Forecasting Inflation and Growth: Do Private Forecasts Match Those of Policymakers?

William T. Gavin and Rachel J. Mandal

Generally, we value forecasts for their accuracy. In some cases, however, the forecasts themselves are interesting because of what they reveal about the forecaster. Monetary policymaker forecasts are important because they partially reveal what policymakers believe will follow from their decisions.

Forecasts of inflation and real output (whether made by Federal Reserve officials or private sector economists) contain information that is important for changing the stance of monetary policy. Market participants generally believe that Fed policymakers will change their policy stance if the economy appears to be headed in a different direction from what was expected at the time policy was adopted. Svensson (1997) and Svensson and Woodford (2000) explain why a central bank might want to target its inflation forecast. The intuition in their explanation is that policymakers should look at everything that is relevant when deciding to change the policy stance. The trouble with looking at everything is that there is so much information to process, one needs an organizing framework such as a forecasting model. Forecasting models are developed to monitor incoming information and to weigh each piece appropriately. Forecasting models range from the very largest, with over a thousand equations, to small models that are no more than simple rules of thumb. Whether using a large econometric model or a simple rule of thumb, forecasters rarely use the values that come directly from the model. Rather, they typically make judgmental adjustments before reporting the forecasts.

In this article, we examine the role of forecasts in the monetary policy process. Our focus is on the forecasts of inflation and economic growth, the main policy objectives. Economic forecasts are important because they reflect incoming information about the current state of the economy, including the forecasters' beliefs about monetary policy objectives. In the United States, there are no explicit numerical objectives for output and inflation. Thus, policymaker forecasts are particularly interesting because they may reveal information about long-run policy goals.

Fed forecasts, unfortunately, are not readily available to the public. We show that the Blue Chip consensus forecasts, made by a group of private economists, are a good stand-in for the policymakers' forecasts. This is important because the policymakers in the Federal Reserve, the members of the Federal Open Market Committee (FOMC), reveal their forecasts only sparingly and after policy decisions are made. First, we show how well the forecasts match. We find that the forecasts of economic growth are very similar and appear to be about equal on average. The result for inflation forecasts is more interesting. Here we see that the private sector economists generally predicted higher inflation than did Fed policymakers, especially in the 1980s. The Blue Chip economists did not believe that the FOMC would achieve and maintain such a low inflation rate in the 1980s. Since 1995, the forecasts have converged. Evidently, the FOMC has achieved some credibility with the Blue Chip economists.

When researchers want to know the history of policymakers' forecasts, they typically go to the Fed's briefing documents to extract the forecasts of the research staff at the Board of Governors. We show that the Blue Chip forecasts for output are as good a proxy for Fed policymakers' views as are the research staff forecasts. In the case of inflation, the results vary with the time horizon. Generally, the Blue Chip consensus forecasts for inflation match the policymakers' forecasts at shorter horizons while the research staff forecasts are closer at the longest horizon.

Finally, we examine the use of alternative forecasts in a version of the Taylor rule, a popular characterization of monetary policy actions. It is popular because it is a simple summary of a complicated policy process. It is expressed as:

$$(1)\quad FF_t^A = r^e + \pi_{t-1} + 0.5(\pi_{t-1} - \pi^T) + 0.5(y_{t-1} - y_{t-1}^F),$$

where FF_t^A is the federal funds rate target chosen

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by the FOMC, r^e is the long-run equilibrium real interest rate (assumed by Taylor to be equal to 2 percent per year), π_{t-1} is the average inflation rate observed over the previous four quarters, π^T is the inflation target (which Taylor assumed to be equal to 2 percent per year), y_{t-1} is last period's real gross domestic product (GDP) measured in logarithms, and y^F_{t-1} is last period's potential real GDP measured in logarithms. The term in the bracket, $(y_{t-1} - y^F_{t-1})$, is approximately equal to the percentage deviation of GDP from the perceived level of potential GDP.

