ECONOMIC COMMENTARY

Forecast Accuracy and Monetary Policy

by Michael F. Bryan and William T. Gavin

It has been suggested that the purpose of economic forecasting is to make weather forecasters look good by comparison. Despite their inaccuracies, though, forecasts of the economy must be useful, given the large number of them available and the relatively high cost of producing such information. Indeed, if forecasters can even marginally reduce uncertainty about future business conditions, the savings to business is potentially huge.

But why do policymakers, specifically the Federal Reserve, use forecasts? Monetary policy is generally thought to influence business conditions, but only after a lag, and therefore an activist policy requires some prevision of the economy.

Yet, the forecasting record of economists suggests that near-term real GNP projections are of limited usefulness to monetary policymakers. However, it may be that monetary policy can affect forecast accuracy. This *Economic Commentary* examines the accuracy of macroeconomic forecasts and discusses some implications for monetary policy.

■ The Nature of the Data

The dimensions of the job faced by forecasters can be put into perspective by examining tendencies in the data. Consider the pattern of quarterly rates of real GNP growth and inflation over the past 35 years (figure 1). The average quarterly growth rate of real GNP was 3.1 percent—1.5 percent less than the average quarterly rate of inflation. Yet, quarterly real growth rates showed a huge dispersion, from a minimum of -9 percent to a maximum of 14 percent, with a standard deviation of 4.0 percent. Quarterly rates of inflation were relatively less variable, ranging from 0 to 15 percent, with a standard deviation of 2.8 percent.[1]

Note, however, that as the number of quarters in the time period increases, the variability of real growth narrows substantially. For example, the four-quarter growth rate of real GNP has only 65 percent of the volatility of the one-quarter growth rate (a standard deviation of 2.6 percent compared with 4.0 percent). The average real growth rate continues to become less variable as the time period lengthens: Five-year real GNP growth rates have only 25 percent of the volatility of quarterly growth rates, and ten-year growth rates have less than 18 percent of the volatility of quarterly rates (standard deviations of 1.0 percent and 0.7 percent, respectively).

Inflation, however, has not shown a similar inclination to become less variable over long periods. The standard deviation of the ten-year inflation rate is still about 70 percent the size of the quarterly inflation rates (a standard deviation of 2.0 percent compared with 2.8 percent).

Moreover, historical patterns indicate that the ten-year rate of real GNP growth has predominantly been between 2 and 3

percent. Alternatively, there is no unique tendency in the long-run inflation rate. That is, the ten-year rate of inflation was just as likely to be low (1 to 2 percent) as high (6 to 7 percent). Thus, the observed patterns of real GNP growth imply that the process that generates output gravitates to a particular value, while the data reveal no comparable forces anchoring the inflation rate.[2]

There are two forecasting implications of these tendencies in the data. Because deviations in quarterly changes in real GNP growth are 43 percent greater than for quarterly inflation rates, it seems reasonable to assume that forecasting quar-

