# Evaluating FOMC Forecasts

| | |
|---|---|
| **Authors** | William T. Gavin, and Rachel J. Mandal |
| **Working Paper Number** | 2001-005C |
| **Citable Link** | https://doi.org/10.20955/wp.2001.005 |
| **Suggested Citation** | Gavin, W.T., Mandal, R.J.; Evaluating FOMC Forecasts, Federal Reserve Bank of St. Louis Working Paper 2001-005. URL https://doi.org/10.20955/wp.2001.005 |

| | |
|---|---|
| **Published In** | International Journal of Forecasting |
| **Publisher Link** | https://doi.org/10.1016/S0169-2070(02)00075-4 |

# *EVALUATING FOMC FORECASTS*

Revised August 2002

Abstract

Monetary policy outcomes have improved since the early 1980s. One factor contributing to the improvement is that Federal Reserve policymakers began reporting economic forecasts to Congress in 1979. These forecasts indicate what the Federal Open Market Committee (FOMC) members think will be the likely consequence of their policies. We evaluate the accuracy of the FOMC forecasts relative to private sector forecasts, the forecasts of the Research Staff at the Board of Governors, and a naïve alternative. We find that the FOMC output forecasts were better than the naïve model and at least as good as those of the private sector and the Fed staff. The FOMC inflation forecasts were more accurate than the private sector forecasts and the naïve model; for the period ending in 1996, however, they were not as accurate as Fed staff inflation forecasts.

**KEYWORDS**: Federal Reserve, Forecast Evaluation, Monetary Policy

**JEL CLASSIFICATION:** E37, E52

William T. Gavin
Vice President and Economist
Research Department
Federal Reserve Bank of St. Louis
P.O. Box 442
St. Louis, MO 63166
Ph. (314) 444-8578
FAX (314) 444-8731
gavin@stls.frb.org

Rachel J. Mandal
Research Analyst
Research Department
Federal Reserve Bank of St. Louis
P.O. Box 442
St. Louis, MO 63166
Ph. (314) 444-8520
FAX (314) 444-8731
rachel.j.mandal@stls.frb.org

We thank Dean Croushore, Chris Neely, Jeremy Piger, Robert Rasche, Pierre Siklos, and two anonymous referees for helpful comments.

## 1. Introduction

For the 15 years leading up to 1979, U.S. inflation accelerated and became more uncertain. Since 1979, inflation has declined dramatically and has become less volatile. There was an institutional change in 1979 that contributed to the improved policy environment. In that year the Fed began providing Congress with economic forecasts, thus allowing some insight into policymakers' beliefs and monetary policy intentions.

There has been an extensive analysis of the research staff forecasts, but not of the FOMC forecasts.[1] The FOMC forecasts that we evaluate are forecasts of the individual policymakers, not the research staff. The Fed reports two summary statistics of the individual forecasts. The first is the low and the high forecast among all the policymakers. The second, which is referred to as the *central tendency*, omits extreme forecasts; it is a smaller range that is meant to better represent the consensus view. In this article, we define the FOMC forecast as the midpoint of the full range of the individual forecasts. We do not report results for the central tendency because the full range performed at least as well as the central tendency on every dimension we examined.[2]

We examine the accuracy and efficiency of the FOMC forecasts and compare them with three alternative forecasts: a naïve "same change" forecast, the Blue Chip consensus forecast (Blue Chip), and the Federal Reserve Research Staff forecast (Green Book) that is prepared for FOMC meetings. After examining the rationality of the FOMC forecasts, we compare them with the alternatives in tests of accuracy and encompassing.

---

[1] For recent studies of Fed staff forecasts, see Jansen and Kishan (1996), Joutz and Stekler (2000), and Romer and Romer (2000).

[2] Gavin and Mandal (2001) use the central tendency to show that the Blue Chip consensus may be a good monthly proxy for the unobserved expectations of policymakers.

## 2. The Data

This study examines forecasts for output growth and inflation. The forecast intervals are measured as the fourth-quarter-over-fourth-quarter growth rate for 1979 through 2001. There are three forecast horizons from which the four-quarter growth rate is predicted. The three forecasts are made early in the months of February and July, approximately 18, 12, and 6 months before the actual data are released. We use this convention to label the forecasts. That is, the forecasts made in July for the next year are labeled 18-month, the forecasts made at the beginning of February are defined as 12-month, and the July updates of the annual forecasts are called 6-month forecasts. In the case of the July updates, the forecaster has information from the first six months of the year, so they are actually predicting what will happen in the second half of the year.

To measure actual output and inflation, we use real-time data rather than the latest vintage data. We use the real-time data for the full calendar year as they were first reported at the end of January in the following year. We think it is appropriate to use these real-time data for three reasons. First, financial market participants and policymakers are most interested in how economic news affects asset prices; the primary impact of an economic news release occurs with the first release of data. Second, we assume that subsequent data revisions are random and our relative evaluation of the forecasts would not change if we used later vintages of the data.[3] Third, this vintage is

[3] Zarnowitz and Braun (1993, Table 5) report forecast errors measured at various stages of revision and find little difference in the errors as GDP data are revised. Schuh (2001) uses current vintage data in an evaluation of private-sector forecasts. He reports that measures of relative accuracy do not change much when he uses real-time data. Faust, Rogers, and Wright (2000) study GNP/GDP revisions in the G-7 and find mixed evidence that revisions are random. The revisions appear to be so for the United States, but not for all the G-7 countries. McNees (1988) argues for using the latest vintage of data but reports in his Table 4 that the measure of forecast accuracy does not seem to depend much on which vintage of data is used.

