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Loss function assumptions in rational expectations tests on financial analysts' earnings forecasts ☆

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Abstract

Prior research concludes that financial analysts do not process public information efficiently in generating their earnings forecasts. The ordinary least squares (OLS) regression-based tests used in prior studies assume implicitly that analysts face a quadratic loss function. In contrast, we argue that analysts likely face a linear loss function, and hence, try to minimize their absolute forecast errors. We conduct and compare rational expectations tests using these two alternative loss functions. We reproduce most prior findings of forecast inefficiency with OLS regressions, but find virtually no evidence of forecast inefficiency with least absolute deviation regressions, where we explicitly assume a linear loss function.

Introduction

It has been widely documented that financial analysts' earnings forecasts are not consistent with rational expectations. In particular, analysts do not efficiently use information in prior earnings levels, (extreme) earnings changes, forecast revisions, forecast errors, and stock returns. Since financial analysts compete with each other and sell their forecasts to market participants, one would not expect them to "leave money on the table" by inefficiently using all this publicly available information (Keane and Runkle, 1998).

Most prior tests are based on the estimation of ordinary least squares (OLS) regressions, which assume implicitly that analysts set their forecasts to minimize their mean squared forecast errors. Similar to Gu and Wu (2003), we question this assumption and argue that financial analysts set their forecasts to minimize their mean absolute forecast errors. In effect, we argue that, ceteris paribus, analysts view a 3¢ per share forecast error as three times as costly as a 1¢ per share forecast error rather than nine times as costly. The proposed linear loss function is as parsimonious as the quadratic one, and perhaps more descriptive of financial analysts' incentives. For example, analysts are usually ranked based on their mean absolute

forecast errors, and not on their mean squared forecast errors (Stickel, 1992; Dorfman, 1994; Pender, 2002). To the extent that these accuracy rankings are indicative of financial analysts' incentives, financial analysts will set their forecasts to minimize their average absolute forecast error rather than their average squared forecast error. Thus, we examine whether prior findings of irrational expectations are explained by the quadratic loss function implicitly assumed in the OLS tests.

When we assume a quadratic loss function (use OLS regressions to test the rational expectations hypothesis), we find that consensus forecasts are inefficient with respect to prior earnings levels, (extreme) earnings changes, forecast revisions, forecast errors, and stock returns. We also find that the estimated OLS coefficients are far from their predicted values under the rational expectations hypothesis. In stark contrast, when we assume a linear loss function (use least absolute deviation, or LAD regressions), we find that the LAD coefficients are very close to their predicted values. The absolute distance between LAD coefficients and the predicted values under the rational expectations hypothesis is on average 5% of the absolute distance of OLS estimates from the same predicted values. This result leads us to conclude that the evidence of financial analyst forecast inefficiency in prior studies is largely driven by the specific assumption of a quadratic loss function. Under the alternative linear loss function, there is very little evidence of forecast inefficiency.

We are not the first to question the widespread use of the quadratic loss function in tests of analysts' rational expectations. Gu and Wu (2003) argue that analysts minimize their absolute forecast errors, and report that analysts' mean forecast bias is predictably related to the skewness of the underlying earnings distribution. We extend Gu and Wu's work by formally incorporating the linear loss function in rational expectation tests on analysts' forecasts. In particular, we examine the efficiency of consensus forecasts conditional on a wide set of publicly available information variables.

Our robust findings that analysts' consensus earnings forecasts are consistent with the rational expectations hypothesis suggest that links often made between stock price anomalies and analyst irrationality may be premature. For instance, DeBondt and Thaler (1990) document financial analysts' overreaction to past earnings levels, and suggest a link between this overreaction and overreaction in stock prices (DeBondt and Thaler, 1985, DeBondt and Thaler, 1987). Abarbanell and Bernard (1992) report that financial analysts underreact to prior earnings changes, and suggest that this underreaction potentially explains the post-earnings announcement drift (e.g. Ball and Brown, 1968; Bernard and Thomas, 1989, Bernard and Thomas, 1990). More recently, Dechow et al. (2000), Bradshaw et al. (2001) and Teoh and Wong (2002) point to forecast bias and inefficiency as a potential explanation for stock price anomalies associated with new securities offerings and high accruals. Since the prior evidence of irrational expectations is largely explained by the assumption of a quadratic loss function, our results suggest caution in relying on such evidence to discriminate between market inefficiency and risk-based explanations of stock market anomalies.

Section snippets

Definition of rational expectations and the role of loss functions

According to Muth (1961, p. 315), expectations are rational "if they are essentially the same as the predictions of the relevant economic theory." He argues that the rational expectations hypothesis is a consequence of optimizing behavior, and demonstrates that irrational expectations give rise to profit opportunities. Optimizing behavior by a forecaster requires that she generate forecasts that maximize her expected wealth, i.e., they minimize her expected losses.[1]…

Data and sample statistics

The forecasted variable is annual earning per share (EPS) announced at time $t+1$, A_{t+1}. The forecast, F_t^{t+1}, is the median of all financial analysts' annual EPS forecasts issued during the 60-day period immediately prior to the announcement of A_{t+1}.[8]...

Rational expectations tests using different information variables

We conduct rational expectations tests using different information variables that have been documented to predict analysts' forecast errors. For each variable, we first briefly describe prior research and then estimate model (1) with OLS and LAD. We report pooled OLS and LAD estimates and standard errors to be consistent with the pooled OLS specification used in most prior research. To control for cross-sectional dependence that could inflate OLS *t*-statistics and lead to spurious inferences, we ...

Alternative loss functions

Prior research offers several theories to explain documented characteristics of analysts' mean forecast errors. An enduring result from early research is that analysts' mean forecasts are, on average optimistic (e.g. Fried and Givoly, 1982; O'Brien, 1988). Related research finds that analysts' forecast optimism is concentrated in poorly performing firms (e.g. Klein, 1990; Elgers and Lo, 1994, Hwang et al., 1996), and that analysts are more likely to drop coverage of poorly performing firms (...

Conclusions

Tests of financial analysts' forecast rationality are joint tests of the rational expectations hypothesis and a specific loss function. Implicitly assuming that financial analysts have a quadratic loss function, prior studies find that financial analysts do not efficiently use information in prior earnings (DeBondt and Thaler, 1990; Abarbanell and Bernard 1992), extreme earnings changes (Easterwood and Nutt, 1999), forecast revisions (Elliott et al., 1995), forecast errors (Mendenhall, 1991),...

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