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A Comparison of U.S. Housing Starts Forecasts

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Abstract

This study examines the Federal Reserve and private forecast accuracy of housing starts. We show that the Federal Reserve (private) forecasts are (generally) unbiased and superior to the random walk benchmark. At the shorter horizon, the Federal Reserve and private forecasts embody distinct predictive information, indicating that one can gain a significant improvement in forecast accuracy by combining the two sets of forecasts. At the longer horizon, our findings support the asymmetric information hypothesis that the Federal Reserve forecasts embody useful predictive information beyond that contained in the private forecasts.

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1. Introduction

Housing construction is an important component of the economy due to its sizeable influence on the demand for financing, basic materials, home furnishings, and employment. In assessing the near-term performance of the economy, policymakers and the private sector are focused on forecasting housing starts among other major macroeconomic indicators. In this study, we set out to evaluate the Federal Reserve and private forecasts of housing starts, defined as the number of new housing (single and multifamily) units on which construction has begun in a quarter. We ask whether these forecasts are unbiased and superior to the random walk benchmark, and whether the private forecasts can match those of the Federal Reserve. The answer to the latter question adds to the recent empirical literature on the asymmetric information between the Federal Reserve and the public.[1] In particular, the Federal Reserve Open Market Committee (FOMC) members, who vote on monetary policy, are mindful of the private forecasts of major macroeconomic indicators. It is, therefore, important to provide some insights about the accuracy of private forecasts of housing starts and whether they are useful in improving forecast accuracy.

The format of this study is as follows: Section 2 describes the Federal Reserve and private forecasts. Section 3 presents the methodology and forecast evaluation results. Section 4 concludes this study.

2. Federal Reserve and private forecasts

As the monetary policymaking arm of the Federal Reserve system, the FOMC meets twice a quarter to vote on the policy to be carried out during the interval between meetings. Prior to every meeting, the research staff at the Federal Reserve Board of Governors presents the FOMC members with the forecasts of major macroeconomic variables in a briefing document called the Greenbook. This document provides us with the current-quarter, and one- through four-quarter-ahead Federal Reserve forecasts of housing starts. The current-quarter, and one- through four-quarter-ahead private forecasts are the consensus (median) data from the Survey of Professional Forecasters (SPF). This survey, currently conducted by the research department of the Federal Reserve Bank of Philadelphia, collects the private forecasts around the middle of every quarter (Croushore, 1993).

With the FOMC meetings occurring twice each quarter, there exist two sets of Federal Reserve forecasts. The first set is made close to the middle of the quarter and the second one is made in the last month of the quarter. In this study, we utilize the forecasts from the FOMC meetings closest to the middle of each quarter since they match the private (SPF) forecasts in terms of timing. Moreover, the Federal Reserve forecasts (released to the public with a five-year lag) are currently available through the last quarter of 2002. We thus examine the forecasts made

[1] See Romer and Romer (2000), Gavin and Mandal (2001), and Sims (2002) who utilize the forecasts of inflation and output growth to test the asymmetric information hypothesis (that the Federal Reserve forecasts embody useful predictive information beyond that contained in the private forecasts). Also, see Baghestani (2006) who utilizes real net exports forecasts to test this hypothesis.

in the first quarter of 1983 through the fourth quarter of 2002. Accordingly, the sample periods for the current-quarter, one-, two-, three-, and four-quarter-ahead forecasts are, respectively, 1983.1-2002.4, 1983.2-2003.1, 1983.3-2003.2, 1983.4-2003.3, and 1984.1-2003.4. Finally, for a meaningful examination, we measure the actual series (against which the forecasts are evaluated) by real-time data available 60 days after the end of the quarter.[2]

3. Forecast evaluation results

We start with examining unbiasedness using the following test equations

$$A_{t+f} = \alpha + \beta P_{t+f} + \varepsilon_{t+f} \qquad (1)$$

$$A_{t+f} - P_{t+f} = \alpha' + \varepsilon_{t+f} \qquad (2)$$

where the forecast horizon $f = 0, 1, 2, 3,$ and 4; A_{t+f} is the actual housing starts in quarter $t+f$ and P_{t+f} is the forecast of A_{t+f} made close to the middle of quarter t; ε_{t+f} is the error term. Note that P_{t+f} is a general representation for PF_{t+f} and PS_{t+f} which are, respectively, the Federal Reserve and private (SPF) forecasts.

Table 1 reports the OLS parameter estimates of equations (1) and (2) with the correct (Newey-West) standard errors for the Federal Reserve forecasts in rows 1-5 and for the private forecasts in rows 6-10.[3] As can be seen, the Federal Reserve forecasts are all unbiased since, for each forecast horizon, we cannot reject (i) the null hypotheses that $\alpha = 0$ and $\beta = 1$ either individually or jointly, and (ii) the null hypothesis that $\alpha' = 0$. The same is true for the one- through four-quarter-ahead private forecasts in rows 7-10. However, the current-quarter private forecast in row 6 fails to be unbiased since we reject the null hypothesis of unbiasedness (the p-value of the joint test, $P1$, is $0.074 < 0.10$) as well as the null hypothesis that $\alpha' = 0$.[4]

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[2] The Federal Reserve (Greenbook) and SPF forecasts in addition to real time data are all available on the Federal Reserve Bank of Philadelphia website. All data are in millions of housing units.