the one the FOMC observed before making policy at the first FOMC meeting of each year. If one wants to study policy reaction functions, then one should use the real-time data that policymakers had available when they were making policy and preparing forecasts for the year ahead.[4]

### *2.1 The FOMC forecast*

Since July 1979, the FOMC has made forecasts of growth rates for nominal GDP, real GDP, and inflation.[5] There is a complication in evaluating the FOMC inflation forecasts because the FOMC switched among price indexes over our sample period. The FOMC began forecasting the implicit price deflator for GNP in 1979 and continued reporting forecasts for the deflator until 1989, when it began making inflation forecasts in terms of the consumer price index (CPI). In 2000, the FOMC switched once again, this time to the chain price index for personal consumption expenditures (PCE). We begin by looking at the forecasts that were made for the different indexes (Figure 1 and Table 1). However, in the statistical evaluation of the forecasting record, we use an implied forecast that is calculated by subtracting the midpoint of the range of real output forecasts from the midpoint of the range of nominal output forecasts (Tables 2 through 6). We do this because the FOMC has consistently forecasted nominal and real output throughout the entire period.

### *2.2 The naïve forecast*

[4] Croushore and Evans (2000) use a structural VAR method to show that estimated monetary policy shocks are quite similar regardless of whether one is using current vintage or real-time data.
[5] The government switched from GNP to GDP in 1992.

The first alternative is a naïve model. The naïve model predicts that the future growth rate will be the same as the most recently observed growth rate. The definition makes sense in the case where the forecasted variables have a growth trend. It also makes more sense when using four-quarter rather than quarterly data, which tend to be volatile with offsetting variation within the year.

*2.3 The Blue Chip consensus forecast*

Our second alternative is the consensus forecast of the business economists who participate in the *Blue Chip Economic Indicators* survey. We use the Blue Chip consensus forecast because we think the Blue Chip forecast is representative of the best private sector forecasts. The Blue Chip began compiling and reporting forecasts at about the same time the FOMC began reporting forecasts to Congress. The Blue Chip consensus forecasts used in this study are taken from the February and July reports. The Blue Chip consensus forecasts the same variables over the same horizon and in approximately the same time frame as the FOMC forecasts.

Schuh (2001) evaluates the year-ahead forecasts of three private sources of economic forecasts: the Survey of Professional Forecasters, forecasters surveyed by the *Wall Street Journal*, and the Blue Chip consensus. He shows that the forecast errors from each of these three sources look quite similar. A visual inspection of the plotted errors for output and inflation reveals that, although the forecasts appear to be very similar, the Blue Chip output forecast looks best in the periods when the output forecast errors were large (in the early 1980s and in the late 1990s). We use the consensus forecast from the

Blue Chip because it is better than the individual forecasts and because we are using a consensus forecast from the policymakers.[6]

### *2.4 The Green Book forecast*

The third alternative we examine is the Green Book forecast produced by the research staff at the Board of Governors of the Federal Reserve System. FOMC members had access to the Green Book forecasting process continuously throughout the year, and no doubt the FOMC forecasts could have been influenced by information provided by this process. We should note that FOMC members submit their forecasts before they see the Green Book. However, they have an opportunity to revise their forecasts after the FOMC meets and decides on policy. Therefore, it is possible that information in the Green Book may be reflected in the final FOMC member forecasts. The series on Green Book forecasts ends in 1996 because these forecasts are not available to the public until at least five years after the meeting for which they are prepared.

## 3. Is the FOMC forecast unbiased and efficient?

Figure 1 shows the 18-month FOMC forecasts for output growth and inflation, as well as the actual values. Economic forecasters are notoriously bad at predicting turning points. The FOMC members are no exception. Generally, they missed the large decline of inflation that occurred during 1981 to 1986 and the recessions in output in 1980-1982, 1990-1991, and 2001.[7] Table 1 reports summary statistics for the FOMC forecasts,

---

[6] McNees (1987) and Batchelor and Dua (1991) evaluate the relationship between the Blue Chip consensus and the individual forecasts.

[7] Joutz and Stekler (2000) show that both the Fed staff and private forecasters missed business cycle turning points in GNP growth and failed to predict the large decline in inflation in the early 1980s.

including the mean error, the root-mean-squared error (RMSE), the average distance in percentage points between the high and low forecast, and, finally, the percentage of times that the actual value fell outside the range of FOMC forecasts. The RMSE is a measure of the predictive uncertainty faced by the forecaster. The width of the range measures the dispersion in the individual forecasts and it can be considered a measure of the consensus among the individual policymakers.

The RMSEs of the policymakers' forecasts are much smaller than those calculated from forecasts in earlier sample periods. Part of this reflects a well-known decline in volatility in the U.S. economy that began in the mid-1980s.[8] Joutz and Stekler (2000) report a substantial reduction in the variance of inflation and output growth in the second half of the 1980s. In their Table 4 they report the RMSE for Fed staff forecasts of four-quarter spans between 1965 and 1989. The RMSEs for output growth (2.42) and inflation (1.83) forecasts made early in the quarter are almost twice as large as those observed in the period from 1980 through 2001. The RMSE for the FOMC's output growth forecasts made early in February was 1.32; for inflation it was 0.98.

The mean errors for the output forecasts are close to zero for all forecast horizons, but the mean errors for the inflation forecasts show that the FOMC tended to over-predict the inflation rate. This apparent bias gets smaller as the forecast horizon shrinks. As one might expect, both the RMSEs and the dispersion of the individual forecasts decline as the forecast horizon becomes shorter.

