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Bias in Federal Reserve inflation forecasts: Is the Federal Reserve irrational or just cautious?☆

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ABSTRACT

Inflation forecasts of the Federal Reserve seem to have systematically under-predicted inflation from the fourth quarter of 1968 until Volcker's appointment as Chairman, and to systematically over-predict it afterwards until the second quarter of 1998. Furthermore, under quadratic loss, commercial forecasts seem to have information not contained in those forecasts. To investigate the cause of this apparent irrationality, this paper recovers the loss function implied by Federal Reserve's inflation forecasts. The results suggest that the cost of having inflation above an implicit time-varying target was larger than the cost of having inflation below it for the period since Volcker, and that the opposite was true for the pre-Volcker era. Once these asymmetries are taken into account, the Federal Reserve's inflation forecasts are found to be rational.

1. Introduction

One of the most important objectives of the Federal Reserve is to achieve stable prices. However, because inflation responds to monetary policy only after a lag, the Federal Reserve needs to make decisions based on forecasts of future inflation behavior. The general perception in economics, supported by Romer and Romer (2000) and Sims (2002), is that Federal Reserve inflation forecasts are quite good. The Romers find that Federal Reserve forecasts of inflation are unbiased, and conclude that the forecasts are rational. They also find that if one had access to inflation forecasts from the Federal Reserve and from commercial forecasters the optimal combination would be to dispose of the commercial forecasts and use only Federal Reserve forecasts, a result maintained by Sims.[1] These results imply that the Federal Reserve uses information efficiently and that it has more information than commercial forecasters.

However, the first part of this paper shows that closer inspection of a data set that extends the one used by the Romers and by Sims indicates that rationality can be rejected. This is not because of the new data, but because there is a change in

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[1] The Romers also find that commercial forecasts are unbiased, and conclude that they are rational.

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behavior in Federal Reserve's forecast errors that seems to coincide with Paul Volcker's appointment as Chairman and that was previously overlooked. It is shown that the forecasts systematically under-predicted inflation before Volcker and systematically over-predicted it afterwards until the second quarter of 1998. This bias is statistically significant and, at about half a percentage point for the sample since Volcker, is also economically significant.

The bias found in Federal Reserve inflation forecasts would be typically considered to imply that the forecasts are irrational, however, this need not be true. Unbiasedness of rational forecasts follows from the well-known result that, under a quadratic loss function, the optimal forecast is the conditional mean. But the optimal forecast is *not* the conditional mean if the loss function is asymmetric in the sense that errors of the same magnitude but of different signs imply different costs.[2] In this case, the optimal forecast is the mean plus an optimal bias term.[3]

Most papers that test rational expectations using forecasts as proxies for expectations, such as those by the Romers and Sims, implicitly assume quadratic loss. But some authors have argued that it does not make sense for a central bank to have symmetric preferences, in particular when referring to central banks that have a loss function that has as one of its arguments the divergence of inflation from an inflation target. Nobay and Peel (2003) provide anecdotal support for the argument that both the European Central Bank and the Bank of England may have asymmetric preferences. Ruge-Murcia (2000) finds evidence that, in practice, Canada's central bank "... may attach different weights to positive and negative inflation deviations from the target." (Ruge-Murcia, 2000, p. 1). In a later paper, (Ruge-Murcia, 2003b) he finds empirical evidence of asymmetric costs for Canada, Sweden, and the United Kingdom.

This paper uses a simple model of an inflation targeting central bank with asymmetric preferences to reconcile the evidence of the apparent inefficient use of information on the part of the Federal Reserve. The model shows that a negative bias in the forecasts (systematic over-prediction) is rational if the central bank is cautious in the sense that inflation above the target is considered more costly than inflation below the target. The mechanism at work is the following: take an inflation targeting central bank that sets its monetary policy instrument so that the forecast of inflation equals the target (Svensson, 1997). If for the central bank inflation above the target is as costly as inflation below it (i.e., the central bank has symmetric loss), then it would set its instrument so that the expected value of inflation equals the target. In this case the forecast coincides with the expected value of inflation. However, if inflation above the target is more costly than inflation below it (i.e., the central bank has asymmetric loss), then the central bank would, as a precautionary move, set the instrument so that the expected value of inflation is below the target. In this case, the forecast does not coincide with the expected value of inflation and hence a rational bias exists.

The literature in psychology has shown that forecasters behave as to minimize a possible asymmetric loss function when they care about the accuracy of the forecasts and when they are able of adjusting these forecasts in a way that incorporates any consequences of their errors (Weber, 1994). It is clear that the Federal Reserve cares about the forecasts, and that the producers of the forecasts, the staff at the Board of Governors of the Federal Reserve System, are capable of adjusting the forecasts. In this context, it is possible that the producers report the forecasts as if using the loss function of their client, the Federal Open Market Committee, in response to strategic considerations. In fact, Ehrbeck and Waldmann (1996) and Laster et al. (1999) justify asymmetric loss functions for individual forecasters when they show that the main goal of the agents is to influence their clients' assessment of their forecasting ability.

To investigate if the empirical evidence is consistent with an asymmetric-cost Federal Reserve, this paper recovers the Federal Reserve's loss function as implied by its forecasts using the methodology proposed by Elliott et al. (2005). The empirical results are that starting with Volcker's appointment as Chairman and until the end of the sample, the second quarter of 1998, the Federal Reserve's cost of under-prediction was four times the cost of over-prediction. For the pre-Volcker era the result is that the cost of under-prediction was a third of that of over-prediction, thus supporting the presence of asymmetric costs in both periods. Hence, this paper provides an empirical reason to move away from quadratic loss, and is in line with the literature that has suggested that there is a significant difference in the way monetary policy was conducted pre- and post-Volcker (e.g., Clarida et al., 2000; Romer and Romer, 2004). Over-identification tests are not able to reject the hypothesis that, once the asymmetries are taken into account, the Federal Reserve is using information efficiently both before and since Volcker.

2. Bias in Federal Reserve inflation forecasts

Federal Reserve forecasts are contained in the "Green Book" prepared by the staff of the Board of Governors before each meeting of the Federal Open Market Committee (FOMC). The forecasts are made with an assumption about monetary policy, and are judgmental in the sense that they are not the direct output of an econometric model, but the product of judgmental adjustments made to forecasts obtained from econometric models.[4] It is the policy of the Federal Reserve (the Fed)

[2] Other papers present evidence that the evaluation of forecasts depends on the loss function. Leitch and Tanner (1991) find that forecasts that appear to be bad forecasts under traditional measures, such as mean squared error, are not so under other measures, such as the profits they generate to firms that use them. Keane and Runkle (1990), analyzing commercial price forecasts, indicate that a biased forecasts is consistent with rationality under asymmetric loss.

[3] See Christoffersen and Diebold (1997), Granger (1999), and Zellner (1986).

[4] Reifschneider et al. (1997), describe the role played by models in forecasting and the monetary policy process at the Federal Reserve. Sims (2002) analyzes both, Green Book forecasts and forecasts that are directly obtained from econometric models.