This backward-looking rule prescribes settings for the federal funds rate, the Fed's short-term policy instrument, according to the deviation of the past year's inflation from a 2 percent target and the deviation of last period's GDP from a measure of potential GDP. We begin by showing that historical analysis of the Taylor rule should use real-time data; that is, data that were available when the federal funds rate target was being set. We show that the forward-looking rule based on policymaker forecasts is virtually identical to one based on Blue Chip consensus forecasts. Neither does quite as well as the backward-looking rule using real-time data; however, all three versions of the Taylor rule do much better at explaining historical movement in the federal funds rate than do rules based on the current revised data. Because purely forward-looking rules may be inherently unstable, we also examine a combination rule that includes both lagged values of inflation and the output gap using real-time data and the Blue Chip forecasts of the current-year inflation and output gap.[1] This rule with both backward- and forward-looking elements matches the actual federal funds rate slightly better than the rule based on real-time data.

FOMC AND BLUE CHIP FORECASTS

FOMC members prepare forecasts for Congressional testimony twice a year.[2] This testimony was mandated by the Full Employment and Balanced Growth Act of 1978. Section 108 of this act explicitly required the Fed to submit "written reports setting forth (1) a review and analysis of recent developments affecting economic trends in the nation; (2) the objectives and plans … with respect to the monetary and credit aggregates …; and (3) the relationship of the aforesaid objectives and plans to the short-term goals set forth in the most recent *Economic Report of the President* …" In order to satisfy the third item, the Federal Reserve Chairman began reporting a summary of Fed policymakers' forecasts to Congress in July 1979. Since then, similar summaries of forecasts have been reported every February and July.[3] Forecasts are made of annual, fourth-quarter-over-fourth-quarter growth rates for nominal GDP, real GDP, and inflation.[4] Fed policymakers also forecast the average level of unemployment for the fourth quarter of the year. In February, the forecasts pertain to the current calendar year (referred to below as the 12-month-ahead forecast). In July, forecasts are updated for the current calendar year (6-month-ahead forecasts) and preliminary projections are made for the next calendar year (18-month-ahead forecasts).

We focus on the forecasts of real output growth and inflation because they best capture monetary policy objectives. We use the output price deflator as the measure of inflation primarily because it has been consistently forecasted throughout the entire period. Even when the Fed was reporting the forecast for inflation based on the consumer price index (from 1989 through 1999), there was also a forecast for both nominal and real output, so there was always an implied forecast for the output deflator.

Individual Federal Reserve officials submit their economic forecasts based on their judgment about the appropriate policy to be followed over the coming year. These individual projections may be revised after the FOMC adopts a specific policy. The revised projections are then reported as a range, listing the high and low values for each item, and as a *central tendency* that omits extreme forecasts and is meant to be a better representation of

[1] See Woodford (2000) for a summary of the argument that purely forward-looking rules may lead to instability.

[2] The FOMC is the policymaking committee of the Federal Reserve System. When the Board is full, the Committee consists of the 7 governors of the Board, the president of the Federal Reserve Bank of New York, and 4 of the remaining 11 Federal Reserve Bank presidents who serve on a rotating basis. All 12 presidents attend every meeting, contribute to the discussion, and provide forecasts that are summarized in testimony to the Congress. The Green Book is a briefing document with macroeconomic forecasts prepared by staff economists at the Board of Governors about three workdays before each FOMC meeting.

[3] This reporting requirement has now expired, but the Fed provided forecasts to Congress on July 20, 2000, and February 13, 2001. These data are not included in this study.

[4] The Fed switched from GNP to GDP in 1992.

Figure 1

Output Forecasts (1983 to 1994)