Is the width of the range of individual point forecasts a good measure of the predictive uncertainty faced by an individual forecaster? Zarnowitz and Lambros (1987)

[8] McNees (1992) shows that perhaps the most crucial determinant of the size of a forecast error is the particular sample period for which the forecast is made.

use data from the ASA-NBER survey of professional forecasters to show that, while these measures of consensus are correlated with measures of predictive uncertainty, the measures of consensus tend to understate the amount of predictive uncertainty. This result is also evident in our data. In every case, the midpoint plus and minus one RMSE is larger than the range of forecasts.

In the case of the output forecasts, the actual growth rate fell outside the range more than 50 percent of the time for all three forecast horizons. It is interesting that as the forecast horizon becomes shorter, the degree of consensus seems to increase faster than the underlying uncertainty falls. This result reflects both a relatively large amount of predictive uncertainty about real output growth and a relatively large degree of consensus about how to interpret incoming economic data. The point estimates converge faster than the predictive uncertainty declines such that the actual output growth rate is less likely to fall within the forecast range as the forecast horizon becomes shorter.

Although the forecasts of inflation appear to be biased, the predictive uncertainty for inflation is less than that for output growth at all forecast horizons. Öller and Barot (2000) note a similar result for output and inflation forecasts from a group of 13 European economies. Despite the lower amount of predictive uncertainty about inflation, the FOMC members seem to have a harder time agreeing on a point forecast for inflation when the forecast horizon is greater than a year ahead. Note that for the 6- and 12-month forecasts, the policymakers are better able to come to a consensus on inflation than they are on output. One hypothesis for this anomaly is that at shorter horizons the policymakers believe that inflation is essentially "baked into the cake." They don't believe that anything they do with policy will have much impact on inflation within the next year. However, the 18-month forecast is far enough away that their inflation forecast will reflect to a greater degree their beliefs about the medium-term objective.

*3.1 Is the FOMC forecast unbiased?*

In this section, we check the alternative forecasts for bias. We estimate the following regression in the first part of our test:

$$x_t = \alpha + \beta\ {}_{t-i}x_t^f + {}_{t-i}\varepsilon_t, \tag{1}$$

where $x$ is the variable being forecast (the fourth-quarter-over-fourth-quarter growth rate of output or the price deflator for output). The forecast ($x^f$) is indexed by the time when the forecast was made (*t-i,* where *i* refers to three forecast horizons) and the year to which it applies ($t$). If the estimates of ($\alpha$, $\beta$) are equal to (0, 1), the forecasts are unbiased. We use an F-statistic to test for unbiasedness. Holden and Peel (1990) show that even if we can reject the null hypothesis that ($\alpha$, $\beta$) is equal to (0, 1), it is still possible that the forecasts may be unbiased. The intuition for their result can be understood by thinking about equation (1) as a mechanism for combining unbiased forecasts where the constant is an unbiased forecast of the series. If we cannot reject the null hypothesis, we can conclude that the forecast is unbiased. If we reject the null hypothesis, it is necessary to examine the properties of the forecast error, $x_t - {}_{t-i}x_t^f$. To make a complete test of bias, we also compute the regression

$$x_t - {}_{t-i}x_t^f = \gamma + {}_{t-i}\varepsilon_t^\gamma \tag{2}$$

and test whether $\gamma$ is equal to zero. In addition, we must take account of possible serial correlation in the error for the 18-month forecast. Because the forecast horizon is longer than the interval over which output growth is measured, the forecast error for year *t* is not available when the forecasts for year $t+1$ are made. Therefore, information that arrives in the second half of year $t$ may be reflected in forecast errors for both years $t$ and $t+1$. If it is, the errors will display first-order serial correlation. For this case, Hansen (1982) has shown that ordinary least squares (OLS) estimates will be unbiased, but the standard errors will be too small, leading to too many rejections of the null hypothesis. Therefore we used the correction for serial correlation suggested by Hansen (1982) when reporting test statistics for the July next-year forecasts.

OLS estimates of equations (1) and (2) for the output and inflation forecasts are listed in Table 2. Table 2 includes the estimates of $\alpha$ and $\beta$, with standard errors in parentheses. The third column of results shows the probability values of the F-statistic for the null joint hypothesis that $(\alpha, \beta) = (0, 1)$. For the three cases with output, the probability values are all above 50 percent, so we conclude that the output forecasts are unbiased. It is not necessary to estimate equation (2) in the case of the output forecasts, however, because we could not reject that the forecasts are unbiased using the F-statistic. In contrast, the probability values of the F-statistic for the inflation forecasts are quite low, always less than 10 percent. To complete the test for bias, the fifth column of Table 2 reports the probability values for the t-statistic for testing whether $\hat{\gamma}$ is equal to zero. Here we find strong evidence that the FOMC inflation forecasts are biased.

These results contrast with past studies of inflation forecasts where the evidence bias is mixed. For example, neither Romer and Romer (2000) nor Joutz and Stekler (2000) can reject the null joint hypothesis that $(\alpha, \beta) = (0, 1)$ for the Green Book inflation forecasts, even at a forecast horizon of 1 year. However, Romer and Romer reject the null joint hypothesis for the Blue Chip inflation forecasts in the period from 1980 to 1991.

