What can we learn from revisions to the Greenbook forecasts?

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ABSTRACT

Although there have been many evaluations of the Federal Reserve's Greenbook forecasts, we analyze them in a different dimension. We examine the revisions of these forecasts in the context of fixed event predictions to determine how new information is incorporated in the forecasting process. This analysis permits us to determine if there was an inefficient use of information in the sense that the forecast revision has predictive power for the forecast error. Research on forecast smoothing suggests that we might find a positive relationship between the forecast error and the forecast revision. Although we do find for some variables and horizons the Fed's forecast errors are predictable from its forecast revisions, there is no evidence of forecast smoothing. Instead the revisions sometimes have a *negative* relationship with the forecast error, suggesting in these cases that the Fed may be *over*-responsive to new information.

1. Introduction

Over the years, the economic forecasts of the Federal Reserve staff, reported in the Greenbook, have been evaluated extensively. These evaluations have primarily focused on the forecasts themselves, their accuracy, and whether they were rational. Previous studies, however, have given little consideration to how the Greenbook forecasts have been revised and the statistical properties of these revisions. Recently, there has been considerable interest in the subject of forecast revisions and the interpretations of the results of these studies.[1] Given the importance of the Federal Reserve's forecasts to monetary policy, it is of considerable interest then to determine whether the revisions of these forecasts have the same attributes that have been observed in studies of other forecasts.

It is important to note that the Greenbook forecasts play a central role in the formulation of monetary policy. They are prepared by the Federal Reserve staff before each Federal Open Market Committee (FOMC) meeting, and are shared with the FOMC members before each scheduled meeting. The Greenbook forecasts have been evaluated many times (e.g. Clements et al., 2007; Joutz and Stekler, 2000; Romer and Romer, 2000; Sims, 2002; Stekler, 1994). These forecasts are often compared with the predictions made by members of the FOMC. These comparisons often find that the Greenbook forecasts are of higher quality than the FOMC forecasts.[2] One reason why the FOMC projections are less accurate is that they are released

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immediately. Thus they may be used for communication purpose and/or may experience political pressures in a way that the Greenbook forecasts are not affected because they are released with a 5 year lag. Moreover, many research papers exploring monetary policy and forward-looking versions of the Taylor rule have assumed that the Greenbook forecasts are what are used for monetary policy decisions.[3] Furthermore, Ben Bernanke, in a speech in 2010 when he was Chairman of the Federal Reserve, presented an estimate of the Taylor rule based on Greenbook forecasts. He only used FOMC projections for the period when Greenbook forecasts were not yet publicly available (Bernanke, 2010).

Previous major analyses of forecast accuracy, bias and efficiency of the Greenbook forecasts were based on the predictions made at a particular horizon. Thus one sample was based on all forecasts made one period ahead; another sample included all predictions made two periods ahead, etc. Nordhaus (1987) suggested another approach: examine all of the forecasts for a fixed event. Thus all forecasts made for a given quarter would be grouped together and the properties of the revisions to those forecasts could be used to test for efficiency. This approach has been applied to several other forecasts but never to the Greenbook forecasts.[4]

Nordhaus provides two propositions about the behavior of forecast revisions if the forecasts are efficient. The first indicates that the forecast *error* at time *t–h* for the target date, *t*, is independent of all previous forecast revisions. The second proposition is that the forecast *revision* at any time *t* is independent of all previous revisions. Thus efficient forecasts required that revisions should be unpredictable and should form a martingale. Although these fixed-target tests could have more power (Nordhaus, p. 669) in testing for efficiency than do the Mincer and Zarnowitz (1969) and Holden and Peel (1990) statistics, the former have not been used as extensively.

Recently more attention has been given to this approach, especially to analyze the extent to which new information is incorporated into forecasts. Lahiri and Sheng (2008, 2010) point out that this model may be used to determine whether forecast revisions underweight (smooth) or overweight new information. This approach has also been used by Coibion and Gorodnichenko (2010) in their analysis of the information rigidity literature and their discussion of the noisy and sticky information models. Later studies which investigate forecast rigidities are Dovern and Weisser (2011) and Loungani et al. (2013).

The aforementioned studies all dealt with the mean forecasts of a number of individuals. While Dovern et al. (2015) examined individual forecasts, there has been no study that has specifically dealt with only one set of forecasts, especially from an organization as important as the Federal Reserve. It is for this reason that we focus on the revisions of the Greenbook forecasts.[5] Thus the main contribution of this paper is to examine the role of forecast revisions within the Fed's forecasting process and to determine how the Fed's forecasting staff weighs new information. This is a subject that has not received much attention in the previous analyses of the Greenbook predictions.

The following section presents a summary of previous findings about the Greenbook and other forecasts made within the Federal Reserve System. That section shows that the forecasts are revised frequently and that a vast amount of information is considered and interpreted. We then present the alternative ways of measuring bias and discuss our analysis of the revisions of the forecasts, the interaction of those revisions with a variable that represents the state of the economy and the implications of those results as it relates to the use of new information. The concluding sections compare our results with those obtained from other forecasters and summarize our results pertaining to the use of new information.

2. Forecasts/reports of the Federal Reserve system

The Greenbook contains both the forecasts made by the Federal Reserve staff and a qualitative analysis and interpretation of the latest data that are considered important in informing the forecast. The forecasts and qualitative analyses are revised prior to each of the FOMC meetings that are held twice in each quarter. These forecasts, themselves have been extensively described and evaluated.

The forecasts are made with horizons of zero to eight quarters. Some analyses of these forecasts of real GDP growth, inflation and unemployment have shown that they contain systematic errors (e.g. Joutz and Stekler, 2000). Using *qualitative* analyses the studies showed that growth was underestimated (overestimated) when the economy was increasing (decreasing).[6] Similar results were found for the inflation forecasts when inflation was accelerating or decelerating. Finally, the recessions that occurred between 1965 and 2007 were not predicted in advance.

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[3] For example, see Nikolsko-Rzhevskyy (2011). Orphanides and Wieland (2008) compared FOMC projections in the Taylor rule with the currently available data referring to the same period. They found that the FOMC projections fit better. However, they did not make a similar comparison with the Greenbook forecasts that are only available with a five year lag.

[4] Tillmann (2011) investigates the revisions of the forecasts of individual members of the FOMC for the period 1992–2000. The members tended to underevise or smooth during the later stages of the forecasting process. Consistent with Romer and Romer (2008), Tillman argues that the poor performance the FOMC forecasts as compared to the Greenbook forecasts could be due to a bias resulting from reputational concerns. Arai tests the efficiency of the midpoint and central tendency of the FOMC forecasts using revisions.

[5] While Clements et al. (2007) and Patton and Timmermann (2012) did consider the revisions of the Greenbook forecasts, neither examined whether the Fed staff over or under adjusted their forecasts in response to the new information. Instead they focused on whether the forecast errors were predictable from information available at the time the forecast was made and whether the forecast revisions were predictable. They did not focus on the issue of forecast rigidity or whether the revision increased the forecast error.

[6] Fildes and Stekler (2002) found similar results in the forecasts of other individuals or institutions.