.64	2.88	1.32	0.82	6.61	***	-3.36	***	46
	3	3.77	4.60	3.02	1.22	0.80	6.41	***	-2.86	***	46
	4	3.08	4.37	2.66	1.42	0.87	8.92	***	-2.31	**	46
1988:07-2002:12	0	1.50	2.02	1.26	1.34	0.84	7.18	***	-2.22	**	41
	1	2.05	2.45	1.59	1.19	0.77	5.40	***	-4.61	***	41
	2	2.41	2.61	1.68	1.08	0.70	3.11	***	-4.76	***	41
	3	2.10	2.43	1.60	1.15	0.76	4.53	***	-3.81	***	41
	4	2.29	2.69	1.88	1.17	0.82	4.92	***	-3.59	***	41

Table 8: Output growth-actual is 3rd month prep (released 3rd month after end of previous quarter)

sample	horizon	RMSE Fed	RMSE High quart	RMSE Low quart	Ratio(High/Fed)	Ratio(Low/Fed)	Modified DM (High=Fed)		Modified DM (Low=Fed)		N
1968:11-2002:12	0	2.09	3.27	1.69	1.56	0.81	11.95	***	-3.83	***	110
	1	3.20	3.96	2.50	1.24	0.78	9.69	***	-7.06	***	110
	2	3.39	4.33	2.91	1.28	0.86	8.36	***	-5.49	***	109
	3	3.52	4.30	3.01	1.22	0.86	9.08	***	-5.30	***	104
	4	2.90	3.85	2.55	1.33	0.88	9.65	***	-3.05	***	94
1968:11-1974:09	0	1.66	2.93	1.12	1.77	0.67	7.97	***	-1.61		23
	1	3.36	4.16	2.70	1.24	0.81	4.65	***	-2.46	**	23
	2	4.50	5.93	4.39	1.32	0.98	5.17	***	-1.31		22
	3	5.07	6.46	4.91	1.27	0.97	6.16	***	-1.69		17
	4	4.56	6.02	4.67	1.32	1.02	2.80	**	0.05		7
1974:10-1988:06	0	2.67	4.19	2.19	1.57	0.82	8.50	***	-2.52	**	46
	1	3.89	4.86	3.03	1.25	0.78	7.27	***	-5.37	***	46
	2	3.54	4.64	2.88	1.31	0.81	6.74	***	-3.56	***	46
	3	3.83	4.61	3.05	1.20	0.80	6.70	***	-3.41	***	46
	4	3.10	4.31	2.64	1.39	0.85	9.22	***	-1.90		46
1988:07-2002:12	0	1.47	2.02	1.26	1.37	0.86	8.35	***	-2.51	**	41
	1	2.03	2.42	1.55	1.19	0.77	5.45	***	-4.94	***	41
	2	2.36	2.61	1.68	1.10	0.71	3.68	***	-4.86	***	41
	3	2.09	2.42	1.60	1.16	0.77	4.53	***	-4.21	***	41
	4	2.24	2.65	1.84	1.18	0.82	4.89	***	-3.27	***	41