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Economic Forecasts and Expectations

ANALYSES OF FORECASTING BEHAVIOR AND PERFORMANCE

JACOB MINCER
Editor

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(Resolution adopted October 25, 1926, and revised February 6, 1933, February 24, 1941, and April 20, 1968)

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FOREWORD

The basic motivation of the studies collected in this volume is the belief that a proper understanding of how the economy functions is not possible without knowledge of how economic expectations are formed and how accurate they are. In contrast to the usual research conditions in which expectational data are not available, these essays deal with recorded expectational or forecasting data. The data provide an opportunity for substantive and methodological inquiry into the basic questions concerning the formation and accuracy of economic expectations. The essays complement one another in focussing on various aspects of these questions.

The following is a brief guide to the contents of the studies in the order in which they are presented. More detailed summaries are provided in the text of each essay.

The first essay, by Jacob Mincer and Victor Zarnowitz, is an exposition and development of methods for assessing the predictive accuracy of forecasts. Accuracy is evaluated first by means of statistical measures of the closeness with which predictions approximate realizations. Accuracy analysis in this absolute sense is followed by a comparative analysis, in which predictive performance is evaluated by comparisons of actual forecast errors with errors resulting from alternative or "benchmark" extrapolations of the series. The margin of superiority of forecasts over such extrapolations can be viewed as a measure of substantive forecasting effectiveness.

The testing of forecasts against benchmark extrapolations is an extension of "naive model" procedures. It is proposed as an optimal naive model test. The optimal benchmark extrapolation is one in which parameters (weights) to be applied to past data in projecting the future are not simply assumed but, rather, are estimated from the data so as to yield the smallest prediction error. Optimal benchmarks of this sort are approximated in practice by linear autoregressions.

Extrapolations not only serve as benchmarks for the evaluation of

forecasting performance but may also be viewed as ingredients in the formulation of forecasts. Methods are presented to decompose forecasts and forecast errors into extrapolative and nonextrapolative (autonomous) components. The analysis is extended to multiperiod forecasting, and illustrated by applications to a sample of macroeconomic forecasts compiled in the National Bureau's study of short-term economic forecasting.

One element of forecast error arises from errors in current and past data which constitute the base for projecting the future. In the second study, Rosanne Cole attempts to estimate to what degree forecasting accuracy might be impaired by the existence of these measurement or data errors. Her analysis distinguishes between effects of data errors on systematic (bias) and random components of forecast errors, and between effects arising from errors in variables and from errors in estimated relationships among variables.

Using successive revisions of provisional GNP estimates as a measure of GNP data errors, and simulating both extrapolative and econometric forecasting methods, Cole estimates that over one-third of the observed average forecast error is likely to have been induced by data errors.

Questions about forecasting behavior, rather than accuracy, are the central focus of the essay by Jacob Mincer. One of the questions is: Can we learn from data on actual forecasts how the forecasts were generated? Specifically, can we learn something about the nature of the forecasting procedure, at least insofar as the extrapolative part of forecasting is concerned? Within limits, positive answers are obtained for linear extrapolation.

These results are based upon a theoretical analysis of properties and implications of different forms of linear extrapolation. The analysis shows that adaptive or "error-learning" behavior is not restricted to the exponential form (geometrically declining weights applied to past observations) but can be ascribed to all forms of linear extrapolation. Moreover, a frequently observed or postulated phenomenon, known as regressivity in forecasting, is associated with a particular type of nonexponential extrapolation, termed "convex." Convex forecasting is adaptive, in the sense that forecast revisions are a fraction of the currently observed forecast error, but the fraction is smaller for longer-term than for near-term forecasts.

The analysis developed in Mincer's paper is extended and applied by Stanley Diller to an exploration of the term structure of interest rates. Diller starts with the question: If the forward rates implicit in the term structure can be viewed as market forecasts of future spot rates, what is the form and what are the properties of the implicit forecasting function? Earlier investigators have inferred two seemingly independent properties of forecasting behavior from data on the term structure: adaptivity—revisions of future forecasts based on discrepancies between past forecasts and current realizations, and regressivity—the prediction that future values will tend to move toward normal or trend levels. To these, Diller adds a third: extrapolation—if the forward rates are forecasts, they must be in part expressible as an extrapolation of past spot rates. Diller shows that all three properties are satisfied by a forecasting scheme with a convex extrapolative component.