[3] With the forecasts made in quarter t, the error term ε_{t+f}, while generally heteroscedastic, follows an $(f+1)$-order moving-average process under the null hypothesis of rationality (see Romer and Romer, 2000). Accordingly, we utilize the Newey-West (1987) procedure to estimate the covariance matrix of the test equations, correcting for both the inherent serial correlation and heteroscedasticity.

[4] The estimates of α' are the mean forecast errors (MEs). As shown in Table 1, the MEs of the Federal Reserve (private) forecasts are 0.015 (0.024), 0.019 (0.025), 0.015 (0.030), 0.013 (0.028), and 0.007 (0.030) for, respectively, $f = 0, 1, 2, 3,$ and 4. These are small compared to the corresponding root mean squared forecast errors (RMSEs). For instance, the RMSEs of the Federal Reserve (private) forecasts are 0.092 (0.091), 0.114 (0.117), 0.126 (0.133), 0.131 (0.153), and 0.157 (0.182) for, respectively, $f = 0, 1, 2, 3,$ and 4. The actual mean value of housing starts for 1983.1-2003.4 is 1.531 with a maximum value of 2.035 and a minimum value of 0.915 million units.

Table 1: Unbiasedness and Encompassing Test Results

Panel A. Test of Unbiasedness

Row no.	f	$A_{t+f} = \alpha + \beta P_{t+f} + \varepsilon_{t+f}$: α	β	R^2	$P1$	$A_{t+f} - P_{t+f} = \alpha' + \varepsilon_{t+f}$: α' = ME	U
Federal Reserve forecasts ($P = PF$)							
1	0	0.020 (0.082)	0.996[a] (0.054)	0.843	0.357	0.015 (0.010)	0.672[b]
2	1	-0.002 (0.116)	1.014[a] (0.076)	0.760	0.370	0.019 (0.014)	0.641[b]
3	2	0.019 (0.163)	0.998[a] (0.104)	0.702	0.703	0.015 (0.019)	0.649[b]
4	3	0.026 (0.183)	0.991[a] (0.117)	0.684	0.861	0.013 (0.025)	0.627[b]
5	4	0.091 (0.254)	0.945[a] (0.163)	0.568	0.930	0.007 (0.032)	0.623[b]
Private (SPF) forecasts ($P = PS$)							
6	0	-0.009 (0.081)	1.022[a] (0.055)	0.851	0.074	0.024[a] (0.010)	0.668[b]
7	1	-0.018 (0.138)	1.030[a] (0.093)	0.756	0.205	0.025 (0.016)	0.672[b]
8	2	-0.073 (0.185)	1.069[a] (0.122)	0.684	0.312	0.030 (0.022)	0.720[b]
9	3	-0.074 (0.250)	1.069[a] (0.164)	0.580	0.569	0.028 (0.031)	0.857
10	4	0.013 (0.316)	1.011[a] (0.208)	0.430	0.750	0.030 (0.040)	0.840

Panel B. Test of Encompassing: $A_{t+f} = \gamma_0 + \gamma^F PF_{t+f} + \gamma^S PS_{t+f} + \varepsilon_{t+f}$

	f	γ_0	γ^F	γ^S	R^2	$P2$
11	0	-0.013 (0.078)	0.396[a] (0.241)	0.627[a] (0.249)	0.857	0.039
12	1	-0.038 (0.119)	0.552[a] (0.256)	0.489[a] (0.270)	0.772	0.201
13	2	-0.045 (0.161)	0.655[a] (0.242)	0.388[a] (0.228)	0.710	0.387
14	3	0.172 (0.171)	1.459[a] (0.334)	-0.569 (0.359)	0.697	0.232
15	4	0.286 (0.219)	1.375[a] (0.429)	-0.568 (0.457)	0.586	0.395

Notes: A_{t+f} is the actual housing starts in quarter $t+f$. P_{t+f} is the forecast of A_{t+f} made close to the middle of quarter t (f is the forecast horizon). P_{t+f} is a general representation for PF_{t+f} and PS_{t+f} which are, respectively, the Federal Reserve and private (SPF) forecasts. All data are expressed in millions of housing units. Correct (Newey-West) standard errors are in parentheses. Superscript "a" indicates significance at the 10% or lower level. $P1$ (the p-value of the correct χ^2-statistic) is for testing the null hypothesis of unbiasedness ($\alpha = 0$ and $\beta = 1$). U is the Theil's U coefficient. Superscript "b" indicates that the p-value (of the modified Diebold-Mariano test statistic) is below 0.10, leading to the rejection of the null hypothesis that the MSE of P_{t+f} is equal to the MSE of the random walk forecast. $P2$ (the p-value of the correct χ^2–statistic) is for testing the joint null hypothesis that $\gamma_0 = 0$, $\gamma^F = 1$, and $\gamma^S = 0$. ME is the mean forecast error.