-

*3.2 Is the FOMC forecast efficient?*

If the FOMC forecasts are efficient, they will take account of information in the most recent output and inflation data as well as what they have learned from previous forecast errors. A weak form test for informational efficiency is a test for serial correlation in the forecast errors. The fourth and sixth columns of Table 2 include Q-statistics that are used to test whether the estimated errors are random. In general, these Q-statistics indicate that there is serial correlation in estimated residuals from equations (1) and (2), except in the case of the 18-month output forecast. Joutz and Stekler (2000) reported that although the Fed staff's four-quarter-ahead inflation forecasts were unbiased in the earlier period, they found significant serial correlation in the forecast error.

We also test for informational efficiency by checking to see if the forecast errors are orthogonal to the previous year's output and inflation data and the past forecast errors that were revealed when that data became available. All forecasters can observe last year's errors just before they make their current-year forecasts in February and July. Thus, the current year's forecast errors should not be correlated with any of the previous year's forecast errors. As noted above, the 18-month forecast overlaps with the current-year forecasts. Therefore, even if the forecasts are efficient, the errors in the previous year's forecasts may be correlated with the errors in the 18-month forecast. If the forecasts are efficient, the forecast errors from two years ago should not be correlated with these forecast errors.

Most forecasters believe that inflation and output are related and that past errors in both these measures should be taken into account when forecasting either inflation or output. Thus, we also check to see whether past inflation forecast errors are correlated with current output forecast errors (and vice versa).

To conduct these orthogonality tests for efficiency, we run the following regression:

$$_{t-i}e_t = \alpha + \beta \, _{t-i}e^k_{t-j} + _{t-i}u_t \,, \tag{3}$$

where $_{t-i}e_t$ is the forecast error for year *t* (for either output or inflation) made at the *t-i* horizon. Because the data set is small, we check for bivariate relationships between the current and past errors. There will be a total of six different dependent variables: three for output and three for inflation from each of the forecast horizons. The term $_{t-i}e^k_{t-j}$ is the error in the forecast for year *t-j* made at the *t-i* forecast horizon. The superscript *k* refers to an error from either the inflation or the output forecast. In principle, we could test efficiency against any information that was available at the time the forecasts were made. Here we are checking against the most recent errors for inflation and output that were known. Thus, *j* = 2 when the dependent variable is a July next-year forecast error, and *j* = 1 when it is a current-year forecast error. We also test efficiency against information about the most recent information available on inflation and output by replacing the error term, $_{t-i}e^k_{t-j}$, with the actual values for output growth and inflation.

Estimation results for equation (3) are shown in Table 3. The table includes the p-values for the t-statistic testing the null hypothesis that $\beta = 0$. Each p-value is calculated in a separate regression. The only statistically significant correlations are with forecast errors from a different variable. Of the 48 cases we examined, we could reject orthogonality in only three. Two cases involved output forecast errors. The 18-month output error was related to the actual inflation rate from two years ago and the 12-month output error was correlated with the previous 18-month inflation forecast error. The other significant relationship was between the 6-month inflation forecast error and the previous year's 6-month output forecast error.

## 4. How does the FOMC perform relative to alternative forecasts?

### *4.1 Is the FOMC forecast as accurate as the alternatives?*

We begin by comparing the FOMC forecasts with the Blue Chip and naïve forecasts for the period from 1979 to 2001. Table 4 reports the mean error, the RMSE, and the probability value for a two-sided Wilcoxon signed-rank test that evaluates the significance of the difference in the size of the forecast errors. Diebold and Mariano (1995) show that the Wilcoxon signed-rank test statistic is well-sized in cases where the sample is small and the alternative forecast errors are highly correlated (and possibly serially correlated—as we expect for the 18-month forecasts). In tests of whether the RMSEs are equal, we assume that the forecasters' loss function is measured by the square of the forecast error. However, there was a substantial bias in inflation forecasts and we want to test whether the differences in bias among the forecasts is statistically significant; therefore, we also construct a test of the mean error in which we measure the forecaster's loss function as the forecast error.

The mean errors for the output forecasts are shown in the first column in Table 4. There were no significant differences between the bias in the FOMC output forecasts and the others. The FOMC output forecast had lower RMSEs than either the Blue Chip or the naïve forecast at all three forecast horizons. However, the FOMC output forecast was not significantly more accurate than the Blue Chip forecast. The FOMC's output forecast was significantly better than the naïve forecast for both the 18- and 6-month horizons.

In the third column of Table 4 we report the mean error of the inflation forecasts. There was a negative bias in every case. The bias in the Blue Chip inflation forecast was significantly larger than the bias in the FOMC forecast for both the 18- and 6-month horizons. Interestingly, the naïve inflation forecast was less biased than the FOMC forecast at the 12-month horizon and they were essentially the same for the 18- and 6-month horizons.

The FOMC had the lowest RMSE compared with all the naïve inflation forecasts and two of the three Blue Chip forecasts. The FOMC forecasts were significantly more accurate than the Blue Chip forecasts at the 18- and 6-month horizons and significantly more accurate than the naïve forecast at the 6-month horizon. The RMSE of the 18-month FOMC inflation forecast was much smaller than the RMSE of the comparable naïve forecast, but the difference was not statistically significant. The large RMSE of the naïve 18-month forecast is mainly due to two observations in 1982 and 1983, where the naïve model was slow to recognize the lower inflation trend.

We consider the Green Book forecasts separately in Table 5 and use a shorter data sample. The FOMC had the lower RMSEs for the 12- and 6-month output forecasts, but the Green Book had the lower RMSE for the 18-month forecast. None of the differences among the mean errors and RMSEs of the output forecasts were statistically significant at the 10 percent level. In contrast, the Green Book had the smallest bias and the lowest

RMSE for all the inflation forecasts. The differences were significant for the 12- and 6-month forecasts.