In ascertaining the empirical consistency of such a scheme with several sets of data, Diller adduces support for the Hicks-Meiselman-Kessel formulations of the expectations hypothesis. He also provides further insights and leads for future research by empirically implementing several alternative decompositions of forecasts (forward rates) into extrapolative and other components, and by exploring their accuracy as predictors of subsequent spot rates.

The last essay, by Thomas Juster, is an analysis of the predictive performance of intentions or plans to buy consumer durables, as expressed in periodic consumer anticipations surveys. Juster compares the predictive contribution of consumer buying intentions data to that of other variables, such as income, income change, and expressed attitudes of optimism or pessimism regarding near-term economic prospects. He finds that intentions data were superior predictors of future purchases by different groups of consumers (cross sections), but performed rather weakly in past efforts to forecast changes in purchases by the population as a whole over time.

Juster's main purpose in this study is to strengthen the predictive power of buying intentions in time series by appropriate revisions of sample size, sampling procedures, and better specifications of forecasting equations.

The proposed reformulation is a logical implication of the notion that expressed intentions represent imperfect information on the sub-

jective purchase probabilities held by consumers. With such reformulation, Juster arrives at the following tentative conclusions, based on accuracy analyses of admittedly short time series: When used in conjunction with such variables as income and income change, the anticipations variables typically exert a dominant influence in predictive efficiency. Forecasting equations incorporating anticipations generate much more accurate predictions than autoregressive extrapolation. Forecasting models containing both consumer attitudes and consumer buying intentions perform best, provided properly measured intentions data are available.

This volume is the fourth in the series of research reports of the National Bureau's study of short-term economic forecasting.[1] The first two essays in this volume were conceived as methodological frameworks for the statistical analysis of forecasting data compiled by the study. In addition to serving this purpose, the formulations and their applications to the empirical materials stimulated additional related research in expectational economics. This research is embodied in the third and fourth essays. The fifth essay has its independent origin in continued analyses of surveys of consumer anticipations conducted at the National Bureau. Efforts to improve the forecasting efficiency of these surveys have been greatly strengthened by the cooperation of the U.S. Census Bureau.

The National Bureau's study of short-term economic forecasting is supported by grants from Whirlpool Corporation, General Electric Company, Ford Motor Company Fund, Relm Foundation, and U.S. Steel Corporation, as well as by other funds of the National Bureau. A grant of electronic computer time to the National Bureau by the International Business Machines Corporation was used for some of the statistical analyses in this volume. Juster's study of consumer anticipations was supported, in part, by the National Science Foundation.

We are indebted to the Bureau staff reading committees, which included Gary Becker, Phillip Cagan, Milton Friedman, John Kendrick, and Julius Shiskin; and to the Board reading committee, which in-

[1] The three reports thus far published are: Geoffrey H. Moore and Julius Shiskin, *Indicators of Business Expansions and Contractions*, New York, NBER, 1967; Victor Zarnowitz, *An Appraisal of Short-Term Economic Forecasts*, New York, NBER, 1967; Rendigs Fels and C. Elton Hinshaw, *Forecasting and Recognizing Business Cycle Turning Points*, New York, NBER, 1968. Scheduled for publication is R. Cole, "Errors in Estimates of Gross National Product."

cluded Emilio G. Collado, Henri Theil, and the late A. G. Abramson. Helpful comments and suggestions were also received from Gregory Chow, Franklin Fisher, Zvi Griliches, Albert Hart, George Katona, Reuben Kessel, Michael Lowell, E. Scott Maynes, Anna Schwartz, and Lester Telser. Geoffrey H. Moore's interest in forecasting behavior and performance and his influence on the substance of this volume predated the initiation of the studies and continued through their development. Finally, the volume represents a largely cooperative effort: The intellectual debt of each author to the co-authors is self-evident.

We are grateful for highly competent research assistance to: Martha Calaghan Bergsten, Avrohn Eisenstein, Dorothy Finger, Veronica Lavitola, Paul Wachtel, and Cecilia Weidemann. The charts were expertly drawn by H. Irving Forman and the manuscript was edited by Sharon Rasmussen.

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