For many economic and financial variables, the random walk forecast is not necessarily a naïve competitor (Diebold and Lopez, 1996). It is, therefore, important to see if the Federal Reserve and private forecasts outperform the random walk benchmark. In so doing, we first set the random walk forecast equal to A_{t-1} and then define the Theil's U coefficient as,[5]

$$U = \sum_t [(A_{t+f} - P_{t+f})^2/n] \,/\, \sum_t [(A_{t+f} - A_{t-1})^2/n]$$

where n is the sample size, and U is the MSE of P_{t+f} divided by the MSE of the random walk forecast. The value of U is zero for a perfect forecast but higher than one for a forecast less accurate than the random walk benchmark. We report the U estimates in the last column of Panel A in Table 1. As can be seen, these estimates are all below one. Using the Harvey, Leybourne, and Newbold (1997) small sample correction of the Diebold-Mariano (1995) test, we examine the null hypothesis that the MSE of the forecast P_{t+f} is equal to the MSE of the random walk forecast (superscript "b" indicates that the p-value of this modified test is below 0.10). As shown by superscript "b" in rows 1-5, we reject the null hypothesis of equal forecast accuracy at every forecast horizon for the Federal Reserve forecasts, indicating that these forecasts are superior to those of the random walk. The same is true for the current-quarter, one- and two-quarter-ahead private forecasts in rows 6-8. We cannot, however, reject this null hypothesis for the forecasts in rows 9 and 10, indicating that the three- and four-quarter-ahead private forecasts do not outperform the random walk forecasts.[6]

In examining the asymmetric information hypothesis, we estimate

$$A_{t+f} = \gamma_0 + \gamma^F PF_{t+f} + \gamma^S PS_{t+f} + \varepsilon_{t+f} \qquad (3)$$

where failure to reject the null hypotheses that $\gamma_0 = 0$, $\gamma^F = 1$, and $\gamma^S = 0$ both individually and jointly indicates that the Federal Reserve forecasts embody useful predictive information beyond that contained in the private forecasts. Table 1 reports the OLS parameter estimates of equation (3) with the correct (Newey-West) standard errors in rows 11-15. For the forecasts in rows 11-13, the estimates of γ^F and γ^S are both positive and significant, indicating that the current-quarter, one- and two-quarter-ahead Federal Reserve and private forecasts embody distinct information. Accordingly, for $f = 0$, 1, and 2, one can gain a significant improvement in forecast accuracy by combining the two sets of forecasts (Granger and Ramanathan, 1984). For $f = 3$ and 4 in rows 14 and 15, we cannot reject the null hypotheses that $\gamma_0 = 0$, $\gamma^F = 1$, and $\gamma^S = 0$ either individually or

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[5] We measure A_{t-1} (the most recent actual rate known at the time of the forecast) by the initial estimates available at the time of the forecast.

[6] Our conclusions remain unchanged when we use the autoregressive integrated moving-average (ARIMA) forecasts as benchmarks. Specifically, we have used real-time data to specify an ARIMA(0,1,2) process for 1960.1-1982.4. Using recursive regression estimates of this model, beginning with the 1960.1-1982.4 estimates, we have generated the ARIMA forecasts of housing starts. For every forecast horizon, the ARIMA forecast is highly correlated with the random walk forecast, indicating that the two sets of forecasts contain similar predictive information. In a related study, Puri and Van Liepor (1988) examine the accuracy of structural vs. univariate ARIMA forecasts of U.S. housing starts. They conclude that the ARIMA model produces better forecasts at the longer horizons.

jointly (the p-values of the joint test, $P2$, are above 0.10). This, in support of the asymmetric information hypothesis, indicates that the three- and four-quarter-ahead Federal Reserve forecasts embody useful predictive information beyond that contained in the private forecasts.

4. Conclusions

This study examines the Federal Reserve and private forecast accuracy of housing starts made in 1983-2002. The Federal Reserve forecasts are unbiased and superior to the random walk benchmark. The private forecasts are generally unbiased but fail to beat the random walk forecasts at the three- and four-quarter-ahead horizons. Additional findings indicate that the current-quarter, one-, and two-quarter-ahead Federal Reserve and private forecasts contain distinct information. Provided that the information content of these forecasts has remained the same, our results suggest that the combined Federal Reserve and private forecast (for each forecast horizon f = 0, 1, and 2) should be more informative and useful to the FOMC members. In support of the asymmetric information hypothesis, the three- and four-quarter-ahead Federal Reserve forecasts embody useful predictive information beyond that contained in the private forecasts. The Fed's superior performance may be due to the fact that the Federal Reserve forecasts are generated using a more model-driven approach that will make the data cohere better at longer horizons.

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