*4.2 Does the FOMC encompass other forecasts?*

The tests for bias and accuracy do not give a complete evaluation of the alternative forecasts. Sometimes we cannot distinguish between the relative accuracy using the RMSE; other times the alternative may have a larger RMSE, yet we would still like to know whether the alternative forecast contained additional useful information that could have been used to improve the FOMC forecast. In this section, we regress the actual changes in output growth and inflation on the FOMC and on each of the alternative forecasts. If the alternative enters the regression significantly, then we conclude that the alternative has independent information that might have been used to improve the forecast. We say that one forecast *encompasses* another if it incorporates all of the relevant information. If it does, then adding information from the other will not help predict the actual value. We run the following regression:

$$x_t - {}_{t-i}x_t^a = c + \beta_b \, {}_{t-i}x_t^b + {}_{t-i}\varepsilon_t^a , \qquad (4)$$

where we compare two forecasts of $x$, $x^a$, and $x^b$. Forecast $x^a$ encompasses $x^b$ if $\beta_b = 0$. We test the alternative, that is, whether forecast $x^b$ encompasses $x^a$ , by switching the roles of forecasts *a* and *b*.

The results of the encompassing tests are shown in Table 6. The results are p-values for the t-statistic testing whether the coefficient $\beta_b$ is equal to zero. We start with the naïve forecasts. The null hypothesis is that forecast A encompasses forecast B. In the case of the naïve output forecasts, we find that we can reject the null hypothesis for both the FOMC and naïve 18-month forecasts. This suggests that there is useful information in both forecasts that could have been combined to make a better forecast. For the 12- and 6-month forecasts, we could not reject that either one encompasses the other. In these cases, there is no reason to consider a combination of the forecasts. In the case of the inflation forecasts, the FOMC forecasts encompass the naïve forecasts at all horizons.

For both the FOMC and Blue Chip output forecasts, we can reject encompassing in only one case; that is, we can reject that the FOMC 6-month output forecast encompasses the Blue Chip. Otherwise, we cannot reject that either one encompasses the other—if you have one of the forecasts, you don't need the other. In the case of the inflation forecasts, the encompassing tests do not distinguish between the Blue Chip and the FOMC. The FOMC encompasses the Blue Chip at the 18-month horizon, but the result is reversed for the 12-month forecast. In the case of the 6-month forecasts, we cannot reject that either forecast encompasses the other.

The encompassing tests reported in the bottom panel of Table 6 do not sharply discriminate between the FOMC and the Green Book forecasts. For the 18-month and 6-month output forecasts, we can reject that either one encompasses the other. For 12-month forecasts we cannot reject in either case. The results for the inflation forecasts are also mixed. We cannot reject that either encompasses the other at the 18-month horizon. The Green Book encompasses the FOMC at the 12-month horizon, but the opposite result occurs at the 6-month horizon.

## 5. Conclusions

This study examines the forecasts of Federal Reserve policymakers. While many have studied the forecasts of the Federal Reserve staff (the Green Book forecasts), this is the first in-depth statistical analysis of the forecasts made by the policymakers themselves. The forecasts are reported as a range of individual forecasts, which may be thought of as a measure of consensus among the policymakers. Forecasts are made at 18-, 12-, and 6-month horizons. As one would expect, both the degree of consensus and the predictive uncertainty fall as the horizon becomes shorter, although the consensus converges faster than the predictive uncertainty declines. Generally, the outcome is more likely to fall outside the full range of forecasts as the horizon becomes shorter.

In testing for bias and informational efficiency in the FOMC forecasts, we find that the long-term output forecast was unbiased and displayed a weak form of informational efficiency. There is some evidence of serial correlation among the errors for the shorter-term output forecast. The inflation forecasts are biased and the errors are serially correlated. For the most part, we find that the forecast errors for both inflation and output pass tests for orthogonality with the previous forecast errors and the most recently observed values of output growth and inflation. There is some evidence that the FOMC did not make efficient use of the dynamic relationship between inflation and output.

In comparisons with alternative forecasts, we find that the FOMC output forecast is more accurate than the naïve model and as accurate as the private sector Blue Chip and the Fed staff's Green Book forecast. The FOMC forecasts look like those from the private sector and the Fed staff, sometimes better and sometimes worse. The FOMC output forecast often had the lowest RMSE. Yet, even in some of those cases, the encompassing results show that there was information in alternative forecasts that might have been used to improve the FOMC forecasts.

The results of the inflation forecasts are interesting. On average, inflation fell throughout the sample period and all of the forecasts tended to overestimate inflation. The bias in the inflation forecasts is larger at longer horizons, but is statistically significant even for forecasts made when the year was half over. The FOMC inflation forecasts are more accurate than the Blue Chip, but not as accurate as the Green Book. Thus, our results support the main result in Romer and Romer (2000). They concluded that policymakers had access to inside information about the inflation outlook because the Green Book inflation forecasts were significantly better than the private sector forecasts. The policymakers were aware of the staff forecasts, and our results are consistent with the idea that the FOMC members took some account of this information when making their own forecasts.

References


Batchelor, R., & Dua, P. (1991). Blue Chip rationality tests. *Journal of Money, Credit and Banking* 23, 692-705.

Croushore, D., & Evans, C. L. (2000). Data revisions and the identification of monetary policy shocks, Federal Reserve Bank of Chicago, Working Paper WP-00-26.