FIGURE 1   PATTERNS OF REAL GNP GROWTH AND INFLATION, 1955 TO 1989

Percent, relative-frequency distribution

Percent, relative-frequency distribution
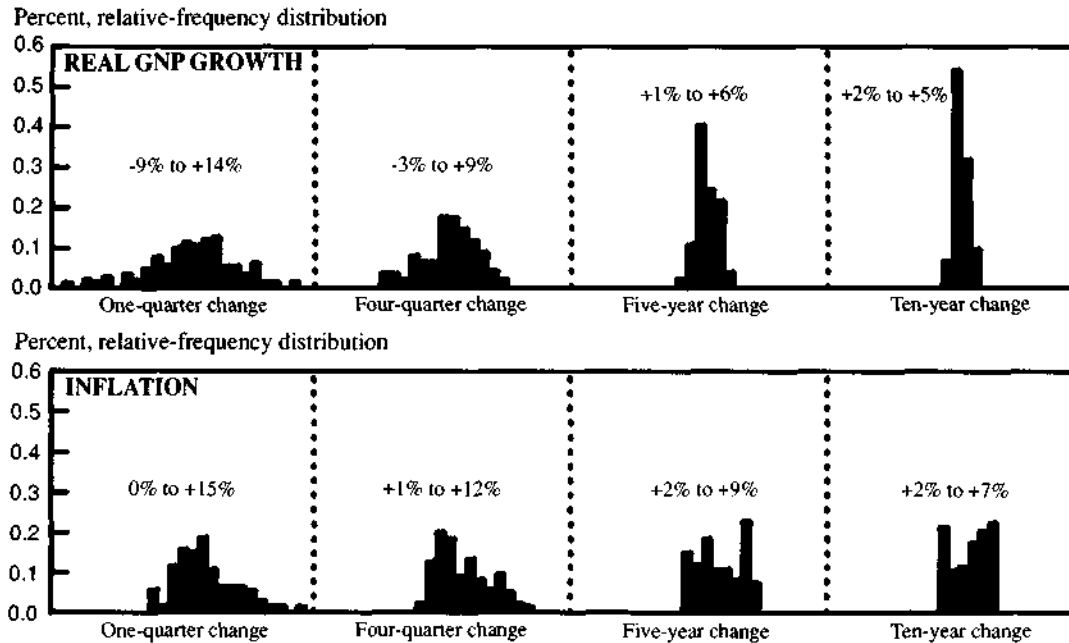
NOTE: Frequency distributions are calculated using data from 1955:IQ to 1989:IVQ. Inflation is measured using the GNP implicit price deflator.
SOURCE: U.S. Department of Commerce, Bureau of Economic Analysis.

terly inflation rates is an easier proposition than forecasting quarterly real GNP growth.[3] Yet, a forecaster's ability to predict real GNP growth should improve substantially as the forecast period increases (annual growth rate predictions should be more accurate than quarterly growth rate predictions, and so forth). This is not true for inflation. Consequently, forecasts of trend real GNP growth (over five- or ten-year intervals) are likely to be more accurate than forecasts of the trend inflation rate.

■ **The Forecast Record**
How accurate have economic forecasts been? Forecasts have clearly reduced uncertainty about the economy. For example, quarterly forecasts up to one year ahead reduced uncertainty about the growth rate of real GNP by roughly 14 percent and by 52 percent for inflation.[4]

The forecasting record of real GNP growth and inflation more or less reflects the characteristics of the data. For example, quarterly forecasts of inflation have, in fact, been more accurate than quarterly forecasts of real GNP growth for horizons at least as distant as two years.

Of course, forecast accuracy diminishes as the forecast horizon increases. That is, a forecast of next quarter is almost certain to be more accurate than a forecast of some distant quarter, since our knowledge about the present is likely to be of more value in predicting the near future than a more distant future. Yet, quarterly forecasts of inflation as much as *one year* ahead have been more accurate than quarterly real GNP forecasts *one quarter* ahead. Consider, for instance, the root mean square error (RMSE) of quarterly real GNP forecasts with quarterly inflation forecasts for the years 1968 to 1979 (table 1).[5] Quarterly inflation forecasts one year ahead had 10 percent smaller errors (on an RMSE basis) than one-quarter-ahead real GNP forecasts (0.98 percentage points and 1.09 percentage points, respectively.)

The relative forecast accuracy of real GNP growth and inflation also depends on the forecast *period*.[6] Because real GNP growth has a strong inclination to a particular trend rate—and inflation doesn't—errors in quarterly real GNP forecasts tend to cancel one another over time, while quarterly inflation forecast errors tend to accumulate.

Consequently, trend inflation forecasts (for periods of two years or longer) have tended to be less accurate than trend forecasts of real GNP growth.

As an example, consider the *cumulative* quarterly forecasting errors for real GNP and inflation from 1976 to 1987 (figure 2).[7] While one-quarter-ahead real GNP forecast errors were substantially larger than one-quarter-ahead inflation forecast errors (mean absolute errors [MAEs] of 2.8 and 1.1 percentage points, respectively), cumulative four-quarter real GNP forecast errors were only marginally larger than the cumulative four-quarter inflation forecast errors (MAEs of 1.6 vs. 1.3 percentage points). And for eight-quarter intervals, cumulative real GNP forecasts were superior to inflation forecasts (MAEs of 1.2 vs. 1.9 percentage points).

