TESTING THE RATIONAL EXPECTATIONS HYPOTHESIS USING SURVEY DATA

By

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Because of the importance of inflation expectations, Lloyd B. Thomas Jr. (Fall 1999, p. 125-44) reexamines "the evidence on the nature and performance of various measures of expected inflation, with special attention given to the issue of rationality" (p. 126). Thomas studies the accuracy and rationality of one-year-ahead mean survey forecasts of CPI inflation. He examines data from three different surveys: the Livingston Survey of professional economists, the Institute of Social Research (Michigan) Survey of Households, and the Federal Reserve Bank of Philadelphia's Survey of Professional Forecasters. Thomas tests the unbiasedness hypothesis using the Livingston and Michigan survey forecasts for the 1960 to 1997 time period and is unable to reject the null hypothesis of unbiasedness.

Thomas warns of potential pitfalls in drawing inferences about rationality from tests based on survey data. For example, agents may have insufficient incentive to make optimal use of their resources when responding to the survey. A related issue is that some forecasters may behave strategically and fail to reveal their true forecasts (Thomas, 1999, p. 137). In addition, it may be rational for agents to assign a probability of less than one to an announced regime change that is eventually implemented. Similarly, it may be rational for agents to assign a probability of greater

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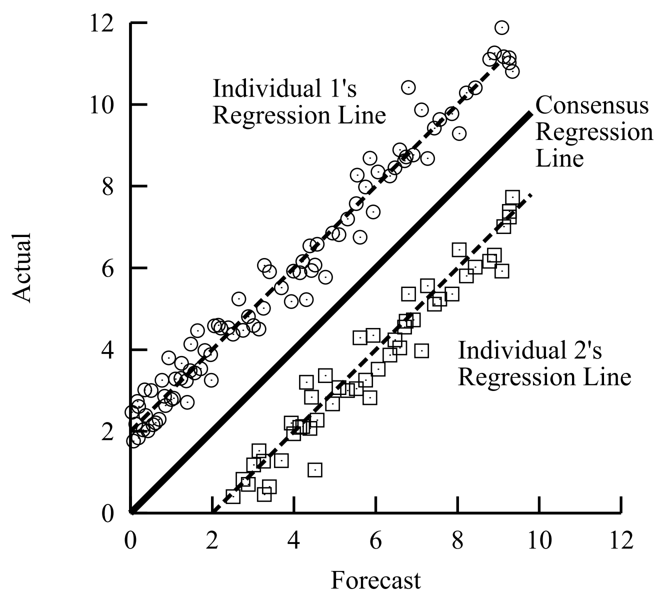
than zero to a potential regime change that does not occur. The resulting systematic forecast errors characterize the well-known peso problem.

Each of Thomas' warnings describes a potential source of statistical bias in *individual* forecasts. Indeed, the rational expectations literature has interpreted Muthian rationality to mean that the "subjective expectations of *individuals* are exactly the true mathematical conditional expectations implied by the model itself" (Begg 1982, p. 30, emphasis added). However, rather than examining the rationality of individual forecasts, Thomas tests the rationality of "consensus" forecasts, that is, the mean forecast across respondents. In particular, his unbiasedness tests regress the actual inflation rate on the consensus forecast and a constant. Unfortunately, two types of problems due to aggregation plague such tests: private information bias and micro-heterogeneity bias.

First, Figlewski and Wachtel (1983) demonstrated that aggregation leads to inconsistent coefficient estimates in consensus regressions. Their conclusions hold when forecasters use private information, even if a consensus exists in the sense that all forecasters produce rational forecasts. The inconsistency occurs because both the consensus regression error and the consensus forecast contain an average of individual forecasters' private information.

Second, as pointed out by Keane and Runkle (1990), aggregation may mask systematic individual differences. In fact, given the complex, potentially changing nature of the data generating process for inflation, it is likely that agents will differ in their choice of both public and private information set variables and in how efficiently they process the information in these variables. Consequently, some agents are likely to produce forecasts that do not satisfy the optimality conditions of the REH. Therefore, the coefficients in individual unbiasedness regressions may differ across forecasters, i.e. micro-heterogeneity exists. Bonham and Cohen (2000) show that, in such cases, parameter estimates in consensus regressions are either inconsistent or lead to false acceptance of the unbiasedness hypothesis due to the averaging of individual biases. Figure 1 demonstrates this possibility for a sample of two forecasters: each produces biased forecasts, yet the consensus forecasts are unbiased.

Figure 1: Misleading Consensus Regression



Theil (1954) studied the properties of aggregated regressions in general. Because he was not concerned with private information bias, which is unique to testing the rational expectations hypothesis, he simply assumed that both consensus and individual parameters could be estimated consistently. He defined aggregation bias as the difference between the mathematical expectation of the macro (consensus) coefficient and the average of the corresponding micro (individual) coefficients. He showed that coefficients in macro relationships generally depend upon complicated combinations of corresponding and noncorresponding micro coefficients. For instance, the intercept in a consensus unbiasedness equation will be a function not only of the individual intercepts, but also individual slope coefficients. Therefore, what Theil meant by aggregation bias was that individual behavioral parameters generally could not be mapped to a single corresponding macro parameter. Theil showed that a sufficient condition for perfect linear aggregation is the equality of all individual coefficient vectors, i.e., micro-homogeneity. The restrictiveness of this sufficient condition led Theil to conclude that macro parameters are not useful in studying micro behavior. Thus, Theil assumed consistency of consensus and individual parameter estimates and used micro-homogeneity as a condition for economic interpretation. Bonham and Cohen (2000) use micro-homogeneity as a pretest both for consistent estimation of consensus unbiasedness regressions and valid interpretation of tests of the unbiasedness hypothesis.

Both cross-sectional forecast dispersion and micro-heterogeneity appear to be very common in panels of survey forecasts. For example, in their retrospective on the Survey of Professional Forecasters, Zarnowitz and Braun (1992, pp. 45-46) conclude: "The distribution of the [forecast] error statistics show that there is much dispersion across the forecasts…. Forecasters differ in many respects and so do their products. The idea that a close consensus persists, i.e., that current matched forecasts are generally alike, is a popular fiction. The differentiation of the forecasts usually involves much more than the existence of just a few outliers." Thus, the very use of the term consensus forecast is generally a misnomer.

The view that individual forecasts differ widely is also prominent in the literature on forecast combination. In fact, for combinations of forecasts to dominate individual predictions, it must be true that individual survey respondents make use of private information, so that individual forecasts are heterogeneous. Unfortunately, the same heterogeneity of individual forecasts that makes the consensus forecast generally superior to individual forecasts also renders the consensus forecast uninformative about the rationality of those individual forecasts.

Bonham and Cohen (2000) test for micro-homogeneity in a Seemingly Unrelated Regression system, adapting a variance covariance structure suggested by Keane and Runkle (1990). Bonham and Cohen (2000) find evidence of micro-heterogeneity for the GNP deflator, as well as several other variables in the SPF. We know of two other papers that have tested for micro-homogeneity in unbiasedness regressions using survey forecasts. Pearce (1984) used a SUR system and rejected micro-homogeneity for unbiasedness tests on S&P stock price index forecasts from the Livingston Survey. More recently, Batchelor and Dua (1991) rejected micro-homogeneity for unbiasedness regressions on real GNP and GNP deflator forecasts (among others) from the Blue Chip Economic Indicators forecasting service. Thus, for these survey forecasts, consensus regressions should not be used to test rationality; rationality can only be tested at the individual level.

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