Diebold, F. X., & Mariano, R. S. (1995). Comparing predictive accuracy. *Journal of Business and Economic Statistics* 13, 253-263.

Faust, J., Rogers, J. H., & Wright, J.H. (2000). News and noise in G-7 GDP announcements. Board of Governors of the Federal Reserve System, *International Finance Discussion Papers* 690.

Gavin, W. T., & Mandal, R.J. (2001). Forecasting inflation and growth: Do private forecasts match those of policymakers? *Business Economics* January, 13-20.

Hansen, L. P. (1982). Large sample properties of generalized method of moments estimators. *Econometrica* 50, 1029-54.

Holden, K.& Peel, D.A. (1990). On testing for unbiasedness and efficiency of forecasts. *The Manchester School* 58, 120-127.

Jansen, D. W., & Kishan, R. P. (1996). An evaluation of Federal Reserve forecasting. *Journal of Macroeconomics* 18, 89-100.

Joutz, F., & Stekler, H.O. (2000). An evaluation of the predictions of the Federal Reserve. *International Journal of Forecasting* 16, 17-38.

McNees, S. K. (1992). How large are economic forecast errors? *New England Economic Review* July/August, 25-42.

________. (1988). How accurate are macroeconomic forecasts?” *New England Economic Review* July/August, 15-36.

________. (1987). Consensus forecasts: tyranny of the majority?” *New England Economic Review* November/December, 15-21.

Öller, L. & Barot, B. (2000). The accuracy of European growth and inflation forecasts. *International Journal of Forecasting* 16, 293-315.

Romer, C. D. & Romer D. H. (2000). Federal Reserve private information and the behavior of interest rates. *American Economic Review* 90, 429-57.

Schuh, S. (2001). An evaluation of recent macroeconomic forecast errors. *New England Economic Review* January/February, 35-56.

Zarnowitz, V., & Braun, P. (1993). Twenty-two years of the NBER-ASA Quarterly Economic Outlook Surveys: Aspects and comparisons of forecasting performance. *Business Cycles, Indicators, and Forecasting,* Stock, J. H. & Watson, M. W., eds., The University of Chicago Press, Chicago, 11-84.

Zarnowitz, V. & Lambros, L. A. (1987). Consensus and uncertainty in economic prediction. *Journal of Political Economy* 95, 591-621.

**Table 1**
**FOMC Forecasts of 4Q/4Q Growth Rates (1979 to 2001)**

| **Output (GNP/GDP)** | **Forecast horizon** (number of months to release of calendar year data) | | |
|---|---|---|---|
| | 18-month | 12-month | 6-month |
| Mean error | 0.02 | 0.14 | 0.07 |
| RMSE | 1.59 | 1.32 | 0.92 |
| Width of range in percentage points | 1.70 | 1.63 | 1.24 |
| Percent of time outside the range | 50% | 64% | 78% |
| **Inflation*** | | | |
| Mean error | -0.47 | -0.36 | -0.23 |
| RMSE | 1.19 | 0.98 | 0.64 |
| Width of range in percentage points | 1.93 | 1.35 | 1.01 |
| Percent of time outside the range | 41% | 55% | 48% |

* These are the mix of inflation rates (output deflator, CPI, and PCE chain price index) actually forecasted by the FOMC.  The forecasts are calculated as the midpoints of the reported range of policymaker forecasts.

**Table 2**
**Tests for Unbiasedness and Weak-Form Efficiency**

Equation (1) $x_t = \alpha + \beta\ {}_{t-i}x_t^f + {}_{t-i}\varepsilon_t^a$

Equation (2) $(x_t - {}_{t-i}x_t^f) = \gamma + {}_{t-i}\varepsilon_t^b$

| Output forecasts | $\hat{\alpha}$ (standard error) | $\hat{\beta}$ (standard error) | F-stat p-value | Q-stat p-value for $\hat{\varepsilon}^a$ | $\hat{\gamma}$ t-stat p-value | Q-stat p-value for $\hat{\varepsilon}^b$ |
|---|---|---|---|---|---|---|
| 18-month | -0.142 (1.50) | 1.121 (0.56) | 0.85 | 0.29 | 0.60 | 0.34 |
| 12-month | -0.094 (0.92) | 1.120 (0.32) | 0.70 | 0.04 | 0.44 | 0.04 |
| 6-month | -0.329 (0.47) | 1.103 (0.15) | 0.78 | 0.01 | 0.91 | 0.01 |
| Inflation forecasts | | | | | | |
| 18-month | 0.158 (0.53) | 0.771 (0.16) | 0.00 | 0.14 | 0.00 | 0.06 |
| 12-month | 0.266 (0.40) | 0.790 (0.12) | 0.01 | 0.26 | 0.01 | 0.03 |
| 6-month | -0.047 (0.34) | 0.927 (0.11) | 0.04 | 0.16 | 0.01 | 0.06 |

Note: The F-statistic tests the joint hypothesis that $(\alpha,\beta) = (0,1)$. The Q-statistic tests the hypothesis that there is no serial correlation among the error terms. Shaded cells indicate that the probability value is less than 10 percent.