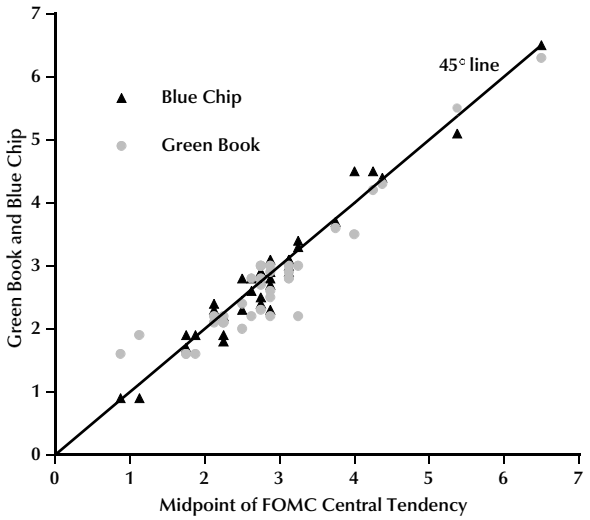
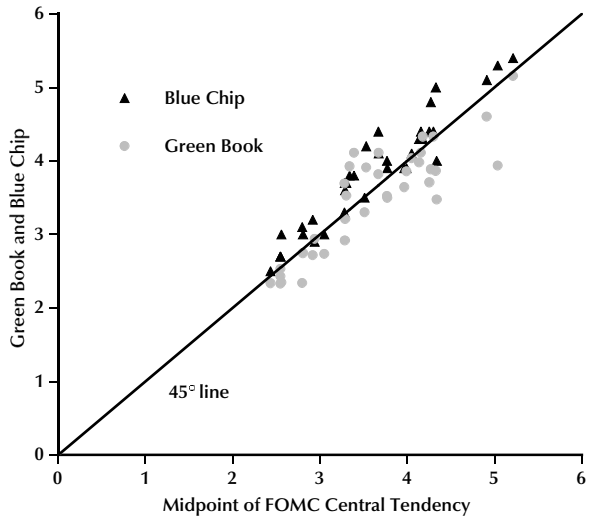


Figure 2

Inflation Forecasts (1983 to 1994)



the consensus view. In this article, we define the consensus FOMC forecast as the midpoint of this central tendency range.

The Blue Chip consensus forecasts are taken from the February and July reports. These forecasts are collected on the first three working days of the month, and the information available to private sector economists is approximately the same as the information available to the FOMC members when they make their forecasts. Most importantly, both groups usually had the latest information on the price indexes from the Bureau of Labor Statistics and the most recent report on actual GDP from the Bureau of Economic Analysis.

Figure 1 is a scatter diagram with triangles showing the relation between the consensus GDP growth forecasts made by the FOMC between 1983 and 1994 and those made by the Blue Chip economists during the same period. We start in 1983 because that is when the Federal Reserve first began to report the central tendency of the forecasts. It was also the first year that they reported forecasts for all the participants: FOMC members and nonvoting Federal Reserve Bank presidents.[5]

If the FOMC and Blue Chip forecasts were exactly the same, they would lie on the 45-degree line shown. As Figure 1 shows, the forecasts were quite similar and seem to be distributed evenly above and below the 45-degree line. That is, there does not seem to be any tendency for the Blue Chip economists to systematically forecast more or less output growth than the FOMC.

The same cannot be said of the inflation forecasts. The triangles in Figure 2, where most of the points lie above the 45-degree line, show that the Blue Chip economists usually forecasted higher inflation than did the FOMC. The period from 1983 to the present has been a period of moderate and falling inflation. Throughout, the Federal Reserve has had a goal of eliminating inflation. In general, the FOMC's forecasts of inflation have been lower than the Blue Chip forecasts. However, as inflation became lower in the 1990s, the forecasts have converged, indicating that the private sector has gained confidence in the Fed's ability to deliver low inflation. So, although the Blue Chip inflation forecasts have not always been unbiased indicators of the FOMC's inflation forecasts, they have been better in recent years.

GREEN BOOK FORECASTS

The Green Book forecast is put together by a large staff of economists at the Board of Governors in Washington, D.C. It is prepared for the FOMC members who read it in advance of the meetings

[5] In July 1979, the Fed reported a range of Board member forecasts (governors only). From 1980 through 1982, the Fed reported a range of forecasts for FOMC members.

Table 1

Blue Chip Versus Green Book as a Proxy for FOMC Forecasts (1983 to 1994)

	RMSE of output forecast		RMSE of inflation forecast	
	Blue Chip	Green Book	Blue Chip	Green Book
All 3 horizons	**0.22**	0.36	**0.32**	0.38
6-Month horizon	**0.17**	0.35	**0.21**	0.25
12-Month horizon	**0.25**	0.32	**0.32**	0.38
18-Month horizon	**0.24**	0.40	**0.40**	0.47

NOTE: Bold typeface indicates a better proxy for the midpoint of the FOMC tendency.

and receive an oral presentation of this forecast at the meeting. These forecasts are only available to the public five years after they are made.