■ **Accuracy and Policy**
Are forecasts accurate enough to be useful guides for monetary policy? It is widely held that monetary policy can influence the growth rate of real GNP only in the short run, but affects the price level in the long run. Therefore, a reasonable assumption is that policy

TABLE 1   FORECAST ACCURACY, 1968 TO 1979
(Root Mean Square Errors)[a]

	Quarters Ahead				
	0	**1**	**2**	**3**	**4**
Real GNP	0.85	1.09	1.24	1.39	1.46
Inflation	0.55	0.69	0.79	0.88	0.98

a. Data at quarterly rates.
SOURCE: Victor Zarnowitz, "The Accuracy of Individual and Group Forecasts from Business Outlook Surveys," National Bureau of Economic Research, Working Paper No. 1053, December 1982.

has been established on the basis of a combined near-term real GNP/long-term inflation outlook.

Unfortunately, near-term real GNP forecasts are unlikely to show whether the economy will be strong or weak, even over the immediate future. Indeed, on average, the most accurate forecasters cannot predict at the beginning of a quarter whether the economy will be receding or booming *that quarter* with any reasonable degree of certainty.[8]

One way to measure our confidence in the near-term real GNP forecast is to examine the size of the typical forecast error relative to the average forecast. For example, the average quarterly growth rate of the economy between 1968 and 1985 was 2.6 percent (at an annual rate), and the average one-quarter-ahead root mean square forecast error was about 4.2 percent.[9] That is, if the quarterly real GNP forecast was 2.6 percent, the

realized growth rate ranged from -1.6 percent to 6.8 percent roughly 68 percent of the time.[10]

How should a policymaker respond to an average forecast, if the range of precision is so wide that it includes both economic decline and rapid expansion? Although the large errors in quarterly real GNP forecasts do not necessarily preclude some countercyclical policy, they do, however, suggest that policy actions based on near-term forecasts should be conservative. Simply, the greater the uncertainty associated with the forecast, the smaller the policy response the forecast should induce.

All of this assumes that the response of the economy to monetary policy is known and invariant. But because of an uncertain and probably variable lag between policy action and its impact on the economy, the large errors associated with the typical forecast make it impossible to be certain that policy based on near-term forecasts will not aggravate the business cycle.

■ Policy and Accuracy
We have considered what forecast accuracy implies for monetary policy decision-making; policy is made in a very uncertain environment. But can monetary policy reduce that uncertainty? Probably not, if its intent is to offset short-run fluctuations in real GNP.

Although there is no clear agreement on the mechanism that links monetary policy to the real economy, it is generally understood that the connection between the two depends importantly on how the public forms expectations; monetary policy affects the economy most noticeably when it produces an unexpected

change in the inflation trend. Inflation rates above the expected trend, for example, are thought to increase employment and production temporarily, while reductions in the inflation rate below the expected trend produce an opposite effect. Consequently, policy is unlikely to improve near-term forecast accuracy because monetary policy seems to be most effective when it is unanticipated.

Monetary policy also cannot reduce trend real GNP forecast errors, because long-run real growth is determined by non-monetary forces such as population growth, labor-force participation, capital accumulation, and changes in technology. If monetary policy influences these "real" factors, it is only through indirect channels that are very difficult to predict.

It seems clear, though, that monetary policy can influence the predictability of the long-term inflation trend. In principle, the Federal Reserve can make the trend in the price level follow any path. In practice, policymakers pursue multiple objectives—price stability and maximum sustainable real growth. The principal policymaking body of the Federal Reserve, the Federal Open Market Committee (FOMC), meets periodically to consider policy options, each time weighing the risks associated with more long-term inflation against the risks associated with slower near-term growth. The fact that inflation has not followed a predictable trend implies something about the conduct of monetary policy: The FOMC has often judged that the need to stimulate the real economy in the near term has outweighed the benefits of a stable inflation rate.