**Table 3**
**Tests for Forecast Efficiency**
(Using May vintage for July Forecasts)
Probability values for the t-statistic on the coefficient $\beta$ in equation (3):

$${}_{t-i}e_t = \alpha + \beta \, {}_{t-i}e_{t-j}^{k} + {}_{t-i}u_t \, .$$

| | Actual* Output | Previous output forecast error: July next-year | Previous output forecast error: Feb current-year | Previous output forecast error: July current-year | Actual* Inflation | Previous inflation forecast error: July next-year | Previous inflation forecast error: Feb current-year | Previous inflation forecast error: July current-year |
|---|---|---|---|---|---|---|---|---|
| Output Forecast Error | | | | | | | | |
| 18-month | 0.178 | 0.174 | 0.306 | 0.380 | 0.074 | 0.138 | 0.211 | 0.130 |
| 12-month | 0.454 | 0.518 | 0.989 | 0.739 | 0.646 | 0.084 | 0.151 | 0.430 |
| 6-month | 0.274 | 0.269 | 0.601 | 0.788 | 0.176 | 0.261 | 0.542 | 0.732 |
| Inflation Forecast Error | | | | | | | | |
| 18-month | 0.192 | 0.349 | 0.395 | 0.580 | 0.411 | 0.937 | 0.204 | 0.812 |
| 12-month | 0.880 | 0.906 | 0.782 | 0.367 | 0.136 | 0.501 | 0.407 | 0.370 |
| 6-month | 0.335 | 0.361 | 0.428 | 0.017 | 0.540 | 0.970 | 0.369 | 0.810 |

Note: The dependent variables are listed in the left-hand side column. The lagged error term included as the regressor in the equation is listed across the top row. Each cell represents the results of a separate regression. Shaded cells indicate that the probability value is less than 10 percent. Annual data are from 1984 to 2001 for the July next-year forecasts and from 1983 to 2001 for the current-year forecasts.

*In these columns we use actual values rather than the forecast error as the regressor in equation (3).

**Table 4**
**Relative accuracy of FOMC, Blue Chip, and Naïve Forecasts**

| | Output | | Inflation | |
|---|---|---|---|---|
| Forecasts | Mean | RMSE | Mean | RMSE |
| 18-month (1981 to 2001) | | | | |
| FOMC | 0.057 | 1.614 | -0.671 | 1.112 |
| Blue Chip | -0.156 | 1.922 | -1.018 | 1.359 |
| | (0.18) | (0.55) | (0.00) | (0.01) |
| Naïve (May series) | 0.061 | 2.753 | -0.670 | 1.758 |
| | (0.79) | (0.02) | (0.36) | (0.81) |
| 12-month (1980 to 2001) | | | | |
| FOMC | 0.142 | 1.352 | -0.559 | 0.951 |
| Blue Chip | 0.054 | 1.479 | -0.563 | 0.914 |
| | (0.87) | (0.41) | (0.32) | (0.73) |
| Naïve (Feb series) | -0.031 | 2.225 | -0.326 | 1.087 |
| | (0.25) | (0.24) | (0.01) | (0.82) |
| 6-month (1979/1980 to 2000*) | | | | |
| FOMC | 0.070 | 1.268 | -0.272 | 0.498 |
| Blue Chip | 0.004 | 1.297 | -0.386 | 0.574 |
| | (0.71) | (0.76) | (0.00) | (0.03) |
| Naïve (May series) | -0.253 | 2.304 | -0.295 | 1.130 |
| | (0.60) | (0.09) | (0.44) | (0.04) |

The values in parentheses are Wilcoxon signed-rank statistics. The test for equality of mean errors is a test of the hypothesis that the bias in the forecast is equal to the bias in the FOMC forecast. The test for equality of RMSEs is a test that the relevant alternative forecast is as accurate as the FOMC forecast. Shading indicates that the probability value of the Wilcoxon signed-rank statistic is less than 10 percent.

* The July current-year forecasts are available in 1979 for output, but not inflation because the Blue Chip did not begin forecasting inflation until 1980.

**Table 5**
**Relative Accuracy of FOMC and Green Book Forecasts**

| | Output | | Inflation | |
|---|---|---|---|---|
| Forecasts | Mean | RMSE | Mean | RMSE |
| 18-month (1980 to 1997) | | | | |
| FOMC | -0.027 | 1.483 | -0.626 | 1.137 |
| Green Book | 0.065 | 1.435 | -0.535 | 0.968 |
| | (0.47) | (0.97) | (0.50) | (0.73) |
| 12-month (1980 to 1996) | | | | |
| FOMC | 0.047 | 1.267 | -0.655 | 1.032 |
| Green Book | 0.163 | 1.392 | -0.369 | 0.75 |
| | (0.17) | (0.78) | (0.06) | (0.04) |
| 6-month (1979 to1996) | | | | |
| FOMC | 0.085 | 1.340 | -0.326 | 0.583 |
| Green Book | 0.176 | 1.400 | -0.155 | 0.389 |
| | (0.21) | (.39) | (0.08) | (0.07) |

The values in parentheses are Wilcoxon signed-rank statistics. The test for equality of mean errors is a test of the hypothesis that the bias in the Green Book forecast is equal to the bias in the FOMC forecast. The test for equality of RMSEs is a test that the Green Book alternative forecast is as accurate as the FOMC forecast. Shading indicates that the probability value of the Wilcoxon signed-rank statistic is less than 10 percent.