Romer and Romer (2000) compare the Green Book forecasts with private sector forecasts using quarterly data from 1965 through 1991 and forecasts over several horizons (usually from forecasts of the current quarter out to seven quarters ahead). They present convincing evidence that the Green Book inflation forecasts have been more accurate than the private forecasts, including the Blue Chip consensus (for the period from 1980 to 1991). They also report that the Green Book forecasts of output were better than private sector forecasts, but the evidence for output forecasts is weaker.

The Green Book forecasts from 1983 through 1994 are depicted as circles in Figures 1 and 2. Casual observation suggests that the Green Book forecasts and the Blue Chip consensus represent the policymakers' consensus equally well. These scatter diagrams combine forecasts across the three horizons of 6, 12, and 18 months ahead.

Table 1 gives more detailed information about how well the Blue Chip consensus and the Green Book forecast match the FOMC consensus. Results are reported for the combined forecasts (combined over the three forecasting horizons) and for the three separate horizons. The forecast error in Table 1 is defined as the difference between the alternative forecast (Blue Chip consensus or Green Book) and the midpoint of the FOMC central tendency forecast. We report root-mean-squared errors (RMSE) for both inflation and output forecasts.

The results are interesting. On average, the differences in errors between the Green Book and Blue Chip are larger for the real output forecasts than they are for the inflation forecasts. For both real output and inflation, the Blue Chip consensus is closer to the FOMC forecast than is the Green Book. For the first 12 years after the FOMC began reporting the central tendency, the Blue Chip forecast has provided a good measure of the FOMC's view of the future, as least as good as one would get by knowing the Green Book forecast.

RELATIVE ACCURACY

1983 Through 1994

Table 2 reports the relative accuracy of real output forecasts to the real-time data from 1983 through 1994. For the separate and combined horizons, we compare the individual forecasts to the value that was first reported by the Bureau of Economic Analysis.[6] The Blue Chip forecasts are best (lowest RMSE) for the 12- and 18-month horizons. The FOMC's forecasts have the lowest RMSE at the 6-month horizon. In none of these cases are the Green Book forecasts of real output best.[7]

The Green Book fares better, however, for inflation forecasts from 1983 through 1994, as shown in Table 3. Earlier, we saw that the Blue Chip inflation forecasts were generally above the FOMC's forecasts in the 1980s. Here we see that all three forecasts, on average, predicted higher than actual inflation, with the FOMC forecasts sandwiched between the Blue Chip forecasts on the

[6] We used the vintage data sets from the Federal Reserve Bank of Philadelphia described in Croushore and Stark (1999).

[7] This is surprising given the conclusions in Romer and Romer (2000). They examined an earlier and longer sample with more frequent forecasts over more horizons. We examine only those dates and forecast horizons for which the central tendency of FOMC members' forecasts were reported to Congress.

Table 2

Accuracy of Output Forecasts (1983 to 1994)

	Mean error			RMSE		
	Blue Chip	FOMC members	Green Book	Blue Chip	FOMC members	Green Book
All 3 horizons	**0.04**	0.06	–0.06	**0.94**	0.96	1.05
6-Month horizon	**0.02**	0.05	**–0.02**	0.76	**0.74**	0.80
12-Month horizon	–0.11	**–0.08**	–0.15	**1.05**	1.11	1.23
18-Month horizon	0.22	0.22	**–0.02**	**0.99**	1.00	1.06

NOTE: Best forecast indicated by bold typeface.

Table 3

Accuracy of Inflation Forecasts (1983 to 1994)

	Mean error			RMSE		
	Blue Chip	FOMC members	Green Book	Blue Chip	FOMC members	Green Book
All 3 horizons	0.69	0.46	**0.35**	0.92	0.80	**0.65**
6-Month horizon	0.45	0.33	**0.21**	0.64	0.55	**0.36**
12-Month horizon	0.60	0.41	**0.26**	0.79	0.74	**0.61**
18-Month horizon	1.01	0.65	**0.57**	1.23	1.05	**0.88**

NOTE: Best forecast indicated by bold typeface.

high end and the more accurate Green Book forecasts on the low end.