Uncertainty about the trend in inflation can be reduced by committing to a long-run target for the price level. Such a policy may even reduce some near-term uncertainties about the economy as it reduces the frequency of monetary "surprises." For example, the announcement of monetary targets and liberalization of price/credit controls in the mid-1970s have been shown to correspond with smaller forecast errors for the Japanese economy.[11] That is, under conditions where markets were encouraged to

FIGURE 2   CUMULATIVE FORECAST ERRORS, 1976 TO 1987
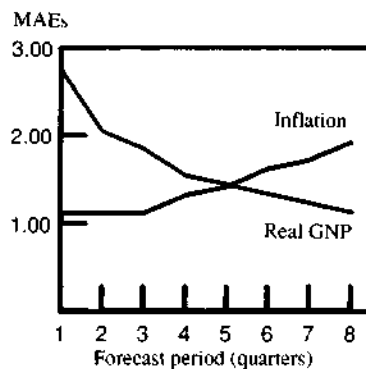
SOURCE: Stephen K. McNees, "How Accurate Are Macroeconomic Forecasts?" Federal Reserve Bank of Boston, *New England Economic Review*, July/August 1988, pp. 15-36.

operate more freely and the monetary authorities adhered to a predictable policy, forecasters were better able to anticipate quarterly real economic growth and inflation.

■ Conclusion
Economic forecasts have reduced some of the uncertainty about the future course of the economy. Yet, forecast errors are still too large to justify basing monetary policy on the near-term real GNP outlook alone. This is not an indictment of the tools or the craftsmanship of forecasters. It merely acknowledges that there is a great deal of uncertainty inherent in the economy over short periods of time.

The long-term real growth rate, which is determined by real forces, has a predictable trend. And the long-term inflation rate, which is ultimately an outcome of monetary policy, does not.

■ Footnotes
1. All data are annualized unless otherwise noted.

2. The real growth rate trend is not stationary, but has probably varied within a very narrow range over the postwar period.

3. It is not always the case, of course, that unpredictability follows variability. Variability may be very predictable in some cases, but these seem likely to be the exceptions.

4. We compare the root mean square error of 79 individual forecasts from 1968 to 1979

relative to the root mean square value of the data. Data are from Victor Zarnowitz, "The Accuracy of Individual and Group Forecasts from Business Outlook Surveys," National Bureau of Economic Research, Working Paper No. 1053, December 1982.

5. Root mean square error is a common gauge of forecast error and is similar to the mean absolute error except that it penalizes errors as they increase in size. Data are from Zarnowitz, ibid.

6. The terminology here can be somewhat confusing. The forecast *period* refers to the frequency of the data, or span of the forecast: for example, quarterly vs. annually. This should not be mistaken for the forecast *horizon*, which refers to the date of a forecast for a specific forecast period, for example, a quarterly forecast four quarters into the future.

7. Average RMSEs from five "early-quarter" forecasts. From Stephen K. McNees, "How Accurate Are Macroeconomic Forecasts?" Federal Reserve Bank of Boston, *New England Economic Review*, July/August 1988, pp. 15-36.

8. See Allan H. Meltzer, "Limits of Short-Run Stabilization Policy," Presidential Address to the Western Economic Association, July 3, 1986, *Economic Inquiry*, vol. 25 (January 1987), pp. 1-14.

9. Data for the 1968 to 1979 period are from Zarnowitz, "The Accuracy of Individual and Group Forecasts." For the 1980 to 1985 period, data are 12 early and mid-quarter forecasts from Stephen K. McNees, "Forecasting Accuracy of Alternative Techniques: A Comparison of U.S. Macroeconomic Forecasts," *Journal of Business and Economic Statistics*, vol. 4, no. 1 (January 1986), pp. 5-15.

10. Forecasts of real GNP growth improve as more information becomes available, but by surprisingly little. Even "late-quarter" forecasts of the economy are so inaccurate that they have little relevance for policy deliberations; that is, they are generally incapable of accurately distinguishing whether we are in a period of boom or bust. In fact, analysis of forecast revisions reveals that adjustments to real GNP forecasts on the basis of incoming data frequently result in *less-accurate* forecasts; adjustments to purely statistical models on the basis of information added by the forecaster were in the wrong direction about 25 percent of the time during the 1980s. See Stephen K. McNees, "Man vs. Model? The Role of Judgment in Forecasting," Federal Reserve Bank of Boston, *New England Economic Review*, July/August 1990, pp. 41-52.

11. See Meltzer, "Limits of Short-Run Stabilization Policy."

Michael F. Bryan is an economist and William T. Gavin is an assistant vice president and economist at the Federal Reserve Bank of Cleveland. The authors would like to thank John B. Carlson, Stephen K. McNees, H. Gregory Pett, and Katherine A. Samolyk for helpful comments.

Federal Reserve Bank of Cleveland
Research Department
P.O. Box 6387
Cleveland, OH 44101

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