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Advances in Economic Forecasting

Matthew L. Higgins
Western Michigan University

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W.E. Upjohn Institute for Employment Research
300 S. Westnedge Avenue
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Matthew L. Higgins
Western Michigan University

The six chapters that follow this introduction are based on lectures the authors gave at Western Michigan University as part of the 2009–2010 Werner Sichel Lecture Seminar Series, organized under the same title as the present volume. The lectures were given over an academic year during a time when the U.S. economy was just beginning to recover from the “Great Recession.” The economics profession’s inability to predict this catastrophe may have seemed like an inauspicious background for a lecture series on economic forecasting. However, the economic distress and surrounding uncertainty actually benefited the series because they heightened interest in the topic of economic forecasting. The question-and-answer sessions following each lecture revealed that some audience members had a healthy skepticism of economists’ ability to ever predict the future course of the economy. I think, however, that each speaker’s candid and realistic assessment of opportunities to improve economic forecasting left most attendees with some sense of optimism.

Several common recommendations emerge from the following six chapters for improving the reliability of economic forecasts. Authors Dean Croushore, Kajal Lahiri, and H.O. Stekler all emphasize that improvements in forecasting will require proper evaluation of the performance of forecasting methods, focusing particularly on the ability of methods to forecast in real time and predict turning points in major macro aggregates. David E. Rapach and Tae-Hwy Lee, in their chapters, argue that the abundance of economic data can be more efficiently exploited through model and forecast combination. Rapach, Lee, and coauthors Michael D. Bradley and Dennis W. Jansen each advocate using models that are adaptive and perform well in the presence of nonlinearity and structural change. Below, I briefly summarize each author’s chapter to help direct the reader to these specific themes.

In the book's second chapter, Croushore addresses the complications that data revisions have on economic forecasts produced in real time. He begins by advocating the use of forecasts provided by the Survey of Professional Forecasters (SPF). He argues that these forecasts are unbiased and efficient over long time periods. This survey is made publicly available by the Federal Reserve Bank of Philadelphia in an easily accessible format. (Croushore provides the Web address for this.) Furthermore, because this survey can be easily matched to the real-time macroeconomic data also maintained by the Philadelphia Fed, the survey provides a good data set for studying the role of data revisions in the forecasting process.

Croushore asserts that many forecast evaluation studies are flawed because real-time forecasts are compared to ex post forecasts that are based on revised data that actual forecasters did not have access to. To the real-time forecaster, recognition of the possible magnitude of data revisions causes uncertainty about model inputs, structure, and coefficient values. Croushore's research indicates that all three factors can degrade the quality of forecasts. Based on his own work, and the work of others, Croushore suggests that attempts to explicitly incorporate the process of data revision into model construction have so far had limited success in improving the quality of economic forecasts.

To illustrate these issues, Croushore examines forecasts in the 1990s from the SPF. When compared to the 2001 vintage actual values, the forecasts of gross domestic product (GDP) growth were consistently too low, and forecasts of inflation and unemployment were consistently too high. Forecasters appeared to be slow to recognize the effect of high productivity growth in that decade. When the forecasts are compared to actual values observed in real time for the variables, the forecasts appear much better. This may explain why forecasters were slow to adapt their models to the surge in potential output. Croushore's chapter demonstrates that research on the role of data revisions in economic forecasts is at a very early stage and should prove to be productive in the coming years.

In the third chapter, Lahiri addresses the intriguing question of how far into the future forecasters can provide information about the growth of GDP. He uses a survey of forecasts of the annual growth rate of GDP for 18 countries in the Organisation for Economic Co-operation and Development (OECD), obtained from Consensus Economics Inc. The

forecasts are monthly and begin at a 24-month horizon. For each country and forecast horizon, Lahiri calculates the Diebold-Kilian information statistic and Theil's U-statistic. Although there is variation across countries, he finds that the quality of the forecasts tends to continuously improve as the forecast horizon declines. For many countries, he finds a dramatic improvement in the information content of the forecasts beginning at about an 18-month horizon. This striking finding suggests that the current state of economic forecasting provides useful predictions only when the lead time is a year and a half or less.

Lahiri also examines the usefulness of the probability forecasts contained in the SPF to predict downturns in U.S. GDP at different horizons. These probability forecasts have been reported since 1968 but have been greatly underutilized by the profession. Lahiri first demonstrates how to use a receiver-operating-characteristic (ROC) curve to select a probability threshold for signaling the rare event of a downturn. Selecting an appropriate threshold, he reports hit/miss frequencies, Kuipers scores, and odds ratios for the implied predicted downturn. He finds that the probability forecast contains useful information for predicting GDP declines for up to two quarters ahead.

Rapach, in Chapter 4, proposes forecasting methods to deal with problems associated with forecasting regional and industry-level (RIL) variables. When forecasting such variables, an economist is confronted with a large number of potential aggregate and region/industry-specific predictor variables. In such a scenario, a traditional regression approach would tend to overfit the model, and the resulting model would likely forecast poorly out of sample. To operate in this data-rich environment, Rapach suggests forecasters consider three new methodologies: 1) bagging, 2) forecast combination, and 3) factor models. Bagging is a Monte Carlo technique that stabilizes the model selection of the traditional approach of choosing variables based on significant t -statistics. Forecast combination averages forecasts from separate autoregressive-distributed lag models using each candidate predictor. A factor model uses one model and a small number of aggregate input variables to forecast the cross section of RIL variables. A final forecast is obtained by averaging the forecasts from the three methods. Rapach cites research that shows such methods have been demonstrated to improve the forecasting of financial returns, another environment where a multitude of potential predictors exists.