1995 Through 1999

Table 4 examines the accuracy of the Blue Chip and FOMC real output forecasts from 1995 through 1999. Again, we report results based on the combined data sets and also separately for each forecast horizon. For these five years, both the Blue Chip and the FOMC policymakers' forecasts for real output growth were about 1 percent below actual. The large bias in the mean error reflects the ongoing surprise about the strength of economic growth and upward revisions to estimates of the underlying trend. We find that in the last five years, on average, the FOMC has been more accurate, as measured by the RMSE, than the Blue Chip at all forecast horizons.

We saw in Figure 2 that the FOMC and Blue Chip forecasts converged as inflation came down in the 1990s. Table 5 looks at the accuracy of the Blue Chip and FOMC inflation forecasts over the last five years of the sample. Both the FOMC and Blue Chip forecasts predicted higher than actual inflation from 1995 through 1999. The FOMC inflation forecasts have been slightly more accurate than the Blue Chip forecast for all three forecast horizons.

Although the FOMC forecasts were more accurate than the Blue Chip forecasts, the forecasts were not far apart. On average for all three horizons, the Blue Chip consensus for GDP growth was a tenth of a percentage point below the FOMC's, and the Blue Chip consensus for inflation was one-tenth higher than the FOMC's. The five years reported in Tables 4 and 5, 1995 through 1999, have been characterized by surprisingly high real GDP growth and surprisingly low inflation, as is seen by the negative mean errors for output growth and the positive mean errors for inflation.

USING FORECASTS IN TAYLOR-TYPE RULES

In this section we use a simple policymaking framework to see whether the differences between the Blue Chip and FOMC forecasts are economically

Table 4

Accuracy of Output Forecasts (1995 to 1999)

	Mean error			RMSE		
	Blue Chip	FOMC members	Green Book	Blue Chip	FOMC members	Green Book
All 3 horizons	–1.13	**–1.02**	NA	1.46	**1.35**	NA
6-Month horizon	**–0.52**	–0.53	NA	0.81	**0.73**	NA
12-Month horizon	–1.26	**–1.01**	NA	1.67	**1.50**	NA
18-Month horizon	–1.73	**–1.65**	NA	1.78	**1.71**	NA

NOTE: Best forecast indicated by bold typeface.

Table 5

Accuracy of Inflation Forecasts (1995 to 1999)

	Mean error			RMSE		
	Blue Chip	FOMC members	Green Book	Blue Chip	FOMC members	Green Book
All 3 horizons	0.59	**0.48**	NA	0.72	**0.64**	NA
6-Month horizon	0.36	**0.29**	NA	0.43	**0.39**	NA
12-Month horizon	0.52	**0.37**	NA	0.64	**0.50**	NA
18-Month horizon	0.98	**0.86**	NA	1.03	**0.96**	NA

NOTE: Best forecast indicated by bold typeface.

significant. Taylor (1993) proposed characterizing past Fed policy as if it were made according to a formula similar to equation (1), which has come to be known as the Taylor rule.[8]

Rotemberg and Woodford (1999) show that a rule of this form can be derived as an optimal policy under certain conditions. Clarida, Gali, and Gertler (1999) show that a rule of this type can be optimal in a dynamic, forward-looking IS/LM model in which the central bank's loss function is quadratic in deviations of inflation from target and output from potential. Even if the central bank cares only about the inflation objective, the nominal interest rate target may be set as a function of the state of the economy. If the real interest rate is procyclical, adjusting the federal funds rate target for changes in the gap between potential and actual GDP may be a method for taking into account the cyclical deviation of the real interest rate from the long-run equilibrium value.[9]

While clearly not advocating that any central bank follow any such simple rule slavishly, Taylor recommended his rule as a reference point in debates about whether a policy change might be needed. Indeed, that has happened as many central banks now regularly monitor variations of the original Taylor rule. Figure 3 shows the quarterly average federal funds rate and our calculation of the federal funds rate target implied by the Taylor rule for the period from 1983 to 1999.