**Table 6**
**Encompassing Tests for FOMC, Blue Chip, and Naïve Forecasts**

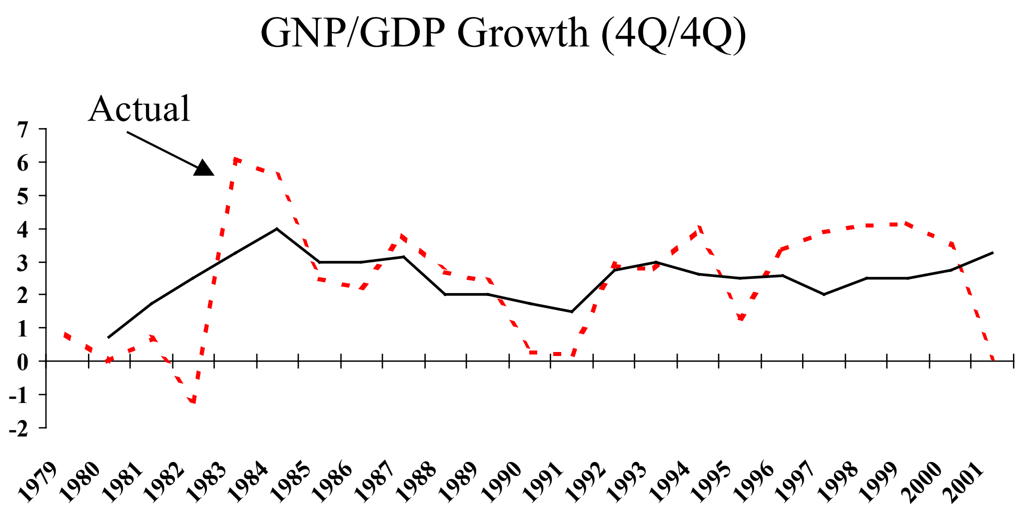
Probability values for the t-statistic on $\beta$ in equation (4):

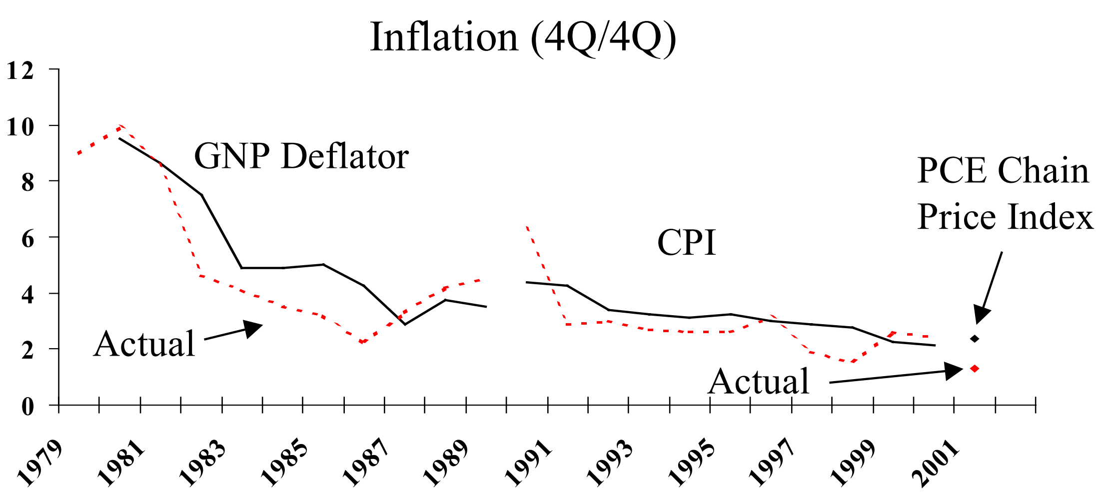
$$x_t - {}_{t-i}x_t^a = c + \beta_b \; {}_{t-i}x_t^b + {}_{t-i}\varepsilon_t^a .$$

| | **Output Forecasts** | | **Inflation Forecasts** | |
|---|---|---|---|---|
| FOMC and Naïve Forecasts | | | | |
| Null hypothesis: Forecast A encompasses Forecast B ⇒ | FOMC encompasses Naïve | Naïve encompasses FOMC | FOMC encompasses Naïve | Naïve Encompasses FOMC |
| 18-month | 0.098 | 0.028 | 0.533 | 0.013 |
| 12-month | 0.896 | 0.183 | 0.571 | 0.000 |
| 6-month | 0.461 | 0.124 | 0.733 | 0.002 |
| FOMC and Blue Chip Forecasts | | | | |
| Null hypothesis: Forecast A encompasses Forecast B ⇒ | FOMC encompasses Blue Chip | Blue Chip encompasses FOMC | FOMC encompasses Blue Chip | Blue Chip encompasses FOMC |
| Forecast Horizon | | | | |
| 18-month | 0.515 | 0.266 | 0.153 | 0.052 |
| 12-month | 0.895 | 0.341 | 0.007 | 0.540 |
| 6-month | 0.036 | 0.220 | 0.941 | 0.119 |
| FOMC and Green Book Forecasts | | | | |
| Null hypothesis: Forecast A encompasses Forecast B ⇒ | FOMC encompasses Green Book | Green Book encompasses FOMC | FOMC encompasses Green Book | Green Book encompasses FOMC |
| 18-month | 0.008 | 0.010 | 0.981 | 0.134 |
| 12-month | 0.902 | 0.771 | 0.051 | 0.525 |
| 6-month | 0.045 | 0.056 | 0.238 | 0.053 |

Note: Shaded cells indicate that the probability value is less than 10 percent.

Figure 1: FOMC 18-month Forecasts
(Made in July for the next calendar year)




Actual values are shown in dashed lines. GNP was used until 1992, then GDP. Inflation forecasts include a mix of the implicit price deflator for GNP from 1980 to 1989, the CPI from 1990 to 2000, and the PCE chain price index in 2001.

-