To provide evidence that such methods improve forecasts of RIL variables, Rapach applies the methods to forecast quarterly employment growth in Michigan and Missouri from the end of the first quarter of 1990 to the end of the first quarter of 2010. He constructs forecasts using the three methods and 11 predictor variables. He finds that the three forecasts tend to outperform forecasts based on a simple autoregressive model and also tend to outperform those based on regression models that use each predictor separately. The best forecast, however, is obtained by averaging the bagging, forecast combination, and factor model forecasts. Seemingly, each method contributes some unique information for forecasting state-level employment growth.

Chapter 5 is based on a Sichel lecture delivered by Jansen, in which he summarized his paper (coauthored with Bradley) exploring the possibility of incorporating nonlinear structure to improve the forecasts of financial and real variables. The authors conduct an exercise to forecast monthly observations on the index of industrial production, the 10-year Treasury yield, and the excess return on Standard and Poor's stock index (the S&P 500). They focus on the threshold autoregressive (TAR), logistic smooth transition autoregressive (LSTAR), and exponential smooth transition autoregressive (ESTAR) models, which allow the structure of the model to depend on an observable state variable. They use lagged values of the series as the state variable. For the industrial production and stock returns series, they also introduce a "current depth of recession" variable, which is the difference between the current value of the series and its previous peak. This variable allows the series to have asymmetric dynamics, depending on whether the series is contracting or expanding.

Although Bradley and Jansen find strong evidence of nonlinearity in the estimation period, the performance of the forecasts based on the nonlinear models is mixed. Depending on the evaluation criterion used, some of the nonlinear models do outperform naive and simple autoregressive models. Formal tests for forecast improvement suggest that the nonlinear models marginally improve the quality of the forecasts of industrial production and excess stock returns. Bradley and Jansen's work demonstrates both the challenges and potential benefits of exploiting nonlinear structure.

Stekler, in Chapter 6, presents a survey of methods for evaluating macroeconomic forecasts. He begins by posing a list of questions that

any evaluation strategy should answer. He briefly describes the common statistical measures that test for unbiasedness, efficiency, and performance relative to a benchmark. He then describes two new developments in forecast evaluation. First, he proposes a method for jointly evaluating the directional accuracy of forecasts of both output growth and inflation based on the predictive performance test of Pesaran and Timmermann. Second, he furnishes an innovative method for appraising a forecast based on the benefit to the user. To measure the benefit of forecasts produced by the Federal Reserve (the Fed), he proposes comparing two things: 1) the targeted federal funds rate from a Taylor rule that uses the Fed's forecasts of output and inflation and 2) the targeted federal funds rate from a Taylor rule that uses the actual values of output and inflation. He reports finding that the Fed's forecasting errors produce a 100-basis-point error in the targeted federal funds rate. Although this error seems large, it is much smaller than errors produced by naive forecasts.

Having described evaluation procedures, Stekler then examines actual forecasts of output growth and inflation. Summarizing the findings of his previous research on forecasts for the Group of Seven (G7) countries, he reports that the results are mixed but tend to suggest that forecasts do have systematic biases and informational inefficiencies. There is also only marginal evidence that the profession's forecasts have improved over time. Stekler suggests that the poor forecasting performance can be attributed to the inability to forecast recessions.

Stekler concludes by describing the evaluation of labor market forecasts. U.S. unemployment is countercyclical and is coincidental with the business cycle in expansions, but lags in contractions. He asserts that the use of nonlinear models to represent this asymmetry has had only limited success in forecasting unemployment. He proposes a new method for evaluating the Bureau of Labor Statistics (BLS) long-term forecast of employment by age/gender categories and for evaluating the Census Bureau forecast of population by state. He decomposes the category/state forecast errors into components: errors that result from forecasting the aggregate and those that result from forecasting the category/state share. He evaluates the share errors using a dissimilarity index. He finds some evidence that the BLS employment-share forecasts outperform a naive forecast, but that the Census Bureau population-share forecasts do not outperform a naive forecast.

In the final chapter, Chapter 7, Lee presents a survey of the methods to efficiently combine abundant economic data to produce an improved forecast of a particular variable. He considers scenarios where there are many input variables and possibly many forecasts of the variable of interest. When many input variables exist, he presents recently developed methods for reducing the data using principal components and then constructing a forecast using a factor model. When many forecasts exist, he describes advanced methods for optimally combining the forecasts. This now-well-developed theory has mainly focused on producing point forecasts. Lee demonstrates that these techniques can also be applied to quantile, density, interval, and binary forecasts.

To conclude, I would like to acknowledge some individuals who made the 2009–2010 lectures a success and a pleasure for me to host. First, I would like to thank the six presenters for their enthusiastic and stimulating public lectures, which, again, formed the basis for the present volume. The long success of this lecture series has always depended on the quality of our speakers.

There are others who must be acknowledged as well. The W.E. Upjohn Institute for Employment Research provided financial support and made the publication of this volume possible. Connie Volenski's administrative skills made the organization of the lectures effortless for me, and I am greatly appreciative. Werner Sichel deserves special acknowledgement for initiating this lecture series nearly 50 years ago. His nurturing of this series over the many years has made an invaluable contribution to the WMU Economics Department. Finally, I would like to thank my wife, Shohreh Majin, and my son, Bakhtyar, for allowing me evenings away from home to contemplate the future of economic forecasting over late dinners with the presenters.