We begin by showing the federal funds rate target implied by equation (1).[10] As Figure 3 shows, the rule does not do particularly well during the periods before 1990 or after 1994. Table 6 shows that the federal funds rate target, predicted by using current revised data, is, on average, 166 basis points below the actual federal funds rate.

[8] In his 1993 paper, Taylor used current year values for the GDP gap and inflation. Since current year data are unknown at the time policy is made, we have used lagged values.

[9] For recent evidence suggesting that the real interest rate is procyclical, see Dotsey and Scholl (2000).

[10] Note that the usefulness of the Taylor rule has been questioned by many researchers, including recent articles by Hetzel (2000), Kozicki (1999), McCallum (1999), and Orphanides (1998).

Figure 3

Taylor Rules: Current Versus Real-Time Data

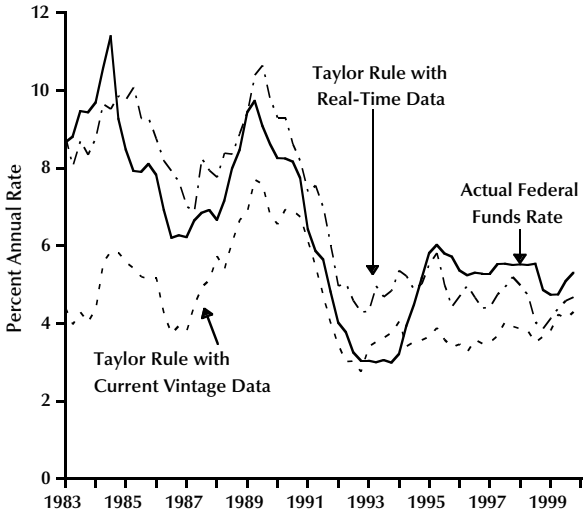


Figure 4

Taylor Rules: Blue Chip Versus FOMC Forecasts (Semi-Annual Data)

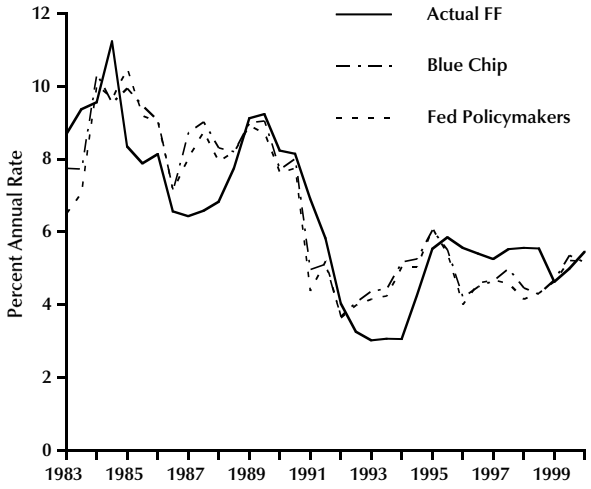


Figure 3 also includes the Taylor rule for the federal funds rate target using real-time data for GDP and inflation and a forecast for potential GDP from a recursive model that fits a quadratic time trend to the real-time data. As the figure shows, there is an important difference in the target calculated for the federal funds rate when we use the real-time data. Contrary to the case using currently available revised data, the real-time Taylor rule generally lies above the actual federal funds rate. The right-most column in Table 6 shows that the average deviation was 34 basis points. These results show that ex post policy rules based on revised data may do a poor job of replicating actual policy choices.

Figure 4 includes two versions of a forward-looking Taylor rule where we modify Taylor's general specification by replacing the backward-looking measures of inflation and output with FOMC and Blue Chip forecasts for the calendar year. The modified Taylor rule used is

$$(2) \quad FF_t^B = r^e + \pi_t^e + 0.5(\pi_t^e - \pi^T) + 0.5(y_t^e - y_t^F),$$

where π_t^e is the forecast of fourth-quarter-over-fourth-quarter inflation for the *current year* and $(y_t^e - y_t^F)$ is the output gap expected for the *current year*. We use the real-time data and our quadratic time trend to predict potential GDP in the fourth quarter of each year. We construct a fourth-quarter forecast of the level of GDP using the actual real-time value of the previous fourth-quarter level of GDP and the fourth-quarter-over-fourth-quarter forecast of GDP for the current year. Whether we use forecasts from the FOMC or Blue Chip, the implications for the federal funds rate target are almost identical.

In Table 6, the RMSE between the actual federal funds rate and the target predicted by the alternative Taylor rules are given along a diagonal in parentheses. For this period, using these forecasts, the backward-looking rule using real-time data predicts the actual federal funds rate slightly more accurately than do the forward-looking rules. The forward-looking version using the Blue Chip consensus forecasts is more accurate than the version using FOMC forecasts. However, the mean error for the FOMC version is closest to zero. As we saw in Figure 4, the Blue Chip and FOMC versions of the Taylor rule seem to move in tandem. The correlation between these versions of the Taylor rule is 0.99.

Bernanke and Woodford (1997) have argued that purely forward-looking Taylor rules may not be practical. Chari (1997) explains simply,

> Suppose, for instance, that the central bank wants to stabilize inflation rates and private forecasters have information that is not available to the central bank about future

Table 6

Alternative Versions of the Taylor Rule

	Actual federal funds rate	Current revised data	Real-time data	Blue Chip forecast	FOMC members' forecasts	Combination: real time and Blue Chip	Mean error
Current revised data	**0.73**	(1.42)					–1.66
Real-time data	**0.87**	**0.82**	(1.04)				0.34
Blue Chip forecast	**0.84**	**0.67**	**0.92**	(1.16)			0.15
FOMC members' forecasts	**0.82**	**0.67**	**0.91**	**0.99**	(1.23)		–0.03
Combination: real time and Blue Chip	**0.88**	**0.76**	**0.98**	**0.98**	**0.97**	(1.02)	0.24

NOTE: Correlations among the alternative predictions of the Taylor rule and the actual federal funds rate are shown in bold. RMSE are shown in parentheses (Taylor rule minus actual federal funds rate). Right column shows the mean error for each version of the Taylor rule.

> inflation. The central bank could use private forecasts of inflation to choose its policy instrument. The problem is that if the central bank is completely effective in using its policy instrument to stabilize inflation, private forecasts of inflation should rationally be the central bank's inflation target in which case, private forecasts provide no information about inflation! This paradox arises because market forecasts of a goal variable depend upon the central bank's policy rule and if the central bank used the information well, market forecasts will not be informative. (p. 685)

Woodford (2000) recommends policies that include both backward- and forward-looking elements. We create a combination rule that uses both the lagged values of inflation and the output gap as well as the Blue Chip forecasts for the current year. It is equivalent to taking an average of the real-time Taylor rule (FF_t^A) and the forward-looking rule using Blue Chip forecasts (FF_t^B). The results for this combination rule are given in the bottom row of Table 6. The federal funds rate target that comes out of this rule has the highest correlation with the actual federal funds rate (0.88) and the lowest RMSE (1.02) of all the rules that we considered.

CONCLUSION

We have found that the Blue Chip consensus appears to have been closely matched to the midpoint of the FOMC's central tendency forecasts. During the period from the beginning of 1983 through the summer of 1994, the Blue Chip forecasts for output were not only more closely related to the FOMC's output forecasts, but they were slightly more accurate than the forecasts in the Green Book. The Green Book forecasts of inflation were much more accurate than were the Blue Chip's during the period between 1983 and 1994. Nevertheless, the Blue Chip forecasts were still as closely related to the FOMC forecasts as were the Green Book forecasts.

In the period since 1994, the FOMC consensus has been more accurate than the Blue Chip consensus for both inflation and output, but not by much. During the period from 1995 through 1999, inflation has been lower than expectations while the real economy has been unexpectedly strong.

For the entire period, the differences between the Blue Chip consensus forecasts and the midpoint of the central tendency are not statistically or economically relevant for the policymaking process, at least not as that process has been characterized by Taylor (1993). We should not be surprised to learn that the Blue Chip forecasts of inflation and output are highly correlated with FOMC forecasts. Both the FOMC members and the economists who contribute to the Blue Chip consensus observe the same statistical releases and use similar economic theories to interpret the data.

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